1962-63 CATALOG

CALIFORNIA STATE POLYTECHNIC COLLEGE

Bulletin

AGRICULTURE
ENGINEERING
ARTS & SCIENCES

SAN LUIS OBISPO
SAN DIMAS
POMONA
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 55, and at Kellogg Campus, page 251.
- Engineering, at San Luis Obispo, page 109, and at Kellogg Campus, page 289.
- Applied Arts (including business), at San Luis Obispo, page 153.
- Applied Sciences, at San Luis Obispo, page 203.
- Arts and Sciences (including business), at Kellogg Campus, page 317.

Does the college offer nondegree occupational curricula? Page 56.

Can I meet the requirements for admission? Page 19.

May a student transfer from another college? Pages 19, 20.

What fees are charged? Page 50; at Kellogg Campus, pages 245, 246.

Where can I obtain board and room? Pages 37, 38; at Kellogg Campus, page 240.

What scholarships are available to freshmen? At San Luis Obispo, page 41 and at Kellogg Campus, page 242.

Does the college have an ROTC unit? Page 39.

What services does the college maintain for students?
- Counseling and testing, at San Luis Obispo, page 40; at Kellogg Campus, page 242.
- Advising, at San Luis Obispo, page 40; at Kellogg Campus, page 242.
- Health, at San Luis Obispo, page 40; at Kellogg Campus, page 242.
- Assistance in finding part-time employment, at San Luis Obispo, page 41; at Kellogg Campus, page 242.
- Loan funds, at San Luis Obispo, page 47; at Kellogg Campus, page 243.
- Placement at graduation, at San Luis Obispo, page 41; at Kellogg Campus, page 242.

Where do I write for further information?
- San Luis Obispo Campus, San Luis Obispo, California
- Kellogg Campus, Pomona, California
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**SUMMER QUARTER, 1962**  
*(Kellogg Only)*

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**SUMMER QUARTER, 1962**  
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(Kellogg Only)

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<td>Final examinations</td>
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<tr>
<td>September 7</td>
<td>Saturday</td>
<td>End of summer quarter</td>
</tr>
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TENTATIVE SUMMER QUARTER, 1963
(San Luis Obispo Only)

Four-week Term

<table>
<thead>
<tr>
<th>Date</th>
<th>Day</th>
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<tbody>
<tr>
<td>June 24</td>
<td>Monday</td>
<td>Registration of all students</td>
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<tr>
<td>June 25</td>
<td>Tuesday</td>
<td>Classes begin for all students</td>
</tr>
<tr>
<td>July 4</td>
<td>Thursday</td>
<td>Independence Day—academic holiday</td>
</tr>
<tr>
<td>July 19-20</td>
<td>Friday-Saturday</td>
<td>Final examinations</td>
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Six-week Term

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<tr>
<td>July 22</td>
<td>Monday</td>
<td>Registration of all students</td>
</tr>
<tr>
<td>July 23</td>
<td>Tuesday</td>
<td>Classes begin for all students</td>
</tr>
<tr>
<td>August 29-30</td>
<td>Thursday-Friday</td>
<td>Final examinations</td>
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ADMINISTRATION
Library Patio with Administration Building in Background
San Luis Obispo
ADMINISTRATION

TRUSTEES OF THE CALIFORNIA STATE COLLEGES

Glenn S. Dumke ............................................................ Chancellor

TRUSTEES

Governor Edmund G. Brown ........................................... Sacramento
Lieutenant Governor Glenn M. Anderson ......................... Sacramento
Roy E. Simpson, Superintendent of Public Instruction .............. Sacramento
Jesse M. Unruh, Speaker of the Assembly ......................... Sacramento
Louis H. Heilbron (Chairman) ...................................... San Francisco
Allen J. Sutherland (Vice Chairman) .............................. San Diego
Thomas W. Braden ..................................................... Oceanside
John E. Carr ............................................................... Newport Beach
William K. Coblenz .................................................... San Francisco
Mrs. Phebe B. Conley .................................................. Fresno
Trevor Gardner ........................................................... Pasadena
Donald M. Hart .......................................................... Bakersfield
Dan A. Kimball ................................................................ Sacramento
Charles I. Luckman ...................................................... Los Angeles
Theodore Meriam .......................................................... Chico
Thomas L. Pitts ........................................................... San Francisco
Daniel H. Ridder .......................................................... Rolling Hills
Albert J. Ruffo .............................................................. San Jose
Paul Spencer ................................................................. San Dimas
E. Guy Warren .............................................................. Hayward

COLLEGE ADMINISTRATION

Julian A. McPhee ............................................................ President
Leona M. Boerman ....................................................... Secretary to the President
Robert E. Kennedy ....................................................... Vice President
Harold O. Wilson ........................................................ Dean, Educational Services
Eugene E. Brendlin ....................................................... Foundation Manager
Douglass W. Miller ....................................................... Publications Manager

SAN LUIS OBISPO CAMPUS

Dale W. Andrews ........................................................ Dean of the College
Everett M. Chandler .................................................... Dean of Students
Carl C. Cummins ........................................................ Dean, Applied Arts Division
Clyde P. Fisher ............................................................ Dean, Applied Sciences Division
Harold P. Hayes ........................................................ Dean, Engineering Division
Jerald F. Holley ........................................................... Registrar
John D. Lawson ........................................................... Associate Dean (Activities)
E. D. Lovett ............................................................... College Physician
Donald S. Nelson ....................................................... Business Manager
Eugene Rittenhouse ..................................................... Placement Officer
Warren T. Smith ........................................................ Dean, Agricultural Division
Joics B. Stone ............................................................ Associate Dean (Counseling and Testing)
Arlene Vokoun .......................................................... Associate Dean (Women)
Howard West ............................................................. Assistant to the President
C. Paul Winner .......................................................... Associate Dean (Admissions and Records)
<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
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<tbody>
<tr>
<td>C. O. McCorkle</td>
<td>Dean of the College</td>
</tr>
<tr>
<td>Albert J. Aschenbrenner</td>
<td>Associate Dean (Counseling and Testing)</td>
</tr>
<tr>
<td>Carl R. Englund</td>
<td>Dean, Agricultural Division</td>
</tr>
<tr>
<td>Lauren J. Henderson</td>
<td>College Physician</td>
</tr>
<tr>
<td>Henry House</td>
<td>Associate Dean (Activities)</td>
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<tr>
<td>Kenneth Kitch</td>
<td>Assistant to the President and Director,</td>
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<td>Voorhis Educational Center</td>
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<tr>
<td>Thomas H. McGrath</td>
<td>Dean of Students</td>
</tr>
<tr>
<td>Robert L. Maurer</td>
<td>Acting Dean, Arts and Sciences Division</td>
</tr>
<tr>
<td>Mary Etta Murray</td>
<td>Associate Dean (Women)</td>
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<tr>
<td>J. Claude Scheuerman</td>
<td>Business Manager</td>
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<td>Harold P. Skamser</td>
<td>Dean, Engineering Division</td>
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<tr>
<td>Milton R. White</td>
<td>Placement Officer</td>
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<tr>
<td>Robert J. Winterbourne</td>
<td>Associate Dean (Admissions and Records)</td>
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<tr>
<td>Richard G. York</td>
<td>Registrar</td>
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</tbody>
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GENERAL INFORMATION
GENERAL INFORMATION

California State Polytechnic College is one of the fifteen California state colleges supported by public funds. These colleges are administered by the Trustees of the State College System of California, a board created by Chapter 49, Statutes of 1960. This new governing board was created as the result of studies conducted over several years concerning the future of higher education in California.

A separate governing board for the colleges was recommended in the Master Plan for Higher Education in California which was presented to the Legislature in February 1960.

AIMS OF THE COLLEGE

California State Polytechnic College provides occupationally centered education at the college level in agriculture, engineering, applied arts, and applied sciences. Instruction in the divisions of applied arts and applied sciences also emphasizes preparation for teaching in the elementary and secondary schools. 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, teaching, 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.

The college is 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.
General Information

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. For example, the Electronic Engineering Department does extensive repair work on radio and television sets for students and faculty.

THE ALUMNI ASSOCIATION

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

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

North Coast, comprising Napa, Sonoma, Lake, Mendocino, Del Norte, and Humboldt Counties.

Golden Gate, comprising Marin, Contra Costa, Alameda, San Francisco, and San Mateo Counties.

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

Central, comprising Calaveras, Alpine, Amador, Sacramento, San Joaquin, Solano, Yolo, El Dorado, Mono, Mariposa, Merced, Stanislaus, and Tuolumne Counties.

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

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

Hawaiian Islands, comprising all the islands constituting the State of Hawaii.

Region at Large, comprising the 48 other states, and other countries.

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 association publishes the Alumni News. This is the official publication of the association aimed at keeping the members informed of its activities, the latest happenings at the college, and news about individual members.

The California State Polytechnic College at San Luis Obispo is the official headquarters of the association and inquiries may be directed to the Kellogg Campus, Pomona.

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;
California State Polytechnic College

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 125 and day groups up to 145. The groups which it is serving represent local, regional, statewide, west coast and national areas.
ADMISSIONS

Admission standards at California State Polytechnic College are stated in the California Administrative Code, Title 5, Education, which provides uniform admissions regulations for all California state colleges.

Admission to California State Polytechnic College is open to the graduate of any high school, or other applicant who is judged by the appropriate college authorities to possess equivalent preparation, upon the submission of evidence of fitness to profit by college instruction—such fitness to be shown by previous scholastic records and by evidence of good moral character and personal qualifications.

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 determine the courses most suited to the student's needs at the time of registration. These 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. Students entering the major in elementary education at San Luis Obispo are given an additional test in penmanship by the Education Department.

At the time of admission to the college all students are accepted into a 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

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 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

HIGH SCHOOL GRADUATES *

For admission to the college, a high school graduate, or other applicant who is judged by the appropriate college authorities to possess equivalent preparation, must, as a minimum, meet one of the following:

1. Have completed the equivalent of 70 semester periods of course work, in subjects other than physical education and military science, with grades of A or B on a five-point scale during the last three years in high school.

Effective September 1, 1963 entering high school graduates must meet new requirements as follows:

1. Have earned 14 or more semester grades of A or B during the last three years of high school including at least six in college preparatory subjects, or
2. Have earned 10 or more semester grades of A or B during the last three years of high school and have attained at least the thirtieth percentile on a standard college aptitude test.

An applicant may be admitted if in the judgment of the appropriate college authority he has preparation equivalent to (1) or (2) above. Further information on the new admission requirements will be available at a later date.
2. Have completed the equivalent of 50 semester periods of course work, in subjects other than physical education and military science, with grades of A or B on a five-point scale during the last three years in high school and attained the twentieth percentile on the national norm of a standard college aptitude test. An applicant who fails to meet these standards may be admitted on a conditional basis, if in the judgment of the appropriate college authorities he gives promise of being able to succeed in college.

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.

LIMITED STUDENTS

Limited students (those registered for six units or less) are subject to the same admission requirements as regular students. See also under "Matriculation."

ADVANCED STANDING—BACHELOR OF SCIENCE PROGRAM

Bachelor of science degree candidates must complete the required curriculum as stated in Section 40501, Title 5, of the California Administrative Code and listed in the college catalog for the major chosen. Preparation for specific occupational fields makes it essential for a transfer student to take sufficient work at California State Polytechnic College for major department personnel to become well acquainted with the student, so that an appropriate placement recommendation may be made. 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.

Not 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.

Applicants Who Were Eligible For Admission With Freshman Standing

An applicant is eligible for admission to a state college with advanced undergraduate standing if he meets all of the following standards:

1. At the time of his graduation from high school, he was eligible for admission with freshman standing.
2. 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 as such colleges or universities.
3. He was in good standing at the last accredited college or university attended.

General Applicants Who Were Not Eligible For Admission With Freshman Standing

An applicant who was ineligible for freshman admission is eligible for admission with advanced undergraduate standing if he was in good standing at the last accredited degree-granting college or university attended and meets all of the requirements set forth in either of the following subsections:

1. He has earned in one or more accredited degree-granting colleges or universities 60 semester units of college credit with 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 has earned in one or more accredited degree-granting colleges or universities 24 semester units of credit with a grade point average of 3.0 (grade of B on a five-point scale) or better in the total program attempted at such colleges or universities.

Applicants With Particular Majors

An applicant who was ineligible for freshman admission may be admitted if his major is such that 60 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:
General Information

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.

Other Applicants

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

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 to the graduate division following graduation.

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 300, 400, or 500 series courses as graduate credit, when such courses are not required in order to receive the baccalaureate degree. These units may apply to graduate objectives, as appropriate, and may be used as part of the 45 unit requirement for the master's degree.

Admission from a Nonaccredited 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.

**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.
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 of college work.

All students, whether regular or limited, must complete the matriculation process. They must also complete Form SC-50, Statement of Residence, in advance so that their residence status can be determined prior to registration.

REGISTRATION PROCEDURE

A "Permit to Register" is prepared by the Registrar's Office for each student who has been accepted to register. 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. Students are not admitted to courses unless they are registered as students at the college.

CHANGE OF CURRICULUM

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

REVISION OF CURRICULAR REQUIREMENTS

A student is not held for courses added to a curriculum in quarters which he has completed. However, a student shall meet all changes in curricular 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.

A fee of $1 will be charged for each program change made after the allowed time except in cases where the change is made upon the recommendation of the student's departmental adviser. Activity courses in physical education and music may be added and changes of program involving refresher courses in English, mathematics, and chemistry may be made before the last day to drop classes without penalty.

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.

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 either as a limited or as a regular student 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**—Withdrawn from course without failure

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 re-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.

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. A student who desires to carry 6 units or less in a regular quarter will register as a limited student. 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 either as a regular or limited student 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.

A limited student may not enroll for either credit or audit in courses totaling more than six units.
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 15 weeks 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 $22\frac{1}{2}$ quarter units. Credit is not given for completion of the six-month Reserve Training Programs.

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-Voorhis 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 must have a year of residence to be eligible.

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.

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.

* Although the California Collegiate Athletic Association, of which the San Luis Obispo Campus is a member, permits three years of varsity competition following two years of junior college competition, junior college transfers who entered Cal Poly on or after October 1, 1961, will be subject to the college regulation stated above.
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 AND CREDENTIALS

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, and arts and 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, 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 Arts and Sciences Division 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) †

9 units from AmCiv 301, 302, 303; Pol Sc 301; Hist 304, 305
6-12 units from Ec 201, 202, 213, 304; 308, 413, 414; LMR 311, 312; Hist 101, 102, 103, 112; Geog. 308, 312, 315; Bus 301; Soc 105, 206; Soc Sc 101; Ant 201, 301; Pol Sc 401; Actg 121, 131

* Administrative Code Section 40405 requires:

40405. REQUIREMENTS IN GENERAL EDUCATION. To be eligible for the bachelor's degree from a state college, the candidate shall have completed a minimum of 45 units of
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, 305, 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, 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

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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.
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

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 300, 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.
   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

This building accommodates a series of large lecture and activity rooms on the top floor and administrative offices on the ground floor. The basement 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 gymnastic rooms 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 grandstand and bleachers seating 5,500 persons. There is also a spacious baseball field with permanent seating, and a track with a 220-yard straightaway.
California State Polytechnic College

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.

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 SERVICES

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.

Off-campus Housing—Men
There are several large privately owned and operated college approved cooperative housing units for single men students in downtown San Luis Obispo. Also there are private homes and apartments which have been inspected and approved by the college.
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. They provide excellent opportunities for leadership and activity programs, as well as guidance in community living. In addition there are three two-story permanent residence halls available for women students.

Off-campus Housing—Women

College approved off-campus housing consists of a limited number of rooms in private homes in the San Luis Obispo area. Some of these include board; some kitchen privileges. The addresses are available in the office of the Dean of Students.

Undergraduate women students not living at home or with close relatives are required to live in campus residence halls or approved off-campus housing. Undergraduate women students living in unapproved housing must have written permission on file in the office of the Dean of Students, prior to registration.

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. Twenty-four hour medical service is provided while the college is in session during the Fall, Winter, and Spring quarters.

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 1½ 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.
San Luis Obispo Campus

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 and Tactics 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 page 219.

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, both men and women, 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 its 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, boxing, 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 page 27 of this catalog.

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 State Polytechnic College

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, vocational 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 or encourage membership in either national or local social fraternities or sororities.

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 special 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. The college maintains a well-equipped clinic and hospital 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 which is required.

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

The college has been successful for a number of years in placing virtually all of its recommended graduates. Not only is placement attempted by the college for each graduate, but men so placed are contacted frequently. The followup program includes contacting both the graduate and the employer to appraise success of placement and satisfaction of employer and employee.

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

For scholarships available to students at the Kellogg Campus see under SCHOLARSHIPS in the Kellogg section of this catalog.

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.

California State Grange Scholarships

Two California State Grange scholarships of $250 are available for entering freshmen 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.
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.

Washburn & Condon Scholarship
Washburn & Condon Livestock Commission Company of Los Angeles and San Francisco makes available a $100 scholarship to a resident of any part of California. This young man must have carried an outstanding home farm project that included the production for market of some beef animals, hogs, or lambs, or two or
more of them. He must have graduated from high school and be eligible to attend California State Polytechnic College for the school year immediately following the awarding of this scholarship, and he must enroll in the Animal Husbandry Department. He should expect to engage in the production of market livestock after completing his education.

**West Coast Electronic Manufacturers’ Association Scholarship**

One $300 scholarship is made available each year to a freshman student entering the Electronic Engineering Department. The award is based on a competitive examination.

**Leopold Edward Wrasse Scholarships**

Approximately 50 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.

**Alumni Leadership Award**

An alumnus of the college provides annually an award of a life membership in the California State Polytechnic College Alumni Association to an outstanding senior student who has demonstrated a high quality of leadership in his student life.

**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 Freezers Association Scholarship**

One annual scholarship of $500 is awarded to a student specializing in the field of food or crops processing.
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.

California Association of Nurserymen, Monterey Bay Chapter, Scholarship

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

California Landscape Contractors Association Award of Merit

The California Landscape Contractors Association provides two scholarships in the amount of $100 each for upperclassmen studying 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.

Earth Equipment Corporation Scholarship

The Earth Equipment Corporation makes available one $500 scholarship for a student working toward a bachelor of science degree in agricultural engineering or mechanized agriculture. The student must have demonstrated interest and ability in farm mechanics and ability and excellence in written English, basic bookkeeping, and accounting.

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.

Harry Huston Scholarship in Agriculture

One $500 scholarship is made available for a student who will enroll as a senior majoring in agriculture.

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.

Kimber Scholarship in Poultry Husbandry

Kimber Farms, Inc., makes one annual $400 scholarship award to a student who is majoring in poultry husbandry and who has completed at least three quarters of outstanding work in this department.

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.
Link-Belt Company Scholarship

The Link-Belt Company provides one $500 scholarship to a student who will enroll with junior standing in the Mechanical Engineering department. Preference is given to a student from the localities of the company plants in California, i.e. San Francisco and Los Angeles.

Mahler Award

Each year, Martin Mahler, consultant on prestressed concrete, awards a membership in the American Society for Testing Materials to the student in architectural engineering doing the best work in the field of prestressed concrete.

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

One $250 award to a sophomore 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.

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 one $400 scholarship to be awarded to a junior, senior, or graduate student in elementary education who intends 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 annual $300 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 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.

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.

West Coast Electronic Manufacturers' Association

One $300 scholarship is made available each year to a student who has 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 pro-
gram 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

For loan funds available to students at the Kellogg-Voorhis Campus see under LOAN FUNDS in the Kellogg-Voorhis section of this catalog.

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.

Edger 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.

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 agricultural journalism.

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 (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.
## FEES AND EXPENSES

### STATE FEES AND DEPOSITS

<table>
<thead>
<tr>
<th>Description</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials and service fee (quarter)</td>
<td>$13.00</td>
</tr>
<tr>
<td>Nonresident tuition (U.S.):</td>
<td></td>
</tr>
<tr>
<td>Each student enrolled for six units or less</td>
<td>$13.00</td>
</tr>
<tr>
<td>Each student enrolled for over six units</td>
<td>$25.50</td>
</tr>
<tr>
<td>Each student enrolled in summer quarter</td>
<td>$25.50</td>
</tr>
<tr>
<td>Nonresident tuition (Foreign):</td>
<td></td>
</tr>
<tr>
<td>Each student enrolled for 15 units or more (per quarter)</td>
<td>$120.00</td>
</tr>
<tr>
<td>Each student enrolled for less than 15 units (per quarter per unit or fraction of unit)</td>
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<tr>
<td>Late registration fee</td>
<td>$5.00</td>
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<tr>
<td>Transcript of record (no charge for first copy)</td>
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<tr>
<td>Course credit by special examination fee (per unit)</td>
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<tr>
<td>Extension course fee (per unit)</td>
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<tr>
<td>Conference, Short Course or Institute, per person Estimated Cost</td>
<td>$6.50</td>
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<tr>
<td>Change of program fee</td>
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<tr>
<td>Failure to meet administratively required appointment or time limit</td>
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</tr>
<tr>
<td>Credential fee</td>
<td>$8.00</td>
</tr>
<tr>
<td>Check returned for any cause</td>
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</tr>
<tr>
<td>Parking fee (nonreserved spaces, per quarter)</td>
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</tr>
<tr>
<td>Associated student card fee (fall quarter)</td>
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</tr>
<tr>
<td>Associated student card fee (winter and spring quarters, each)</td>
<td>$3.75</td>
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<tr>
<td>Post office fee (all students, per quarter)</td>
<td>$1.00</td>
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<tr>
<td>Medical fee (per quarter)</td>
<td>$3.00</td>
</tr>
<tr>
<td>Graduation fee (must be paid at time application for graduation is submitted)</td>
<td>$10.00</td>
</tr>
</tbody>
</table>

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

### LIVING EXPENSES FOR STUDENTS LIVING IN CAMPUS RESIDENCE HALLS

<table>
<thead>
<tr>
<th>Description</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room and board per quarter, including parking fee (subject to change)</td>
<td>$245.00</td>
</tr>
<tr>
<td>Housing security deposit (payable prior to occupancy)</td>
<td>$20.00</td>
</tr>
</tbody>
</table>

**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 payments.

**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 Friday, late breakfast and early dinner on Saturdays and Sundays. The cafeterias are closed on college holidays.

### 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.

*Not state fees, subject to change.*

† Proportionate fees apply during summer quarter.
registration and approximately the same amount at the time of winter and spring quarter registration.*

<table>
<thead>
<tr>
<th>Service</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associated student card (fall quarter, $7.50, winter and spring quarters, $3.75 each)</td>
<td>$7.50</td>
</tr>
<tr>
<td>Post office fee (per quarter)</td>
<td>$0.50</td>
</tr>
<tr>
<td>Medical fee (per quarter)</td>
<td>$3.00</td>
</tr>
<tr>
<td>Materials and service fee (per quarter)</td>
<td>$25.50</td>
</tr>
<tr>
<td>Room and board (19 meals per week)</td>
<td>$245.00</td>
</tr>
<tr>
<td>Books and supplies (estimated)</td>
<td>$50.00†</td>
</tr>
<tr>
<td>Weekend meals (estimated $10 per month)</td>
<td>$30.00</td>
</tr>
<tr>
<td>Laundry (estimated $10 per month)</td>
<td>$30.00</td>
</tr>
</tbody>
</table>

Estimated total per quarter (approximately 3 months) $391.50

**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:

- General Elementary Credential
- General Secondary Credential with Majors in: Agriculture, Life Sciences and General Science, Mathematics, Physical Education, Physical Science and General Science, Social Sciences
- Special Secondary Credential in Vocational Agriculture
- Special Secondary Limited Credential in Agriculture
- Special Secondary Credential in Homemaking Education
- Special Secondary Credential in Physical Education

**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:

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

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.*

* 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.
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. **Intelligence.** A satisfactory score on appropriate tests.
2. **Achievement.** Satisfactory performance in the areas of English usage, reading, spelling, arithmetic, science, handwriting, and the social studies as indicated by scores on achievement tests.
3. **Personal Adjustment.** Evidence of satisfactory personal adjustment, habits, interests and attitudes as shown by evaluation instruments, observations, interviews, and faculty ratings.
4. **Speech.** Demonstration of satisfactory speech quality and habits as indicated by a speech interview test or the satisfactory completion of a course in public speaking.
5. **Physical Fitness.** Evidence of good physical health must be shown before the time of student teaching.
6. **Scholarship.** Satisfactory scholarship on all work accepted by the college toward curriculum requirement must be in evidence before approval of candidacy for the teaching credential.
   a. Elementary credential, grade point average of 2.25.
   b. Secondary credential, grade point average of 2.50.
   c. Graduate work, grade point average of 2.75.
7. **General Education Requirements.** All applicants must show satisfactory progress toward meeting specific and degree requirements in general education.
8. **Professional Aptitude.** Applicants must show evidence of ability and willingness to work with pupils, parents, and school officials.

**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, the submission of photos, and the listing of references for the confidential teacher placement folder which is sent 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. Co-operation of the candidate in keeping information in the folder up to date is necessary for most effective service.
THE AGRICULTURAL DIVISION
THE AGRICULTURAL DIVISION

The Agricultural 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.

Curricula in the Agricultural 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 Agricultural 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 Agricultural 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 Agricultural 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 Agricultural Division at San Luis Obispo: agricultural business management, agricultural engineering, mechanized agriculture, animal husbandry, field and truck crops production, fruit production, dairy husbandry, dairy manufacturing, farm management, food processing, ornamental horticulture, poultry husbandry, and soil sciences. 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.
At Cal Poly, the student preparing for certification to teach agriculture in high schools of California pursues one of the undergraduate majors offered in the Agricultural Division. This assures the potential teacher of depth in the technical field of agriculture. The agriculture teacher candidate will need to use carefully the elective units available in the undergraduate curriculum to complete courses additionally required for the teaching credential. Guidance in course selection to meet teaching credential requirements in Agricultural Education is available through advisers in the Agricultural Education office.

Candidates for the Special Secondary Credential in Vocational Agriculture take a fifth year of college work. During this year the candidate completes five months of course work in education, agriculture and agricultural education and five months of student teaching in a selected high school vocational agriculture department. The student teacher receives a minimum apprentice-type salary. Most candidates for the vo-ag credential also qualify for the General Secondary with a teaching major in agriculture and a minor usually in life sciences and general science. Upon satisfactory completion of his graduate year the candidate is within 12 quarter units of meeting course requirements for the M. A. degree in education with a concentration in agriculture.

Candidates may also prepare for the teaching of general agriculture, requiring a somewhat shorter period of preparation.

See Education Department for description of courses in Agricultural Education.

**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 agricultural departments: agricultural business management, agricultural engineering, animal husbandry, dairy husbandry and manufacturing, farm management, field, fruit, and truck 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.

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 Agricultural Division and department heads.
**Agricultural Division**

**Freshman**

<table>
<thead>
<tr>
<th>Course</th>
<th>F</th>
<th>W</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeds and Feeding (AH 101, 102)</td>
<td></td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Market Beef Production (AH 121)</td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Elements of Swine Production (AH 122)</td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Elements of Sheep Production (AH 123)</td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Agricultural Mechanics (AE 121, 122)</td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>*Applied English Composition (Eng 100)</td>
<td></td>
<td></td>
<td>3</td>
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<tr>
<td>Agricultural Math (Math 102)</td>
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<td>3</td>
<td></td>
</tr>
<tr>
<td>Agricultural Project Records (FM 100)</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Physical Education (PE 141)</td>
<td>½</td>
<td>½</td>
<td>½</td>
</tr>
<tr>
<td>*Agricultural Biology (Bio 100)</td>
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<td>3</td>
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</tr>
<tr>
<td>Soils (SS 121)</td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Electives</td>
<td>4</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

| Total | 16½ | 15½ | 16½ |

A student enrolled in the technical program may transfer to a degree program by completing courses offered in the specific four-year degree curriculum.

**HORSESHOEING**

A short 12-week 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, Southdown. From 20 to 40 breeding ewes are maintained in each of the breeds, giving the students an opportunity of carrying on typical pure-bred 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.

*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.
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 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>Semester</th>
<th>F</th>
<th>W</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Freshman</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Introduction to Agricultural Business Management (ABM 101)</td>
<td>3</td>
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<tr>
<td>Agricultural Marketing Programs in California (ABM 102)</td>
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<tr>
<td>Agricultural Business Organization (ABM 103)</td>
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</tr>
<tr>
<td>Agricultural Mathematics (Math 102, 103)</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Agricultural Mechanics (AE 121, 122)</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Language Communication (Eng 104, 105, 106)</td>
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<td>3</td>
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<tr>
<td>Physical Education (PE 141)</td>
<td>½</td>
<td>½</td>
<td>½</td>
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<tr>
<td>Health Education (PE 107)</td>
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<tr>
<td>General Botany (Bot 121)</td>
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</tr>
<tr>
<td>* Electives</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>16 ½</strong></td>
<td><strong>16 ½</strong></td>
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<tr>
<td><strong>Sophomore</strong></td>
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<tr>
<td>Agricultural Business Sales and Service (ABM 201)</td>
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<td></td>
</tr>
<tr>
<td>Agricultural Cooperative Organization and Management (ABM 202)</td>
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<td>3</td>
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<tr>
<td>Agricultural Business Credit and Finance (ABM 203)</td>
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<tr>
<td>Basic Accounting (Actg 131)</td>
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<tr>
<td>Principles of Economics (Ec 201)</td>
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<tr>
<td>Agricultural Marketing (FM 304)</td>
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<tr>
<td>Public Speaking (Sp 201)</td>
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<td>2</td>
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<tr>
<td>§§ Literature, Philosophy</td>
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<tr>
<td>Report Writing (Eng 301)</td>
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<td>Sports Education (PE 241)</td>
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<tr>
<td>Applied Biology (Bio 110)</td>
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<tr>
<td>Descriptive Statistics (Math 211)</td>
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<td>* Electives</td>
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<td><strong>16 ½</strong></td>
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</tr>
</tbody>
</table>

*At least 36 units shall be chosen with the approval of the adviser from other fields of agriculture. Twelve of the 36 units shall be in any one agricultural major.

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

Agricultural Business Management and Government Policy (ABM 301) 3
Agricultural Business Sales Management (ABM 302) 3
Agricultural Property Management and Sales (ABM 321) 4
Advanced Agricultural Business Management (ABM 323) 4
General Psychology (Psy 202) 3
Advanced Public Speaking (Sp 202) 2
General Inorganic Chemistry (Chem 324, 325) 4 4
Organic Chemistry (Chem 326) 4
American Government (Pol Sci 301) 3
* Electives 3 7 6

Senior

Agricultural Labor Relations and Personnel Management (ABM 403) 3
Agricultural Business Operations Analysis (ABM 421) 4
Agricultural Business Communication (ABM 422) 4
Senior Project (ABM 461, 462) 2 2
Undergraduate Seminar (ABM 463) 2
Business Law (Bus 301) 3
Agricultural Biochemistry (Chem 328) 4
Growth of American Democracy (Hist 304) 3
The U. S. in World Affairs (Hist 305) 3
* Electives 5 6 8

- At least 36 units shall be chosen with the approval of the adviser from other fields of agriculture. Twelve of the 36 units shall be in any one agricultural major.

**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.

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.

* California State Polytechnic College
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 323 Advanced Agricultural Business Management (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 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. Prerequisites: ABM 203, 323

ABM 422 Agricultural Business Communication (4)
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, 1 two-hour laboratory. Prerequisite: Senior standing.

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.
Agricultural Division
AGRICULTURAL ENGINEERING DEPARTMENT
Department Head, James F. Merson
Ralph O. Bille
James H. Carrington
John Dunn
William M. Kirkpatrick
Wayne F. Kroutil
E. Louis LeBay
Willard H. Loper
Robert M. Matheny
Vernon H. Meacham
John L. Merriam
Clive O. Remund
Glenn W. Rich
Glenn W. Salo
Leo Sankoff
Donald R. Warden

A student majoring in this department may follow one of two curricula:

1. The Agricultural Engineering curriculum 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.

2. The Mechanized Agriculture curriculum 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 Agricultural Division. Two new 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.

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

CURRICULUM IN AGRICULTURAL ENGINEERING

<table>
<thead>
<tr>
<th>Freshman</th>
<th>F</th>
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<tbody>
<tr>
<td>Introduction to Agricultural Engineering (AE 100)</td>
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<tr>
<td>Agricultural Mechanics (AE 128)</td>
<td>2</td>
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<tr>
<td>Farm Machinery (AE 221, 222)</td>
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<tr>
<td>Farm Tractors (AE 241)</td>
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<tr>
<td>Engineering Drafting (ME 151, 152, 153)</td>
<td>1</td>
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<tr>
<td>Machine Shop (MS 141)</td>
<td>1</td>
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<tr>
<td>Shop Processes (MS 147, 148)</td>
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<tr>
<td>Shop Processes (Weld 147, 148)</td>
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<tr>
<td>Soils (SS 121)</td>
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<td>Plant Production</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>Language Communication (Eng 104, 105, 106)</td>
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<td>Health Education (PE 107)</td>
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<tr>
<td>Physical Education (PE 141)</td>
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<tr>
<td>* Elective</td>
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</table>

* Of the 46 units of electives a student specializing in Power and Machinery or Soil and Water will select 23 or 22 units respectively with the approval of the adviser. An additional 10 units must be selected from courses in the Agriculture Division.
## Sophomore

<table>
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<th>Course</th>
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<tbody>
<tr>
<td>Farm Structures (AE 231)</td>
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<td>Principles of Irrigation (AE 236)</td>
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<td>Engineering Surveying (AE 237, 238)</td>
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<td>Soil Conservation (SS 202)</td>
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<td>Animal Production</td>
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<tr>
<td>Public Speaking (Sp 201)</td>
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<tr>
<td>Applied Biology (Bio 110)</td>
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<tr>
<td>Analytic Geometry and Calculus (Math 201, 202, 203)</td>
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<td>General Physics (Phys 131, 132, 133)</td>
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<td>Engineering Statics (Phys 201)</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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<td><strong>Literature</strong></td>
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## Junior

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<tr>
<td>Hydraulics (AE 312)</td>
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<td>Rural Electrification (AE 324, 325)</td>
<td>3</td>
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<td>Irrigation Systems (AE 331)</td>
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<td>Farm Power (AE 334, 335, 336)</td>
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<tr>
<td>Engineering Dynamics (Phys 202)</td>
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<tr>
<td>General Inorganic Chemistry (Chem 324, 325)</td>
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## Senior

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<tbody>
<tr>
<td>Farm Structures (AE 433)</td>
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<tr>
<td>Senior Project (AE 461, 462)</td>
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<tr>
<td>Undergraduate Seminar (AE 463)</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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<tr>
<td><strong>Literature or Philosophy</strong></td>
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<td>General Psychology (Psy 202)</td>
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## CURRICULUM IN MECHANIZED AGRICULTURE

### Freshman

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<tbody>
<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>Farm Construction and Maintenance (AE 129)</td>
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<td>Farm Tractors (AE 241)</td>
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<td>Soils (SS 121)</td>
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<tr>
<td>Animal Production</td>
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<td>Plant Production</td>
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<tr>
<td>Agricultural Mathematics (Math 102, 103)</td>
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<tr>
<td>Language Communication (Eng 104, 105, 106)</td>
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<tr>
<td>Engineering Drafting (ME 151, 152, 153)</td>
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<tr>
<td>Machine Shop (MS 141)</td>
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<tr>
<td>Shop Processes (MS 147, 148)</td>
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<td>Shop Processes (Weld 147, 148)</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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</table>

* Of the 46 units of electives a student specializing in Power and Machinery or Soil and Water will select 22 or 23 units respectively with the approval of the adviser. An additional 10 units must be selected from courses in the Agriculture Division.

** To be selected from the General Education list.

† 15 units of electives shall be selected from courses in the Agricultural Division.
Agricultural Division

Sophomore

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<th>Course</th>
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<td>Farm Machinery (AE 221, 222)</td>
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<td>Farm Structures (AE 231, 232)</td>
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<td>Engineering Surveying (AE 237, 238)</td>
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<td>Irrigation (AE 240)</td>
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<td>Mathematics (Math 114, 115)</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>General Botany (Bot 121)</td>
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<td>Public Speaking (Sp 201)</td>
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<td>Welding (Weld 155, 156, 254)</td>
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<td>Sports Education (PE 241)</td>
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* Electives                          |   |   | 4 |

Junior

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<td>Farm Engines (AE 220)</td>
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<td>Agricultural Products Handling (AE 323)</td>
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<td>Farm Power (AE 335)</td>
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<td>Farm Equipment Projects (AE 344)</td>
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<tr>
<td>Soil Conservation (SS 202)</td>
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<tr>
<td>Report Writing (Eng 301)</td>
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</table>
** Literature, Philosophy            | 2 | 3 |   |
** Principles of Economics (Ec 201)  |   | 3 |   |
** Business Law (Bus 301)            |   |   | 3 |
** College Physics (Phys 121, 122, 123) | 4 | 4 | 4 |
* Electives                          |   |   | 7 |

Senior

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<tr>
<th>Course</th>
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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>Farm Records (FM 321)</td>
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<td>Ag Business Sales and Service (ABM 201)</td>
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§§ Management Elective               |   |   | 3 |
** General Psychology (Psy 202)       | 3 |   |   |
** American Government (Pol Sc 301)  |   | 3 |   |
** Growth of American Democracy (Hist 304) |   | 3 |   |
** U. S. in World Affairs (Hist 305) |   |   | 3 |
* Electives                          | 6 | 5 | 2 |

16 17 17

** Electives                          |   |   | 7 |

16 17 17

** Electives                          |   |   | 7 |

16 17 17

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; wood joints, wood fasteners and hardware; tool sharpening and fitting; concrete form building, mixes and materials; cold metal work; pipe fitting; sheet metal work; lumber grades and estimating. For majors other than Agricultural Engineering and Mechanized Agriculture. 1 lecture, 1 laboratory.

* 15 units of electives shall be selected from courses in the Agricultural Division.
** See General Education list. Include at least one course in literature.
§§ To be selected from any 300-400 series course in ABM or FM.
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 129 Farm Construction and Maintenance (2)
Maintenance, construction, modification, and repair of farm buildings and equipment. Cost estimates based on materials and methods of repair. Students will register for this course by sections according to their major. 1 lecture, 1 laboratory. Prerequisite: AE 122 or 128

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 Agricultural Division students other than degree majors in Agricultural Engineering. 2 lectures, 1 laboratory. Prerequisite: Math 103

AE 220 Farm Engines (3)
Fundamental principles of gasoline and diesel engines and their accessories. Tuneup, adjustment, minor overhaul, and servicing. Fuels and lubricants. For Agricultural Division students other than Agricultural Engineering. 2 lectures, 1 laboratory. Prerequisite: AE 241

AE 221 Farm Machinery (3)
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. 2 lectures, 1 laboratory. Prerequisites: AE 241, Math 102 or 117

AE 222 Farm 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 Structures (2)
Development of practical skills in farm carpentry and construction. Selection of lumber and materials. Concrete work. Foundation. Legal requirements. Farm buildings repaired or constructed during laboratory periods. 1 lecture, 1 laboratory. Prerequisite: AE 122 or AE 128

AE 232  Farm Structures (2)
Development of practical skills in carpentry and construction. Basic requirements of farm buildings. Selection of materials and equipment for farm buildings. Farm buildings repaired, constructed or modified during laboratory periods. 1 lecture, 1 laboratory. Prerequisite: AE 231

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: 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. Prerequisites: 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 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. Prerequisites: Math 103, SS 121

AE 241  Farm 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 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 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. Indentification, 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 334  Farm Power (2)
Fundamental principles of the gasoline engine and its application to agriculture. Troubleshooting, servicing, tuneup, and major overhaul of gasoline engines and their accessories. 1 lecture, 1 laboratory. Prerequisites: MS 147, AE 334

AE 335  Farm Power (2)
Fundamental principles of the diesel engine and its application to agriculture. Troubleshooting, servicing, tuneup, and major overhaul of high-speed diesel engines and their accessories. Liquefied petroleum equipment. Additional practice on gasoline engines. 1 lecture, 1 laboratory. Prerequisites: AE 220 or 334, or ME 103

AE 336  Farm 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. Prerequisites: AE 335, Phys 133

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

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. Prerequisites: SS 202, AE 312, AE 331

AE 421  Equipment Engineering (3)
Design and construction of specialized farm equipment. 1 lecture, 2 laboratories. Prerequisites: ME 153, MS 148, 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. Prerequisites: AE 221, 223, 421

AE 433  Farm Structures (4)
Functional planning of farm buildings. Environmental control factors. Loading and stress analysis. Structural design with steel and timber. 3 lectures, 1 laboratory. Prerequisite: ME 203 or Arch 206

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 240
AE 436  Advanced Hydrology (3)

The determination of design hydrographs for storage reservoirs, flood protection reservoirs, and channel improvement by the Rational, Unit Hydrograph, and Regional Flood Study methods. 2 lectures, 1 laboratory. Prerequisite: AE 315

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. Prerequisites: 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.
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.

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 Agricultural Division which describes this program. Detailed curriculum information is available from the department head.

### CURRICULUM IN ANIMAL HUSBANDRY

#### Freshman

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<tr>
<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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<tr>
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#### Sophomore

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<tr>
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<td>Commercial Beef Production (AH 222)</td>
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<td>Marker Swine (AH 223)</td>
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<td>Farm Machinery (AE 221, 222)</td>
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<td>Farm Tractors (AE 241)</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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<td>Public Speaking (Sp 201)</td>
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<td>Principles of Economics (Ec 201)</td>
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#### Electives

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<td>Sports Education (PE 241)</td>
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<td>General Bacteriology (Bact 221)</td>
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<td>Electives</td>
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$\S$ To be selected from the General Education list.
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.

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)

Types, breeds, and market classes and grades of swine. Hog production under California and cornbelt conditions, nutritional requirements, rations utilizing common feeds, and parasites and diseases. 3 lectures, 1 laboratory.

* With the approval of the adviser, the student may substitute other courses in the Agricultural Division for two of these three courses.

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

§§ To be selected from any 300-400 series course in ABM or FM.
AH 123  Elements of Sheep Production (4)
The background of successful sheep operations in the West. Selection of breeds and type in relation to location. Market classes and grade of sheep. The dry lot feeding of lambs. 3 lectures, 1 laboratory.

AH 131  Basic Equitation (3)
Grooming, saddling, bridling, mounting, seat and hands. Horseback riding both bareback and under saddle. Designed to teach basic equitation to 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 management through a sheep year. Breeding season, preparation of ewes and rams. Gestation, summer care. Preparation for lambing, lambing and lamb growing seasons, selling lambs and wool, buying replacements, culling, controlling disease. Equipment and bar details. 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. Prerequisites: AH 102, 121

AH 223  Market Swine (4)
Management of a commercial swine herd and care of pigs till marketing. Market channels and cycles, production cost analysis, hog slaughter and pork processing. Nutritional deficiency diseases and ration formulation utilizing garbage, cull and byproduct feeds. 3 lectures, 1 laboratory. Prerequisite: AH 102, 122

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 (3)
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. Prerequisites: Bio 303, VS 123

AH 321  Swine Husbandry (3)
The purebred swine industry including selection of breeding stock, production registry and testing programs, meat-type certification programs, breeding systems, pedigrees, breed history, purebred shows and sales, and facilities and equipment. 2 lectures, 1 laboratory. Prerequisite: AH 223

AH 322  Specialized Sheep Enterprises (4)
The management of a purebred flock of sheep. Production of range and stud rams. Use of irrigated pastures by fattening lambs and ewes and lambs. 3 lectures, 1 laboratory. Prerequisite: AH 221

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
Selection of beef cattle, sheep, swine, and horses according to breed, type and use. 1 lecture, 2 laboratories.

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. Prerequisites: AH 102, Chem 328

AH 434  Specialized Horse Enterprises (3)
Training and gentling, driving and ground work with young horses. Training and advanced equitation on stock horse, high schooled horses, three-gaited saddle horses, and jumpers. 1 lecture, 2 laboratories. Prerequisites: AH 232 and AH 333 or the equivalent in experience.

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 326

AH 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.

AH 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.

AH 580  Advanced Animal Nutrition (3)
Current findings and problems in the field of animal nutrition. Effects of new experimental research on the livestock industry. 3 lectures.

AH 581  Graduate Seminar in Animal Production (3)
Current findings and research problems in the field and their application to the industry. 3 lectures.
The Crops Department curricula are designed to prepare students for field, fruit, and truck crop production. Instruction in field crops qualifies students for placement in specialized crop production and for general farming involving combinations of both crops and livestock; for placement in such related fields as service and sales in seeds, weed and pest control, and fertilizers, as fieldmen in sugar beets and other crops; and for government employment as agronomists.

The curriculum in crops production prepares for specialized farm production and for employment with shipping firms, process plants, pest control and fertilizer companies, seed distributing companies, and governmental employment.

The curriculum in fruit production is designed to train majors to manage and operate orchards and for such other production jobs in deciduous fruits and grapes and related activities as fieldmen for canneries and shipping companies, and as fruit inspectors.

Graduates in these fields have entered vocational agriculture teaching and agricultural extension work.

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

The department has 25 acres of productive orchard and vineyard with about 100 varieties of fruit represented. Additional non-bearing acreage is being planted and the development of this acreage is available for class participation. Truck crop farming will annually occupy up to 30 acres with some of this land being double cropped. About 125 acres are devoted to field crop projects including irrigated and dry farmed crops. In addition, some 500 acres of college farm are extensively used in the instructional program. Field trips to areas where crops not common to San Luis Obispo are grown supplement the instructional program. All Crops Department majors are encouraged to carry a production project during their course of study.

**CURRICULUM IN CROPS PRODUCTION**

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<th>Freshman</th>
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<td>Introduction to Farm Crops (CP 101)</td>
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<td>Row Crops (CP 122)</td>
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<td>Combine Harvest Crops (CP 126)</td>
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*Of the 36 units of electives a student specializing in Agronomy or Truck Crops will select 11 units with the approval of the adviser.*
### Agricultural Division

#### Sophomore

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<td>Vegetable Production (TC 232)</td>
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<td>Weeds and Poisonous Plants (CP 221)</td>
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<td>Farm Machinery (AE 221, 222)</td>
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| Total                                      | 17½ | 17½ | 16½ |

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| Total                                      | 16 | 17 | 15 |

#### Senior

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<td>Senior Project (CP 461, 462)</td>
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<td>Irrigation (AE 240)</td>
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<td>Genetics (Bio 303)</td>
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| Total                                      | 16 | 16 | 15 |

#### CURRICULUM IN FRUIT PRODUCTION

#### Freshmen

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| Total                                      | 17½ | 16½ | 17½ |

* Of the 36 units of electives a student specializing in Agronomy or Truck Crops will select 11 units with the approval of the adviser.

** 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.
### Sophomore

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| Total                                                                 | 16½ | 17½ | 16½ |

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<td>Citrus and Avocado Fruit Production (FP 332)</td>
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<td>Orchard Disease and Pest Control (FP 334)</td>
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<td>Farm Records (FM 321)</td>
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<td>Agricultural Code of California (CP 303)</td>
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<td>Genetics (Bio 303)</td>
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| Total                                                                 | 16 | 16 | 16 |

### Senior

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<td>Senior Project (CP 461, 462)</td>
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<td>Fertilizers (SS 221)</td>
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| Total                                                                 | 16 | 16 | 16 |

### Descriptions of Courses in Crops Production

**CP 100 Principles of Crops, Pest and Disease Control (5)**

Symptoms, identification, and methods of control for the principal diseases and pests of field, truck, fruit, and nursery crops and ornamentals. Field practice in operation of spray equipment and dust machines. 4 lectures, 1 laboratory. To be taken only by technical students. Not open to degree students for degree credit.

**CP 101 Introduction to Farm Crops (1)**

Introductory course for crops production students. Importance of crops production to California agriculture and areas of production. Technical areas and job opportunities. Orientation to student project program in farm crops. 1 lecture.

*To be selected from the General Education list.

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

*Offered in odd-numbered years only.

§ Offered in even-numbered years only.

§§ See General Education list. Include at least one course in literature.
CP 121 Farm Crops of California (4)
Production principles for field and vegetable crops. Includes fundamental botany, taxonomy and the cultural practices for crop production such as soil preparation, tillage, fertilization, seed selection, planting and harvesting methods, irrigation, weed control, pest control, and crop rotation. Cotton and sugar beet production practices. 3 lectures, 1 laboratory.

CP 122 Row Crops (4)
Adaptation, production, utilization of major cool season field and vegetable crops such as potatoes, cauliflower, lettuce, carrots, onions. 3 lectures, 1 laboratory. Prerequisite: CP 121

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

CP 126 Combine Harvest Crop (4)
Production, distribution, adaptation and utilization of major combine-harvested crops including cereals, large seeded legumes, safflower, flax and corn; with field trips to major cereal producing areas of California. 3 lectures, 1 laboratory. Prerequisite: CP 121

CP 221 Weeds and Poisonous Plants (4)
Common and noxious weeds of California. Their identification, life histories, and control. Chemicals and equipment used for weed control in cultivated land and irrigation ditches on the range and wasteland. Poisonous weeds, their effects and prevention. 3 lectures, 1 laboratory.

CP 230 General Field Crops (4)
Production, harvesting, and use of important California cereal and field and truck crops. Production areas, crop rotations, disease and pest control. 3 lectures, 1 laboratory.

CP 231 Commercial Seed Production (4)
California field vegetable and flower industry production. Location, methods of growing, harvesting, storing. Economic outlook for principal kinds. Growing disease-free seed for other states. Certified seed production. Seed laws. 3 lectures, 1 laboratory. Prerequisites: CP 121, 122, 123

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

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

CP 321 Crop Disease and Pest Control (3)
Methods of combating disease, insect pests, and rodents attacking important California crop plants. Sprays, dusts, fumigants, poisons; cultural and sanitary controls. 2 lectures, 1 laboratory.

CP 322 Crop Technology (4)
Grades and qualities of California crops as they affect market values. Effects of harvesting and storage. Technological processes, especially as they affect demand and determine processing. 3 lectures, 1 laboratory. Prerequisites: CP 122, 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, as they apply to bloat and feed values. 2 lectures, 1 laboratory.
CP 330  Irrigated Pasture and Ranges (4)
Identification, production, utilization of irrigated pasture crop plants and range plants. A study of pasturing and grazing systems and comparison of mixtures and non-mixtures. A field trip to major production areas is required. 3 lectures, 1 laboratory.

CP 400  Special Problems for Advanced Undergraduates (1-2)
Individual or group study. Total credit limited to 4 units. 1 or 2 meetings per week. Prerequisite: Permission of the department head.

CP 410  Crops Physiology (3)
Practical studies in plant nutrition, soil and water relationships, seed physiology, modes of action of some herbicides, and systemic insecticides and practical applications of growth regulators; controlled environments. 3 lectures. Prerequisites: Bot 122, SS 221, Bot 126 or 223, Chem 328

CP 421  Oil and Fiber Crops (4)
Culture, fertilization, harvest, grading, and marketing of cotton, flax, safflower, castor beans, minor oil and fiber crops. Field trips to important centers of production. 3 lectures, 1 laboratory. Prerequisite: CP 121 or 230

CP 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.

CP 463  Undergraduate Seminar (2)
Student presentation and group leadership under faculty supervision on new developments in crop, fruit, and truck crop enterprises. 2 lectures.

CP 581  Graduate Seminar in Field Crop Production (3)
Group study of current problems of crop production; current experimental and research findings as applied to production and marketing. 3 lectures.

DESCRIPTIONS OF COURSES IN TRUCK CROPS PRODUCTION

TC 230  General Truck Crops (4)
Principles involved in production, harvesting, packaging, and marketing of major truck crops grown in California; survey of vegetable industry. 3 lectures, 1 laboratory.

TC 232  Truck Crops Production (4)
Production, adaptation, propagation utilization of major warm and cool season truck crops such as corn, beans, tomatoes, peppers, squash, melons, peas, broccoli, potatoes, cauliflower, lettuce, carrots, onions. 3 lectures, 1 laboratory.

TC 324  Harvesting and Packaging Truck Crops (4)
Harvesting methods and procedures; current handling and packaging techniques; marketing, grades and grading, minimum standards, containers, storage; requirements of crops for fresh markets. 3 lectures, 1 laboratory.

TC 326  Vegetables for Processing (4)
Production principles and methods; cultural and harvesting practices as applied to vegetable crops grown for processing (canning, freezing, etc.). Considerations include scope, varieties, special growing methods and harvesting factors for crops i.e., tomatoes, asparagus, green lima beans, sweet corn. 3 lectures. 1 laboratory.

TC 424  Truck Crops 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.
DESCRIPTIONS OF COURSES IN FRUIT PRODUCTION

FP 123 Beekeeping (3)
Elementary beekeeping, possibilities and problems of home and commercial beekeeping in California. Sources of nectar. Honey processing and marketing. Bee diseases and equipment. Pollination problems. 2 lectures, 1 laboratory.

FP 131 Pomology (4)
History of fruit growing; outlook; apple, peach, pear, and prune production; cover crop management. Field laboratories in harvesting, grading and storing of college orchard products. 3 lectures, 1 laboratory.

FP 132 Pomology (4)
Apricot, cherry, fig, olive and plum production. Establishing the orchard, pruning principles of young and bearing trees. Planting of deciduous trees. Practice in pruning young and bearing deciduous fruit trees and grapevines. 3 lectures, 1 laboratory.

FP 133 Pomology (4)
Almond, walnut, filbert, pecan, and miscellaneous nuts identification, culture, harvesting, and processing. Field practice in thinning of deciduous fruits, spring cultural problems. Field trips to nut orchards, hulling and processing plants. Culture and harvesting of bush berries and strawberries. 3 lectures, 1 laboratory.

FP 230 General Deciduous Fruit Production (4)
Common orchard practices in producing deciduous fruits, nuts, and grapes. Varieties, areas, propagation, planting, pruning, pollination, disease and insect control for home and commercial plantings. For students other than crops majors. 3 lectures, 1 laboratory.

FP 231 Viticulture (4)
Establishment of vineyards. Identification and uses of varieties of table, raisin, and wine grapes. Vineyard operations, disease and pest control, harvesting, packing grapes, making and processing raisins, wine making. Field practice in pruning, propagation, harvesting and variety identification in college vineyard. 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 131 or 132 or 133 or 230.

FP 236 Orchard Management (4)
Management problems in orchard and packing house operations. Job instruction training. 3 lectures, 1 laboratory.

FP 239 Home Fruit and Vegetable Production (3)
Growing and handling of fruits and vegetables common to backyard conditions. Practice in gardening. 2 lectures, 1 laboratory.

FP 322 California Fruit Growing (4)
Survey of citrus, deciduous, small fruit, and subtropical fruit production practices in California. Areas of production, propagation, harvesting, and marketing. 3 lectures, 1 laboratory.

FP 332 Citrus and Avocado Fruit Production (4)
Growing and marketing oranges, lemons, grapefruit, avocados and dates. Minor subtropical fruits also included. Orchard practice. For noncitrus majors. 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. Offered in odd-numbered years.
FP 421  Advanced Pomology (3)
Storage problems, postharvest physiology, environmental factors affecting fruit development. Two-day field trip required. 2 lectures, 1 laboratory. Offered in even-numbered years.

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.
DAIRY HUSBANDRY AND MANUFACTURING
DEPARTMENT

Department Head, Harmon Toone
Kenneth D. Boyle... 2
Russell Nelson
Elmer D. McGlasson
Herman E. Rickard

Instruction offered by the Dairy Husbandry and Manufacturing Department has two primary objectives:
1. To train students for the efficient and economical production of dairy products and the management, feeding, and breeding of dairy cattle.
2. To train students in the processing, distribution, and sale of the various dairy products.

Dairy husbandry and dairy manufacturing are closely related and many dairy enterprises combine the production, processing, and distribution phases of the industry. Although dairy majors elect to specialize either in husbandry or manufacturing, the curricula are so arranged that a student automatically receives considerable concentration in the other field. Selection of specific elective courses in the biological sciences will provide the dairy husbandry or dairy manufacturing major with the background needed to enter the field of public health sanitation.

Graduates who specialize in dairy production find employment as farmers, farm foremen, farm managers, feed salesmen, fieldmen, herdsmen, vocational agriculture teachers, and in numerous other positions related to dairy production. Graduates who major in dairy manufacturing may find placement as dairy plant foremen, superintendents, salesmen, dairy inspectors, fieldmen, or testers.

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 includes a pipeline milker unit and a bulk trailer tank. 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.

A well-equipped dairy laboratory and college creamery is operated under commercial conditions with various dairy products tested, processed, and sold. Deliveries are made to the college cafeterias and student store.

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

CURRICULUM IN DAIRY HUSBANDRY

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<td>Dairy Cattle Judging (DH 142)</td>
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## Sophomore

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**Junior**

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<td>History of Dairy Breeds and Pedigrees (DH 323)</td>
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**Senior**

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** To be selected from the General Education list.

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

§ To be selected from any 300-400 series courses in ABM or FM.
Agricultural Division

CURRICULUM IN DAIRY MANUFACTURING

**Freshman**

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<td>Dairy Products Judging (DM 233)</td>
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<td>Butter Making (DM 236)</td>
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<td>Boilers and Steam Equipment (AC 237)</td>
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<td>Refrigeration in Agriculture (AC 238, 239)</td>
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**Junior**

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<td>Creamery Records (DM 336)</td>
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**Senior**

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* See General Education list. Include at least one course in literature.
** To be selected from any 300-400 series courses in ABM or FM.
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 photographing. 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. Prerequisites: DH 102, 121, 142

DH 222 Commercial Dairy Herd Management (4)
Commercial dairy practices from the standpoint of cost of feeding and management. Visits are made to successful dairy farms. 3 lectures, 1 laboratory. Prerequisite: DH 221

DH 230 General Dairy Husbandry (4)
Selection, breeding, feeding, and management of dairy cattle. Composition and food value of dairy products. Dairy industry statistics and opportunities. Producing and handling products. A general course for other than dairy majors. 3 lectures, 1 laboratory.

DH 243 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. 2 laboratories. 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. Prerequisites: DH 222, 243, 301, 323
Agricultural Division

DH 330  Artificial Insemination (2)
Techniques in the collection, evaluation, processing, storage and shipment of semen. Fertility problems. Record keeping. 1 lecture, 1 laboratory. Prerequisites: DH 121 or AH 121, VS 123 or VS 100

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. Prerequisites: 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. Prerequisites: 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. Prerequisites: 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. Prerequisites: 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. Prerequisites: 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. Prerequisites: DM 461, 462
The main purpose of this curriculum is to train the student to operate and manage a farm or ranch. While the operation of a farm should be the primary purpose of most students taking the curriculum, those students who plan to engage in allied work such as farm credit and farm appraisal will find the training ideal. Other employment fields include vocational agriculture teaching.

A large block of agricultural production courses is provided so that the student may be proficient in this vital area of training. To meet specialization desires, the student may choose 40 units of production courses with the approval and guidance of his adviser. In addition to the business training received in the farm management curriculum proper, the student will be instructed in other departments in such courses as accounting, statistics, law and business organization.

Interwoven throughout the curriculum are general education courses such as English, mathematics, history, economics, and political science. This training is provided to make for better citizenship and to allow the graduate to deal with his business associates on a high cultural and intellectual level.

### CURRICULUM IN FARM MANAGEMENT

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* Of the total "other agricultural courses and electives" 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.
### Senior

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<td>Crop Farm Management Problems (FM 421)</td>
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**DESCRIPTIONS OF COURSES IN FARM MANAGEMENT**

**FM 100  Project Records (1)**

Organization 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 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, 425, 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

* Of the total "other agricultural courses and electives" at least 40 units shall be chosen with the approval of the adviser from other fields of agriculture.
Agricultural Division

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 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 industry and related areas. Instruction in the field qualifies students for placement in the production phases, both field or plant, and the operating phases of the industry. This curriculum does not prepare students for the specialized field of food technology or research.

The curriculum specifically provides for training that will enable the graduate to accomplish doing and management jobs connected with the field and plant operations of the food processing industry. Skills achieved in the production aspects of the processing business are co-ordinated with theory study in science, humanity, and business courses.

The department when fully equipped will have a modern food processing laboratory with equipment for canning, freezing, and dehydrating food products. College products produced on campus will be processed in this model laboratory.

Two options are offered by the department. The Food Processing Management option emphasizes preparation for the production and management aspects of the industry. The Food Processing Operations option includes a concentration of related engineering and equipment skills courses applicable to the industry.

### CURRICULUM IN FOOD PROCESSING OPERATIONS

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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>General Truck Crops (TC 230)</td>
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<td>Agricultural Mechanics (AE 128)</td>
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<td>Engineering Drafting (ME 151, 152, 153)</td>
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<td>Sanitation and Waste Disposal (FI 232)</td>
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<td>General Deciduous Fruit Production (FP 230)</td>
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<td>Refrigeration in Agriculture (AE 238, 239)</td>
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### CURRICULUM IN FOOD PROCESSING MANAGEMENT

#### Freshman

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* To be selected from the General Education list.

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

§ To be selected from any 300-400 series course in ABM or FM.
### Agricultural Division 93

#### Junior

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<td>Harvesting and Marketing Truck Crops (TC 224)</td>
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<td>Agricultural Products Handling (AE 323)</td>
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<td>Agricultural Labor Relations and Personnel Management</td>
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<td>Report Writing (Eng 301)</td>
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#### DESCRIPTIONS OF COURSES IN FOOD PROCESSING

**FI 101 Survey of Food Industry (1)**

Introductory course including size, distribution, major production areas of the food processing industry. 1 lecture.

**FI 122 Food Processing Machinery (2)**

Processing equipment selection, use, maintenance and repair. 1 lecture, 1 laboratory.

**FI 123 Elements of Food Processing (3)**

Principles of unit processes in food processing including canning, freezing, concentration, dehydration and fermentation. 2 lectures, 1 laboratory.

**FI 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.

**FI 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.

**FI 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: FI 210

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

** To be selected from any 300-400 series course in ABM, FM, or Ec.
Fl 221, 222, 223, 224 Food Processing Operations (2) (2) (2) (2)
Lecture and laboratory study of complete processing procedures for seasonal fruits and vegetables, specialties and other processed food. 1 lecture, 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 (2)
Fundamentals, principles and procedures for inspecting processed foods based upon federal and state grades. Laboratory work in grading various products. 1 lecture, 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. Prerequisites: Fl 221, Math 211

Fl 332, 333 Food Production Control (4) (4)
Plant equipment construction, plant layout and flow lines, cost estimating, work simplification, automation and control systems. 3 lectures, 1 laboratory. Prerequisite: Fl 122, 123, 221, 222 or 223

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. 1 lecture, 2 laboratories. 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. Prerequisites: 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. Prerequisites: 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.
ORNAMENTAL HORTICULTURE DEPARTMENT

Department Head, Howard C. Brown

Anthony J. Amato  Jeanne H. Tucker  Ernest R. Houston

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, cold-frames, 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 Agricultural Division which describes this program. Detailed curriculum information is available from the department head.

CURRICULUM IN ORNAMENTAL HORTICULTURE

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<thead>
<tr>
<th>Freshman</th>
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<td>Nursery Practice (OH 121)</td>
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<td>Ornamental Shrubs (OH 122)</td>
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<td>Physical Education (PE 141)</td>
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<td>General Botany (Bot 121)</td>
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<td>Families of Agricultural Plants (Bot 235)</td>
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<td>General Entomology (Ent 126)</td>
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Sophomore

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<td>Ornamental Trees (OH 221)</td>
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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>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>§§ Literature, Philosophy</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>Fruit Crops (FP 230, 322, or 332)</td>
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**DESCRIPTIONS OF COURSES IN ORNAMENTAL HORTICULTURE**

**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.

**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. Prerequisites: OH 121

*A student specializing in Nursery Management, Landscape Contracting or Floriculture will select 12 of the 35 elective units 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 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. Prerequisites: 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, 123

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. Prerequisites: 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. Prerequisites: OH 125, 227

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. Prerequisites: 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. Prerequisites: OH 122, 124, 221, 223

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. Prerequisites: 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. Prerequisites: 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. Prerequisites: 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. Prerequisites: 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. Prerequisites: 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. Prerequisites: OH 121, 233

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. Prerequisites: OH 221, 337

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.
Agricultural Division

POULTRY INDUSTRY DEPARTMENT

Department Head, Richard I. Leach

Roland Pautz

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 Agricultural Division which describes this program. Detailed curriculum information is available from the department head.

CURRICULUM IN POULTRY INDUSTRY

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<td>Poultry Industry and Breeds (PI 121)</td>
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<td>Poultry Brooding (PI 122)</td>
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<td>Poultry Feeding (PI 123)</td>
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<td>Agricultural Mechanics (AE 121, 122)</td>
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<td>Feeds and Feeding (AH 101)</td>
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<td>General Botany (Bot 121)</td>
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*Eng 106 may be replaced by Eng 219 or 301.
California State Polytechnic College

Sophomore

- Poultry Selecting and Culling (PI 221) 2
- Poultry Products (PI 222) 3
- Poultry Incubation (PI 223) 2
- Poultry Housing (PI 233) 2
- Agricultural Surveying (AE 131) 2
- Poultry Anatomy and Physiology (VS 231) 3
- Soils (SS 121) 4
- Public Speaking (Sp 201) 2
- Principles of Economics (Ec 201) 3
- Sports Education (PE 241) 1.5
- General Bacteriology (Bact 221) 4
- Genetics (Bio 303) 3
- General Psychology (Psy 202) 3
- Electives 2

Junior

- Poultry Breeding (PI 321) 4
- Hatchery Management (PI 322) 4
- Poultry Hygiene and Diseases (VS 303) 3
- Farm Structures (AE 231, 232) 2
- Farm Records (FM 321) 2
- Principles of Farm Management (FM 322) 3
- ** Literature, Philosophy 3
- American Government (Pol Sc 301) 3
- Growth of American Democracy (Hist 304) 4
- General Inorganic Chemistry (Chem 324, 325) 4
- Organic Chemistry (Chem 326) 4
- Electives 4

Senior

- Advanced Poultry Plant Management (PI 402) 3
- Turkey Production (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 8

** 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.

** DESCRIPTIONS OF COURSES IN POULTRY INDUSTRY **

PI 121 Poultry Industry and Breeds (4)
Scope and importance of the poultry industry as a part of California agriculture. Poultry organizations, publications, employment opportunities. Breeds and varieties of poultry and their commercial adaptations. 3 lectures, 1 laboratory.

PI 122 Poultry Breeding (4)
Organization and planning of the replacement program on the commercial poultry ranch. Brooding and rearing techniques and practices, costs, and equipment. Growing stock care, feeding, diseases, and management. 3 lectures, 1 laboratory.

PI 123 Poultry Feeding (4)
Poultry feeds, nutritional requirements, feeding principles and practices. Feed deficiency diseases, formulation of rations for specific purposes, and commercial economy practices. 3 lectures, 1 laboratory. Prerequisite: AH 101
Agricultural Division

PI 221 Poultry Selection and Culling (2)
Biological and environmental factors that affect the number, size, and quality of eggs produced. Culling techniques, culling practices, and methods of selection for commercial purposes. 1 lecture, 1 laboratory.

PI 222 Poultry Products (3)
Packaging, grading, storing, and selling of poultry products. Market grade standards and laws. Dressing, drawing, cutting, and grading of poultry. Egg grading and candling. 2 lectures, 1 laboratory.

PI 223 Poultry Incubation (2)
Fundamentals of embryology and metabolism of the developing embryo. Principles and practices of artificial incubation. Environmental, nutritional, and breeding factors affecting the hatch. Selection and care of hatching eggs. 1 lecture, 1 laboratory.

PI 230 General Poultry Production (4)
Problems of selecting stock, brooding, feeding, culling, judging, and marketing. Housing and equipment for general farm use. Not open to poultry majors. 3 lectures, 1 laboratory.

PI 233 Poultry Housing (2)
Planning and organizing the buildings and equipment for the poultry plant. Principles of construction, organization, and types of design. Balancing the brooding, growing, and laying house facilities. 1 lecture, 1 laboratory. Prerequisite: PI 122

PI 248 Hatchery Practice (1)
Care and operation of incubators, sanitation in the hatchery, grading and sorting chicks, wing banding and pedigreering chicks, and hatchery records. 1 laboratory.

PI 321 Poultry Breeding (4)
Fundamental factors of genetics as applied to problems of poultry breeding, hereditary factors as applied to developing a strain. Sib testing, progeny testing, experimental mating, and pedigrees. Analysis of breeding records. 3 lectures, 1 laboratory. Prerequisites: PI 221, Bio 303

PI 322 Hatchery Management (4)
Organization and layout for the operation of a breeder or multiplier hatchery. Breeding program and interrelationship of the hatchery and co-operating egg producers. Advertising and selling program, financing, chick deliveries, and record keeping. 3 lectures, 1 laboratory. Prerequisite: PI 321

PI 402 Advanced Poultry Plant Management (3)
General organization and co-ordination of the commercial poultry plant. Trends in efficiency of operations. Replacement program, marketing, and health of the flock. 3 lectures. Prerequisites: All required freshman and sophomore poultry courses and PI 321

PI 421 Turkey Production (3)
Commercial turkey production in California and its relationship to other poultry meat products. Turkey varieties, breeding, judging, and selection. Feeding, housing, and disease control program. Market grades and standards. 2 lectures, 1 laboratory. Prerequisites: PI 123, 321, VS 231

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, research, and problems related to poultry husbandry. 2 lectures.

PI 581 Graduate Seminar in Poultry Production (3)
Current findings and research problems in the field and their application to the industry. 3 lectures.
SOIL SCIENCE DEPARTMENT

Arnold M. Dean  B. A. Dickson  Raymond V. Leighty
John V. Stechman

The functions of this department are to provide training in soil science for students in the Agricultural Division enrolled in other graduation majors and to prepare students in the occupational fields of soils, conservation, range management, education, and farming. 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 train individuals for employment in two major categories: namely, positions that require a wide knowledge of agriculture, such as vocational agriculture teachers, soil conservationists, land appraisers, fertilizer distributors, farm advisers, farm managers, or farm operators; and, secondly, highly specialized work, such as that of soil surveyors, laboratory technicians, college instructors, and soil specialists.

Students majoring in soil science may, by the proper selection of available courses in the junior year, specialize in one of two occupational areas: Soil Science or Soil Conservation.

Facilities of the department have been expanded to provide sufficient laboratory and fieldhouse space and equipment to meet the needs of the programs. 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. Work of outstanding value on nearby ranches and that being carried on by public agencies is also widely utilized.

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

CURRICULUM IN SOIL SCIENCE

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<td>Crop Production (CP 121 or 122 or 230 or TC 230)</td>
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<td>Animal Production (AH 230 or DH 230 or PI 230)</td>
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<td>Health Education (PE 107)</td>
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<td>Range Management (SS 223)</td>
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<td>Fruit Production (FP 131 or 132 or 230)</td>
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<td>Nursery Practices (OH 220 or 230)</td>
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<td>Agricultural Surveying (AE 131)</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>Social Sciences Elective</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>Sports Education (PE 241)</td>
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**To be selected from the General Education list.
**Agricultural Division**

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<td>Soil Fertility (SS 322)</td>
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<td>Range Technology (SS 332 or SS 323 or SS 433)</td>
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<td>Farm Records (FM 321)</td>
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<td>Farm Management (FM 322)</td>
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<td>Agricultural Biochemistry (Chem 328)</td>
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<td>General Bacteriology (Bact 221)</td>
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<td>U. S. in World Affairs (Hist 305)</td>
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<td>Public Speaking (Sp 201)</td>
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### Senior

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<td>Soil Chemistry (SS 423)</td>
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<td>Soil Physics (SS 432)</td>
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<td>Senior Project (SS 461, 462)</td>
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<td>Undergraduate Seminar (SS 463)</td>
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<td>General Psychology (Psy 202)</td>
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<td>Introduction to Philosophy (Phil 201)</td>
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<td>Literature (Eng 211 or 212 or 311 or 312 or 313)</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

**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 122

**SS 221 Fertilizers (4)**

Composition, value, and use of fertilizer materials and soil correctives. Methods employed in the manufacture, distribution, and application of fertilizers. 3 lectures, 1 laboratory. Prerequisite: SS 121

**SS 223 Range Management (4)**

Soil and plant characteristics of rangelands. Management practices used to maintain range resources and increase production of forage and livestock. 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.

* 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.**
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 323 Range Ecology (3)

Identification of range plants, succession, environment, and the application of ecological factors to the use of rangeland. 2 lectures, 1 laboratory. Prerequisite: Completion of 18 units in Soils Science courses.

SS 332 Range Technology (3)

Technical problems in range management. Development of plans for effective production and utilization of range forage. 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 DEPARTMENT
Chairman, John K. Allen
Wallace Glidden

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. Prerequisites: 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. 2 lectures, 1 laboratory. Prerequisite: Bact 221

VS 203  Animal Parasitology (2)
Identification, life cycles, prevention and control of the common external and internal parasites causing economic loss in livestock. 2 lectures. Prerequisites: Zoo 131, 132

VS 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

VS 303  Poultry Hygiene and Sanitation (3)
Flock health problems encountered by the poultryman. Control and prevention of common diseases and parasites. 3 lectures. Prerequisites: Bact 221, VS 231

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. Prerequisites: Zoo 131, Bact 221
THE ENGINEERING DIVISION
Mechanical Engineering Laboratory

East Engineering Building

Architect's Drawing of West Engineering Building (now under construction)
THE ENGINEERING DIVISION

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:

![Diagram of the program]

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.
The Aeronautical Engineering curriculum prepares students for engineering work dealing with the structure, propulsion, control, and ground support equipment for flight craft. 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 flightcraft fabrication, propulsion, structural test, and aerodynamics, and also has two design rooms and a hangar with adjoining airstrip.

The department sponsors student chapters of two national societies—the Institute of the Aerospace Sciences (IAS) and the American Rocket Society (ARS). Both of these chapters offer an active program of professional and social activity.

### CURRICULUM IN AERONAUTICAL ENGINEERING

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<tr>
<td><strong>Freshman</strong></td>
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<tr>
<td>Flightcraft Power Plants (Aero 124)</td>
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<td>Flightcraft Fabrication (Aero 125)</td>
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<td>Aeronautical Laboratory (Aero 126)</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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<td>Analytic Geometry and Calculus (Math 118, 201)</td>
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|                |   |   |   |
| **Sophomore**  |   |   |   |
| Flightcraft Materials (Aero 211) | 3 |   |   |
| Strength of Materials (Aero 205, 206) |   | 3 | 3 |
| Strength of Materials Lab (Aero 229) |   | 2 |   |
| Gas Thermodynamics (Aero 202) |   |   | 3 |
| General Physics (Phys 133) |   | 4 |   |
| Analytic Geometry and Calculus (Math 202, 203) | 3 | 3 |   |
| Language Communication (Eng 105, 106) | 3 | 3 |   |
| Differential Equations (Math 316) |   |   | 3 |
| Engineering Statics (Phys 201) |   |   | 3 |
| Engineering Dynamics (Phys 202) |   |   | 3 |
| Introductory Circuit Analysis (EL 213) |   | 3 |   |
| Electronics Lab (EL 253) |   |   | 1 |
| Literature (Eng 201) |   |   | 2 |
| Applied Biology (Bio 110) |   |   | 3 |
| Sports Education (PE 241) | ½ | ½ | ½ |
| Electives | 2 | 3 |   |
| **Total** | 18½ | 18½ | 17½ |

* Shop Processes AC 147, MS 147, MS 148, IE 147, Weld 147, Weld 148.
### Junior

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<td>Elementary Aerodynamics (Aero 302, 303)</td>
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<td>Flightcraft Stress Analysis (Aero 324, 325)</td>
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<td>Differential Equations (Math 317)</td>
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<td>Electromechanics (EL 311)</td>
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<td>Analog Computer Techniques (EL 313)</td>
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<td>Flightcraft Detail Design (Aero 344, 345)</td>
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<td>Principles of Economics (Ec 201)</td>
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<td>Flightcraft Design Laboratory (Aero 444)</td>
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<td>Supersonic Aerodynamics (Aero 404)</td>
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<td>Aerodynamics of Stability and Control (Aero 415)</td>
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<td>Flightcraft Design Lab (Aero 445, 446)</td>
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<td>** Industrial Management (LMR 311)</td>
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<td>Growth of American Democracy (Hist 304)</td>
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<td>Mechanical Vibrations in Flightcraft (Aero 410)</td>
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### Descriptions of Courses in Aeronautical Engineering

**Aero 124 Flightcraft Power Plants (3)**


**Aero 125 Flightcraft Fabrication (3)**

Methods of fabricating flight vehicles and their components. Identification of materials and nomenclature of parts. Basic manufacturing processes used in the aerospace industry. Environmental protection. 1 lecture, 2 laboratories.

**Aero 126 Aeronautical Laboratory (3)**

Introduction to the graphical and analytical solution of aeronautical engineering problems. Tabulation of engineering data, slide rule computations, and 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 202 Gas Thermodynamics (3)**

Fundamental thermodynamic relationships between gas pressure, temperature, specific volume, enthalpy and entropy. The thermodynamic laws governing energy and continuity of fluids. Ideal cycle applications to nozzles, compressors, engines and jets. 3 lectures. Prerequisite: Math 201, Phys 132 **Industrial Relations (LMR 312) may be substituted.**

* Senior Aero electives:

6 units to be selected from the following sequences:

Aero 412, 413; Aero 457, 458; Aero 463, 468; Aero 409, 411; Aero 409, 416.

† To be selected from the General Education list.
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 206  Strength of Materials (3)
Beam deflections. Statically indeterminate, restrained, continuous and curved beams. Column analysis. Failure under combined and fluctuating stresses. Shear flow in thin-walled members subjected to bending. 3 lectures. Prerequisite: Aero 205

Aero 211  Flightcraft Materials (3)
Chemical and physical characteristics of metallic and nonmetallic materials used in flightcraft construction. Standard tests for determining behavior-underload properties. Principles of heat treatment. 3 lectures.

Aero 229  Strength of Materials Laboratory (2)

Aero 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.

Aero 301  Fluid Mechanics of Flight (3)
Properties and characteristics of fluids. Fluid statics. Euler and Bernoulli equations of flow. Impulse and momentum forces in fluids. Compressible gas flow. Dimensional analysis. Boundary-layer theory. 3 lectures. Prerequisite: Phys 202

Aero 302  Elementary Aerodynamics (3)
The atmosphere, dynamics and thermodynamics of air, airspeed determination, types of fluid flow, fluid friction, airfoil theory, wing theory, lift, induced drag, parasite drag, power. 3 lectures. Prerequisite: Aero 301

Aero 303  Elementary Aerodynamics (3)
Propeller theory, propeller selection methods, aircraft propulsion methods, basic airplane performance problems, special performance problems. 3 lectures. Prerequisite: Aero 302

Aero 324, 325  Flightcraft Stress Analysis (4) (4)
Analysis of airplane and missile structural components; combined stress and failure theories; column and sheet-stringer panel analysis. Sheer-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, 209

Aero 344, 345  Flightcraft 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 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 laboratories.
Aero 401, 402  Flightcraft Propulsion Systems (3) (3)
Flightcraft power plant types, components, characteristics, and requirements. Principles of thrust and energy utilization. Thermodynamic processes and performance of turboprop, turbojet, ramjet, and rocket engines. 3 lectures. Prerequisite: Aero 401: Aero 124, 202; Phys 202. Aero 402: Aero 401, 404

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 402

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 403

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  Flightcraft Design Laboratory (3) (3) (3)
Premilinary aircraft, ballistic missile, and space vehicle design. Analysis of major parameters. Performance estimates, stress calculations, and stability analysis. Preparation of layout, balance and general arrangement drawings. Mathematical lofting technique. Trajectory design. 3 laboratories. Prerequisite: Aero 303, 345

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 forman 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  Sven A. Poulsen  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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<td>Air Conditioning Drafting (AC 121, 122, 123)</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>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 Physics (Phys 131, 132)</td>
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<td>Duct Construction (AC 124)</td>
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<td>Plumbing System Design (AC 131, 132)</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>Physical Education (PE 141)</td>
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#### Sophomore

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<td>Language Communication (Eng 104, 105, 106)</td>
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<td>Plumbing System Design (AC 231)</td>
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<td>Heating and Ventilating (AC 201, 202)</td>
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<td>Thermal Laboratory (AC 241, 242)</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>General Physics (Phys 133)</td>
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<td>General Chemistry (Chem 321, 322)</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 Literature (Eng 201)</td>
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<td>Strength of Materials (ME 202)</td>
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<td>Sports Education (PE 241)</td>
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* AC 147, MS 147, MS 148, IE 147, Weld 147, Weld 148.
California State Polytechnic College

Junior

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<td>Noise and Vibration Control (AC 307, 308)</td>
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<td>Thermal and Fluid Laboratory (AC 331, 332, 333)</td>
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<td>System Design (AC 341, 342, 343)</td>
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<td>Electrical Engineering (EE 207, 208)</td>
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<td>General Chemistry (Chem 323)</td>
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<td>Heat Transfer (AC 313)</td>
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<td>Fluid Flow (ME 311)</td>
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Senior

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<td>Advanced Fluid Flow (AC 402)</td>
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<td>Control Systems (AC 403)</td>
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<td>Air Conditioning System Design (AC 441, 442, 443)</td>
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<td>Psychology (Psy 202)</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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<td>Business Law (Bus 301)</td>
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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 147 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 Agricultural 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 Agricultural 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. 2 laboratories. Prerequisite: Phys 132. Concurrent: AC 201, 202

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 professional practice of architecture, structural engineering, and the many fields of the building industry provide a wide occupational choice. The curriculum in architectural engineering develops the background, design skills and attitudes which permit graduates to enter these fields with view toward eventually becoming a professional practitioner.

Emphasis in the early part of the curriculum is on elementary architectural design, construction, working drawings, mathematics, and science. With this background, instruction progresses to more advanced work in architectural and structural design and planning. In the senior year, a student may elect to specialize in architectural or structural design. All student work submitted for course credit becomes the property of the department.

The four-year curriculum leads to a bachelor of science degree in architectural engineering which the California State Board of Architectural Examiners recognizes as three of the seven years experience required for eligibility to take the examination for an architect’s license.

Scarab, honorary professional fraternity, and the American Institute of Architects, sponsor chapters in the department. The Los Angeles chapter of the Producers' Council presents a yearlong lecture series designed to introduce building products to the student. Lectures are also provided by visiting architects and engineers.

Field trips are taken to the Los Angeles and Bay areas each year to inspect outstanding buildings and construction projects.

**CURRICULUM IN ARCHITECTURAL ENGINEERING**

**Freshman**

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<td>Orientation (Arch 104)</td>
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<td>Basic Design (Arch 138, 139)</td>
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<td>Construction and Working Drawings (Arch 141, 142, 143)</td>
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<td>Perspective (Arch 145)</td>
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<td>Architectural Delineation (Arch 146)</td>
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<td>Freehand Drawing (Arch 147)</td>
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**Sophomore**

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<td>Strength of Materials (Arch 205, 206)</td>
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<td>City Planning (Arch 217)</td>
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<td><strong>Total</strong></td>
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* Students electing to specialize in structural design will substitute Arch 407, 408, 421, 422, 451, 452, 453. Math 316 is prerequisite to the senior courses in structural design.
Junior

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<td>Stress Analysis (Arch 314)</td>
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<td>Steel Structures (Arch 315)</td>
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<td>Wood Structures (Arch 316)</td>
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<td>Plumbing and Building Sanitation (ME 333)</td>
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<td>History of Architecture (Arch 304, 305, 306)</td>
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<td>Business Law (Bus 301)</td>
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<td>Introduction to Literature (Eng 201)</td>
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Senior

* Architectural Design (Arch 441, 442, 443) 5 5 5
* Concrete and Masonry Structures (Arch 401, 402) 2 2 2
* Structural Frameworks (Arch 403) 2
* Applied Biology (Bio 110) 3
* Office Practice (Arch 457, 458, 459) 2 2 2
Senior Project (Arch 461, 462) 2 2
* Undergraduate Seminar (Arch 463) 2
* General Psychology (Psy 202) 3
** Literature or Philosophy 3
Electives 2 2 3

17 18 19

16 16 17

DESCRIPTIONS OF COURSES IN ARCHITECTURAL ENGINEERING

Arch 101 Materials of Construction (3)
The use and application of building materials, structural makeup of buildings. 3 lectures.

Arch 104 Orientation (1)
Familiarization with the professional fields of architecture and engineering. Development of techniques useful to the student in his academic progress. 1 lecture.

Arch 138 Basic Design (2)
Studies of form, space, color, texture, light, and their applications. Circulation, flow, and human needs with respect to architecture. 1 lecture, 1 laboratory. Prerequisite: Arch 147

Arch 141, 142, 143 Construction and Working Drawings (2) (2) (2)
Study of construction, and detailed working drawings of elementary wood and steel structures. Application of building codes. 2 laboratories.

Arch 145 Perspective (2)
Mechanical perspective. 2 laboratories. Prerequisite: Arch 141

Arch 146 Delineation (2)
Three-dimensional representation with various drawing media which enable the student to express his architectural ideas. 2 laboratories. Prerequisite: Arch 145

Arch 147, 148, 149 Freehand Drawing (1) (1) (1)
Exercises in drawing without mechanical aids. 1 laboratory.

* Students electing to specialize in structural design will substitute Arch 407, 408, 421, 422, 451, 452, 453. Math 316 is prerequisite to the senior courses in structural design.

** To be selected from the General Education list.
Arch 153  Industrial Presentation Techniques (2)
Graphic presentation for Industrial Engineers. Symbols, techniques, and freehand
drawing. Construction drawings and flow diagramming. 2 laboratories.

Arch 159  Basic Design (2)
Continuation of Arch 138. Studies of form, space, color, and human needs with
respect to architecture. 2 laboratories. Prerequisite: Arch 138

Arch 202  Quantity Survey and Estimating (2)
Methods and applications in estimating costs and quantities of materials, labor, and
equipment. 2 lectures. Prerequisite: Arch 143

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. Prerequisites: Phys 131, Math 201

Arch 217, 218  City Planning (3) (3)
Principles of planning. Study in community organization growth, and guidance.
3 lectures. Prerequisite: Eng 106

Arch 221, 222, 223  Architectural Design (2) (3) (3)
Elementary work in architectural design. Development of architectural logic,
planning, and aesthetics with relation to structure. One designated field trip
required. Arch 221: 2 laboratories; Arch 222, 223: 3 laboratories. Prerequisites:
Arch 143, 146, 159

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  Construction and Working Drawings (2) (2) (2)
Construction techniques and working drawings for masonry and concrete struc-
tures. Application of building codes. Elementary member sizing. 2 laboratories.
Prerequisite: Arch 143

Arch 247  Delineation (2)
Continuation of Arch 146. Three-dimensional representation with various drawing
media which enable the student to express his architectural ideas. 2 laboratories.
Prerequisite: Arch 146

Arch 304, 305, 306  History of Architecture (2) (2) (2)
Periods of architecture, philosophies, and conditions that influenced them. 2
lectures. Prerequisite: Eng 106

Arch 312  Home Design (3)
For students not majoring in Architectural Engineering. Home planning funda-
mentals; relation of house to lot and community. Furniture grouping. Landscape
and economic considerations. 3 lectures.

Arch 314  Stress Analysis (3)
Stress analysis of statically determinate and indeterminate structures. 3 lectures.
Prerequisite: Arch 206

Arch 315  Steel Structures (3)
Design of members and connections, ties, trusses, plate girders, and determinate
frames. Vertical and lateral loading. 3 lectures. Prerequisite: Arch 314

Arch 316  Wood Structures (3)
Design of members and connections. Light frame buildings, diaphragms, long span
trusses, and glued laminated wood arches. Vertical and lateral loading. 3 lectures.
Prerequisite: Arch 315

Arch 341, 342, 343  Architectural Design (5) (5) (5)
The development of the student's logic and creative abilities in the application
of skills to the solution of architectural problems. One designated field trip required.
5 laboratories. Prerequisite: Arch 206, 223, 243, 247

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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 354, 355, 356  Water Color (1) (1) (1)
   Outdoor sketching with water color. 1 laboratory. Prerequisite: Permission of instructor.

Arch 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.

Arch 401, 402  Concrete and Masonry Structures (2) (2)
   Elements and design of concrete and masonry structures. Vertical and lateral loading. 2 lectures. Prerequisites: Arch 316, 343, 344, Math 203, Phys 133

Arch 403  Structural Frameworks (2)
   Multi-storied rigid frame structures for vertical and lateral loading. 2 lectures. Prerequisite: Arch 402

Arch 404  Specifications and Contracts (2)
   The elements, structure, and writing of specifications. Legal aspect of architectural engineering. 2 lectures.

Arch 407, 408, 409  General Engineering (2) (2) (2)
   Topics which serve to supplement and unify the professional engineering background. Prerequisites: Arch 316, 344, Math 316, Chem 321, Phys 133

Arch 411, 412, 413  Advanced Structural Design (2) (2) (2)
   Advanced topics in structural analysis and engineering practice. 2 lectures. Prerequisites: Arch 316, 344, Math 316

Arch 415  Current Practice in Related Fields (2)
   Visiting practitioners provide instruction in topics related to the architectural engineering field: business methods; law; real estate; contracting; highway and bridge design; management, etc. 2 lectures.

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 316, Math 316, Phys 133, Chem 321

Arch 441, 442, 443  Architectural Design (5) (5) (5)
   Advanced problems relating the students’ background in sociology, economics, structure and aesthetics to architectural design. 5 laboratories. Prerequisite: Arch 316, 343

Arch 451, 452, 453  Structural Design (5) (5) (5)
   Stress analysis of long-span structures, arches, influence lines, plate girders, multiple-storied rigid frame structures. Prestressed concrete, shells and domes. Introduction to dams and bridges. Theory and applications. 5 laboratories. Prerequisite: Arch 316, 343, 344, Math 316

Arch 457, 458, 459  Office Practice (2) (2) (2)
   Architectural office administration and procedures; specifications and contracts; professional ethics. A comprehensive office type project with coordinated engineering. Prerequisite: Arch 441 and 401, concurrent.

Arch 461, 462  Senior Project (2) (2)
   Selection and completion of a comprehensive type project under a minimum of supervision. Problems to involve the student’s technical and creative skills. Minimum 120 hours total time.

Arch 463  Undergraduate Seminar (2)
   Discussion and lectures on problems of architectural firms and the building industry. Professional ethics. Students present organized material on some subject of interest in architectural engineering. 2 two-hour meetings. Prerequisite: Arch 462
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: California State Polytechnic Branch of the Los Angeles Section of the American Institute of Electrical Engineers, a technical organization; and the Poly Phase Club, a social club.

**CURRICULUM IN ELECTRICAL ENGINEERING**

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<td>Fundamentals of Electrical Engineering (EE 101, 102, 103)</td>
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<td>Electric Shop (EE 141)</td>
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<td>Electrical Drafting (EE 146)</td>
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<td>Orientation (EE 151)</td>
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<td>* Shop Processes</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>Physical Education (PE 141)</td>
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17 ½ 18 ½ 16 ½

* AC 147, MS 147, MS 148, IE 147, Weld 147, Weld 148.
### Sophomore

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<td>Fundamentals of Electrical Engineering (EE 201, 202, 203)</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>Engineering Dynamics (Phys 202)</td>
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<td>Strength of Materials (ME 202, 203)</td>
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<td>Circuits Laboratory (EE 342, 343)</td>
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<td>Electronics Laboratory (EE 355, 356)</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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### Senior

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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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**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 (LMR 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)
Wiring materials, tools and wiring. Electric shop practice. 1 laboratory.

EE 146  Electrical Drafting (1)
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 radia-
tion. 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, 208  Electrical Engineering (3) (3)
controls and applications. Industrial wiring systems. Control and measurements. For
non-electrical engineering majors. 3 lectures. Prerequisites: Math 201, Phys 133

EE 223  Wiring and Codes for Architects (3)
Elements of electricity. Electric circuits. Direct current voltage, current, and
power. Alternating currents. Effective voltage and current. Power factor. Wiring
Writing specifications. 3 lectures. Prerequisite: Phys 133

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 exer-
cises 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.
Use of electric meters. Experiments and exercises involving direct and alternating current circuits, machines and their controls. 1 laboratory. Concurrent: EE 207, 208

Construction maintenance, and operation of electrical machines. 1 laboratory. Concurrent: EE 203

Electric Circuits (3) (3) (3)

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

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

Electronics (3) (3) (3)
Electron tubes. Transistors. Active networks. 3 lectures. Prerequisite: EE 203

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

Circuits Laboratory (1) (1)
Study of electric circuits in the laboratory. Distributed constant systems. 1 laboratory. Concurrent: EE 301, 302

Electric Machine Laboratory (1) (1) (1)

Electronics Shop (1)
Shop technique of constructing systems using electronic devices. 1 laboratory. Concurrent: EE 314

Electronics Laboratory (1) (1)
Electron tube characteristics. Transistor characteristics. Study of active networks. 1 laboratory. Concurrent: EE 315, 316

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.

Control Systems (3)
Fundamentals of automatic feedback control systems. Analysis and introduction to design of linear systems. 3 lectures. Prerequisite: EE 303

Power System Analysis (3)
Equivalent circuits. Sequence impedances. Symmetrical components. Faults and sudden loads. 3 lectures.

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 431 Introduction to Analog Computers (4)
General background. Theory of operation. Fields of application. Laboratory work with typical computers. 3 lectures, 1 laboratory. Prerequisite: Math 317

EE 432 Digital Computers (4)
Field of useful applications. Theory of operation. Programming techniques. Laboratory experience in computer operation. 3 lectures, 1 laboratory. Prerequisite: EE 314 or equivalent

EE 433 Control Systems Engineering (4)
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, 1 laboratory. Prerequisite: EE 401

EE 441 Control Systems Laboratory (1)
Advanced servomechanisms laboratory arranged for individual study. 1 laboratory. Concurrent: EE 401

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 Radio Engineers and the amateur Radio Club which operates a modern and well-equipped station W6BHZ.
CURRICULUM IN ELECTRONIC ENGINEERING

Freshman

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<th>Course</th>
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<td>Experimental—Electronics (EL 151, 152)</td>
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| Engineering Division
CURRICULUM IN ELECTRONIC ENGINEERING
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<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 (EL 304, 305, 306)</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>Thermo-Fluids (ME 301, 302)</td>
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<td>Engineering Materials (ME 314)</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 (LMR 311)</td>
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<td>** Differential Equations (Math 317)</td>
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* AC 147, IE 147, MS 147, MS 148, Weld 147, Weld 148 (1 unit each).
** Industrial Relations (LMR 312) may be substituted.
† To be selected from the General Education list.
Senior
Microwave Electronics (EL 401, 402, 403) 2 2 2
Advanced Amplifier Theory (EL 404) 3 3 3
Advanced Communication Theory (EL 405) 3 3 3
Principles of Digital Computers (EL 406) 3 3 3
Electronic Systems Engineering (EL 441, 442, 443) 1 1 1
Senior Project (EL 461, 462) 2 2 2
Undergraduate Seminar (EL 463) 3 3 3
Solid State Physics for Engineers (Phys 412) 3 3 3
* Approved Senior Courses 3 3 3
American Government (Pol Sc 301) 3 3 3
Growth of American Democracy (Hist 304) 3 3 3
U.S. in World Affairs (Hist 305) 3 3 3
Electives 3 3 3

17 17 17

DESCRIPTIONS OF COURSES IN ELECTRONIC ENGINEERING

EL 101, 102 Elements of Electronics (2) (2)
Fundamentals of electronic components and unit circuits. Application of unit circuits in some electronic systems. Elementary analysis of electronic instrumentation. Application to engineering measurements with an introduction to both the analog and digital computer to engineering problems. For majors in Aero, AC, IE, ME and WM. 2 lectures, offered every quarter.

EL 111, 112 Introductory Electronics (2) (2)
Fundamentals of electronic components and unit circuits. Application of unit circuits in selected electronic systems. For EL majors. 2 lectures.

EL 113 Electronic Instruments (2)
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

EL 141, 142 Electronics Laboratory (1) (1)
Directed projects facilitating an understanding of electronic components, unit circuits, and electronic instrumentation in engineering. 1 laboratory. Concurrent with EL 101 and 102

EL 146 Graphics in Electronics (1)
Schematic drafting and delineation. Electronic and industrial symbols. Printed circuits. Technical sketching. 1 laboratory. Prerequisite: ME 151, EL 102

EL 151, 152 Experimental Electronics (1) (1)
Experimental study of the properties of components, unit circuits, and selected electronic systems. 1 laboratory. Concurrent: EL 111, 112

EL 153 Electronic Instruments Laboratory (1)
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

EL 156 Freshman 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 with EL 153

* Network Synthesis (EL 411), Principles of Analog Computers (EL 412), or Control Systems Engineering (EL 413). Other courses may be elected with the approval of the department head.
EL 205, 206  Introductory Circuit Analysis (4) (3)

Electric and magnetic circuits. Work, power and energy relationships. Direct and alternating current circuits with introduction to pole-zero patterns in the complex frequency plane. Network theorems. Coupled circuits. Fourier analysis. Principally linear elements with sinusoidal driving functions. 4 lectures-3 lectures. Prerequisite: EL 207

EL 207  Physical Electronics (4)

Introduces the basic concepts of physics underlying the field of electronics in a logical manner. Emphasis is placed on electric and magnetic field theory and the controlled motion of charged particles. 4 lectures. Prerequisites: Phys 132, Math 201

EL 208  Electron Devices (2)

Physical analytical study of some vacuum and gaseous electron tubes. Small-signal equivalent circuit study of these active devices with resistive loads. Emphasis on graphical analysis of circuits. 2 lectures. Prerequisite: EL 207, Phys 211

EL 209  Electron Devices (2)

Physical analytical study of some solid-state devices. Small-signal equivalent circuit study of these devices with resistive loads. Emphasis on graphical analysis. 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. Prerequisites: Phys 133, concurrent Math 316

EL 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.

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 247  Physical Electronics Laboratory (1)

Selected laboratory experiments in the subject matter of EL 207. Emphasis placed on validating some fundamental physical principles. 1 laboratory. Concurrent: EL 207

EL 248, 249  Electron Devices Laboratory (1) (1)

Fundamental experiments investigating the physical and electrical properties of the more common types of electron tubes, semiconductors, and transistors. Emphasis placed on collecting, correlating, graphing, and evaluating laboratory data. 1 laboratory. Concurrent: EL 208, 209

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 Systems Analysis (2) (2) (2)

Fourier integral and Laplace transformation. The response of linear electronic, mechanical and electromechanical systems to different types of excitation. Systems with feedback. Sample data systems and the Z transformation. 2 lectures. Prerequisite: EL 206

EL 304  Electronic Circuits (3)

Analytical study of electron tube and transistor circuits for the amplification of voltage, current and power at audio and radio frequencies. Cascaded stages. Feedback. 3 lectures. Prerequisite: EL 206, 209, 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; monostable, bistable and astable multivibrators. Equal consideration given
to circuits employing electron tubes and transistors. 3 lectures. Prerequisites:
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. Prerequisites: EL 213, concurrent
Math 317

EL 313  Analog Computer Techniques (3)
Course designed for mathematics, science and engineering majors other than
electrical and electronic. Fundamental principles of analog computers, field of
3 lectures. Prerequisite: Math 203

EL 314  Digital Computer Techniques (3)
Course designed for mathematics, science and engineering majors other than
electrical and electronic. Fundamental principles of digital computers, fields of
3 lectures. Prerequisite: Math 203

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 appli-
cations 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)
Experimental study of audio and radio frequency voltage, current and power
amplifiers using electron tubes and transistors. Performance testing of amplifiers
using EIA-IRE Standard procedures. 1 laboratory. Concurrent: EL 304
EL 345  Electronic Circuits Laboratory (1)
Experimental study of oscillators, modulators, frequency changers and demodulators using electron tubes and transistors. Performance testing of typical circuits using EIA-IRE standard procedures. 1 laboratory. Concurrent: EL 305

EL 346  Electronic Circuits Laboratory (1)
Experimental study of wave shaping and pulse-forming circuits using electron tubes and transistors. 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
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. Properties of microwave components and radiating structures. 2 lectures. Prerequisite: EL 306

EL 404  Advanced Amplifier Theory (3)
Analysis and synthesis of amplifier networks using vacuum and solid state active elements. Transient analysis of high speed, high gain amplifiers. Pole-zero analysis of band-pass amplifiers. Noise analysis. 3 lectures. Prerequisites: EL 303, 306

EL 405  Advanced 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. 3 lectures. Prerequisite: EL 303, 306

EL 406  Principles of Digital Computers (3)
Design of switching circuits; switching functions; coding methods; adders, accumulators, counters, multipliers. Memory systems. Input-output systems. 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 (3)
Principles of design and operation of the electronic analog computer. Application to problems in mathematics, science and engineering. Programming and scaling techniques. Output devices. 3 lectures. Prerequisite: EL 346

EL 413  Control Systems Engineering (3)
Analysis of dynamic electromechanical feedback control systems including root-locus and frequency response techniques. 3 lectures. Prerequisite: EL 303
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**

**Freshman**

<table>
<thead>
<tr>
<th>Course</th>
<th>F</th>
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<tbody>
<tr>
<td>Introduction to Industrial Engineering (IE 101)</td>
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<td>2</td>
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<tr>
<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><em>Shop Processes</em></td>
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<tr>
<td>Engineering Drafting (ME 151, 152, 143)</td>
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<td>Industrial Presentation Techniques (Arch 153)</td>
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<td><strong>Total Freshman</strong></td>
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**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>Differential Equations (Math 316)</td>
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<td>Principles of Economics (Ec 201)</td>
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*Shop Processes: AC 147, MS 147, MS 148, IE 147, Weld 147, Weld 148.*
### Junior

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<td>Motion and Time Study (IE 321)</td>
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<tr>
<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>Statistical Quality Control (IE 336)</td>
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<td>Strength of Materials (ME 202, 203)</td>
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<td>Applied Biology (Bio 110)</td>
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<td>American Government (Pol Sc 301)</td>
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### Senior

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<td>Supervision Fundamentals (IE 441, 442, 443)</td>
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<td>Manufacturing Management (IE 421, 422)</td>
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<td>Senior Project (IE 461, 462)</td>
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<td>Numerical Control Machining (IE 433)</td>
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<td>Advanced Motion and Time Study (IE 434)</td>
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<td>General Chemistry (Chem 321, 322)</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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### 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.

† To be selected from the General Education list.
IE 147  Shop Processes (1)

Metal casting—sand and shell molding; precision casting; die casting; plastic forming and molding; powder metallurgy forming; forging and hot forming. 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 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 (3)
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. Laboratory work consists of solving programming problems. 2 lectures, 1 laboratory. 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 advancedJunior 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)
The main categories of engineering decisions will be defined. The use of interest rates in our industrial complex will be studied. The basic principles and tools of analysis will be studied in detail, and application of these principles to industrial engineering will be accomplished through the use of case studies. Other common tools of analysis developed by specific industries will be reviewed as to their application in industrial engineering situations. 3 lectures. Prerequisite: Senior standing.

IE 421 Manufacturing Management (4)
An advanced course 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: IE 421

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. Punch presses, diecasting machines, plastics presses, and diesinking machines are provided for engineering students taking advanced courses.

**DESCRIPTIONS OF COURSES IN MACHINE SHOP**

**MS 141 Machine Shop (1)**
Fundamentals of precision measurement, layout, and hand and drill press operations. 1 laboratory.

**MS 143 Machine Shop (1)**
Fundamentals of lathe operation including taper turning, internal thread cutting, precision boring, and other chucking operations. Tool grinding. 1 laboratory. Prerequisite: MS 147

**MS 145 Machine Shop (1)**
Advanced lathe practice, lathe accessories, and elementary toolmaking. Elementary heat treatment of steels. 1 laboratory. Prerequisite: MS 143

**MS 146 Machine Shop (1)**
Advanced milling machine and shaper practice including contoured and angular surfacing operations, and rack and spur gear cutting. 1 laboratory. Prerequisite: MS 148

**MS 147 Shop Processes (1)**
Basic lathe operation including turning and boring, external threading, tool grinding. 1 laboratory.

**MS 148 Shop Processes (1)**
Milling machine and shaper operation including precision setups and indexing operations. 1 laboratory.

**MS 240 Machine Shop (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: MS 146

**MS 241 Grinding Machines (1)**
Fundamentals of grinding machine operation including the universal cylindrical grinder, surface grinder, tool and cutter grinder, and drill grinders. 1 laboratory. Prerequisite: MS 146

**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 146

**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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<td>* Shop Processes</td>
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<td>Engineering Drafting (ME 141, 142, 143)</td>
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Total: 18 ½

* AC 147, MS 147, MS 148, IE 147, Weld 147, Weld 148.
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<td>Advanced Metal Joining Processes (Weld 251, 252)</td>
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† Industrial Relations (LMR 312) may be substituted.
‡ To be selected from the General Education list.
* One of the following sequences must be included: Tool Design (ME 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, Turbo-machinery (ME 411, 412, 413).
DESCRIPTIONS OF COURSES IN MECHANICAL ENGINEERING

ME 125 Descriptive Geometry (3)
Principles of multiview projection. Fundamental views. Perpendicular, parallel and skew lines. Relationships of points, lines and planes. Intersections and developments of geometric surfaces and solids including planes, ruled surfaces and warped surfaces. Solution of typical drafting room problems by application of multiview projection. 1 lecture, 2 laboratories.

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 projection systems. Application of multiview projection to representation of typical mechanical components and graphical solutions for typical layout problems. Introduction to dimensioning. 2 laboratories.

ME 142 Engineering Drafting (2)
Graphical solutions for typical layout problems involving intersections and developments of geometric surfaces and solids. Section views and conventional practices for machine drawing, including methods of placing dimensions on working drawings. Basic principles of chart and graph construction. Vector diagrams. Elementary principles of graphical mathematics and nomograms. 2 laboratories. Prerequisite: ME 141 or ME 151

ME 143 Engineering Drafting (2)
Theory of selecting dimensions. Precision dimensions and tolerances for interchangeable parts. Detail drawings. Assembly drawings. Fasteners and thread representation. Welding symbols. Piping symbols and drawings. Basic principles of architectural and structural drawing. 2 laboratories. Prerequisite: ME 142 or ME 152

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 projection systems. Application of multiview projection system to representation of typical mechanical components and graphical solutions for typical layout problems involving lines, planes and points in space. 1 laboratory.

ME 152 Engineering Drafting (1)
Graphical solutions for typical layout problems involving intersections and developments of geometric surfaces and solids. Section views and conventional practices for machine drawing, including methods of placing dimensions on working drawings. Basic principles of chart and graph construction. Graphical mathematics. 1 laboratory. Prerequisite: ME 151 or ME 141

ME 153 Engineering Drafting (1)
Theory of selecting dimensions. Precision dimensions and tolerances. Detail drawings, assembly drawings. Fasteners and thread representation. 1 laboratory. Prerequisite: ME 152 or ME 142

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. Concurrent: ME 203

ME 301, 302  Thermo-Fluids (4) (4)

ME 303  Thermodynamics (4)
Thermodynamic properties and potentials, equilibrium binary mixtures, chemical reactions. System studies. 4 lectures. Prerequisite: Phys 152, Math 203

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 143

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 143

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, Math 316

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, 324

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 (2)


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.
WELDING AND METALLURGICAL ENGINEERING DEPARTMENT

Department Head, Richard C. Wiley
Edward P. Cook

Ray Allen
Enrico P. Bongio
Mel D. Compton
Harry H. Honegger
Glenn E. Seeber
Orien W. Simmons

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

Freshman

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<td>* Shop Processes</td>
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<td>Elements of Electronics (EL 101, 102)</td>
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* Shop Processes: AC 147, MS 147, MS 148, IE 147, Weld 147, Weld 148.
### Junior

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<td>Materials for Special Environments (WM 431)</td>
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<td>Undergraduate Seminar (WM 463)</td>
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*Senior Elective ........................................ 4 4 4

** Electives ............................................. 5 6 3

### DESCRIBITIONS OF COURSES IN WELDING

**Weld 147 Shop Processes (1)**
Fundamentals of the gas and resistance welding metal joining processes. Selection and application of joining methods and materials. 1 laboratory.

**Weld 148 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

**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

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* 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 (LMR 311) may be substituted.
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 metallurgy. 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 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
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, Education, Home Economics, Physical Education, Printing Engineering and Management, Technical Arts, and Technical Journalism. Two departments which provide services to the entire student body are Music, and English and Speech.
The business program prepares students for employment in the administrative and technical functions of business, labor unions, and governmental agencies. The training provides an opportunity for employment in the business community. 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 operation.

The program provides courses in general education together with a core of basic business courses upon which to build a specialized field in business. Examples of these specializations, which are worked out in conjunction with the adviser, are in the following fields: Accounting, General Business, Marketing and Sales Management, and Labor and Management relations. Sufficient course work is offered to meet the requirements for the teaching of business.

The opportunity afforded the student in the business program is unique in that the offerings of the Agricultural, Engineering, and Applied Sciences Divisions are available to the student as well as the Applied Arts. 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.

**CURRICULUM IN BUSINESS**

<table>
<thead>
<tr>
<th>Freshman *</th>
<th>F</th>
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<tbody>
<tr>
<td>Language Communication (Eng 104, 105)</td>
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<td>Public Speaking (Sp 201)</td>
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<td>Mathematics of Business (Math 108, 109)</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 **</td>
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<tr>
<td>Introduction to the Social Sciences (Soc Sc 101)</td>
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<td>Introduction to Literature (Eng 201)</td>
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<tr>
<td>Physical Sciences **</td>
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<tr>
<td>The Business Enterprise (Bus 101)</td>
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<td>Business Reports (Bus 103)</td>
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<tr>
<td>The Labor Movement in California and the United States (LMR 111)</td>
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<td>Human Relations (LMR 118)</td>
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<tr>
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<td>Sports Education (PE 241)</td>
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<td>Advanced Public Speaking (Sp 202)</td>
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<tr>
<td>Physical Sciences **</td>
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<tr>
<td>Introduction to Philosophy (Phil 201)</td>
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<td>Logic (Phil 202)</td>
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<tr>
<td>Literature, Music or Art **</td>
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<td>General Psychology (Psy 202)</td>
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<td>Principles of Economics (Ec 201)</td>
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<td>Investment Mathematics (Math 207)</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>Marketing Principles (MSM 204)</td>
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<td>Business and its Environment (Bus 202)</td>
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<tr>
<td>Accounting Principles (Actg 221, 222, 223)</td>
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* Unless already acceptable typists, majors will be required to take Bus 140 and/or 141 during their freshman year.

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

#### Junior

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<thead>
<tr>
<th>Course Description</th>
<th>Fall</th>
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<tr>
<td>Ethics (Phil 204)</td>
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<td>Report Writing (Eng 301)</td>
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<td>Psychology of Business and Industry (Psy 302)</td>
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<td>Principles of Economics (Ec 202, 203)</td>
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<td>American Government (Pol Sc 301)</td>
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<td>Business Law (Bus 301, 302, 303)</td>
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<td>Machine Techniques in Business (Bus 351)</td>
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<td>Political and Economic Geography (Geog 315)</td>
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#### Senior

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<th>Course Description</th>
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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>Cultural Anthropology (Ant 201)</td>
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<td>Senior Project (Bus 461, 462)</td>
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<td>Undergraduate Seminar (Bus 463)</td>
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<tr>
<td>Business Fluctuations and Forecasting (Bus 406)</td>
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<td>Money, Banking and Credit (Bus 407)</td>
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<td>Business Finance (Bus 408)</td>
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<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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<tr>
<td>*Electives</td>
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#### DESCRIPITIONS OF COURSES IN ACCOUNTING

**Actg 131, 132 Basic Accounting (3) (3)**

A review of accounting to show how records are kept. Accounting reports, uses, and limitations. For the student who needs a general knowledge of accounting. Not applicable for credit toward curriculum in business. 2 lectures, 1 two-hour laboratory.

**Actg 221, 222, 223 Principles of Accounting (4) (4) (4)**

Principles and practices of fundamental accounting theory. Cost control applicable to production, distribution, and service enterprises. Form, analysis and interpretation of financial statements. 3 lectures, 1 two-hour laboratory.

**Actg 304, 305 Tax Accounting (3) (3)**

Analysis of the federal and state tax laws and their application to taxpayers. Series of practical problems. 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 (3) (3) (3)**

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. 2 lectures, 1 two-hour laboratory. Prerequisite: Actg 222

**Actg 331 Accounting Systems and Data Processing Methods (3) (3)**

The 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.

* 21 of the elective units in the junior and senior years must be chosen with the approval of the adviser in a field of specialization.
Actg 452 CPA Problems (3)
tensive 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 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. Prerequisite: Eng 105

Bus 104 Office Organization and Operation (3)
Basic office procedures and practices. Knowledges 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 co-operation 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: Ec 201

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 co-operation, taxation incidents, patents, copyrights, trademarks, trade names, insolvency, and business terminations. 3 lectures. Prerequisite: Bus 302

Bus 306 General Business Administration (3)
Forms and structure 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. Areas discussed: 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.
Applied Arts Division

Bus 311 Property and Casualty Insurance (3)
A survey of property and casualty insurance. Topics included are analysis of insurance investments, policies, forms, endorsements and rate making. Fidelity and surety bonding and analysis of policies and rate making are included. 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 331 Real Estate Principles and Practices (3)
Nature and scope of the real estate business including transfers of property, financing methods, property management. 3 lectures. Prerequisite: Ec 201

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. 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.

Bus 401 Techniques for Teaching of 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

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 Business Finance (3)
Problems of financing business including promotion, types of organization, long and short-term capital, dividends, involvements, and expansion. 3 lectures. Prerequisite: Bus 407

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 and shifts in demand for services of labor, the economics of demand and supply for labor, the work week and labor from a business point of view. The changing field of labor law and changes in the supply of labor will be discussed. 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: Permission 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 interrelationship 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 developments in the students' major fields. 2 meetings. Prerequisite: Senior standing or special permission.

DESCRIPTIONS OF COURSES IN LABOR AND MANAGEMENT RELATIONS

LMR 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.

LMR 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.

LMR 213 Personnel Administration (3)

Understanding the basic objectives, viewpoints, principles, and methods that distinguish personnel administration and personnel functions. 3 lectures.

LMR 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 measurements, incentive wages and managerial compensation. 3 lectures.

LMR 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.

LMR 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.
LMR 315 Individual and Group Human Relations (3)
Individual and group practice in decision making using the case method. 3 lectures. Prerequisite: Permission of adviser and junior standing.

LMR 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. Prerequisite: LMR 312

LMR 412 Labor Law (3)
Federal and state labor laws and their effects upon labor and management. 3 lectures. Prerequisite: Bus 301

LMR 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. Prerequisite: LMR 312

DESCRIPTIONS OF COURSES IN MARKETING AND SALES MANAGEMENT

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 404 Product Management (3)
Marketing responsibilities of a manager of a product or product line in the marketing department of a business firm. Includes planning, operations, and controls. Coordination of product management with other activities of a business. 3 lectures. Prerequisite: MSM 206 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 as they pertain 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 404 or consent of instructor.
The Education Department offers the curriculum in Elementary Education and the Master's Degree in Education; professional courses in Secondary Education, Agricultural Education, School Supervision, School Administration; and service courses in Art, Audio-Visual Education and Psychology.

Special emphasis is placed on the preparation of persons to teach vocational subjects in the schools. Instruction is also given in the 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 academic and 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 following experiences are a part of the preparation of a teacher for work in the elementary school:

1. Advisement for four years by an Education Department staff member who works regularly in the public schools and closely with the student in all campus and off-campus phases of preparation.
2. Association for four years in the Student California Teachers Association with other students who plan to teach.
3. Enrollment in a course in the major field (education) during the freshman year and other professional courses each subsequent year.
4. Observation on a planned basis in schools during sophomore year.
5. Working with youth groups in the community during sophomore year.
6. Surveying during junior year the methods used in the elementary school.
7. Engaging in full-time student teaching for 12 weeks during junior year.
8. During senior year the student analyzes and improves abilities and expands knowledge for responsibilities of teaching based on the experience and needs growing out of student teaching.

Throughout the four-year course the student engages in learn-by-doing experiences either in the public schools or closely related work on the campus. Early and continuous association with public education enables each student to develop competence in the actual working conditions of the public school.

The Education Department provides coordination for the following secondary education credential programs which are accredited by the State Board of Education:

Special Secondary Credential in Vocational Agriculture
Special Secondary Limited Credential in Agriculture
Special Secondary Credential in Homemaking Education
Special Secondary Credential in Physical Education

The General Elementary Credential program also is accredited by the State Board of Education.

The student who is interested in teaching as a career should consult the section of this catalog entitled PREPARATION FOR ELEMENTARY AND SECONDARY SCHOOL TEACHING.
# CURRICULUM IN ELEMENTARY EDUCATION

## Freshman

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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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<tr>
<td>Agriculture</td>
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<tr>
<td>History of California (Hist 112)</td>
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<tr>
<td>Arithmetic for Elementary Teachers (Math 121, 122)</td>
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<tr>
<td>Introduction to the Teaching Profession (Ed 101)</td>
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<td>§ Electives</td>
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## Sophomore

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<th>Course</th>
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<tr>
<td>Sports Education (PE 241)</td>
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<tr>
<td>General Psychology (Psy 202)</td>
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<td>Principles of Economics (Ec 201)</td>
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<td>Public Speaking (Sp 201)</td>
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<td>Music for Classroom Teachers (Mu 201)</td>
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<td>Orientation to Art Materials (Art 232)</td>
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<td>General Physical Science (PSc 101, 102, 103)</td>
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<td>Elements of Geography (Geog 221, 222)</td>
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<td>Children’s Literature (Eng 205)</td>
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<td>Philosophy, Art or Music Appreciation</td>
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<td>School and Community Health Education (PE 203)</td>
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<td>School Observation (Ed 300)</td>
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<td>Fieldwork with Youth Groups (Ed 353)</td>
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## Junior

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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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<td>Senior Project (Ed 461)</td>
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<td>Audiovisual Instruction (AV 431)</td>
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<td>Advanced Composition (Eng 314)</td>
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<td>Educational Psychology (Ed 312)</td>
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<td>Principles of Elementary Education (Ed 302)</td>
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<td>Human Growth and Development (Ed 304)</td>
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<td>Survey of Elementary School Methods (Ed 330)</td>
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<td>Student Teaching (Ed 430)</td>
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## Senior

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<tr>
<td>U.S. in World Affairs (Hist 305)</td>
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<td>Senior Project (Ed 462)</td>
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<td>English Literature (Eng 411, 412, or 413)</td>
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<td>American Literature (Eng 311, 312 or 313)</td>
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<tr>
<td>Elementary School Reading and Language Arts (Ed 434)</td>
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<td>Teaching Social Studies in the Elementary School (Ed 435A)</td>
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<td>Teaching Arithmetic in the Elementary School (Math 435)</td>
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<td>Teaching Science in the Elementary School (Ed 435C)</td>
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<td>Safety and First Aid (PE 121)</td>
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<td>§§ Elementary School Teaching Methods</td>
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<td>Undergraduate Seminar (Ed 463)</td>
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* A general course in agriculture to be approved by adviser.

§ 21 of the 36 units of electives will require approval of the adviser.

§§ Two courses to be selected from: Teaching Physical Education in the Elementary School (PE 332); Teaching Music in the Elementary School (Mu 436); Teaching Art in the Elementary School (Ed 437).
DESCRIPTIONS OF COURSES IN EDUCATION

* Ed 1 Remedial Penmanship (1)
  Development of skills in handwriting for education majors showing a deficiency. Cursive and manuscript styles. 1 laboratory.

Ed 101 Introduction to the Teaching Profession (2)
  Qualifications of successful teachers; analysis of duties and amenities of elementary and secondary teaching; school law and certification requirements; opportunities in the teaching profession; observation of teaching. 2 lectures.

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 353 Fieldwork With Youth Groups (2)
  Work with groups of children such as Boy Scouts, Camp Fire Girls, recreational groups. Leadership, human relations, adjusting to different personalities, skills in group management. Serves to appraise professional aptitude. 1 lecture, 1 activity period. Prerequisite: Ed 300

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.

* Required for elementary education students if penmanship test indicates need for remedial work.
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, 4 activity periods. 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 437  Teaching Art in the Elementary School  (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.

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 units
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 interviewing, counseling, test administration and interpretation, case conference techniques, 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, individual problems. 3 lectures.

Ed 588 School Administration Field Work (3-6)
Supervised field work in school administration or supervision at the elementary or secondary level; specific assignments made to cover important aspects of school administration 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 administrators. 3 discussion meetings. Prerequisite: Valid general credential.

DESCRIPTIONS OF COURSES IN ART

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. Consideration of the development of appreciative and creative skills. Emphasis on drawing and graphic work. The development of units and procedures. Problems in developing 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. Laboratory 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.

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 Materials and Methods (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.

DESCRIPTIONS 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
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

DESCRIPTIONS 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)
Special study in the areas of career opportunities in agriculture, and program development in such areas as the Future Farmers of America, and supervised practice. Development of up-to-date approaches in an integrated program; operating policies and procedures. 3 lectures.

Ag Ed 521A-B Curriculum and Methods in Vocational Agriculture (3) (2)
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. 6 lectures, 4 laboratories. Offered each half of winter quarter.

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. Offered each half of winter quarter. 4 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 525A-B Student Teaching in Vocational Agriculture (10) (5)
Five months off-campus assignment under the direction of a selected 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.
Courses in English are designed to serve three purposes: first, to help the student develop habits of sound thinking and logical organization of material; second, to provide opportunities for the student to use language accurately, clearly, and interestingly, both in speaking and in writing; and third, to develop the technique of reading to the point of understanding others' ideas and using those ideas in the solution of one's own problems. The sole objective of the department is to provide service courses in the fields of English and speech and to offer appropriate courses in these fields to meet the general education needs of students in the majors offered by the college.

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 unity. 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 English 104.

**DESCRIPTIONS OF COURSES IN ENGLISH**

Eng 4 Preparatory English (3)
For the student who needs additional work before entering English 104. The 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)
Required of all students not passing the special English placement tests for foreign students. Class practice in pronunciation, sentence structure, reading, and composition. Laboratory practice with recorded materials. Two two-hour lectures, two two-hour laboratories. Prerequisite: Placement examination score.

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. 3 lectures. Prerequisite: passing grade on placement examination or Eng 4. Not open to degree students for degree credit.

Eng 104 Language Communication (3)
Use of reference materials. Review of language skills. Organization of material, paragraphs, and sentence structure. Business letters. 3 lectures. Prerequisite: Satisfactory score on placement examination or Eng 4

Eng 105 Language Communication (3)
Forms of exposition and argumentation. Development of effective and forceful style. Preparation of term papers or project reports. 3 lectures. Prerequisite: Eng 104

Eng 106 Language Communication (3)
Continuation of basic skills in composition. Introduction to organization of materials, choice of materials, and presentation of speaking assignments. 3 lectures. Prerequisite: Eng 105

Eng 125 English Composition for Foreign Students (3)
May be substituted for Eng 104. Review of English fundamentals, reading, letter writing, and composition. 3 lectures. Prerequisite: Eng 5 or satisfactory placement score.
Eng 126 English Composition for Foreign Students (3)
May be substituted for Eng 105. Introduction to forms of exposition and logic. Library research and preparation of term paper. 3 lectures. Prerequisite: Eng 125

Eng 201 Introduction to Literature (2)
Intensive introduction to poetry, drama, the essay, short story, and novel. 2 lectures. Prerequisite: Eng 105

Eng 205 Children’s Literature (3)
Survey of available stories, plays, and poems which are suitable for language instruction in the elementary grades. 3 lectures. Prerequisite: Eng 105 or permission of instructor.

Eng 211 European Literature (3)
Study, in translation, of literary masterpieces from the Greek and Roman periods for understanding of forms and content, ideas, values and techniques. 3 lectures. Prerequisite: Eng 105

Eng 212 European Literature (3)
Study, in translation, of literary masterpieces from Dante to the close of the Renaissance in the seventeenth century for understanding of forms and content, ideas, values and techniques. 3 lectures. Prerequisite: Eng 105

Eng 213 European Literature (3)
Study, in translation, of masterpieces from the neo-classical period to the present: major writers and writings from Russia and the West exclusive of England and the Americas. 3 lectures. Prerequisite: Eng 105

Eng 219 Technical Writing (3)
Preparation of training materials; popular presentation of technical data and results; technical communication within industries; extensive experience in technical writing. 3 lectures. Prerequisite: Eng 105

Eng 301 Report Writing (3)
Study of the engineering and research paper; extensive writing experience. 3 lectures. Prerequisite: Eng 105

Eng 311 American Literature (3)
Readings from American literature to achieve a better understanding of democratic ideals and of the written forms in which they are presented. 3 lectures.

Eng 312 American Literature (3)
Selections from American literature to reflect the ways that man looks at his physical and social environment. Study of the literary forms by which these ideas may be expressed. 3 lectures.

Eng 313 American Literature (3)
Romanticism and realism in American literature. Study of the forms by which these movements and ideas have been expressed. 3 lectures.

Eng 314 Advanced Composition (3)
Intensive study of modern English usage. Assignments and practice in written composition. 3 lectures. Prerequisite: Eng 105

Eng 315 Shakespeare (3)
An introductory course in Shakespeare’s plays and poetry. 3 lectures. Prerequisite: Eng 106 or Sp 201

Eng 402 Advanced Letterwriting (2)
Advanced letterwriting problems; letters of application, inquiries, questionnaires, and the psychology of modern business letters. 2 lectures. Prerequisite: Eng 105
Eng 411 English Literature (3)
Selected readings in English literature from the beginnings to the seventeenth century. 3 lectures.

Eng 412 English Literature (3)
Selected readings in English literature of the seventeenth and eighteenth centuries. 3 lectures.

Eng 413 English Literature (3)
Selected readings in English literature from the nineteenth century to the present. 3 lectures.

Eng 414 The Drama (3)
Readings in representative dramas from the Greek and Latin through English, American, and Continental literature. 3 lectures.

Eng 415 The Modern Novel (3)
Readings in representative contemporary novels with special emphasis on their origins, content, form, and style. 3 lectures. Prerequisite: 6 units of European, American, or English literature.

Eng 433 The Short Story (4)
Selected short stories to demonstrate characteristics of form, content, style, and plot. Assignments in the writing of the short story. 3 lectures. 1 2-hour laboratory. Prerequisite: 6 units of European, American, or English literature.

Eng 461, 462 Senior Project (2) (2)
Selection and completion of a project under a minimum of supervision. Projects are typical of problems which a graduate must solve in his field of employment. Project results are presented in a formal written report. Minimum of 120 hours total time.

Eng 463 Undergraduate Seminar (2)
Reports of senior projects, discussions of professional articles of an appropriate level. 2 lectures. Prerequisite: Completion of Senior Project.

Eng 521 Curriculum and Methods in English (3)
Curricula, methods, devices, and procedures that may be used effectively in organizing and conducting secondary school courses in English, speech and journalism. 2 lectures, 1 laboratory.

Eng 590 Graduate Seminar in English (1-3)
Special problems in selected areas of literature and language. Maximum of six units credit may be earned. 1 to 3 lecture-discussions.

**DESCRIPTIONS OF COURSES IN SPEECH**

Sp 201 Public Speaking (2)
Training and giving speeches before audiences. Experiences in practical speaking situations, such as business reports, sales talks, interviews, and parliamentary meetings. 2 lectures. Prerequisite: Eng 105

Sp 202 Advanced Public Speaking (2)
Problems in parliamentary law and formal discussion. Specialized speaking situations in business, engineering, and agriculture; attention will be given to individual problems and interests. 2 lectures. Prerequisite: Sp 201 or Eng 106

Sp 221 Stagecraft (3)
Scenery design, construction, painting, lighting, costumes, and make-up. 1 lecture, 2 laboratories. May be repeated for a total of 9 units. Prerequisite: Eng 106 or Sp 201
Sp 302  Speech for the Classroom Teacher  (2)
Common and typical speech deviations usually found in the elementary grades; classroom procedures for the improvement and correction of speech; speech activities for the elementary grades. 2 lectures. Prerequisite: Sp 201 or Eng 106

Sp 304  Argumentation and Persuasion  (2)
Argumentation and persuasion as forms of oral discourse. Introduction to forensics, such as persuasive oratory and debate. 2 lectures. Prerequisite: Sp 201 or Eng 106

Sp 305  Techniques of Oral Reading  (2)
Selection, preparation, and presentation of materials for oral reading. Individual instruction in problems of voice and diction. 2 lectures. Prerequisite: Sp 201 or Eng 106

Sp 306  Introduction to Radio and Television Programming  (3)
Fundamentals of adapting materials for presentation on radio and television. Production of special types of programs. 3 lectures. Prerequisite: Sp 201 or Eng 106

Sp 321  Acting  (3)
Acting theory, character study, stage movement. Workshop productions and acting experience in college productions. 1 lecture, 2 laboratories. May be repeated for a total of 9 units. Prerequisite: Eng 106 or Sp 201

Sp 347  Creative Dramatics  (2)
The preparation, casting, and presentation of simple dramatic forms using minimal staging. May be repeated for not more than 6 units. 2 laboratories. Prerequisite: Sp 201 or Eng 106

Sp 403  Speech Techniques in Society  (2)
Role of spoken discourse in the solution of social problems. Special concern with forms of discussion such as panels, forums, and symposia. 2 lectures. Prerequisite: Sp 201 or Eng 106

Sp 421  Directing  (3)
Casting, rehearsing, and production of plays. Workshop productions and directing experience in college productions. 1 lecture, 2 laboratories. Prerequisite: Eng 106 or Sp 201

Sp 451, 452, 453  Radio and Television Laboratory  (2) (2) (2)
Practical instruction and experience in the presentation of material on radio and television. 2 laboratories. Prerequisite: Sp 306

Sp 590  Graduate Seminar in Speech  (1-3)
Special problems in selected areas of speech. Maximum of 6 units credit may be earned. 1 to 3 lecture-discussions.

DESCRIPTION OF COURSES IN SPANISH

Span 221, 222, 223  Conversational Spanish  (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 training for persons interested in homemaking, in teaching homemaking in secondary schools, extension service, home economics journalism, home equipment demonstration work, and other occupations closely related to homemaking. With some deviation in the general curriculum and careful selection of electives an option in food administration can be taken. This option prepares for positions in school lunch, college, industrial, hotel and other types of food service.

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 about their special interests in homemaking and family life education.

Considerable emphasis is placed upon practical 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 to 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.

### CURRICULUM IN HOME ECONOMICS

#### Freshman

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<thead>
<tr>
<th>Course</th>
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<tr>
<td>Language Communication (Eng 104, 105)</td>
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<td>Advanced Composition (Eng 314)</td>
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<td>Physical Education (PE 141)</td>
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<td>Basic Mathematics for General Education (Math 100)</td>
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<td>General Physical Science (PSc 101, 102)</td>
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<td>Art in the Home (Art 238)</td>
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<td>Health Education (PE 107)</td>
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<td>Introduction to the Social Sciences (Soc Sc 101)</td>
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<td>Family Meals (HE 121)</td>
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<td>Clothing Selection and Construction (HE 131)</td>
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<td>Home Furnishings (HE 142)</td>
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<td>Personal and Home Management (HE 123)</td>
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<td>Problems of the Beginning Family (HE 103)</td>
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#### Sophomore

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<tr>
<td>General Physical Science (PSc 103)</td>
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<td>General Psychology (Psy 202)</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>Elementary Human Physiology (Zoo 122)</td>
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<td>General Bacteriology (Bact 221)</td>
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<tr>
<td>Foods for Special Occasions (HE 221)</td>
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<td>Family Clothing (HE 241)</td>
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<td>Household Equipment (HE 231)</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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<td>Consumer Economics (Ec 105)</td>
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<td>The Child and the Family (HE 233)</td>
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### Applied Arts Division

#### Junior

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<th>Course Description</th>
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<td>American Government (Pol Sc 301)</td>
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<td>Applied Color and Design (Art 321)</td>
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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>Textiles (HE 322)</td>
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<td>Home Design (Arch 312)</td>
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<td>Home Decoration (HE 323)</td>
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<td>U.S. in World Affairs (Hist 305)</td>
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<td>Costume Design and Construction (HE 333)</td>
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<td>Senior Project (HE 461)</td>
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<td>Electives</td>
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#### Senior

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<tr>
<td>Senior Project (HE 462)</td>
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<tr>
<td>Undergraduate Seminar (HE 463)</td>
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<td>Home Management (HE 423)</td>
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<td>Public Relations (Jour 412)</td>
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<td>Meal Management (HE 421)</td>
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<td>Electives</td>
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### Descriptions of Courses in Home Economics

**HE 103  Problems of the Beginning Family** (2)

Problems of the beginning family. 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. For both men and women. 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. For both men and women. 2 lectures, 3 one-hour laboratories.

**HE 123  Personal and Home Management** (3)

Practical home management as it is affected by housing 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)

Home furnishings related to actual living situations of students. Methods of drapery construction. Upholstering a unit of furniture. For both men and women. 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. For both men and women. 1 lecture, 1 two-hour laboratory.

* To be selected from the General Education list.
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.

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: PSc 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. For both men and women. 2 lectures, 2 laboratories. Prerequisite: Psy 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. Design and production of modern textiles. Consumer approach to textile fabrics—selection, use and care. 1 lecture, 1 laboratory. Prerequisite: PSc 103 or equivalent.

HE 323 Home Decoration (2)
Selection and arrangement of furnishings as they relate to family income, 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 of food for the family, using all of the practical current methods. 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. Relation of current fashions to previous styles. Designing for the individual and the fabric. Advanced construction 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  (3)
Practical experience in menu planning and meal service for small groups with emphasis on food buying, management, and catering. 1 lecture, 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, preparing and serving foods to large groups. 1 lecture, 2 laboratories. Prerequisite or concurrent: HE 321

HE 426  Food Production Management  (3)
Principles of good 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)
Qualitative and quantitative laboratory studies of the normal diets for persons of various ages and occupations. 1 lecture, 2 laboratories. 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. Construction problems of fabrics. 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 to be 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 throughout 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 15 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)**
Lower piano elementary grades: selections as from Bach, Couperin’s First Lessons, Handel Minuets and Gavottes, Haydn and Mozart Dances. Technical studies. Major and minor scales and arpeggi. 1 activity.

**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 147 Instrumental Ensembles (1)**
Open to qualified musicians. Rehearsal and public performances in trios, quartets, and quintets. Prerequisite: permission of the instructor. Total credit limited to 12 units. 1 activity.

**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. Prerequisite: Permission of the instructor. 1 or 2 laboratories. 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. Prerequisite: Mu 101

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 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)
Continuation of Mu 231. 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. Prerequisite: Mu 101, 201, or consent of the instructor. 3 lectures.

Mu 437, 438, 439 Advanced Voice—Theory and Performance (1) (1) (1)
Continuation of Mu 237. Selected readings in the theory of voice production. Study of many types of vocal literature. 1 activity. Prerequisite: Mu 237
PHYSICAL EDUCATION DEPARTMENT

Richard Anderson  LeRoy B. Hughes  Doris Ann Thomas
Sheldon Harden    James J. Jensen   Walter G. Williamson
William R. Hicks  Edward J. Jorgensen Mary Lou White
Thomas J. Lee

Department Head, 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 boxing room, 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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<th>Freshman</th>
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<td>Language Communication (Eng 104, 105, 106)</td>
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## Sophomore

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<td>Human Physiology (Zoo 238, 239)</td>
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<td>Apparatus and Gymnastics (PE 255M) (PE 255W)</td>
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## Junior (Women)

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<td>† Growth of American Democracy (Hist 304)</td>
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## Senior (Women)

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<td>Organization and Administration of Health and Physical Education (PE 401)</td>
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* To be selected from the General Education list.
† Social Science teaching minors take Hist 301, 302, 303 in lieu of this course.
Junior (Men)  
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Senior (Men)  
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**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 (1½)**

Swimming, field and court sports, gymnastics, combatives for men, dance for women. 2 one-hour periods. Total credit limited to 1½ units.

*Social Science teaching minors take Hist 301, 302, 303 in lieu of this course.*
PE 144, 145  Beginning Swimming (½) (½)
Beginning swimming for all who do not pass college swimming test. 2 one-hour periods.

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. 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.

PE 151  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.

PE 201  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.

PE 203  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.

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 232  Intramural Sports (3)
The principles and policies underlying programs of intramural sports in secondary schools and community centers. 2 lectures, 1 two-hour laboratory.

PE 241  Sports Education (½)
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.

PE 245  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.

PE 251  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.

PE 255M  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.

PE 255W  Apparatus and Gymnastics (2)
Progression and teaching techniques in tumbling and gymnastic stunts. 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 302  Kinesiology (2)
Energy, leverage, angle positions, sequence, and efficiency applied to body movements 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 laboratory.

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 laboratory.

PE 323M Baseball Coaching Theory and Practice (2)
A critical analysis of the methods and problems of teaching and coaching baseball at the secondary school level. Emphasis on strategy, selection of players, officiating, 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 laboratory.

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 laboratories.

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 experience; class organization, management of games and relays. 3 lectures.
Applied Arts Division

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.

PE 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 establishment 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 education 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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<thead>
<tr>
<th>Course</th>
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<td>History of Printing (Pr 101)</td>
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<td>Proofreading (Pr 102)</td>
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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>Production Problems (Pr 123)</td>
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<tr>
<td>Hand-Fed Platen Presswork (Pr 131)</td>
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<tr>
<td>Automatic Platen Presswork (Pr 132)</td>
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<tr>
<td>Elementary Cylinder Presswork (Pr 133)</td>
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<td>Bindery Operations (Pr 151)</td>
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<tr>
<td>News Writing (Jour 202)</td>
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<td>Editing and Copy Desk (Jour 233)</td>
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<td>Language Communication (Eng 104, 105, 106)</td>
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<td>Shop Processes (MS 147, 148)</td>
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### Sophomore

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<tr>
<td>Theory of Color (Pr 201)</td>
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<td>Intermediate Typography (Pr 221)</td>
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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>Public Speaking (Sp 201)</td>
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<td>Principles of Economics (Ec 201)</td>
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<td>General Psychology (Psy 202)</td>
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<td>Cold Type Processes (Pr 322, 323)</td>
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<td>Offset Camera Work (Pr 324)</td>
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<td>Offset Platemaking (Pr 325)</td>
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<td>Offset Presswork (Pr 326)</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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### Senior

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<td>Plant Organization and Layout (Pr 433)</td>
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<td>Business and Its Environment (Bus 202)</td>
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<td>Marketing Principles (MSM 204)</td>
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<td>Principles of Accounting (Actg 223)</td>
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<td>Industrial Management (LMR 311)</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.

**Pr 102 Proofreading (2)**

Printshop English, proofreading, spelling, punctuation, division of words, compounding, style. Practical experience on the college paper and other publications. 2 lectures.
Pr 103 Graphic Design and Display (3)
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.

Pr 121 Elementary Typography (4)
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 lectures, 2 laboratories. Prerequisite: Pr 103

Pr 123 Introductory Production Problems (3)
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, shell-cast and type-high stereotypes and metallurgy. Color reproduction from stereotype casts. 2 lectures, 1 laboratory. Prerequisite: Pr 121

Pr 131 Hand-fed Platen Presswork (3)
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.

Pr 132 Automatic Platen Presswork (3)
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

Pr 133 Introduction to Cylinder Press (2)
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.

Pr 151 Bindery Operation (3)
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.

Pr 201 Theory of Color (3)
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.

Pr 221 Intermediate Typography (4)
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

Pr 232 Automatic Cylinder Presswork (3)
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

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 quaders, hydroquaders 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, Protoype-composing and other reproduction processes. Copyfitting, composing and makeup of newspapers, magazines and catalog advertising using the type-to-negative and paste-up method. 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 322 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.
Modern industry and education have need for men with a broad understanding of the basic factors involved in our complex industrial-technological society and yet with sufficient specialized preparation to make them employable in jobs related to production, distribution or teaching. The technical arts curriculum is designed to meet this need.

During the first two years of the program, the student develops a general understanding of several areas of technology including drafting, wood technology, electricity, electronics, metal technology, power mechanics and graphic arts. Emphasis is placed upon the study of tools, machines, materials, processes and products. Practical applications are made through laboratory experiences in the new technical arts laboratories, supplemented by the more specialized shops of the agriculture and engineering divisions.

Each student gains a substantial general education through courses in the areas of language communication, social sciences, natural sciences, mathematics, physical education and the arts. His ability to communicate in technical areas is further developed through courses in speech, technical writing and technical drawing. Special consideration is given to the industrial application of mathematics, physics and chemistry.

The curriculum is arranged so that each student participates in a maximum of "learn by doing" experiences in his major field early in the program. This provides him with the incentive to seek the basic scientific explanations which support his technical studies.

Secondly, it assists the student in discovering, at an early point in his college career, his interests and aptitudes. Those students who may terminate their education before completing college will have acquired the fundamentals and skills necessary for employment in many jobs which do not require a college degree.

Before starting his junior year, each student will elect one of two options: industrial sales and service or industrial arts teaching.

INDUSTRIAL SALES AND SERVICE

The student electing this program continues his study in advanced technical areas concentrating on industrial systems and product knowledge. Emphasis is placed upon the design and operational characteristics of mechanical, electrical and electronic equipment as well as the processes basic to modern industrial technology. Concurrently the student studies several areas of business including accounting, business law, economics, industrial management, labor management and sales management, industrial leaders serving as advisers to the college have endorsed this balanced program.

Men are in demand for numerous positions in the fields of industrial production and marketing. Since each graduate has a strong background in basic engineering and related sciences together with a broad knowledge of business operations and procedures, he is ready to assume a challenging and rewarding position such as manufacturer's salesman, purchasing agent, personnel officer, production supervisor or technical publication editor.

INDUSTRIAL ARTS TEACHING

This program prepares students for teaching industrial arts courses in secondary schools or junior colleges. Upon completion the graduate may secure the Special Secondary Credential in Industrial Arts. Candidates may also meet the requirements for a General Secondary Credential. Each student is required to choose two areas of concentration from the following: drafting, wood technology, metal technology, electricity-electronics, power mechanics, industrial arts crafts, and graphic arts. To gain the knowledge and skills needed for teaching in each of these technical areas, the student will complete a minimum of 24 units.

Students are prepared for entrance into the teaching profession through a sequence of selected courses and school observations directed cooperatively by the Education and Technical Arts Departments. During one quarter of the senior year, students work in a neighboring school as a practice teacher, supervised by an experienced secondary school teacher as well as a member of the Technical Arts staff.
The new Technical Arts facilities provide for instruction and laboratory experiences in drafting, wood technology, electricity, electronics, metal technology, industrial arts crafts and graphic arts. The laboratories will also be utilized to offer a number of service courses for students from other departments of the College.

### CURRICULUM IN TECHNICAL ARTS

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<td>Market Sales Development (MSM 206)</td>
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* Of the 28 elective units in the Sales and Service option, 11 shall be chosen with the approval of the adviser.
### Applied Arts Division

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| **Industrial Arts Teaching Option**

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### 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.

* Of the 28 elective units in the Sales and Service option, 11 shall be chosen with the approval of the adviser.

** Of the 48 elective units in the Industrial Arts Teaching option, 35 shall be chosen with the approval of the adviser.

† To be selected from the General Education list.

7—62811
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

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: TA 121, MS 148, Weld 148

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 321

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 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 specialties 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 specialty field.

Regardless of specialty 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 semiweekly publications; community radio station operation and management.

**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.

**CURRICULUM IN TECHNICAL JOURNALISM**

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

§ A minimum of 45 elective units shall be chosen in a field of specialization with the approval of the adviser.
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<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>Senior Project (Jour 462)</td>
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<td>2</td>
<td></td>
</tr>
<tr>
<td>Undergraduate Seminar (Jour 463)</td>
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<tr>
<td>Newspaper and Magazine Advertising (Jour 421)</td>
<td>3</td>
<td></td>
<td></td>
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<tr>
<td>Advertising Layout and Copywriting (Jour 425)</td>
<td></td>
<td>2</td>
<td></td>
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<tr>
<td>Newspaper Management (Jour 403)</td>
<td></td>
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<td>3</td>
</tr>
<tr>
<td>Applied Journalism Techniques (Jour 451, 452, 453)</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>* Magazine Production (Jour 427)</td>
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</tr>
<tr>
<td>$ Electives</td>
<td>6</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>16</td>
<td>15</td>
<td>16</td>
</tr>
</tbody>
</table>

### 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.

* The student may substitute Jour 303, 412, or 432 for Jour 427.

§ A minimum of 45 elective units shall be chosen in a field of specialization with the approval of the adviser.
Jour 203 Reporting I (1)
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.

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 (1)
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. 1 lecture.

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 (1)
Daily experience and responsibilities in editing and rewriting news and feature stories for campus news media. Practical application of headline writing and page makeup principles. 1 lecture. Prerequisite: Jour 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
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 General Secondary Teaching Credential with teaching majors and/or minors in Life Science and General Science, Physical Science and General Science, Mathematics, and Social Studies. 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: Agricultural Chemistry, Biological Sciences, Mathematics, Physical Sciences (with options in either Chemistry or Physics) and Social Sciences. The Division also offers, through the department of Military Science and Tactics, 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.

AGRICULTURAL CHEMISTRY

(See Physical Sciences)
The department offers a complete program of college work, leading to the bachelor of science degree in biological sciences. 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. Majors in the department may concentrate in botany, bacteriology, zoology, and other areas and still maintain a broad background in biology.

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**

<table>
<thead>
<tr>
<th>Class Year</th>
<th>Course Title</th>
<th>Freshman</th>
<th>Sophomore</th>
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<tbody>
<tr>
<td></td>
<td><strong>F</strong>  <strong>W</strong>  <strong>S</strong></td>
<td><strong>F</strong>  <strong>W</strong>  <strong>S</strong></td>
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<tr>
<td>Freshman</td>
<td><strong>General Botany</strong> <em>(Bot 121, 122, 123)</em> or <strong>General Zoology</strong></td>
<td>4 4 4</td>
<td>4 4 4</td>
</tr>
<tr>
<td></td>
<td><em>General Inorganic Chemistry</em>* <em>(Chem 324, 325)</em></td>
<td>4 4 4</td>
<td>4 4 4</td>
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<tr>
<td></td>
<td><strong>Organic Chemistry</strong> <em>(Chem 326)</em></td>
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<tr>
<td></td>
<td><strong>Language Communication</strong> <em>(Eng 104, 105, 106)</em></td>
<td>3 3 3</td>
<td>3 3 3</td>
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<tr>
<td></td>
<td><strong>Public Speaking</strong> <em>(Sp 201)</em></td>
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<tr>
<td></td>
<td><strong>Basic Mathematics for General Education</strong> <em>(Math 100, 200)</em></td>
<td>3 3 3</td>
<td>3 3 3</td>
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<tr>
<td></td>
<td><strong>Health Education</strong> <em>(PE 107)</em></td>
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<td></td>
<td><strong>Physical Education</strong> <em>(PE 141)</em></td>
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<tr>
<td></td>
<td><strong>Electives</strong></td>
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<td></td>
<td><strong>Total</strong></td>
<td>16½ 16½ 16½</td>
<td>16½ 16½ 16½</td>
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</tbody>
</table>

* Of the total elective units a minimum of 23 shall be chosen in a field of specialization in the Biological Sciences with the approval of the adviser.

1. Chem 321, 322, and 323 will substitute for Chem 324 and 325.
2. Math 102 and 103 or Math 117 and 118 will substitute.
3. Phys 131, 132, 133 will substitute.
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 application of microbiology stressing food, dairy, water, air and sewage; practical aspects of environmental sanitation emphasized. 2 lectures, 1 laboratory. Prerequisite: Bio 110.

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.

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.

* Of the total elective units a minimum of 23 shall be chosen in a field of specialization in the Biological Sciences with the approval of the adviser.
Bio 101 General Biology (3)
Characteristics of living things; cellular composition and organization; functional approach to organ systems of man. 3 lectures.

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.

Bio 127 Nature Study (3)
Scope of natural history; formation and identification of land forms and rocks; physical aspects of the oceans; identification of the components of weather and climate; classification and identification of the major groups of animals; importance of the conservation of natural resources. 1 lecture, 2 laboratories.

Bio 128 Nature Study (3)
Principles of biological classification, taxonomy, nomenclature, ecology, and natural history; classification and identification of the major groups of plants; interrelations between organisms and their environment; introduction to the techniques of field study and the scientific method. 1 lecture, 2 laboratories.

Bio 129 Nature Study (3)
California natural history; more detailed examination of communities with further emphasis on the identification and interrelations of plants, animals and environmental factors. 1 lecture, 2 laboratories.

Bio 142 Biological Techniques (3)
Preparation of plant and animal specimens for display or study purposes. 1 lecture, 2 laboratories. Prerequisite: Bot 121 or Zoo 131

Bio 225 Microtechnique (3)
Methods of preparing plant and animal tissues for microscopic study. 1 lecture, 2 laboratories. Prerequisite: Bot 121 or Zoo 131

Bio 303 Genetics (3)
Principles of heredity and variation. 3 lectures. Prerequisite: one quarter of college biology and two quarters of college mathematics.

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 333 Radiation Biology (2)
Effect of radiation on plant and animal tissues. This 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 400  Special Problems (1-2)
Total credit limited to 4 units with no more than 2 units in any one quarter. Individual or group investigations for advanced students. 1 or 2 laboratories.

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; Ed 430 completed or concurrent.

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)
Nature 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)
Elementary plant genetics, paleobotany, organic evolution, plant ecology, and plant geography. 2 lectures, 2 laboratories. Prerequisite: Bot 122

Bot 223  Plant Pathology (4)
Principal diseases of plants; symptoms, field identification, and control methods. 3 lectures, 1 laboratory. Prerequisite: Bot 122 or 235

Bot 235  Families of Agricultural Plants (4)
Recognition of the families of flowering plants which are of major agricultural importance in California. 2 lectures, 2 laboratories. Prerequisite: Bot 121

Bot 238  Native Plant Materials (3)
Identification, habits of growth, cultural requirements and landscape use of native California plants suitable for landscape purposes. 2 lectures, 1 laboratory. Prerequisite: Bot 122 or Bot 235

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 and Bio 323

Bot 334 Plant Morphology (3)
Evolution of the plant kingdom as illustrated by comparative morphology of major plant groups. 2 lectures, 1 laboratory. Prerequisite: Bot 123

Bot 343 Taxonomy of Higher Plants (3)
General principles of classification of plants; procedure for identification of unknown plants; preparation and use of specimens. 2 lectures, 1 laboratory. Prerequisite: Bot 122 or Bot 235

Bot 426 Mycology (3)
Morphological, cultural and pathological characteristics of fungi. 2 lectures, 1 laboratory. Prerequisite: Bot 122 or Bot 235 or consent of 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.

DESCRIPTION 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 331 Taxonomy (3)
Major principles of classification, taxonomy, speciation and nomenclature, particularly as they apply to insects. Designed primarily for biology majors. Term report required. 2 lectures, 1 laboratory. Prerequisite: Ent 126

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 function 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 226 Vertebrate Field Zoology (4)
Identification, life histories, and economic importance of vertebrates. Fieldwork emphasized. 2 lectures, 2 laboratories. Prerequisite: Zoo 132 or Bio 129

Zoo 236 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 237 Human Anatomy (3)
Morphology of the organ systems of man. 2 lectures, 1 laboratory. Prerequisite: Zoo 132. Recommended: knowledge of elementary chemistry.

Zoo 238 Human Physiology (3)
Cellular metabolism. Functions of respiratory, circulatory, digestive, and excretory systems. 2 lectures, 1 laboratory. Prerequisite: Zoo 237

Zoo 239 Human Physiology (3)
Functions of skeletal, muscular, nervous, endocrine, and reproductive systems. 2 lectures, 1 laboratory. Prerequisite: Zoo 238

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 323 Embryology (4)
Embryonic development of the vertebrate body with particular emphasis on the frog, chick, pig, and man. 2 lectures, 2 laboratories. Prerequisite: Zoo 133 or permission of the instructor.

Zoo 326 Comparative Anatomy of Vertebrates (4)
Comparative structure of vertebrate organ systems. 2 lectures, 2 laboratories. Prerequisite: Zoo 132. Recommended: Zoo 323

Zoo 422 Histology (4)
Tissues, microscopic organology, and correlation of form with function. 2 lectures, 2 laboratories. Prerequisite: Zoo 132. Recommended: Bio 225

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, Immunology and Hematology  (5)
Nature of innate and acquired immune reactions: theory and techniques of serological methods in diagnosing disease. Survey of methods used in studying blood cells. Course is designed for preparing laboratory technologists. 2 lectures, 3 laboratories. Prerequisite: Permission of the instructor.

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.
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 intending to teach in elementary schools will start with Math 121. Students majoring in Business 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 Agricultural Division will normally begin with Math 102.

**CURRICULUM IN MATHEMATICS**

**Freshman**

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<th>Course</th>
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<tbody>
<tr>
<td>Mathematics for Engineers (Math 117)</td>
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</tr>
<tr>
<td>Analytic Geometry and Calculus (Math 118, 201)</td>
<td>3</td>
<td>3</td>
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</tr>
<tr>
<td>Language Communication (Eng 104, 105, 106)</td>
<td>2</td>
<td>4</td>
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</tr>
<tr>
<td>General Physics (Phys 131, 132)</td>
<td>1</td>
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<td>½</td>
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<tr>
<td>Health Education (PE 107)</td>
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<tr>
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<td>16½</td>
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**Sophomore**

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<tr>
<td>Analytic Geometry and Calculus (Math 202, 203)</td>
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<tr>
<td>Differential Equations (Math 316)</td>
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<tr>
<td>General Physics (Phys 133)</td>
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<tr>
<td>Biological Sciences</td>
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<td>General Psychology (Psy 202)</td>
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<td>Principles of Economics (Ec 201)</td>
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<td>Applied Mathematics (One Department other than Math)</td>
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<tr>
<td>Sports Education (PE 241)</td>
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<tr>
<td>Electives</td>
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</tr>
<tr>
<td>Total</td>
<td>16½</td>
<td>16½</td>
<td>16½</td>
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* To be selected from the General Education list.
* Fifteen units must be selected from approved skills courses including at least one unit of arts acceptable for General Education.
* Not required of Mathematics teaching major.
* Applied Mathematics major must select these from applied mathematics courses approved by adviser. Mathematics teaching major uses these for teaching minor requirements.
## California State Polytechnic College

### APPLIED MATHEMATICS SPECIALIZATION

<table>
<thead>
<tr>
<th>Junior</th>
<th>F</th>
<th>W</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Differential Equations (Math 317)</td>
<td>2</td>
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<tr>
<td>Advanced Engineering Problems (Math 318, 319)</td>
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<tr>
<td>Mathematics of Statistics (Math 321)</td>
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<td>Programming for Digital Computers (Math 221 or 304)</td>
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<td>General Chemistry (Chem 321)</td>
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<td>*Literature</td>
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<td>Biological Sciences</td>
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<td>Social Sciences</td>
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<tr>
<td>American Government (Pol Sc 301)</td>
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<td>Senior Project (Math 461)</td>
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<td>Electives</td>
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<tr>
<td>Senior Project (Math 462)</td>
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<td>Undergraduate Seminar (Math 463)</td>
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<td>Approved Mathematics</td>
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<td>*Literature or Philosophy</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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### MATHEMATICS TEACHING SPECIALIZATION

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<tr>
<td>Mathematics of Statistics (Math 321)</td>
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<td>Modern Algebra (Math 381, 382)</td>
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<td>Theory of Equations (Math 307)</td>
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<td>General Chemistry (Chem 321)</td>
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<td>American Government (Pol Sc 301)</td>
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<td>Educational Psychology (Ed 312)</td>
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<td>Biological Sciences</td>
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<td>Principles of Secondary Education (Ed 301)</td>
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<tr>
<td>Secondary School Mathematics (Math 402, 403)</td>
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<td>College Geometry (Math 442)</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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<tr>
<td>Teaching Plans and Techniques (Ed 403)</td>
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<tr>
<td>Human Growth and Development (Ed 304)</td>
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*To be selected from the General Education list.

1Fifteen units must be selected from approved skills courses including at least one unit of arts acceptable for General Education.

2Teacher candidates should use at least 30 units of their electives to complete their teaching minor.
DESCRIPTIONS OF COURSES IN MATHEMATICS

Math 1 Preparatory Mathematics (4)
Decimal system and systems of other basis, 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 100.

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. 3 lectures. Prerequisite: Math 102.

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; banking, cash and trade discounts; exponents, radicals, logarithms, equations and basic algebraic operations. 3 lectures. Prerequisite: Math 7 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 agricultural chemistry. 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 agricultural chemistry. 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, binominal 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 Arithmetic 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 Arithmetic 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'Hopital'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 Investment Mathematics (3)
 Bonds, general annuities and advance topics, approximation methods, contingent annuities, life insurance, probability and mortality tables. 3 lectures. Prerequisite: Math 109

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 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)
Subroutine structure: analysis of structure of input and output subroutines and elementary function subroutines; systems analysis; structure of compilers and assembly programs; problems in data processing; real time analyses; problems from current computer literature. Two lectures, one two-hour activity period. Prerequisite: Math 221 or consent of the instructor.

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. An introduction to matrices and determinants. 3 lectures. Prerequisite: Math 201

Math 312 Linear Systems and Matrices (3)
Linear substitutions and their compositions; representation by matrices; arithmetical properties of matrices; matrices, vector spaces, and determinants; characteristic vectors and characteristic numbers; basic methods of solving systems of linear equations; applications to differential equations. 3 lectures. Prerequisite: Math 317

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 distributions, the median and other quartiles, 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 nonparametric 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: Permission of the 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 newer 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 Arithmetic in the Elementary School (3)
Developing readiness for arithmetic; forming number concepts; teaching the mathematical rationale of the fundamental operations; the discovery or laboratory approach and the role of manipulative materials; developing skills, appreciation, and understanding for arithmetical problems; contemporary programs and development; 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. Prerequisites: 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)
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 reports 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.
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 and Tactics 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.

BASIC COURSE

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 voluntary. 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 and Tactics 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.

ADVANCED COURSE

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 for 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 MS&T winter quarter requirements during each of the junior and senior year sequences.

ROTC SUMMER CAMP

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 AND TACTICS

* MS&T 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.

* Enrollment in the basic course makes completion thereof a prerequisite to graduation from the College unless the student is sooner discharged by appropriate authority.
Applied Sciences Division

* MS&T 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.

† MS&T 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.

MS&T 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 MS&T 303.

MS&T 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 makes completion thereof a prerequisite to graduation from the College unless the student is sooner discharged by appropriate authority.
† Enrollment in the advanced course makes completion thereof a prerequisite to graduation from the College unless the student is sooner discharged by appropriate authority.
The Department of Physical Sciences 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 two major curricula of the department lead to the bachelor of science degree in physical sciences or in agricultural chemistry.

The occupational objectives of the curriculum in physical sciences are to qualify students for entry at the bachelor's level into positions in civil service and industry and to help prepare secondary teachers of the physical sciences. The curriculum is so set up that a student may take an option in either physics or chemistry according to his own wishes.

Graduate courses are offered which help to complete the requirements for the general secondary 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 follow the curriculum in physical sciences 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 agricultural chemistry 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 agricultural chemistry 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 PHYSICAL SCIENCES**

<table>
<thead>
<tr>
<th>* Physics Option</th>
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<tbody>
<tr>
<td>Biological Sciences (Bio 101, 110, Bot 121, or Zoo 131)</td>
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<tr>
<td>Language Communication (Eng 104, 105, 106)</td>
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<tr>
<td>Shop Processes (MS 147, 148)</td>
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<tr>
<td>Health Education (PE 107)</td>
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<tr>
<td>Physical Education (PE 141)</td>
<td>½</td>
<td>½</td>
<td>½</td>
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<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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<tr>
<td>General Chemistry (Chem 321, 322, 323)</td>
<td>4</td>
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<tr>
<td>General Physics (Phys 131, 132)</td>
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<tr>
<td></td>
<td>16½</td>
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* This option fulfills the undergraduate Physical Sciences requirements for the teaching major in Physical Sciences and General Science.
### Sophomore

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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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<tr>
<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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<td>Light (Phys 223)</td>
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<tr>
<td>Electives</td>
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| Total                                                                 | 17 1/2 | 16 1/2 | 17 1/2 |

### Junior

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<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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<tr>
<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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<td>Nuclear Physics Laboratory (Phys 442, 443)</td>
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<td>Electives</td>
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| Total                                                                 | 16 1/2 | 16 | 16 |

### Senior

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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>2 Social Sciences</td>
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<td>3 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>Solid State Physics (Phys 406)</td>
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<td>Undergraduate Seminar (Phys 463)</td>
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<tr>
<td>Electives</td>
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| Total                                                                 | 16 | 16 | 16 |

### Freshman

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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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<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>Physical Education (PE 141)</td>
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<td>Health Education (PE 107)</td>
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<td>Biological Sciences (Bio 101, 110, Bot 121 or Zoo 131)</td>
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<td>Electives</td>
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</table>

| Total                                                                 | 15 1/2 | 16 1/2 | 17 1/2 |

* This option fulfills the undergraduate Physical Sciences requirements for the teaching major in Physical Sciences and General Science.

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.

3 To be selected from the General Education list.
### Sophomore

<table>
<thead>
<tr>
<th>Course Description</th>
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<tbody>
<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>Laboratory Glassblowing (Chem 342)</td>
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<tr>
<td>General Physics (Phys 131, 132, 133)</td>
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<tr>
<td>Analytic Geometry and Calculus (Math 202, 203)</td>
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<tr>
<td>Shop Processes (MS 147, 148)</td>
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<td>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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<tr>
<td>Report Writing (Eng 301)</td>
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### Junior

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<tbody>
<tr>
<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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<tr>
<td>Introduction to Optics and Atomic Physics (Phys 211)</td>
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<td>Light (Phys 223)</td>
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<tr>
<td>General Psychology (Psy 202)</td>
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<tr>
<td>American Government (Pol Sc 301)</td>
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<td>Social Sciences</td>
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### Senior

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<th>Course Description</th>
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<tbody>
<tr>
<td>Advanced Organic Chemistry (Chem 403)</td>
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<tr>
<td>Senior Project (Chem 461, 462)</td>
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<tr>
<td>Undergraduate Seminar (Chem 463)</td>
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<tr>
<td>Advanced Physical Chemistry (Chem 437)</td>
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<tr>
<td>Special Problems for Advanced Undergraduates (Chem 400)</td>
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<td>Atomic Physics (Phys 401)</td>
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<td>Growth of American Democracy (Hist 304)</td>
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### CURRICULUM IN AGRICULTURAL CHEMISTRY

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<td>Shop Process (MS 147, 148)</td>
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<td>Language Communications (Eng 104, 105, 106)</td>
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<td>Agricultural Mathematics (Math 102, 103)</td>
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<td>Physical Education (PE 141)</td>
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<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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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.
3. To be selected from the General Education list.
4. Agricultural Mechanics (AE 121) will substitute.
### Sophomore

<table>
<thead>
<tr>
<th>Course Description</th>
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<tbody>
<tr>
<td>Quantitative Analysis (Chem 331, 332)</td>
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<td>Organic Chemistry (Chem 326)</td>
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<tr>
<td>Physics (Phys 121, 122 or 131, 132)</td>
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<tr>
<td>Laboratory Glassblowing (Chem 342)</td>
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<td>Mathematics (Math 114, 115, 118)</td>
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<td>Engineering Drafting (ME 141)</td>
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**Approved Courses:**

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<td>Physics (Phys 121, 122 or 131, 132)</td>
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<td>Laboratory Glassblowing (Chem 342)</td>
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<td>Mathematics (Math 114, 115, 118)</td>
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**Electives:**

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### Junior

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<td>Agricultural Biochemistry (Chem 328, 329)</td>
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<td>Organic Chemistry (Chem 327)</td>
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<tr>
<td>Physical Chemistry (Chem 432, 433)</td>
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<td>Qualitative Organic Analysis (Chem 343)</td>
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<tr>
<td>Report Writing (Eng 301)</td>
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<tr>
<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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**Electives:**

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### Senior

<table>
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<tbody>
<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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<td>Undergraduate Seminar (Chem 463)</td>
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<td>Special Problems for Advanced Undergraduates (Chem 400)</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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**Electives:**

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### 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, physical sciences, and mathematics majors. 3 lectures, 1 laboratory. Prerequisite: Chem 4 or the passing of a placement test.

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1. Literature, Philosophy, or Arts from General Education list will substitute.
2. Ten units to be selected with approval of adviser.
3. To be selected from the General Education list.
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 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 325

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 in Chem 400 and Phys 400 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. Prerequisites: 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 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, 111, 114, or 117
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 115 or 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 or 204

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. 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: Math 405

Phys 400 Special Problems for Advanced Undergraduates (1-2)
Total credit limited to 4 units in Phys 400 and Chem 400 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. Prerequisites: 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. Semiconductors. 3 lectures. Prerequisites: Phys 211, 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, 443 Nuclear Physics Laboratory (1) (1)
Techniques of measurement including Geiger, proportional and scintillation counting. Determination of the properties of alpha, beta and gamma radiation. Neutron flux measurements. Particle energy measurements. Selected specialized techniques. 1 laboratory. Prerequisite or concurrent: Phys 402, 403

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

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)
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. Not for students majoring in mathematics or physical science. 3 lectures, 1 recitation. Prerequisite: Math 100, 103, 108, or 122

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 application. Some special knowledge of modern science that will function in a socially desirable manner in the lives of students. 3 lectures, 1 recitation. Prerequisite: PSc 101

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. 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 301. 3 lectures.

PSc 301 General Astronomy (3)
Quantitative and descriptive properties of the earth, solar system, stars and galaxies. Astronomical applications of the laws of the physical sciences. Occasional photographic and other quantitative observational periods. 3 lectures. Prerequisites: 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 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: Graduate standing.
The Department of Social Sciences serves the four divisions of the College in the area of general education for citizenship. Stated in terms of general objectives the Department seeks to provide the student with an understanding of the society in which he lives; to develop in the student those skills which are prerequisites for effective citizenship in a democracy; and to prepare and encourage the individual toward intelligent 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 which will permit the student to qualify for a Master of Arts degree in education, with concentration in the field of the social sciences.

There are no special requirements for entrance into this major. Prerequisites for certain courses are stated in the catalog descriptions of courses.

**CURRICULUM IN SOCIAL SCIENCES**

**Freshman**

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<tr>
<th>Course</th>
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<td>Language Communication (Eng 104, 105, 106)</td>
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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>Health Education (PE 107)</td>
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<td><em>Basic Mathematics for General Education (Math 100)</em></td>
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<td>†Natural Science</td>
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<td>History of Civilization (Hist 101, 102, 103)</td>
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<td>‡Electives</td>
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16½ 17½ 16½

**Sophomore**

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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>General Psychology (Psy 202)</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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<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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17½ 17½ 17½

* Students interested in the fields of social welfare or civil service employment should also elect Math 200.
† A minimum of 15 units of natural science is required for graduation. These 15 units must meet the following requirements: (1) 3-12 units in life science (see General Education list); (2) 3-12 units in physical sciences (see General Education list); (3) the 15 units in science must include one sequence course which meets for three quarters with a minimum of 9 units.
‡ 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.
### California State Polytechnic College

#### Junior

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<th>Course</th>
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<tr>
<td>Literature (Eng 211, 212, 213; or 311, 312, 313)</td>
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<td>Advanced Public Speaking (Sp 202)</td>
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<td>Social Problems (Soc 301)</td>
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<td>International Relations (Pol Sc 312)</td>
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<td>History (Hist 351, 352, 353; or 411, 412, 413)</td>
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#### Senior

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<td>Undergraduate Seminar (Soc Sc 463)</td>
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#### Approved Courses in Social Sciences

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<td>Economics (Any 3 units from 300 or 400 level)</td>
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<td>Philosophy (Phil 202 or Phil 204)</td>
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#### Electives

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<td>Economics (Any 3 units from 300 or 400 level)</td>
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### DESCRIPTION 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 economic problems selected with reference to the needs of the students. 3 lectures. Prerequisite: Ec 201, 202

**Ec 304 Comparative Economic Systems (3)**
Analysis of economic principles and institutions applicable to capitalism, socialism, and communism. 3 lectures. Prerequisite: Ec 202

**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 HISTORY

**Hist 101, 102, 103 History of Civilization (3) (3) (3)**
Development of civilization from earliest times to the present. Political, economic, social, intellectual, and religious contributions of the various peoples of 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: Eng 105, Pol Sc 301, Hist 304

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 364 History of Political Thought (3)
Theories of political control and the relationship of man and the state from Greeks and Romans to modern times. 3 lectures. Prerequisites: Pol Sc 301 and U. S. History.

Hist 411, 412, 413 History of the Far East (3) (3) (3)
Social, economic, and political developments in Japan, China, Korea, Philippines, India, and southwest Asia from earliest times to the present. 3 lectures. Prerequisite: Junior standing or permission of the instructor.

Hist 583 Contemporary Problems of the Far East (1-3)
Internal and international problems of the countries of the Far East since 1945. Conducted as a seminar. 1 to 3 lectures. Prerequisite: Graduate standing and major in social sciences. Maximum of 6 units 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 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 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: Pol Sc 301 and Hist 304 or equivalent.

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. Prerequisites: 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.

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 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 geo-
graphic factors in current international affairs. 3 lectures.

DESCRIPTONS 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, 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 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.

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.

DESCRIPTONS 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 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.
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 Agricultural Division offers four-year programs leading to the bachelor of science degree in seven majors. They are Agricultural Business Management, Animal Husbandry, Fruit Industries, Agronomy, Agricultural Services and Inspection, Ornamental Horticulture, and Landscape Architecture. In addition, the division offers the first two years of a major in Soil Sciences. The last two years of this curriculum are offered only at San Luis Obispo. 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, Arts and Sciences, 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 general secondary credential.

In the field of business, major offerings are provided in Accounting, Business Administration, and Marketing.

GENERAL INFORMATION

FACILITIES

Agricultural Classroom Building

Occupied for the first time at the beginning of the Fall Quarter, 1962, the Agricultural 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 Husbandry, 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 new Library Building on the Kellogg Campus. The library collection includes basic and general books plus specialized documents and periodicals in support of the majors offered.

Air View of Kellogg Campus
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 two 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, head-house 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.

Cafeterias
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.

On-campus Housing
The Kellogg Campus has four residence halls that were opened in the 1960-61 academic year. Each residence hall accommodates 200 students. Students live two to each room and are furnished with beds, wardrobe, study desks, bookshelves, etc. Each residence hall also has a lounge, party kitchen, and recreational room. Personal laundry facilities are also available.
Residence hall life gives students ready access to the college library, gymnasium, athletic playfields and permits full participation in college life. Good study habits are encouraged in the campus residence halls through planned study schedules that also provide for group socialization and individual interests.
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.

Off-campus Housing
Because it is felt that students who live in campus residence halls profit from their association with other students and staff members through sponsored activities,
the college recommends that whenever possible students live on the campus. However, because of the limited capacity of college facilities, a listing of private homes, hotels, motels, and apartments is maintained in the college Housing Office. Unmarried women students not living with their immediate family, must live in college housing.

Chapel
Occasional nonsectarian services, student weddings, 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 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 regular students are members of the Associated Student Body. The membership fee totals $15 per year and entitles the student to full participation in the activities of the association. Membership also includes a subscription to the weekly newspaper, *Poly Views*, and the privilege of purchasing at a reduced price the college yearbook, *Madre Tierra*.

PUBLICATIONS

*Poly Views* 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.

CAMPUS ORGANIZATIONS
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 or encourage membership in either national or local social fraternities or sororities.

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 by the student are designed to provide the services of a family physician while the student is in college and does not include the services of specialists. Diseases of a chronic nature which a student contracted before entering school are not covered. Students may consult the college physician at the Health Center by appointment. No hospitalization or major surgery is provided. 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

Individual counseling service is offered each student. This service consists of educational, vocational, and personal counseling in accordance with the needs of the student.

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.

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

Sears-Roebuck Foundation Agriculture Scholarship awards include annual scholarships of $300 each 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.
The Harry E. Rosedale Memorial Scholarship 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.

The Lemon Men's Club Annual Award of Merit of $100 goes to an outstanding upper classman in Citrus Fruit Production.

One $200 scholarship and one $100 scholarship are included in the Chet Pencille Memorial Fund. They 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.

Three $100 scholarships are made available at the Kellogg Campus by the California Landscape Contractors Association as awards of merit to upper classmen specializing in the field of ornamental horticulture.

One $100 scholarship is awarded by the Bandini Fertilizer Company to an outstanding student specializing in ornamental horticulture.

One $100 scholarship is made available by the Vitren Corporation for an outstanding student in poultry or animal husbandry.

The Jim Bastady Memorial Scholarship is an award of $100 made annually to a deserving freshman specializing in the field of Fruit Production.

An award of $100 is made annually by the California Association of Nurserymen to a student demonstrating the greatest abilities and desirable qualities for success in the ornamental horticulture field.

Two annual $100 scholarship awards are made available by the Solar Aircraft Company 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.

Two $100 awards are made annually to qualified continuing Cal Poly students in recognition of outstanding achievement in the fields of soil science or crop production.

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.

One $150 scholarship is awarded by each of the following clubs to an entering student in Fruit Production.

1. Central California and Tulare County Sunkist Managers Club
2. Foothill Sunkist Managers Club
3. Sunkist Managers Club (San Diego and Orange Counties)
4. Tri-County Sunkist Managers Club

One $150 scholarship is awarded by Sunkist Growers, Inc., as a second-year award to the most outstanding recipient of the Sunkist Managers Club Scholarships.

An alumnus of the college provides annually an award of a life membership in the California State Polytechnic College Alumni Association to an outstanding senior student who has demonstrated a high quality of leadership in his student life.

**STUDENT LOANS**

A number of student loan funds on the Kellogg Campus provide temporary assistance to needy 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 Student Personnel 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.

"Los Ganaderos Club" Loan Fund

The college animal husbandry club established the "Los Ganaderos 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.
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.

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): 120.00
- Each student enrolled for less than 15 units (per quarter per unit or fraction of unit): 8.00

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): 1.00

Conference, Short Course or Institute, per person: 1.00

Change of program fee: 1.00

Failure to meet administratively required appointment or time limit: 2.00

Library fines: See Schedule in Library

Credential fee: 8.00

Check returned for any cause: 2.00

Parking fee:
- Nonreserved spaces (per quarter):
  - Regular students: 9.00
  - Limited students: 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

† Proportionate fees apply during summer quarter.
California State Polytechnic College

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
- Medical fee (per quarter) ................................................................................. 3.00
- 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 of the Trustees of the California State Colleges.

Living Expenses

STUDENTS LIVING IN CAMPUS RESIDENCE HALLS

- Room and board per quarter, including parking fee (subject to change) ...................... $231.00
- 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) .................................................................................. 0.50
- Medical fee (per quarter) .................................................................................... 3.00
- Materials and service fee (per quarter) ..................................................................... 25.50
- Room and board (15 meals per week) ....................................................................... 231.00
- 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 ........................................................................ $392.50

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

SPECIAL INSTRUCTIONAL SERVICES

SUMMER 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

* Not State fees, subject to change.
† 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.
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.

SHORT COURSES AND WORKSHOPS

The facilities of the Kellogg Campus are made available to appropriate agencies wishing to offer short courses and workshops both for college credit and on a non-credit basis. The appropriateness of each proposal is considered on its merits in terms of its relationship to the college curricula and overall college objectives. Programs proposed for college credit are further evaluated with respect to how well they meet the college's requirements for credit in its regularly offered educational programs.

PREPARATION FOR ELEMENTARY AND SECONDARY SCHOOL TEACHING

The California State Polytechnic College, Kellogg Campus, offers courses which lead to the general teaching credential with elementary and secondary specializations. Those interested in professional positions at the elementary level should consult the catalog description of the program in arts and sciences. Prospective secondary school teachers are advised to enroll in one of the following majors: Biological Sciences, Language Arts, Mathematics, Physical Education, Physical Sciences, or Social Sciences.

Admission to the college is not equivalent to being accepted for either teacher education program. Students must be admitted to the program before they will be permitted to undertake advanced work and student teaching. Requirements for admission coincide generally with those outlined for the San Luis Obispo Campus.
THE AGRICULTURAL 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
Instruction in agriculture on the Kellogg Campus of the California State Polytechnic College is primarily confined to eight graduation majors leading to the Bachelor of Science degree.

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 production 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 entire program totals 198 quarter units which vary according to the student's major.

Admission to the Agricultural Division is open to any high school graduate who meets the requirements listed in the section on admissions. Although no specific high school pattern of courses is required, it is to a student's advantage to have a good background in vocational agriculture and both physical and biological science.

The college has facilities necessary for the best practical training possible in its major fields. The college farm consists of fertile soils typical of the Southern California area with enough variation in soil types 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 for training students in mechanical skills such as farm machinery operation and repair, farm building construction, welding, electrical wiring and plumbing. Auxiliary buildings house farm machinery and tractors, and provide space for equipment construction and repair, and farm power instruction.

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 honey house.

In the Agronomy program approximately 250 acres are devoted to the production of field crops, vegetable crops, and irrigated pastures. Available for student use is modern equipment necessary for complete instruction in crops production, including equipment for tillage, pest control, weed control, planting, fertilizing, and harvesting. Facilities in this department also include vegetable packinghouse and propagation areas.
The Animal Husbandry 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 department include a modern feed mill and a completely equipped meats processing building. A modern poultry plant emphasizing egg and meat production complete with a modern dressing plant is available for student use.

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, including equipment for cultivation, weed control, orchard heating, pest control, and propagation. A modern, student-operated packinghouse on campus is used to process fruit from the college orchards.

The Landscape Architecture program 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.

The facilities of the Soil Science Department include a soils laboratory equipped with modern soil testing equipment as well as a fieldhouse for growing plants under controlled conditions of nutrition and environment. The facilities of the entire farm are also available for the use of students in obtaining practical knowledge in soil management.

In addition to modern irrigation pump testing and demonstration equipment, irrigation facilities include distributive systems typical of those used commercially in Southern California. Students obtain practice in working with check irrigation, furrow irrigation, and sprinkler irrigation both stationary and portable.

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 the college instruction and all departments offer jobs outside of class time so that students may earn while attending college.
The Agricultural Business Management major is a business program as 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 a concentration of work 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, this department offers an optional curriculum in Agricultural Marketing. This emphasis is designed to train students 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.

**CURRICULUM IN AGRICULTURAL BUSINESS MANAGEMENT**

<table>
<thead>
<tr>
<th>Freshman</th>
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<tbody>
<tr>
<td>Introduction to Agricultural Business (ABM 101)</td>
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<tr>
<td>Office Administration (OA 121)</td>
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<td>Agricultural Mechanics (AE 121, 122)</td>
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<td>Basic Mathematics (Math 101)</td>
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<td>Business Mathematics (Math 106)</td>
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<tr>
<td>* General Physical Science (PSc 101, 102)</td>
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<td>* General Psychology (Psy 202)</td>
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<td>** Electives</td>
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* Students specializing in Agricultural Marketing will delete the courses marked * and will substitute the following: Freshman (Bio 145, Chem 324, OA 141, 151); Sophomore (Chem 325, 326); Senior (ABM 418).

** All students will select twenty-four units from courses in agricultural production majors with the approval of the adviser. Chem 324, 325, 326 may be substituted for PSc 101, 102, 103.
## Sophomore

<table>
<thead>
<tr>
<th>Course Description</th>
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<tr>
<td>Agricultural Economics (FM 201)</td>
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<tr>
<td>Salesmanship (Mktg 208)</td>
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<td>Job Instruction Training (ABM 203)</td>
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<td>Public Speaking (Sp 200)</td>
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<tr>
<td>Principles of Accounting (Actg 121, 122)</td>
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<td>Business Law (Bus 301, 302)</td>
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<td>Storage and Inventory Control (ABM 302)</td>
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<tr>
<td>Advertising and Promotion of Agricultural Products (ABM 305)</td>
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<tr>
<td>Agricultural Marketing (FM 304)</td>
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<td>* Descriptive Statistics (Math 211)</td>
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<td>Human Relations (Psy 304)</td>
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<td>* Economic Problems (Ec 213)</td>
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<tr>
<td>* Principles of Accounting (Actg 123)</td>
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<td>American Civilization (Am Civ 301, 302, 303)</td>
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## Senior

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<td>Business and Sales Finance (ABM 303)</td>
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<td>Personnel Management and Industrial Relations (ABM 402)</td>
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<td>Wholesaling Agricultural Commodities (ABM 412)</td>
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<td>Retailing of Agricultural Products (ABM 414)</td>
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<td>Transportation of Agricultural Commodities (ABM 416)</td>
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<td>* Land Appraisal and Sales (ABM 406)</td>
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<td>Insurance Principles (Bus 403)</td>
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<td>State and Local Government (Pol Sc 401)</td>
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<td>Advanced Public Speaking (Sp 300)</td>
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## Descriptions 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.

* Students specializing in Agricultural Marketing will delete the courses marked * and will substitute the following: Freshman (Bio 145, Chem 324, OA 141, 151); Sophomore (Chem 325, 326); Senior (ABM 418).

** All students will select twenty-four units from courses in agricultural production majors with the approval of the advisor. Chem 324, 325, 326 may be substituted for PSc 101, 102, 103.

† To be selected from the General Education list.
ABM 203 Job Instruction Training (1)
The principles and techniques of instructing mechanical or technical jobs. 1 lecture.

ABM 204 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 301 Agricultural Credit (3)
Use of credit in establishing and operating the agricultural enterprise. Extension of credit and collection of accounts by businesses dealing in agricultural supplies and products. 3 lectures.

ABM 302 Storage and Inventory Control (3)
Techniques of storage and warehousing operations of perishable agricultural commodities. Changing agricultural storage patterns. Long term storage when production exceeds consumption. How the Cash and Futures Market influences agricultural storage. Methods of inventory control of perishables. 2 lectures, 1 laboratory.

ABM 303 Business and Sales Finance (3)
Methods of financing. Analysis of financial requirements, instruments, and statements of agricultural business and sales agencies. Sources and uses of credit. Financial planning. 3 lectures.

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 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
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 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 FARM MANAGEMENT

FM 100 Project Records (1)
Organization of the Foundation, records needed in conducting a project, methods of keeping records and their analysis. Adapted to student-conducted projects under the supervision of the college. 1 lecture.

FM 201 Agricultural Economics (3)
A history of U.S. Agriculture, agriculture's role in the economy, prices of agricultural products, agricultural resources and land use, agriculture and the government. 3 lectures.

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 324 Agricultural Enterprise Accounting (3)
Fundamental processes of double entry accounting as applied in modern agricultural production and business, the cash and accrual basis of federal and state farm tax reporting, farm enterprise accounts and statement analysis. 2 lectures, 1 laboratory.
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
The Agricultural Services and Inspection Department's program offers a broad background in the sciences that serve agriculture. Graduates are prepared for a variety of opportunities.

(1) Careers in civil service and other positions with county, state, and federal agencies which promote and protect the various agricultural enterprises are available. Governmental officials are cooperative agents whose duties are to help people 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 and state agencies or commercial companies after one year of training in this major provide experience and an income.

CURRICULUM IN AGRICULTURAL SERVICES AND INSPECTION

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<td>Agricultural Law (SI 101)</td>
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<td>Freshman Composition (Eng 104, 105, 106)</td>
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<td>Basic Mathematics (Math 101, 112)</td>
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<td>Agricultural Mechanics (AE 121 or 122)</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>General Entomology (Ent 126)</td>
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<td>Basic Biology (Bio 115)</td>
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<td>Basic Biology Lab (Bio 145)</td>
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<td>Agricultural Botany (Bot 120)</td>
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### Sophomore

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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 225)</td>
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<td>Plant Identification (SI 224)</td>
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<td>Fruit and Vegetable Standards (SI 321)</td>
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<td>Services and Inspection Problems (SI 372, 373)</td>
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<td>General Psychology (Psy 202)</td>
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<td>General Inorganic Chemistry (Chem 324, 325)</td>
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<td>Office Administration (OA 121)</td>
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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>American Civilization (Am Civ 301, 302, 303)</td>
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<td>Human Relations (Psy 304)</td>
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### Descriptions of Courses in Agricultural Services and Inspection

**SI 101 Agricultural Law (3)**

Provisions of the Agricultural Code and other laws affecting industries serving agriculture and the agricultural inspector; structures, and functions of state and county departments of agriculture, California seed law, agricultural chemicals, grain warehouse inspection, agricultural and structural pest control operators. 3 lectures.

**SI 223 Vertebrate Pest Control (3)**

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. 2 lectures, 1 laboratory.

* To be selected from the General Education list with not more than 2 units from arts and music.

** Two plant pathology courses to be selected with approval of major adviser.
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 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 federal, foreign, and domestic plant quarantines and California plant quarantine laws and regulations; identification, habits and seasonal history of pests and diseases concerned; areas under quarantine, commodities covered, restrictions, and established treatments. 3 lectures, 1 laboratory. Prerequisites: SI 101, 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, 373 Services and Inspection Problems (1) (1)

Breakdown of fields of employment and opportunities. Application forms, letter of application, data sheet, the interview, application followup. Speakers representing agricultural and structural pest control, agricultural chemical, crop marketing, and allied industries, and governmental agencies. 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 446 Methods in Structural Pest Control (2)

Field pest control operations directed against wood destroying and household pests. 2 laboratories. Prerequisites: SI 332, 333, 334, Path 335. Offered even-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 is the study of scientific agriculture, with particular reference to general farm crops. The science and art of the culture, harvesting, packaging and marketing of crops, profitably, demands an accumulation and application of information in a variety of subject area. 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; and with agencies of the federal and state governments. 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 develop skills in these areas before entering college.

**CURRICULUM IN AGRONOMY**

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<td>Vegetable Crops (TC 226)</td>
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## Junior Courses

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<td>Crop Technology (CP 322)</td>
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<td>Genetics (Bio 303)</td>
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<td>Agricultural Enterprise Accounting (FM 324)</td>
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### Senior Courses

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<td>Crops Diseases (CP 421)</td>
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<td>Crop Farm Operations (CP 437)</td>
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## Descriptions of Courses in Agronomy

**CP 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.

**CP 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.

**CP 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.

**CP 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.

**CP 230 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.

**CP 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.

† To be selected from the General Education list.
CP 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. Prerequisites: CP 121, 122, TC 224

CP 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. Prerequisites: CP 121, 122, 133, TC 226

CP 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.

CP 404 Plant Breeding (3)
Principles and techniques of improving ornamental and agronomic plants. 2 lectures, 1 laboratory. Prerequisite: Bio 303

CP 421 Crop Pest Control (4)
Methods of recognizing and combating insect pests, plant diseases, and rodents attacking commercial vegetable and field crops. Sprays, dusts, fumigants, and poisons, as well as cultural and sanitation practices of control. 3 lectures, 1 laboratory. Prerequisites: Bot 120, Path 223, Ent 126

CP 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. Prerequisites: CP 121 or 122, TC 224 or 226

CP 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.

CP 463 Undergraduate Seminar (2)
New methods and developments. Practices and procedures in the field. 2 lectures.

DESCRIPTIENS OF COURSES IN TRUCK CROPS PRODUCTION

TC 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.

TC 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.

TC 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.

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.
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 husbandry are designed to prepare men and women in educational, commercial and the scientific phases of the allied 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 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 Ramboullot, Southdown and Suffolk sheep, and a herd of Minnesota No. 1, 2, 3, and crossbred swine. 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.

**CURRICULUM IN ANIMAL HUSBANDRY**

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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>Feeds and Feeding (AH 101, 102)</td>
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* Ag. Engineering—Select four units from AE 121, 122, 131, two units from AE 123, 221, 227, 240.
### California State Polytechnic College

#### Junior

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#### Senior

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#### DESCRIPtIONS OF COURSES IN ANIMAL HUSBANDRY

**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 by-product 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 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.

**AH 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: AH 101

**AH 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.

†To be selected from the General Education list.
‡Economics Selection—ABM 201, 303, Bus 301, FM 403.
AH 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.

AH 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. Prerequisites: AH 102, 122

AH 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.

AH 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.

AH 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.

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

AH 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. Prerequisites: AH 102, 123

AH 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, soilage, hay, by-products. Supplemental feeding. 3 lectures, 1 laboratory. Prerequisites: AH 102, 131

AH 234  Horseshoeing  (3)
Fundamentals of horseshoeing, anatomy and physiology of the horse's foot, pattern and legs. Trimming feet, fitting, nailing shoes. Normal shoeing, corrective shoeing. 1 lecture, 2 laboratories.

AH 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: AH 102

AH 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

AH 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
AH 329  Advanced Horse Production  (3)
An advanced and detailed course in breeding, mare and stallion selection, con-
formation and bloodlines, fertility and sterility diagnosis, pregnancy, gestation and
foaling management, feeding techniques for stallions and mares, breeding hygiene,
breeding problems, records and office procedures. 2 lectures, 1 laboratory. Prere-
quisite: AH 225

AH 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 per-
formance testing. Fitting and marketing sale cattle. Breeding systems and blood-
lines. 2 lectures, 1 laboratory. Prerequisite: AH 233

AH 333  Meat Processing  (3)
The manufacturing of processed meats, with emphasis on sanitation, sausage
formulation, quality control, and smokehouse operations. 1 lecture, 2 laboratories.
Prerequisite: AH 227

AH 335  Meat Classification and Grading  (2)
A study of 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 near-by packing plants required. 1 lecture, 1 laboratory.
Prerequisite: AH 227

AH 336  Wool Technology and Marketing  (3)
Study of factors which determine commercial value of fleeces. Emphasis on
clean fleece weight for grade and relative importance of quality, length, soundness,
purity, crimp, color, and condition. Detailed study of markets and wool marketing.
Management practices affecting wool value. 2 lectures, 1 laboratory. Prerequisite:
AH 232. Offered odd-numbered years.

AH 337  Wool Judging  (1)
Training in judging and scoring fleeces on the basis of grade, class, yield, quality,
etc. Preparation for intercollegiate judging contests. 1 laboratory. Prerequisite: AH
232

AH 338  Basic Horse Training Techniques  (2)
For students interested in training, principles, and procedures. Includes descrip-
tions 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: AH 329

AH 402  Animal Nutrition  (3)
The metabolism of proteins, carbohydrates, fats, minerals, and vitamins. Relation-
ship of proper nutrition to livestock production. 3 lectures. Prerequisites: AH 102,
Chem 328

AH 421  Meat Technology  (3)
Characteristics of meat and meat products as related to processing operation,
manufacture, and marketing. 2 lectures, 1 laboratory. Prerequisites: AH 227, Chem
326

AH 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.

AH 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 market-
ing agencies. 2 lectures, 1 laboratory. Prerequisites: AH 131, 122, 123. Offered
even-numbered years.
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 326

AH 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.

AH 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 VETERINARY SCIENCE

VS 205  Physiology of Domestic Animals (3)
Coverage of the 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 303  Animal Parasitology (3)
Life cycles and control of internal and external livestock parasites of economic importance to the livestock industry. 3 lectures. Prerequisite: Zoo 134
FRUIT INDUSTRIES DEPARTMENT

Department Head, Albert E. Canham
William W. Armstrong                  Lloyd A. Newell

Fruit production in California constitutes a major part of the agricultural income and economy of the state. The Fruit Industries Department specializes in fruit production and marketing, emphasizing the services to the citrus and avocado industries. Additional work is provided in other subtropical and deciduous fruits. The need for trained men in all phases of the fruit industries of the state is a continuing one and the Fruit Industries Department has designed its curriculum to meet this need.

Each student obtains actual experience in orchard practices through the operation of college-owned orchards. Students are also able to gain additional experience by conducting a production project of their choice. Knowledge related to the handling and marketing of tree fruit crops is obtained in the college operated packinghouse facility and in local processing plants and marketing associations.

Opportunities for students of the Fruit Industries Department are found in orchard operation and management; commercial orchard pest control; fruit tree nurseries; laboratory and field technicians for public and private agencies; fruit marketing and processing companies; teaching; and with commercial business serving the fruit industries of California.

CURRICULUM IN FRUIT INDUSTRIES

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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>Fruit Propagation (FI 245, 246)</td>
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**Kellogg Campus**

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**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.

**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.

★ To be selected from the General Education list.
Fl 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

Fl 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.

Fl 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

Fl 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. Offered even-numbered years.

Fl 231 Grape Production (4)
Production, processing, and marketing of raisins, table and wine grapes. 3 lectures, 1 laboratory. Offered even-numbered years.

Fl 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

Fl 246 Fruit Propagation II (1)
Topworking and grafting fruit plants. Types of grafts used, selection of propagating material. 1 laboratory. Prerequisite: Bio 115

Fl 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

Fl 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

Fl 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

Fl 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.
FI 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 interest of student. Total credit limited to 4 units with not more than 2 units in any one quarter. Prerequisite: Advanced standing.
Landscape architecture provides a broad range of occupational choice: from positions with the many offices engaged in private practice, to civil service opportunities with city, county and state governments in either landscape architecture or the closely related urban or city planning field.

The first two years of the curriculum emphasize construction, elementary design, technical and drawing skills, plant materials, and science. This background of working with materials and design fundamentals 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. All student work and designs submitted for course credit become the property of the department.

The Urban Planning option provides the necessary knowledge of planning principles together with training in basic techniques and design. It also offers a strong background in social sciences, English and speech. 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 of landscape architects and planners, private and governmental offices of landscape architects and city planners in the Southern California area provide a wealth of instructional experiences available through field trips to these sites and places.

The major leads to a Bachelor of Science Degree in Landscape Architecture which is accredited by the California Board of Landscape Architects. The American Society of Landscape Architects, through its Southern California Chapter, and the American Institute of Landscape Architects sponsor student affiliate memberships for advanced students.

### CURRICULUM IN LANDSCAPE ARCHITECTURE

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<th>Course</th>
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<td>Freshman Composition (Eng 104, 105)</td>
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* Students specializing in Urban Planning will delete the courses marked and will substitute 35 units of required courses at the direction of the adviser.

† To be selected from the General Education list.
**Kellogg Campus**

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**DESCRIPTIONS OF COURSES IN LANDSCAPE ARCHITECTURE**

**LA 141** Landscape Drafting (3)

Drafting techniques and standards, progressing from tracings to light-construction working drawings. 3 laboratories.

**LA 142, 143** Theory of Design (3) (3)

Studies in form, space, color, and materials, and their relation to three-dimensional problems. 1 lecture, 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.

* Students specializing in Urban Planning will delete the courses marked and will substitute 35 units of required courses at the direction of the adviser.
† To be selected from the General Education list.
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.

LA 226  Planting Design (3)
The proper association of plant materials according to texture, color, and mass. The techniques involved in their grouping, arranging, and planting about buildings. 2 lectures, 1 laboratory. Prerequisites: OH 122, 221, 321, LA 229 or LA 225

LA 228, 229  Basic Landscape Design (4) (4)
Fundamental concepts in the analysis and solution of site problems. 2 lectures, 2 laboratories. Prerequisites: LA 141, 143

LA 241  Perspective (2)
Mechanical and sketching perspective. 2 laboratories. Prerequisites: LA 141 or ME 121

LA 242, 243  Delineation (2) (2)
Two-dimensional representation of three-dimensional subjects using different media which enable a student to express his ideas visually. 2 laboratories. Prerequisite: LA 241

LA 311  Planning I (3)
An introduction to the principles and practices of Urban Planning: Social Science elective, History, administrative procedures and design concepts. 3 lectures. Prerequisite: LA 229, or permission of the instructor.

LA 322  Planning II (3)
Field and office procedures and practices of municipal and regional planning agencies. 2 lectures, 1 laboratory. Prerequisite: LA 311

LA 323  Planning III (3)
The design of urban and regional environments. 3 laboratories. Prerequisite: LA 322

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. Prerequisites: LA 229, 243

LA 331, 332  Landscape Contracting (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. Prerequisite: LA 338

LA 333  Landscape Construction Drawing (4)
Landscape construction problems involving the formulation and preparation of plans for grading, drainage, staking, reference and lighting, planting, irrigation, details and other working drawings; relationship to specifications and contract documents. Preparation of a complete set of landscape construction drawings and documents. 2 lectures, 2 laboratories. Prerequisites: Math 112, LA 141, AE 122, 132

LA 334  Landscape Construction Drawing (4)
Problems relating to those undertaken in the first quarter, but of a more complex nature. Emphasis is on construction details, strength of materials, and structures. 2 lectures, 2 laboratories. Prerequisite: LA 338

LA 324  History and Literature of Landscape Architecture (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 I, II, III  (4) (4) (4)
The methods and procedures of master planning as it relates to large scale environmental development. The sequence of courses are devoted increasingly to more complex regional and metropolitan planning problems. 1 lecture, 3 laboratories. Prerequisite: LA 323

LA 434, 435, 436  Advanced Landscape Design  (4) (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. The writing of specifications. 1 lecture, 3 laboratories. Prerequisite: LA 326

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 462  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.
It is the objective of this department to prepare graduates for employment in
the ornamental horticulture industry. The curriculum is varied to allow specializa-
tion in either the growing-marketing phase, or in landscape management.

The function of the growing-marketing phase is to prepare students for employ-
ment in, or operation of, wholesale and retail nurseries, floral production, and
related areas.

The function of the landscape management phase is to prepare students for em-
ployment as licensed landscape contractors, as estimators or superintendents in the
landscape field, or as managers of public or private parks.

The well-landscaped Kellogg and Voorhis Campuses offer excellent opportunity
for practical application of principles and methods in all phases of landscape
installation and management. The excellent ornamental horticulture facilities con-
sisting of 12,000 square feet of greenhouse, 5,000 square feet of lath and saran
shade and the more than five acres of growing ground provide opportunity for
all phases of nursery and floral growing and management. The proximity of the
campus to highly populated areas and the fine cooperation of nearby landscapers,
park systems, and nurserymen provide opportunity for gainful knowledge. The
close alliance with the Landscape Architecture Department gives opportunity for
training extending from landscape design through installation procedures to main-
tenance and management.

Each year students grow the flowers necessary for decoration of the “Cal Poly”
float for the Pasadena Tournament of Roses. Students growing cut flowers, potted
plants or nursery stock in this department’s project program have the opportunity
of marketing their products through the student-operated produce store.

**CURRICULUM IN ORNAMENTAL HORTICULTURE**

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<td>Plant Materials I (OH 122)</td>
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<td>*Nursery Operations (OH 121)</td>
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<td>Freshman Composition (Eng 104, 105, 106)</td>
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*Students specializing in Landscape Contracting will delete the courses marked * and will sub-
stitute 34 units of required courses at the direction of the adviser.
†Students specializing in Landscape Contracting will select 12 units of Biological Science from
those marked †.
### Sophomore

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<td>*Greenhouse Design and Management (OH 323)</td>
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### Descriptions of Courses in Ornamental Horticulture

**OH 121 Nursery Operations (4)**

Commercial nursery operations. Propagation, nursery layout, seed sowing, transplanting, potting, canning, fertilizing, irrigation, and pest control. Bedding plants, hot plants, trees and shrubs. 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.

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† Students specializing in Landscape Contracting will select 12 units of Biological Science from those marked †.

‡ To be selected from the General Education list.
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. Prerequisites: OH 131, 231, Bot 120

OH 223 Basic Floral Design (3)
An introduction to basic commercial floral design, covering preparation of flowers, color harmony and design principles. 1 lecture, 2 laboratories. Prerequisite: Sophomore standing in Ornamental Horticulture.

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 or 116

OH 323 Greenhouse Design and Management (4)
Construction, maintenance, and management of forcing structures. Growing of commercial flower crops under glass, lath, and cloth. Experience in greenhouse watering, fertilizing, and pest control operations. 3 lectures, 1 laboratory. Prerequisites: OH 222, 231, 232

OH 327 Diseases and Pests of Ornamental Plants (4)
Effect of diseases and pests on ornamental plants found in nurseries, greenhouses, and commercial cut flowers. Their identification, control, and prevention. Field trips to the production areas to study field conditions. 3 lectures, 1 laboratory. Prerequisites: Bio 115, 145, Ent 126, Path 223

OH 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

OH 333 Turf Maintenance and 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. Prerequisites: OH 131, SS 221

OH 334 Commercial Cut-flower Growing (4)
Planting, cultural care, pest control, harvesting, storage, and marketing of cut flowers. Field trips to nearby production centers and the flower market. 3 lectures, 1 laboratory. Prerequisites: OH 131, 222, 231

OH 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. Prerequisites: OH 131, LA 224, 226

OH 336 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 339 Flower Shop Operation (4)
Operations of a retail florist shop. History and background, selection of location, layout and arrangement, equipment and supplies, policies and management, buying and selling. 3 lectures, 1 laboratory. Prerequisite: OH 223

OH 422 Horticultural Marketing and Management (3)
Horticultural management, marketing practices, contractual agreements and the merger of related enterprises. 2 lectures, 1 laboratory. Prerequisites: Departmental major with at least 150 units.
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.
SOIL SCIENCE DEPARTMENT

Department Head, Harry V. Welch, Jr.
George W. Schmitz

The functions of this department are to provide training in soil science for students in the Agricultural Division enrolled in other majors and to prepare students in the occupational fields of soils, conservation, range management, education, and farming. 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. The last two years of the curriculum are offered only at San Luis Obispo.

Facilities of the department have been expanded to provide sufficient laboratory space and equipment to meet the needs of the program. The application of soil management practices on the college farm is utilized to the fullest possible extent in the study of methods for putting soil knowledge to work. Work of outstanding value on nearby ranches and that being carried on by public agencies is also widely utilized.

CURRICULUM IN SOIL SCIENCE

<table>
<thead>
<tr>
<th>Freshman</th>
<th>F</th>
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<tbody>
<tr>
<td>Soils (SS 121)</td>
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<td>Range Management (SS 223)</td>
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<td>California Soils (SS 133)</td>
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<td>Crop Production</td>
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<td>Agricultural Mechanics (AE 121 or 122)</td>
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<td>Freshman Composition (Eng 104, 105, 106)</td>
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<td>Mathematics (Math 101, 112 or 117 or 118)</td>
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<td>Physical Education (PE 141)</td>
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<td>Health Education (PE 107)</td>
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<td>Basic Biology (Bio 115)</td>
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<td>Basic Biology Lab (Bio 145)</td>
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<td>Agricultural Botany (Bot 120)</td>
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<tr>
<td>Fertilizers (SS 221)</td>
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<tr>
<td>Soil Management (SS 122)</td>
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<td>Soil Conservation (SS 222)</td>
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<td>Public Speaking (Sp 200)</td>
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<tr>
<td>Fruit Production</td>
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<td>Basic Horticultural Skills (OH 131)</td>
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<tr>
<td>Surveying (AE 131)</td>
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<td>Principles of Economics (Ec 201, 202)</td>
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<td>Physical Education (PE 141)</td>
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<td>General Entomology (Ent 126)</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>Geology (PSc 329)</td>
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<td>Electives</td>
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### Junior (San Luis Obispo)

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<th>Course Title</th>
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<tr>
<td>Soil Classification (SS 321)</td>
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<td>Soil Fertility (SS 322)</td>
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<td>Range Technology (SS 332 or 323, or 433)</td>
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<tr>
<td>Mathematics (Math 100, 200 or 117 or 118)</td>
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<tr>
<td>Farm Records (FM 321)</td>
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<td>Farm Management (FM 322)</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>Agricultural Biochemistry (Chem 328)</td>
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<tr>
<td>U. S. In World Affairs (Hist 305)</td>
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<tr>
<td>General Bacteriology (Bact 221)</td>
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<tr>
<td>Animal Production (AH 230, or DH 230, or PH 230)</td>
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*Electives* 3-3

**Total:** 17

### Senior (San Luis Obispo)

<table>
<thead>
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<th>Course Title</th>
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<tbody>
<tr>
<td>Soil Physics (SS 432)</td>
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<tr>
<td>Soil Chemistry (SS 423)</td>
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<tr>
<td>Soil Microbiology (SS 422)</td>
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<td>Senior Project (SS 461, 462)</td>
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<tr>
<td>Undergraduate Seminar (SS 463)</td>
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<td>General Psychology (Psy 202)</td>
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<td>Literature</td>
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<td><em>Electives</em></td>
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</table>

**Total:** 16

### 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

**SS 133 California Soils** *(3)*

Origin, formation, and composition of California soils. Interpretation and utilization of soil survey and other data in crop production. 2 lectures, 1 laboratory. Prerequisite: SS 121. Offered odd-numbered years.

**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 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. Offered even-numbered years.

**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

* Of the total elective units a minimum of 16 shall be chosen with the approval of the adviser.
† To be selected from the General Education list.
SS 230 General Soils (4)
General properties of soils including common soil management, fertility, and conservation practices. Nonsoils majors. 3 lectures, 1 laboratory.

SS 231 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. Prerequisites: SS 122, 221
RELATED AGRICULTURAL COURSES

DESCRIPTIONS OF COURSES IN AGRICULTURAL ENGINEERING

Chairman, Haven Q. Conard

Warren Asa
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. Prerequisites: 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. Prerequisites: AE 121, AE 123

DESCRIPTIONS OF COURSES IN AGRICULTURAL EDUCATION

Ag Ed 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 (1-3)
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

The bachelor of science degree in engineering is granted in five major fields: aerospace, civil, electronic, industrial, and mechanical. The specific objectives of the respective majors are described in the introductory statements which precede each departmental section. However, all of the curricula have certain common objectives and characteristics.

1. They are designed to produce a well-rounded graduate who is particularly well-qualified in the engineering fields of design, planning, product development, production, operation, management, service, and technical sales.

2. They place substantial emphasis on laboratory work. Students study in close contact with actual engineering equipment in order that they may develop a natural feeling for engineering work.

3. They place substantial emphasis on personal growth and the ability to deal with people and economics as well as with equipment.

4. They utilize considerable concentration in a major field to enable students to attain a depth of knowledge in subject matter.

The curricula are taught in an atmosphere of dynamic engineering activity. Wherever possible, problems are related to actual engineering situations rather than academic exercises. This approach makes course work an exciting and challenging experience. The student finds himself faced with problems that require clear and complete thinking combined with the development of sound engineering judgment.

The resources of a growing industrial community are also utilized to provide additional atmosphere and experiences.

There is very little basic difference between the engineering curricula at San Luis Obispo and at the Kellogg campus. However, geographical location and minor differences in course structure and emphasis do give the student reasons for choosing one or the other campus as most suited to his individual needs. He is encouraged to consult with the administrative staff of either campus in examining the detailed basis for his choice.

It is recommended that the high school student planning a career in engineering take a balanced program including mathematics, physical science, drawing and shops.

AEROSPACE ENGINEERING DEPARTMENT

Acting Department Head, Rodney D. Sutherland
George R. Graves Conway H. Roberts *

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 not only can they be understood, but they can also be 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 jobs may be in: aerodynamics, propulsion systems, aerospace testing and research, stress analysis, flight test engineering and design groups. These graduates are employed by various aerospace vehicle and component manufacturers, airlines, government test bases, research laboratories, and propulsion unit manufacturers.

* On military leave.
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 laboratories, shops and a wind-tunnel test facility. 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 Institute of the Aerospace Sciences, a national society organized for the advancement of aerospace knowledge.

CURRICULUM IN AEROSPACE ENGINEERING

<table>
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<tr>
<th>Course</th>
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<tr>
<td>Aerospace Engineering Fundamentals (Aero 124, 126)</td>
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<tr>
<td>Aircraft Construction Laboratory (Aero 155)</td>
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<tr>
<td>Aerospace Construction Laboratory (Aero 156)</td>
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<tr>
<td>Engineering Drafting (ME 121, 122)</td>
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<td>Descriptive Geometry (ME 125)</td>
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<td>Metal Processing (MP 142, 144)</td>
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<td>Welding Survey (Weld 144)</td>
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<td>Production Welding Processes I (Weld 145)</td>
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<td>College Algebra and Trigonometry (Math 117)</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>Freshman Composition (Eng 104, 105, 106)</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>Physical Education (PE 141)</td>
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<td>Aerospace Engineering Fundamentals (Aero 125)</td>
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<tr>
<td>Aircraft Strength of Materials (Aero 205, 206)</td>
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<td>Flight Dynamics (Aero 209)</td>
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<td>Aerospace Hydraulic Systems (Aero 223)</td>
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<td>Aerospace Design and Layout (Aero 247, 248, 249)</td>
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<td>Engineering Statics and Dynamics (ME 211, 212)</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>General Chemistry (Chem 321, 322)</td>
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<td>Physical Education (PE 141)</td>
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† To be selected from the General Education List.
### 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. Prerequisite: 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 201

**Aero 126 Aerospace Electrical and Propulsion Systems (3)**
- Basic theory of rockets and introduction to space flight. Angular velocity experiments, aircraft engine testing. Environmental testing procedures. 1 lecture, 2 laboratories. Prerequisite: Aero 124. Concurrent: Math 118

**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. Concurrent: Aero 156

**Aero 156 Aerospace Construction Laboratory (1)**

† To be selected from the General Education List.
Aero 205  Aircraft Strength of Materials (4)
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. Determination and testing of the physical properties of materials used in aircraft. Effect of heat treatment on material properties. Use of the SR-4 strain rosette for determining principal strains. 3 lectures, 1 laboratory. Prerequisite: Aero 125, ME 201. Concurrent: Math 202

Aero 206  Aircraft Strength of Materials (3)

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 inviscid, incompressible flow. Flow about a body; potential and vortex motion. The thin airfoil and finite wing. Introduction to viscous flow. Navier-Stokes equations. Incompressible laminar and turbulent boundary layers. The compressible boundary layer. Methods of solving viscous flow equations. 3 lectures. Prerequisite: Aero 223. Concurrent: Math 316

Aero 302  Aerodynamics (3)
Study of the atmosphere, experimental aerodynamics, trajectory mechanics, basic and special performance problems of aircraft and missiles, static stability and control, mechanics of maneuvers. 3 lectures. Prerequisite: Aero 301, Math 316

Aero 304, 305  Aerodynamic Heating and Gas Dynamics (2) (3)
Heating of aerodynamic surfaces due to supersonic and hypersonic velocities. Heat transfer through the field surrounding an airplane or missile. Equipment and personnel protection. Atmospheric re-entry problems. Kinetic theory, equation of state, polytropic processes, Maxwell's equations, combustion, applications from the aero-space field. 2 lectures, 3 lectures. Prerequisite: Aero 223. Concurrent: Math 316
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 (3)
Statically indeterminate structures. Beam-column theory. Shear flow in multicell structures. Diagonal tension theory. Analysis of indeterminate structures. 2 lectures, 1 laboratory. Prerequisite: Aero 327

Aero 343 Wind Tunnel Testing (2)
Theory of operation and fundamental principles of wind tunnel testing. Special instruments used in wind tunnel testing. Scale effect, end effect, and correction factor calculations. 2 laboratories. Prerequisite: Aero 302. Concurrent: EL 223

Aero 347 Experimental Design Analysis (2)

Aero 349 Aerospace Structures Laboratory (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 Aircraft 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. Prerequisites: 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. Prerequisite: Aero 401

Aero 403 Rocket Propulsion (3)

Aero 404 Aerodynamics (3)
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. 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 349

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 302

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. Prerequisites: Aero 401, 404

Aero 444 Advanced Aerospace Design (3)
Design of aircraft components and systems. Static systems, design parameters. Design verification by written analysis. 3 laboratories. Prerequisites: Aero 401, 404

Aero 445 Advanced Aerospace Design (3)
Design of aircraft, missile and rocket system components. Dynamic systems, design parameters. Design verification by written analysis. 3 laboratories. Prerequisite: Aero 444

Aero 446 Advanced Aerospace Design (3)
Advanced design of aircraft, missile, rocket systems and components. Design verification by written analysis. 3 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. Prerequisites: EL 223, Aero 343, 347, 349

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. Prerequisites: Senior standing, EL 223, Aero 343, 347, 349

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**

<table>
<thead>
<tr>
<th>Freshman</th>
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<tr>
<td>Introduction to Civil Engineering (CE 121, 122)</td>
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<td>Route Surveying (CE 132)</td>
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<td>Advanced Surveying (CE 133)</td>
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<td>Analytic Geometry and Calculus (Math 118, 201)</td>
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<td>Traffic Engineering (CE 222)</td>
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<td>Engineering Soil Mechanics (CE 223)</td>
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<td>Civil Engineering Drafting (CE 224)</td>
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<td>Engineering Statics (ME 211)</td>
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<td>Strength of Materials (ME 218, 219)</td>
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<td>Engineering Dynamics (ME 212)</td>
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* On military leave.
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<td>Construction Materials (CE 322)</td>
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<td>Hydrology and Flood Control (CE 333)</td>
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<td>Fluid Mechanics (ME 311)</td>
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<td>Principles of Economics (Ec 201, 202)</td>
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| Total                                              | 18| 18| 17|

### Senior

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<td>Reinforced Concrete Design (CE 421)</td>
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<td>Substructure Design (CE 423)</td>
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<td>Water Supply Engineering (CE 431)</td>
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<td>Waste Disposal Engineering (CE 432)</td>
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<td>Senior Project (CE 461, 462)</td>
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<td>Undergraduate Seminar (CE 463)</td>
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<td>Thermodynamics (ME 301)</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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<td>† Literature or Philosophy</td>
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<td>Electives</td>
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| Total                                              | 17| 17| 17|

### DESCRIPTIONS OF COURSES IN CIVIL ENGINEERING

**CE 121, 122 Introduction to Civil Engineering (2) (2)**

Problems involving civil engineering subjects such as construction equipment, construction methods, ethics, piping, and utility facilities. Field trips, films, demonstrations. 1 lecture, 1 laboratory.

**CE 131 Elementary Surveying (3)**

Use and care of surveying instruments, fundamental surveying methods, traverse closures and area computations. 1 lecture, 2 laboratories.

**CE 132 Route Surveying (3)**

Simple, transition, and vertical curves. Earthwork computations. Introduction to photogrammetric methods. Design and layout of route. 1 lecture, 2 laboratories. Prerequisite: CE 131

**CE 133 Advanced Surveying (3)**

Elements of topographic, hydrographic, geodetic surveying. Astronomical observations. City and land surveys. Precise equipment and control surveys. 1 lecture, 2 laboratories. Prerequisite: CE 132

**CE 221 Highway Engineering, Planning (2)**

Highway administration, finance, and planning. Geometric design. Location. 1 lecture, 1 laboratory.

**CE 222 Traffic Engineering (2)**

Driver and vehicular characteristics. Traffic control, intersection, and roadway design. Traffic surveys and routing studies. Parking and public transit planning. 1 lecture, 1 laboratory. Prerequisite: CE 221 or permission of instructor.

† To be selected from the General Education List. Include one course in literature.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>CE 223</td>
<td>Engineering Soil Mechanics</td>
<td>3</td>
<td>Structure, identification and classification of soil for engineering purposes. Determination of physical properties of soils by laboratory experiments including compressibility, consolidation, shearing strength, permeability. Application to simple problems. 2 lectures, 1 laboratory.</td>
<td>ME 202</td>
</tr>
<tr>
<td>CE 224</td>
<td>Civil Engineering Drafting</td>
<td>3</td>
<td>Architectural, structural, topographic, street improvement, and survey drawing and plotting practices. Ink on linen, lettering style, and use of drafting machines stressed. 1 lecture, 2 laboratories.</td>
<td>ME 125</td>
</tr>
<tr>
<td>CE 228</td>
<td>Estimating and Engineering Economics</td>
<td>3</td>
<td>Techniques in material take-offs and estimating of costs for construction projects. Principles governing the economic aspects of engineering decisions. Retirement and replacement studies. 2 lectures, 1 laboratory.</td>
<td>ME 202</td>
</tr>
<tr>
<td>CE 233</td>
<td>Elementary Structural Analysis</td>
<td>3</td>
<td>Analysis of statically determinate beams, trusses, and three-hinged arches due stationary and moving loads. Influence lines. Graphic and analytical methods. 2 lectures, 1 laboratory.</td>
<td>ME 202</td>
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<tr>
<td>CE 240</td>
<td>Additional Engineering Laboratory</td>
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<td>Total credit limited to 4 units, with not more than 2 units in any one quarter. 1 or 2 laboratories.</td>
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<tr>
<td>CE 301</td>
<td>Statically Indeterminate Structures</td>
<td>3</td>
<td>Analysis of statically indeterminate structures by analytical and graphical methods. 3 lectures.</td>
<td>CE 233</td>
</tr>
<tr>
<td>CE 326</td>
<td>Highway Engineering, Structural</td>
<td>2</td>
<td>Design of rigid and flexible pavements. Culverts and drainage. Soil stabilization. Construction. 1 lecture, 1 laboratory.</td>
<td>CE 223, 332</td>
</tr>
<tr>
<td>CE 332</td>
<td>Hydraulics</td>
<td>3</td>
<td>Open channel flow, backwater curves, pipe network analysis, hydraulic machinery, flow measurement. 2 lectures, 1 laboratory.</td>
<td>ME 311</td>
</tr>
<tr>
<td>CE 333</td>
<td>Hydrology and Flood Control</td>
<td>2</td>
<td>Study of precipitation, stream flow, flood flow, ground water flow and development. Flood routing and control. Design of dams and channels. 1 lecture, 1 laboratory.</td>
<td>ME 311</td>
</tr>
<tr>
<td>CE 341</td>
<td>Steel Structures Design</td>
<td>3</td>
<td>Analysis and design of steel members and connections. Design of trusses, building frames, plate girders, and bracing systems. 3 laboratories.</td>
<td>CE 223, 332</td>
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<tr>
<td>CE 400</td>
<td>Special Problems for Advanced Undergraduates</td>
<td>1-2</td>
<td>Total credit limited to 4 units, with not more than 2 units in any one quarter. 1 or 2 laboratories.</td>
<td>CE 233</td>
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<tr>
<td>CE 403</td>
<td>Engineering Law, Contracts and Specifications</td>
<td>3</td>
<td>Basic features of laws and practices relating to engineering projects. Relationship of engineer, owner, and contractor. State laws relating to subdivisions, and land surveying. Contract documents. Specification writing. 3 lectures.</td>
<td>ME 311</td>
</tr>
<tr>
<td>CE 421</td>
<td>Reinforced Concrete Design</td>
<td>3</td>
<td>Analysis and design of reinforced concrete structures. 1 lecture, 2 laboratories.</td>
<td>CE 301</td>
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</table>
CE 423  Substructure Design (3)
Analysis and design of substructures such as footing, sheet piling, cofferdams, caissons, retaining walls, piers, piles and abutments. 2 lectures, 1 laboratory. Prerequisite: CE 223, 421

* CE 427  Interpretation of Aerial Photographs (3)
Interpretation of patterns in aerial photographs. Fundamentals used in determination of soil texture, type of bedrock, and drainage. 2 lectures, 1 laboratory. Prerequisite: CE 223

CE 431  Water Supply Engineering (3)
Engineering of a complete water supply system. Population estimates and water requirements. Design of reservoirs, transmission and distribution systems. Water-quality characteristics and processes of water treatment. Design of treatment plant. 2 lectures, 1 laboratory. Prerequisite: CE 333

CE 432  Waste Disposal Engineering (3)
Design of sanitary and storm sewers. Characteristics of sewage. Treatment operations and processes. Design of treatment plant. Waste disposal. 2 lectures, 1 laboratory. Prerequisite: CE 333

* CE 434  Industrial and Radioactive Wastes (3)
Industrial waste treatment processes and disposal methods. Problems of radioactive wastes. 2 lectures, 1 laboratory. Prerequisite: CE 432

* CE 437  Urban Planning (3)
Facilities and improvements necessary for urban populations. Problems in zoning, housing, utilities, subdivisions, planning, rapid transit systems, and freeways. Study of municipal and county administration. 2 lectures, 1 laboratory. Prerequisite: CE 222

* CE 441  Timber Structures Design (3)
Analysis and design of timber members and connections. Design of timber trusses. Laminated glued wood arches. Diaphragms. 3 laboratories. Prerequisite: CE 233

* CE 442  Masonry Design (3)
Design of concrete block and clay brick structures. 3 laboratories. Prerequisite: CE 421

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 fields of employment. Project results are presented in a formal report. Minimum 120 hours total time. Prerequisite: Senior standing.

CE 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 lectures. Prerequisite: Senior standing.

* To be offered when course enrollment justifies.
The program in electronic engineering prepares students for that branch of engineering which is concerned with the transmission, reception, and utilization of information, and the electronic control of mechanical and electrical operations. Graduates of this department are employed by manufacturing concerns, broadcast and television stations, oil companies, utilities, government laboratories and agencies, sales organizations, and schools. The work of these graduates is concerned chiefly with application engineering, product development, test and evaluation, technical operations, and engineering sales. The multiplicity of electronic devices in industry business offices, military installations, and the home is rapidly increasing the opportunities for field engineering and self-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 in 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 six laboratories, two shops, and several 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 the method of "learn by doing" provide an opportunity for the student to gain a knowledge of industrial practices as well as an excellent theoretical background.

The department is sponsoring three student organizations: a student branch of the Institute of Radio Engineers, an Electronics Club, and an amateur radio group.

**CURRICULUM IN ELECTRONIC ENGINEERING**

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<td>Electronic Technology Laboratory (EL 141, 142, 143)</td>
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<td>Engineering Drafting (ME 121, 122)</td>
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<td>General Chemistry (Chem 321, 322)</td>
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<td>College Algebra and Trigonometry (Math 117)</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>Engineering Statics (ME 211)</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>Physics of Electricity and Magnetism (Phys 204)</td>
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<td>Transmission Lines (EL 303)</td>
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### Senior

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### Descriptions of Courses in Electronic Engineering

**EL 101 Fundamentals of Electronic Technology** (3)

Fundamentals of DC and AC circuits, meters, inductance and capacitance and applications of basic electrical concepts which provide a fundamental background for the beginning student. 3 lectures.

* To be selected with the approval of the adviser.
† To be selected from the General Education List. Include one course in literature.
EL 102 Fundamentals of Electronic Technology (3)
Basic electronic concepts for the beginning student. The vacuum tube, semiconductor fundamentals, power supplies, amplifiers, and an introduction to AM receivers. Problem solving and application of fundamentals to practical situations. 3 lectures. Prerequisite or concurrent: Math 118

EL 103 Fundamentals of Electronic Technology (3)
Introduction to the fundamentals of radio communication for the beginning student. Basic oscillator circuits, receivers, transmitters, transmission lines, antennas, introductory VHF and UHF techniques, and electronic test instruments. 3 lectures. Prerequisite or concurrent: Math 201

EL 141, 142, 143 Electronic Technology Laboratory (2) (2) (2)
Directed assignments facilitating an understanding of the operation and construction of electrical instruments and electronic equipment. Use of test equipment. 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 Electron Devices (3) (3)
Physical and electrical characteristics and mathematical analysis of the more common types of electron tubes. Introduction to solid state electronics. 2 lectures. Prerequisites: Math 201, Phys 204

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. Prerequisites: Math 201, EE 231

EL 224, 225, 226 Electronic Measurements (2) (2) (2)
Applied measurement techniques applicable to radio frequencies, pulse circuits, electronic control circuits and instrument calibration. 1 lecture, 1 laboratory. Prerequisites: EL 103, 143, Math 201

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 Physical Electronics Laboratory (1) (1)
Fundamental experiments investigating the physical and electrical properties of the more common types of electron tubes and transistors and their equivalent circuits. 1 laboratory. Concurrent: EL 208, 209

EL 301 Linear Systems Analysis and Synthesis (3)
Network topology and the formulating and solving of equations for linear RLC circuits. Solution of integrodifferential equations by classical and Laplace transform methods. Electrical duals, mechanical and electrical analogs, initial conditions, transient response to driving functions, time domain and frequency domain relationships. 3 lectures. Prerequisite EE 213. Prerequisite or concurrent: Math 317. Concurrent: EL 341

EL 302 Linear Systems Analysis and Synthesis (3)
Concept of complex frequency, transform immittances, poles and zeros, sinusoidal steady-state analysis, one-port reactive networks, filters with applications for amplifier networks, and an introduction to network synthesis. 3 lectures. Prerequisites: EL 301, Math 317. Concurrent: EL 342

EL 303 Transmission Lines (3)
Circuit with distributed constants. The general transmission line equations. High frequency transmission lines. Artificial lines. Impedance charts. 3 lectures. Concurrent: EL 343
EL 304 Audio Engineering (3)
Vacuum tubes and transistors as circuit elements. Rectifiers and power supply circuits. Audio voltage and power amplifiers. Feedback amplifiers. 3 lectures. Prerequisite: EL 209. Concurrent: EL 344

EL 305 Radio Engineering (3)
Single- and double-tuned radio frequency voltage amplifiers. Class C power amplifiers, loading and coupling networks. Radio frequency oscillators, frequency stability considerations. 3 lectures. Prerequisite: EL 304. Concurrent: EL 345

EL 306 Modulation and Detection (3)
Formulation and analysis of the modulation process. Amplitude, phase, and frequency modulation systems. Detection and frequency conversion. Radio transmitter and receiver systems. 3 lectures. Prerequisite: EL 305. Concurrent: EL 346

EL 307 Servomechanisms (3)
Principles of closed loop control systems. Analysis of transfer functions. Corrective networks. Stability criteria. 3 lectures. Prerequisite: EL 306. Concurrent: EL 347

EL 341, 342 Linear Systems Analysis and Synthesis Laboratory (1) (1)
Experimental study of communication network characteristics and behavior. Familiarization with the capabilities and limitations of laboratory equipment and instruments. 1 laboratory. Prerequisite: EL 226. Concurrent: EL 301, 302

EL 343 Transmission Lines Laboratory (1)
Experimental study of circuits with distributed constants. Low frequency and radio-frequency lines. Stub matching. Use of transmission line charts. 1 laboratory. Prerequisites: EL 341, 342. Concurrent: EL 303

EL 344 Audio Engineering 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. Concurrent: EL 304

EL 345 Radio Engineering Laboratory (1)
Experimental determination of the important operating characteristics of tuned radio frequency voltage and power amplifiers and radio frequency oscillators. Performance testing of radio receivers in accordance with standard IRE-EIA procedures. 1 laboratory. Concurrent: EL 305

EL 346 Modulation 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. Prerequisites: EE 211, 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

* To be offered when course enrollment justifies.
† These courses consist of 1 lecture, 1 laboratory.
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 application. 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 (4) (4) (2)
  Microwave concepts, signal generation, applications to navigation, communication, scientific analysis, and microwave energy propagation. 3 lectures, 1 laboratory. Prerequisites: senior standing, EL 303, 343; EL 401 prerequisite or concurrent with EL 427

* 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  Electronic System Synthesis (1) (1) (1)
  Product engineering and product development through all stages from conception of plan to finished product. Commercial standards of performance and appearance. 1 laboratory.

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.

**DESCRIPTIONS OF COURSES IN ELECTRICAL ENGINEERING**

**EE 211, 212, 213  Fundamentals of Electrical Engineering (3) (3) (3)**

**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  Fundamentals of 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

* To be offered when course enrollment justifies.
† These courses consist of 1 lecture, 1 laboratory.
The industrial engineering program prepares students for employment with manufacturing firms in work related to planning, production, sales, and management. The curriculum aptly combines basic engineering, industrial planning and management, and general education courses.

Emphasis is placed on planning the use of equipment rather than designing the equipment itself; 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.

The program is intended for students who like engineering but who have talents for planning, management, and sales rather than technical design.

The department shares facilities with the Mechanical Engineering and Metal Processes Departments. Excellent production facilities are available to make the instruction realistic and characteristic of the requirements of industry.

**CURRICULUM IN INDUSTRIAL ENGINEERING**

**Freshman**

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<th>Course</th>
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<td>Motion and Time Study (IE 122, 123)</td>
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<td>Mechanical Engineering (ME 131)</td>
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<td>Engineering Drafting (ME 121, 122, 123)</td>
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<td>Metal Processing (MP 141, 142, 143)</td>
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+ Literature

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<td>Analytic Geometry and Calculus (Math 118, 201)</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>Industrial Incentives (IE 214)</td>
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<td>Production Planning (IE 216)</td>
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<td>Engineering Statics (ME 214)</td>
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<td>Manufacturing Processes Laboratory (MP 148)</td>
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† To be selected from the General Education List.
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<td>Production Scheduling and Control (IE 304)</td>
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<td>Plant Layout and Material Handling (IE 331, 332)</td>
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<td>Industrial Processes Laboratory (IE 343)</td>
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<td>Electrical Engineering (EE 231, 232)</td>
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<td>Strength of Materials (ME 218, 219)</td>
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<td>Quality Control (IE 415)</td>
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<td>Industrial Data Processing (IE 428)</td>
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<td>Tooling for Production (IE 438)</td>
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<td>Senior Project (IE 461, 462)</td>
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<td>Heat Transfer (ME 313)</td>
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### Electives

- 3
- 4
- 3
- 2

### Total Credits

- 18
- 16
- 18

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### DESCRIPTIONS OF COURSES IN INDUSTRIAL ENGINEERING

**IE 111 Industrial Engineering (3)**

An introduction to the field of industrial engineering showing the relationship of the industrial engineer to various division of business organizations, including manufacturing, sales and services. 3 lectures.

**IE 122 Motion and Time Study (3)**

Principles of motion economy affecting the design of product, work place layout, and services; effective use of human effort as related to tools and equipment; use of right hand-left hand charts, idle time charts, and other tools used in motion studies. 2 lectures, 1 laboratory.

**IE 123 Motion and Time Study (3)**

Uses for time study. Principles and techniques used to obtain information for setting standards. Training in the different uses of a stop watch and in rating of work rates. 2 lectures, 1 laboratory.

**IE 202, 203 Production Processes (3) (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. 3 lectures. Prerequisites: MP 143, Weld 145

**IE 214 Industrial Incentives (3)**

Types of incentives used in industry such as individual and group incentive plans, bonus plans, and suggestion systems. 3 lectures. Prerequisite: IE 122. Concurrent: IE 123

† To be selected from the General Education List.
IE 216 Production Planning (3)
Techniques used in planning for production such as flow charts, standard cost and time data, sales forecast and process charts. 3 lectures.

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 243 Production Processes Laboratory (1)
Inspection trips to selected industrial installations which represent typical examples of the manufacturing processes studied in IE 202, 203. 1 laboratory. Prerequisite: IE 202

IE 304 Production Scheduling and Control (3)
Organization of control, scheduling of production, routing of operations and processing, dispatching and expediting, reporting procedures. Materials planning procurement and control, work-in-process, finished products. 2 lectures, 1 laboratory. Prerequisite: IE 203

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 203

IE 343, 344 Industrial Processes Laboratory (2) (2)
Operation and use of modern machine tools, plastics and metal-forming machinery. Operation by the student of representative types of equipment. 2 laboratories. Prerequisites: IE 203, 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, 405, 406 Production Management Planning (3) (3) (3)
Principles of organization and administration; administrative techniques, interdepartment relationships; cost and budgetary controls; personnel relations; industrial work measurement, job evaluation; wage payment systems; plant maintenance, industrial safety; plant protection. 2 lectures, 1 laboratory. Prerequisite: IE 322

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 304

IE 428 Industrial Data Processing (3)
Operations and functions performed by modern electronic data processing machines, and how they may be applied to control machine processes, compute control data, and to perform routine clerical work. 2 lectures, 1 laboratory. Prerequisite: Math 309

IE 438 Tooling for Production (3)
Techniques for design and fabrication of tooling jigs and fixtures which result in the most economical production in modern manufacturing plants. 2 lectures, 1 laboratory. Prerequisite: MP 146

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, piping design, 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.

**CURRICULUM IN MECHANICAL ENGINEERING**

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<td>Mechanical Engineering (ME 131, 132, 133)</td>
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<td>Mechanical Engineering Laboratory (ME 144)</td>
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<td>Welding (Weld 144, 145, 146)</td>
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<td>Metal Processing (MP 142)</td>
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<td>College Algebra and Trigonometry (Math 117)</td>
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<td>Analytic Geometry and Calculus (Math 118, 201)</td>
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<td>Freshman Composition (Eng 104, 105, 106)</td>
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Sophomore

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<td>Engineering Statics (ME 214)</td>
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<td>Engineering Kinematics and Dynamics (ME 215)</td>
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<td>Mechanical Engineering Laboratory (ME 245)</td>
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<td>Strength of Materials (ME 218, 219)</td>
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<td>Materials Test Laboratory (ME 249)</td>
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<td>Descriptive Geometry (ME 125)</td>
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<td>Metal Processing Laboratory (MP 141)</td>
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<td>Metal Processing (MP 143-144)</td>
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<td>Sheet Metal Processes (MP 155)</td>
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<td>Metal Processing (MP 146)</td>
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<td>Light Metal Production Processes (MP 156)</td>
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<td>Manufacturing Processes Laboratory (MP 148)</td>
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<td>Analytic Geometry and Calculus (Math 202, 203)</td>
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<td>General Physics (Phys 132, 133)</td>
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<td>Applied Biology (Bio 110)</td>
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Junior

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<tr>
<td>Thermodynamics (ME 301, 302)</td>
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<td>Fluid Mechanics (ME 311, 312)</td>
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<td>Machine Design (ME 324, 325, 326)</td>
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<td>Production Processes (IE 202)</td>
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<td>Mechanical Vibrations (ME 315)</td>
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<td>Metallurgy (ME 334)</td>
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<td>Mechanical Engineering Laboratory (ME 346)</td>
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<td>Electrical Engineering (EE 231, 232, 233)</td>
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<td>Electronic Engineering (EL 222, 223)</td>
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Senior

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<th>Course Description</th>
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<td>Senior Project (ME 461, 462)</td>
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<td>Undergraduate Seminar (ME 463)</td>
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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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<td>Principles of Economics (Ec 201, 202)</td>
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<td>American Civilization (Am Civ 301, 302, 303)</td>
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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

† To be selected from the General Education List.
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)
The general and specialized fields of engineering, professional requirements, engineering approach to problem solving, reflecting modern machines and practices, slide rule, unit conversions, static machine problems, bodies in motion, analysis of work, power and energy. 2 lectures, 1 laboratory.

ME 132, 133 Mechanical Engineering (2) (2)
Basic principles of measurement, sources of energy, processes and cycles, gas laws, steam and steam tables, refrigeration and vapor charts, fuels and combustion, conversion of energy, thermodynamic cycles, air compression, heat transfer and refrigeration, air conditioning, internal combustion engines, gas turbines, jet propulsion, rockets, steam generation, steam power plants and auxiliary equipment. 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, 212 Engineering Statics and Dynamics (3) (3)
Vector approach to classical statics and dynamics. Topics will be selected from the material presented in ME 214, 215, 216. 3 lectures. Prerequisites: Phys 131, Math 201 for ME 211. Math 202 for ME 212. For majors in EL, CE, 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: ME 214 or ME 211 and Math 201

ME 215 Engineering Kinematics and Dynamics (3)
Distributed forces including 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 vibrations. 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 under axial, torsional, or flexural loading. Use of Mohrs 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; combined stresses; columns,
concentric and eccentric loading. 3 lectures.

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 interpre-
tation 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 en-
gineering 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. 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 relation-
ships that obtain in the study of imperfect gases. Fundamentals of heat transfer,
aplications 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 com-
pressible 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 lec-
tures. 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 iso-
lation, commercial vibration control and measuring hardware and electrical analogs
of vibratory systems; balance and critical speeds of rotating machine members, fly-
wheel 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, 216, MP 148

ME 325 Machine Design (3)
Design of basic machine elements such as mechanisms, ball, roller, nylon, sintered, and babbitt bearings, ways, ball sleeves or bushings. The lubrication of machine elements, gaskets, seals, “O” Rings, fasteners such as keys, snap rings, rollock and taper pins, screws, bolts, lock nuts, and shrink fits. 2 lectures, 1 laboratory. Prerequisite: ME 324, IE 202

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 325, 334

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 involved in the 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, 213

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, gyrodynamics, 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 servomechanisms including theory of dynamic stability. 3 lectures. Prerequisite: ME 414, Math 317

* To be offered when course enrollment justifies.
ME 417  Mechanical Systems in Buildings (3)
Problems dealing with the physiological effect of environment, psychometrics, ventilation, and the flow of air in ducts, calculations of heat and cooling loads on buildings. Problems are related to actual applications. 3 lectures. Prerequisite: ME 302, 313

ME 418  Mechanical Systems in Buildings (3)
Problems in the application of refrigeration and air conditioning systems are solved for actual cases. Industry standards and building codes pertaining to the various types of equipment in buildings. 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

* ME 438  Advanced Machine Design (3)
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

* ME 439  Advanced Machine Design (3)
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

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 326, and all required MP courses.

ME 463  Undergraduate Seminar (2)
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, including engraving, are provided for engineering students taking advanced courses.

**DESCRIPTIONS OF COURSES IN METAL PROCESSES**

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tr>
<td>MP 141</td>
<td>Measurement and Layout (1)</td>
<td>Fundamentals of precision measurement, layout, hand and drill press operations.</td>
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<td>MP 142</td>
<td>Metal Processing (1)</td>
<td>Fundamentals of lathe operation including straight and taper turning between centers, chuck work, and thread cutting. Also feeds, speeds, and tool grinding.</td>
<td>(1)</td>
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<td>MP 141</td>
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<tr>
<td>MP 143</td>
<td>Metal Processing (1)</td>
<td>Fundamentals of lathe operation including taper turning and taper boring, thread cutting, and other chucking operations.</td>
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<td>MP 142</td>
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<tr>
<td>MP 144</td>
<td>Metal Processing (1)</td>
<td>Fundamentals of milling machine and shaper operation including precision setup and plane surfacing operations.</td>
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<td>MP 142, MP 146</td>
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<tr>
<td>MP 146</td>
<td>Metal Processing (1)</td>
<td>Advanced milling machine and shaper practice including contoured and angular surfacing operations, boring, serrations, rack and spur gear cutting.</td>
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<td>MP 144, MP 142</td>
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<tr>
<td>MP 148</td>
<td>Manufacturing Processes Laboratory (1)</td>
<td>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.</td>
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<td>1</td>
<td>MP 143, MP 146</td>
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<tr>
<td>MP 155</td>
<td>Sheet Metal Processes (1)</td>
<td>Basic sheet metal processes including the techniques of hand and machine operation used in layout, cutting, forming, assembling and finishing.</td>
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<td>1</td>
<td>MP 143, MP 146</td>
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<tr>
<td>MP 156</td>
<td>Light Metal Production Processes (1)</td>
<td>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.</td>
<td>(1)</td>
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<td>MP 144, MP 146</td>
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<tr>
<td>MP 240</td>
<td>Machine Tools (1-2)</td>
<td>Advanced individual instruction on all machine tools. Construction and repair of laboratory equipment. Total credit limited to 4 units.</td>
<td>(1-2)</td>
<td>1 or 2</td>
<td>MP 144, MP 145</td>
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</table>
Leo P. Gorman
William H. Penrod

It is the aim of this department to give students in the engineering and agricultural 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

Weld 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.

Weld 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: Weld 144

Weld 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: Weld 144

Weld 153  Fundamentals of Oxyacetylene Welding  (1)
Oxyacetylene welding of piping joints and connections. Techniques used for welding some nonferrous metals. Introduction of simple templet layouts for piping. 1 laboratory. Prerequisite: Weld 145

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 146

Weld 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. Prerequisites: Weld 145 or 146, Permission of Department. NOTE: Application of credit as elective in major department requires approval of major Department Head.

Weld 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: Weld 156

Weld 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: Weld 156

Weld 421, 422  Weld Design  (3) (2)
Study of the various welding processes, their applications and limitations. Design of welded joints as related to the welded processes, performance of welded joints under various load conditions with various metals and filler metals. Welding costs and tooling methods. 3 lectures for 421, 2 laboratories for 422. Prerequisite: Weld 146, MP 144, ME 324, or Aero 349 or CE 341. ME 334 recommended.
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, mathematics, physical education, physical sciences, and social sciences. These programs offer opportunities in secondary school teaching. The Arts and Sciences Program is planned for those students who desire to enter the teaching profession at the elementary school level. 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 except the Arts and Sciences Program is designed to prepare its graduates for specific non-teaching jobs in its area in keeping with the college's philosophy of occupational education. The Department of Music 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 administration, 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.

ACCOUNTANCY DEPARTMENT

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.
## Freshman

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<td>Job and Process Cost Accounting (Actg 221)</td>
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## Senior

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<td>Budgeting Principles (Bus 426)</td>
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## Descriptions of Courses in Accountancy

**Actg 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.

* To be selected from the General Education List.

** Of the 52 units of electives, 12 units will be taken with the specific approval of the student’s adviser.
Kellogg Campus 319

Actg 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: Actg 123

Actg 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: Actg 221

Actg 223  Advanced Problems in Cost Accounting (3)
Advanced problems in cost finding and cost control. 2 lectures, 1 two-hour activity period. Prerequisite: Actg 222

Actg 306  Accounting Systems (3)
The installation and operation of accounting systems in business, with special attention to internal control. 2 lectures, 1 two-hour activity period. Prerequisites: Actg 221, 322

Actg 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. Prerequisites: Actg 123, and permission of instructor.

Actg 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: Actg 323

Actg 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. Prerequisites: Actg 323, Actg 222, or consent of instructor.

Actg 332  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. Prerequisites: Actg 123 or permission of instructor. (Not applicable for credit toward major in accountancy.)

Actg 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.

Actg 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. Prerequisites: Senior standing.

Actg 421  Federal Tax Course I (3)
Income, expenses, exclusions, deductions, and credits. Emphasis on individual returns. 2 lectures, 1 two-hour activity period. Prerequisite: Actg 321

Actg 422  Federal Tax Course II (3)
Continuation of Actg 421. Emphasis on estates, trusts, partnerships and corporations. 2 lectures, 1 two-hour activity period. Prerequisite: Actg 421

Actg 423  Governmental and Institutional Accounting (3)
Accounting for nonprofit institutions and governmental organizations. 2 lectures, 1 two-hour activity period. Prerequisite: Actg 323
Actg 431, 432  Advanced Accounting  (5) (4)
Partnerships, joint ventures, home office and branch, consolidated financial statements, statement of affairs, receiverships, realization and liquidation statements, estates and trusts, and actuarial problems. 431: 4 lectures, 1 two-hour activity period. 432: 3 lectures, 1 two-hour activity period. Prerequisite: Actg 323

Actg 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 co-ordinator. Prerequisite: Permission of the instructor.

Actg 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.

Actg 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.

* Actg 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: Actg 432, Bus 302 or consent of instructor.

* Actg 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: Actg 432 or consent of the instructor.

* Actg 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 of such theory to advanced problems of the type found in the C.P.A. examinations, 2 two-hour lectures. 2 two-hour activity periods. Prerequisite: Actg 432 or consent of instructor.

* Not offered in 1962-63.

ART
(See Language Arts)
The curriculum in Arts and Sciences is planned for those students who desire to enter the teaching profession at the elementary school level.

Upon matriculation a student majoring in Arts and Sciences must declare a minor in Mathematics, Language Arts, Biological Sciences, Physical Sciences, Art and Music, History, or Economics and Political Science. A faculty member in the appropriate minor department will serve as the student's adviser. Admission as a student in Arts and Sciences does not constitute admission to the teacher education program. Specific college criteria for admission to teacher education programs may be obtained from the Coordinator of Teacher Education. Students must apply for admission to the credential program early in the junior year and select appropriate elective 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 education program. Because of the breadth of the Arts and Sciences Program, a change of objective and transfer to another major can be made without undue loss of time.

The first three years of this program will be offered in the 1962-63 school year. Present plans call for the addition of the fourth and fifth years for the 1963-64 school year, after clarification of requirements and their adoption by the State Department of Education.

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ARTS AND SCIENCES CURRICULUM
(Senior Year Not Offered in 1962-63)

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1 Mathematics minors take Math 117 instead of Math 207.
2 Physical Science minors should follow Physical Science minor pattern; they are not required to take PSc 101, 102, 103.
3 To be selected from the General Education list.
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<td>The Grammars of English (Eng. 409)</td>
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* Senior (For students admitted to the teacher education program only)

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* To be selected from the General Education list.

* Students admitted to the teacher education program must elect Ed 420 in the junior year and Ed 421, 422, 431 in the senior year. In addition 12 units must be taken from senior level courses in the major or minor field with the approval of the adviser.

* Not offered in 1962-63.

**AUDIOVISUAL**

(See Music)
A four-year curriculum leading to the Bachelor of Science Degree in Biological Sciences is offered by the department in addition to a wide variety of courses supportive of other major curricula. 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.

**CURRICULUM IN BIOLOGICAL SCIENCES**

**Freshman**

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**Junior**

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<td>General Bacteriology (Bact 221)</td>
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<td>Principles of Evolution (Bio 213)</td>
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* Of the 61 units of electives, 30 will be taken with direct approval of the student's adviser.
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 and Chem 321 or Chem 324

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. Prerequisites: Bact 221 and 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

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.

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 resume 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

* Of the 61 units of electives, 30 will be taken with direct approval of the student's adviser.
** Offered in even-numbered years only.
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. Prerequisites: Bot 125, Zoo 134 and 135

* Bio 335  Cellular Physiology (4)
Physical mechanisms at the cellular level. 2 lectures, 2 laboratories. Prerequisite: Chem 328

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 423  General Cytology (4)
Detailed study of plant and animal cells, structurally and functionally. 2 lectures, 2 laboratories. Prerequisites: Bot 124 and Zoo 134

* Offered in odd-numbered years only.
Bio 431 Radiation in 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. Prerequisites: Bio 145 and Chem 321

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.

Bio 590 Seminar in Biology (1-3)
Arrangements to be made with faculty. 1-3 units in one quarter, maximum of 6 units. Prerequisite: Graduate standing.

DESCRIPTIONS OF COURSES IN BOTANY

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 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

* Offered in odd-numbered years only.
** Offered in even-numbered years only.
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. Prerequisites: 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.

DESCRIPTIONS 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.

DESCRIPTIONS 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. Prerequisites: Path 223 and Zoo 135.

DESCRIPTIONS 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.

* Offered in odd-numbered years only.
** Offered in even-numbered years only.
* Zoo 224 Animal Physiology (4)
  Introduction to functions of vertebrate organ systems. 2 lectures, 2 laboratories. Prerequisite: Zoo 134, 135

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)
  Study of invertebrate groups of animals with emphasis on taxonomy, structure, distribution, and economic importance. 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 and 135

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 134 and 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 odd-numbered years only.
** Offered in even-numbered years only.
The Business Administration 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 and public service; e.g., proprietor-manager, management trainee, executive trainee, department head in a large business, purchasing agent, department store buyer, credit manager, office manager, records supervisor, systems analyst, and executive secretary candidate for the Certified Professional Secretary program. 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.

With the aid of his adviser, the student may select courses emphasizing Industrial Management; Finance, Insurance and Real Estate; Government Administration; Office Administration; Executive Secretaryship; or he may elect to continue in a broad business curriculum.

CURRICULUM IN BUSINESS ADMINISTRATION

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1 Math 117 may be substituted for Math 101.
2 To be selected from the General Education List.
### California State Polytechnic College

#### Junior

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**DESCRIPTIONS OF COURSES IN BUSINESS ADMINISTRATION**

**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 203 Small Business Organization and Management (3)**

How to organize and operate a small business. Small business hazards and factors in business success. Adequate protection and financing for the small business. 3 lectures.

**Bus 212 Business Statements (1)**

Business statements examined from the standpoint of their use as a managerial tool in the operation of a business enterprise in industry or agriculture. Interpretation of the balance sheet, the profit and loss statement, and supplementary financial statements. 1 lecture. (Not open to any business majors without consent of adviser.)

**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)**

Negotiable instruments, including formation, negotiation, holder in due course, real and personal defenses, liability of parties, and discharge. Partnerships, including formation, partnership property, relationships of partners, dissolution. Corporations, including incorporation, promotion, and powers, management and transfer of stock, rights of stockholders, and dissolution. Emphasis on California law. Casebook method. 3 lectures. Prerequisite: Bus 301 and Actg 122

**Bus 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.

*To be selected from the General Education list.

*Courses in these areas are to be selected with approval of the student's adviser.

* Of the 58 units of electives, 27 are to be taken with direct approval of the student's adviser.
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. 3 lectures. Prerequisite: Bus 101

Bus 306 Managerial Accounting (3)
Accounting as a managerial tool, including budget, cost, and profit interpretation. 3 lectures. Prerequisite: Actg 123 and permission of the instructor.

Bus 311 Business Forecasting (3)
The 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. 3 lectures.

Bus 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: Actg 123

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 4 units with not more than 2 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 403 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.

Bus 404 Investment Management (3)
Principle 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: Bus 314 or consent of instructor.

Bus 405 Analysis of Investments (3)
Analysis and evaluation of corporate securities and their price fluctuation. 3 lectures. Prerequisite: Bus 404

Bus 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 trusts. 3 lectures. Prerequisite: Bus 302

Bus 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 sale 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: Bus 302

Bus 408 Trade Regulation Law (3)
Law of unfair competition. Trade-marks, trade names, registration under the Lanham Trade-Mark Act of 1946, patents, copyrights, interference with contractual relations, trade labels, price-fixing, fair trade laws, unfair sales acts, monopolies and anti-trust statutes, lotteries, trade stimulators, false and misleading advertisements. 3 lectures. Prerequisite: Bus 302
Bus 409  Law of Insurance and Creditors' Rights (3)
Life, casualty, marine, and workmen's compensation insurance. Rights and liabilities of insurer, insured, and beneficiary. Applicable principles of negligence. Rights of creditors prior to and after judgment, including composition, arrangements, voluntary and involuntary petitions in bankruptcy, and corporate reorganization under the bankruptcy laws. 3 lectures. Prerequisite: Bus 302

Bus 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: Bus 403

Bus 415  Real Estate (3)
The nature and classification of property rights. Property ownership. Financing real estate. How to operate a real estate business. 3 lectures.

Bus 426  Budgeting Principles (3)
Principles and methods of preparing budgets, estimating income, and controlling expenditures of a manufacturing enterprise. Preparation of budgeted balance sheet, income, and application of funds statements. 2 lectures, 1 laboratory. Prerequisite: Actg 123 and permission of the instructor.

Bus 441, 442  Internship in Business Administration (2) (2)
On-the-job training with a business in some phase of business administration. 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 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 students' major fields. 2 lectures. Prerequisite: Senior standing or special permission.

DESCRIPTIONS OF COURSES IN OFFICE ADMINISTRATION

OA 121, 122, 123  Office Administration (3) (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.

OA 141, 142, 143  Typewriting (1) (1) (1)
Fundamentals of the touch system. Training in preparing business forms and business letters. 2 one-hour periods. Prerequisites: OA 142: OA 141 or 25 wpm; OA 143: OA 142 or 40 wpm.

OA 151  Calculating Machines (1)
Experience and discrimination in the use of adding and listing machines and rotary and printing calculators. 1 laboratory.

OA 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.

OA 221  Data Processing (3)
Application of the latest techniques in the use of modern methods of handling information, with special reference to accounting and statistical methods. Includes principles of punched card machines and electronic data processing. 2 lectures, 1 activity period. Prerequisite: Actg 123
OA 222  Systems Analysis  (3)
    General analysis of business systems using techniques such as flow charting, pro-
    cedural analyses, work-distribution charting, work measurement and simplification
    studies. 2 lectures, 1 activity period. Prerequisite: Actg 123

OA 223  Electronic Data Processing Systems  (3)
    Analysis of complex systems for large clerical operations, cost vs. information
    retrieval, competitive value of information, and analysis of applications and pro-
    gramming of latest electronic equipment. 2 lectures, 1 activity period. Prerequisite:
    Actg 123

OA 244, 245, 246  Shorthand  (2) (2)  (2)
    The most effective techniques for recording and transcribing personal dictation.
    2 two-hour laboratories. Prerequisite: OA 245: OA 244 or 60 wpm; OA 246:
    OA 245 or 80 wpm.

OA 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.

OA 302  Inventory Control  (2)
    Management problems of production, maintaining proper control records, financ-
    ing, and materials handling and storage. 2 lectures.

OA 321, 322, 323  Advanced Secretarial Practice  (4) (4)  (4)
    Individual activities similar to those in an actual office. Practical application of
    all the secretarial skills, including use of typewriter, adding machines or calculators,
    filing, duplicating machines, shorthand, machine dictation, shorthand transcription
    and machine transcription. 2 lectures, 2 laboratories. Prerequisite: Junior standing
    or consent of instructor.

OA 400  Special Problems for Advanced Undergraduates  (1-2)
    Individual or group investigation of problems in the areas of office administration.
    Total credit limited to 4 units with not more than 2 units in any one quarter. Pre-
    requisite: Senior standing or consent of instructor.

OA 441, 442  Internship in Office Administration  (2) (2)
    On-the-job training with a business in the field of office administration. 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 instructor.
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 communication. 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 may emphasize Journalism, Speech-Drama, or Literature-Language; or he may choose a general program. However, he will take, whatever his emphasis, certain required courses:

On the first-year level, Modern Theater Practice, Public Speaking, Fundamentals of Journalism, and Western Literary Heritage. In his second year, he will take Speech Composition, History and Principles of Journalism, Survey of American Literature from 1919, Survey of British Literature from 1937 to the Present. In the third year, he will take Advanced Composition. In the last year, he will take Shakespeare, the Senior Project, and the Undergraduate Seminar. All these courses, some of which answer the general-education requirement, enable Cal Poly to turn out a Language Arts graduate well-rounded in the principal fields of Communications and especially trained in those areas most demanded in elementary and secondary school and junior college teaching or in entry jobs in various types of journalistic enterprises such as small community newspapers and technical and house organs.

Courses in Art and Spanish are offered as electives and to supply needs in other departments and in general education.

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**CURRICULUM IN LANGUAGE ARTS**

*(Senior Year Not Offered in 1962-63)*

<table>
<thead>
<tr>
<th>Freshman</th>
<th>F</th>
<th>W</th>
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</thead>
<tbody>
<tr>
<td>Freshman Composition (Eng 104, 105)</td>
<td>3</td>
<td>3</td>
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</tr>
<tr>
<td>Language Communication (Eng 107)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>§ Natural Sciences</td>
<td>3</td>
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<tr>
<td>Physical Education (PE 141)</td>
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<tr>
<td>§ Mathematics</td>
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<tr>
<td>Fundamentals of Journalism (Jour 101)</td>
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<tr>
<td>Modern Theater Practice (Dr 103)</td>
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<tr>
<td>Western Literary Heritage (Eng 111)</td>
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<tr>
<td>Health Education (PE 107)</td>
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<tr>
<td>History of Civilization (Hist 101, 102, 103)</td>
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</tr>
<tr>
<td>* Electives</td>
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<td>3</td>
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<tr>
<td><strong>Total</strong></td>
<td>15 ½</td>
<td>16 ½</td>
<td>17 ½</td>
</tr>
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* Of the 98 units of electives, 39 are to be taken with direct approval of the student's adviser to complete requirements for the major.

§ To be taken from the General Education list.
### Sophomore

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<th>Course</th>
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<tr>
<td>Physical Education (PE 141)</td>
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<td>§ Natural Sciences</td>
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<tr>
<td>American Literature (Eng 215)</td>
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<tr>
<td>History and Principles of Journalism (Jour 203)</td>
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<td>British Literature (Eng 209)</td>
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<td>Public Speaking (Sp 200)</td>
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<td>General Psychology (Psy 202)</td>
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<tr>
<td>§ Philosophy, Art, or Music</td>
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<tr>
<td>* Electives</td>
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<td>7</td>
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</table>

| Total Units | 16½ | 16½ | 16½ |

### Junior

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<tr>
<td>Advanced Composition (Eng 302 or 303)</td>
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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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<tr>
<td>* Electives</td>
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</table>

| Total Units | 17 | 17 | 17 |

### Senior

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<th>Course</th>
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<tr>
<td>Senior Project (Eng 461, 462)</td>
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<td>2</td>
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<tr>
<td>Shakespeare (Eng 403)</td>
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<td>3</td>
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<tr>
<td>Undergraduate Seminar (Eng 463)</td>
<td>14</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>* Electives</td>
<td>14</td>
<td>14</td>
<td></td>
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</tbody>
</table>

| Total Units | 16 | 16 | 16 |

### Descriptions of Courses in Literature-Language

**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 105

**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

* Of the 98 units of electives, 39 are to be taken with direct approval of the student’s adviser to complete requirements for the major.

§ To be taken from the General Education list.
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 beginnings to the present, with emphasis on the major works. 3 lectures. Prerequisite: Eng 111

Eng 214, 215  Survey of American Literature (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 220  Advanced Technical Writing (2)
Preparation of training materials; technical reports; technical papers. 2 lectures. Prerequisite: Eng 219

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

Eng 304  The Development of the Short-Story (3)
Critical Analysis; history and evaluation of form. 3 lectures. Prerequisite: Eng 106 or 107

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 105

Eng 308  The Modern Drama (3)
Continental, British, and American dramatic trends from the rise of Naturalism. 3 lectures. Prerequisite: Eng 105

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 105
Eng 403 Shakespeare (3)
Introduction and intensive reading of the major plays. The place of Shakespeare's plays in the school curriculum and methods of presenting them to young people for enjoyment and appreciation. 3 lectures. Prerequisite: Eng 105

Eng 407 Literature and Oral Interpretation for Young People (4)
Consideration of past and present works that might be adopted for the elementary and secondary curriculum in order 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

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 105

* Eng 461, 462 Senior Project (2) (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.

* Eng 463 Undergraduate Seminar (2)
Reports of senior projects, discussions of professional articles of an appropriate level. 2 lecture-discussions. Prerequisite: Completion of senior project.

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 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. 2 lectures, 1 laboratory.

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

* Not offered in 1962-63.
Sp 307 Conference Techniques and Group Discussion (3)
Theory and practice in forms of discussion such as panels, forums, and symposia; business reporting and group dynamics; parliamentary procedure and formal discussion, brainstorming and other methods of investigative problem solving. 3 lectures. Prerequisite: Sp 200

Sp 310 Speech Correction (3)
Theory and practice in diagnosis and treatment of speech disorders; speech testing, record keeping, observation, and diagnosis. Emphasis on correction of sound distortions, substitutions, omissions, and dialect problems. 2 lectures, 1 laboratory. Prerequisite: Sp 301. Offered in alternate years.

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.

DESCRIPTIONS OF COURSES IN DRAMA

Dr 103 Modern Theater Practice (3)
Survey and analysis of theater 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 theater criteria. 3 lectures.

Dr 201 Playwriting and Dramatic Structure (3)
Intensive study of dramatic structure as applied to theater practice. Theory and practice in playwriting, program structure, and criticism. 3 lectures.

Dr 231 Acting Theory and Technique (3)
Theory and practice of acting with special attention to body movement, pantomime, improvisation, and characterization. 2 lectures, 1 laboratory.

Dr 244 Theater Workshop (1-2)
Practical experience by participation in theatrical productions. Technical crews, theater management, and acting. 1 or 2 laboratories. May be repeated for not more than 6 units.

Dr 441 Advanced Projects in Acting and Directing (1-3)
Advanced problems in acting, directing, and play production, including participation in major 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

* Not offered in 1962-63.
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 204 Feature Writing (3)
Writing the feature story; study of the sources and types of feature material. Some introduction to the column. 3 lectures. Prerequisite: Jour 202

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 225 Editing (3)
Copy editing, headline writing, layout, and makeup. 2 lectures 1 two-hour laboratory. Prerequisite: Jour 101

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 308 Business and Labor Reporting (2)
Gathering material for and writing stories pertaining to labor, business, and industry. 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. Prerequisites: 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 and 212

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 the instructor. Total credit limited to 6 units.

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.

DESCRIPTIONS OF COURSES IN ART
Art 210 Art and Life (3)
Sensibility toward one's environment. The relation of art to man's conquest of knowledge. The evolution of artistic principles and their application in modern times. Art and education, society, the individual, and industry. 3 lectures.

Art 234 Art Materials and Skills (3)
The development of appreciative and creative skills. The 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 such as ceramics, metal, textiles, wood, and leather. The 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 2 dimensional media. Projects in layout, design, lettering. 2 two-hour laboratories.

Art 244 Fundamentals of Drawing (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. 2 two-hour laboratories.

Art 249 Watercolor Painting (2)
Methods and techniques with watercolor. Outdoor sketching and studio projects. 2 two-hour laboratories.
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 training leading to such jobs 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 as well as their educational backgrounds.

**CURRICULUM IN MARKETING**

### Freshman

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<th>Course</th>
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<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>* Natural Sciences</td>
<td>3</td>
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<td>Principles of Accounting (Actg 121, 122, 123)</td>
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<td>Office Management (OA 121)</td>
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<td>Typewriting (OA 141, 142)</td>
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<td>Management Principles (Bus 101)</td>
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*To be selected from the General Education List.*

### Sophomore

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<td>Report Writing (Eng 216)</td>
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<td>Business Communication (Eng 218)</td>
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<td>Advertising Principles (Mktg 204)</td>
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<td>Marketing Principles (Mktg 201, 202)</td>
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<td>* Literature, Philosophy, Fine &amp; Practical Arts</td>
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<td>Principles of Economics (Ec 201, 202)</td>
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### Junior

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<td>Sales Management (Mktg 301)</td>
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<td>Business Forecasting (Bus 311) or Statistics (Math 211)</td>
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<td>Human Relations (Psy 304)</td>
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<td>Industrial Marketing (Mktg 302)</td>
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<td>Retail Store Management (Mktg 303)</td>
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<td>Money and Banking (Ec 308)</td>
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<td>Advanced Public Speaking (Sp 300)</td>
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<td>Economic Problems (Ec 213)</td>
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<td><strong>Total</strong></td>
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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

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 400  Special Problems for Advanced Undergraduates  (1-2)
Individual or group investigation of special areas in the field of marketing. Total credit limited to 4 units with not more than 2 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 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 the instructor.

Mktg 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. Minimum 120 hours total time. 2 meetings. Prerequisite: Senior standing or special permission.

Mktg 463 Undergraduate Seminar (2)
Study and discussion by students of recent developments in the students' major fields. 2 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

<table>
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<td>College Algebra and Trigonometry (Math 117)</td>
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<td>† Biological Science</td>
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<td>General Physics (Phys 131)</td>
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<td></td>
<td>Analytic Geometry and Calculus (Math 118, 201)</td>
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<td>Health Education (PE 107)</td>
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<td>General Chemistry (Chem 321, 322)</td>
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<td>Economics</td>
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<td>† Literature, Philosophy, Art or Music</td>
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<td>Differential Equations (Math 316)</td>
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† To be selected from the General Education List.
### 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 102 Agricultural Mathematics I (3)**
Percentage, formulas, linear equations, simultaneous linear equations, problems involving soils and irrigation, dairy products, horticulture and agronomy, feeds, fertilizers, discounts and interest, slope, mixtures, nutritive ratio, perimeters, areas, volumes, specific gravity, ratio and proportion, farm construction, farm mechanics. 3 lectures. Prerequisite: Satisfactory score on placement examination or Math 1

**Math 103 Agricultural Mathematics II (3)**
Exponents, logarithms, Mannheim slide rule, introduction to trigonometry, statistical data, measures of central tendency, standard deviation, rectangular coordinates, plotting curves, expanding and factoring polynomials. 3 lectures. Prerequisite: Math 102

**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

†† To be selected with approval of the adviser, including 15 units of applied mathematics.

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<th>Junior</th>
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<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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<tr>
<td>Senior Project (Math 461)</td>
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<td>Statistics (Math 309 or 311)</td>
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<td>Undergraduate Seminar (Math 463)</td>
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</table>
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 or 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, 103, or 207

Math 213  Elementary Engineering Problems  (2)
Selected problems from engineering fields which are solvable by the methods of elementary mathematics. Selection of topics from: polar co-ordinates, empirical equations, properties of determinants, infinite series, hyperbolic functions, multiple integration, partial derivatives. 2 lectures. Prerequisite: Math 203

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  (2)
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, 1 activity period. Prerequisite: Math 203

Math 304  Programming of Digital Computers  (3)
Coding of general purpose and special purpose digital computers. Preparation of programs of general purpose computers. Subroutines. 3 lectures. Prerequisite: Math 218

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. Measurment 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)

* Not offered in 1962-63.
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 316

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 322 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 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 316

Math 409 Functions of a Complex Variable (2)
Integration in the complex plane, power series, conformal mapping with applications. 2 lectures. Prerequisite: Math 408

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 Advanced Calculus (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: 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.
Courses in the Music Department are designed to give all musically inclined students the opportunity to participate in college musical organizations and to further their proficiency in singing and in playing instruments. An effort also is made to give students interested in music a broader insight into the general field of music through courses in theory and appreciation.

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 singing is helpful, it is not mandatory.

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 141, 142, 143 Dance Orchestra (1-2) (1-2) (1-2)**
Limited to those who have had considerable experience playing musical instruments, dances, community programs, and radio broadcasts. 1 or 2 activity periods. Total credit limited to 24 units.

**Mu 147, 148, 149 Brass, String, or Woodwind Choir (1) (1) (1)**
Open to qualified players. Rehearsal and public performance in trios, quartets, and quintets. 1 activity period. Total credit limited to 12 units.

**Mu 151, 152, 153 Band (1) (1) (1)**
Limited to those students who have had experience with band instruments. The band plays for college functions, assemblies, athletic games, and rallies. Smaller groups organized from the band for special functions. 1 activity period. Total credit limited to 12 units.

**Mu 154, 155, 156 Men's Glee Club (1-2) (1-2) (1-2)**
Four-part vocal compositions; fundamentals of breathing, tone production, diction, and interpretation. Quartets, octets, and soloists. Tryouts in fall only. 1 or 2 activity periods. Total credit limited to 24 units.

**Mu 157, 158, 159 Women's Glee Club (1-2) (1-2) (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 and at campus functions. Small groups and soloists. Tryouts in fall only. 1 or 2 activity periods. Total credit limited to 24 units.

**Mu 161, 162, 163 Choir (1-2) (1-2) (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 to basic music skills necessary for the elementary school teacher; singing, theory, conducting, playing an instrument, listening, and creating music. 3 lectures.

**Mu 202 Music Theory (3)**
Elements of music theory; construction of major and minor scales; intervals, rhythms, sight singing, musical terms, syllable work. 3 lectures.

**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 musical ensembles. Lectures, recordings, and demonstration. 2 lectures.
DESCRIPTIONS OF COURSES IN AUDIO-VISUAL EDUCATION

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. Lecture, lecture-demonstration, discussion, previewing, and laboratory work. Planning and correlating use of audio-visual techniques in the classroom. 2 lectures, 1 laboratory. Prerequisite: Psy 312 or permission of the 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 the instructor.
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 welfare. Facilities include a new gymnasium, outdoor basketball, tennis, and volleyball courts and turfed area for football, baseball, track and field.

**CURRICULUM IN PHYSICAL EDUCATION**

<table>
<thead>
<tr>
<th>Year</th>
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<td>Mathematics</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>Basic Biology (Bio 115, 145)</td>
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<td></td>
<td>General Physical Science (PSc 101, 102, 103) or equivalent</td>
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<td>* Electives</td>
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<td>Principles of Economics (Ec 201, 202)</td>
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<td>Principles of Physical Education (PE 201)</td>
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<td>Apparatus and Gymnastics (PE 225M or 225W)</td>
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<td>Public Speaking (Sp 200)</td>
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<td>Human Anatomy and Physiology (Zoo 234, 235)</td>
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<td>Physical Education (PE 141)</td>
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<td>* Electives</td>
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<td>Junior</td>
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<td>Football Coaching Theory and Practice (PE 321)</td>
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<td>Track and Field Coaching Theory and Practice (PE 333)</td>
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<td>* Baseball Coaching Theory and Practice (PE 323)</td>
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<td>* Teaching Progression in Girls Sports (PE 324W, 325W, 326W)</td>
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<td>* Teaching Elementary School Physical Education (PE 327)</td>
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<td></td>
<td>* Child Growth and Development (Psy 305)</td>
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<td></td>
<td>* Physiology of Exercise (PE 303)</td>
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<td></td>
<td>* Kinesiology (PE 302)</td>
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<td></td>
<td>* Techniques of Officiating (PE 331M or 331W)</td>
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<td></td>
<td>* Direction of Physical Education Activity (PE 341)</td>
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<td>* Electives (Men)</td>
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<td></td>
<td>* Electives (Women)</td>
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* Of the 68-71 units of electives, 30 are to be taken with direct approval of the student's adviser.
1 To be taken from the General Education List.
2 Alternative requirements for men and women majors.
**California State Polytechnic College**

Senior

<table>
<thead>
<tr>
<th>Course Description</th>
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<tr>
<td>352 California State Polytechnic College</td>
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<tr>
<td>352 Senior Minor Sports Theory and Practice (PE 441, 442, 443)</td>
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<td>or</td>
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<tr>
<td>352 Teaching Progression in Dance (PE 446W, 447W, 448W)</td>
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<tr>
<td>352 Senior Project (PE 461, 462)</td>
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<tr>
<td>352 Basketball Coaching Theory and Practice (PE 422)</td>
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<tr>
<td>or</td>
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<tr>
<td>352 Introduction to Dance (PE 334)</td>
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<tr>
<td>352 Tests and Measurements in Physical Education (PE 425)</td>
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<tr>
<td>352 Athlete Training &amp; Massage (PE 432M) (Men majors only)</td>
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<tr>
<td>352 Adapted Physical Education (PE 406)</td>
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<td>352 Undergraduate Seminar (PE 463)</td>
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<td>352 Electives (Men)</td>
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<tr>
<td>352 Electives (Women)</td>
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<td>352 Total</td>
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</table>

**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 (1/2)**

Enrollment in activity classes limited as follows:

- **Men only**: Apparatus and Tumbling, Basketball, Body Building, Flag Football, Handball, Soccer, Speedball, Softball, Swimming, Track and Field, Volleyball, Wrestling, Judo.
- **Women only**: Basketball, Body Mechanics, Modern Dance, Field Hockey, Softball, Swimming, Volleyball.
- **Coeducational**: Archery, Badminton, Dance, Golf, Swimming, Tennis.

2 activity periods. Total credit limited to 3 units.

**PE 144 Beginning Swimming (1)**

Beginning swimming for all who do not pass college swimming test. 2 activity periods. Total credit limited to 1 unit.

**PE 147 Adaptive Activities (1)**

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 upon recommendation of the college physician. 2 activity periods. Total credit limited to 3 units.

**PE 151M 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.

* Of the 68-71 units of electives, 30 are to be taken with direct approval of the student's adviser.

* Alternative requirements for men and women majors.
PE 201  Principles of Physical Education (3)
History and concept of physical education and recreation as a profession. Cor-
relation between principles and methods. 3 lectures.

PE 203  School and Community Health Education (2)
Organization and administration of the school health program and its inter-
relationship to community health agencies; underlying principles; legal aspects;
administrative divisions of health instruction, health services, and healthful school
living. 2 lectures.

PE 221M  Wrestling (2)
A critical analysis of the methods and problems in teaching and coaching wres-
tling. Emphasis on lesson planning, development of teaching units, organization for
class activity and administration of the program. 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 225M  Apparatus and Gymnastics (2)
A critical analysis of the methods and problems in teaching and coaching appa-
ratus 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. Pre-
requisite: PE 141, Gymnastic Activity.

PE 225W  Apparatus and Gymnastics (2)
Progression and teaching techniques in tumbling and gymnastic stunts. 1 lecture,
1 two-hour laboratory.

PE 232  Intramural Sports (3)
The 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, com-
munity, and traffic situations. Accident prevention. 3 lectures.

PE 301  Industrial Recreation (3)
The field of industrial recreation. The history, philosophy, organization and
administration of recreation programs in private business and industry. 3 lectures.

PE 302  Kinesiology (3)
The 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. 2 lectures.
Prerequisite: Zool 235

PE 303  Physiology of Exercise (3)
effects of physical activity upon the circulatory, respiratory, and other physio-
logical systems. The relationship of strength, co-ordination, flexibility, endurance,
fatigue, conditioning, and related factors to human movement and athletic perform-
ance. 3 lectures. Prerequisite: PE 302

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.
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)
A critical analysis of the methods and problems of teaching and coaching baseball at the secondary school level. Emphasis on strategy, selection of players, officiating, 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, 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)
Prepares the student to guide elementary school age children through a well-balanced program in physical education, aims, objectives, program planning, methods, evaluation including practical experiences in conducting games of the elementary level. 2 lectures, 1 two-hour laboratory.

PE 331M Techniques of Officiating (2)
Problems, techniques, and practices of officiating men's sports. 1 lecture, 1 laboratory.

PE 331W Techniques of Officiating (2)
Techniques of officiating girls' sports. 1 lecture, 1 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. 1 lecture, 2 two-hour laboratories.

PE 341 Direction of Physical Education Activity (1)
Required of all majors in physical education. Under close staff supervision students conduct regular physical education classes. 2 one-hour periods. Total credit limited to 3 units.

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 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)
A consideration of the principles, policies, and practices involved in the administration of the school health curriculum and its relation to public and private health agencies in the community. 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. Prerequisite: Senior standing, PE 214 and departmental approval. 1 lecture, 3 two-hour laboratories.

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 427M  Advanced Sports Theory  (2)
Detailed study of the theory and strategy of interscholastic and intercollegiate sports. The use of audio-visual, statistical and scouting techniques as coaching aids. Prerequisite: Completion of the appropriate Theory of Coaching course, one year of intercollegiate experience in the sport, or permission of the instructor. 1 lecture, 1 two-hour laboratory.

PE 432M  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. Prerequisite: PE 406

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 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 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.
Students desiring to major in Physical Science will find the curriculum is very flexible. Three course selections are available allowing the student to concentrate in physics, chemistry, or physical sciences. These emphases have different objectives and offer careers in different fields.

The student concentrating in chemistry or physics will find himself prepared for careers as a chemist or physicist in industry or governmental service. These programs also provide prerequisites for entrance to graduate work at most universities. The student carrying a general program in the physical sciences will have a wide choice of electives. Students following this program may qualify for secondary school teaching. Others may secure 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 underlying 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.

### CURRICULUM IN PHYSICAL SCIENCES

#### Freshman

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<th>Course</th>
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<td>Freshman Composition (Eng 104, 105, 106)</td>
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<td>General Chemistry (Chem 321, 322, 323)</td>
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<tr>
<td>Physical Education (PE 141)</td>
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<tr>
<td>* Biological Science</td>
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<td>Mathematics for Engineers (Math 117)</td>
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<td>General Physics (Phys 131, 132)</td>
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<td>Analytic Geometry and Calculus (Math 118, 201)</td>
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<td>Health Education (PE 107)</td>
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**Total:** 15½ 16½ 16½

#### Sophomore

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<td>Physical Education (PE 141)</td>
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<td>Principles of Economics (Ec 201, 202)</td>
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<td>General Physics (Phys 133 or 204)</td>
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<td>Analytic Geometry and Calculus (Math 202, 203)</td>
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<td>Optics and Atomic Physics (Phys 211)</td>
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<td>General Psychology (Psy 202)</td>
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**Total:** 16½ 16½ 16½

* To be selected from the General Education List.
† Of the 86 units of electives, 49 are to be taken with direct approval of the student’s adviser.
### 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 103 or 112.

**Chem 171 Chemical Laboratory Practices (1)**

The use, care, and handling of laboratory glassware and apparatus. Safety procedures. 1 laboratory.

**Chem 321 General Chemistry (4)**

General principles emphasizing correlation of properties of elements with atomic orbital 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 analytic 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.

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*To be selected from the General Education list.
† Of the 86 units of electives, 49 are to be taken with direct approval of the student's adviser.
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 332 or 325

** 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 (3)

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 the nutrition of humans, animals and plants. 2 lectures, 1 laboratory. Prerequisite: Chem 326

Chem 400 Special Problems for Advanced Undergraduates (1-2)
Individual or group investigations for advanced students. Total credit limited to 4 units in Chem 400 and Phys 400 with not more than 2 units in any one quarter. 1 or 2 laboratories.

** Offered in even-numbered years.
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. Prerequisite: Chem 326

* 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. Prerequisite: 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 emf 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. Prerequisites: Chem 326 and 332

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.

* Offered in odd-numbered years.
** Offered in even-numbered years.
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, electrochemistry, magnetism and magnetic fields, measuring instruments, magnetic field of a moving charge, induced emf, ac circuits, electronics. 3 lectures, 1 laboratory. Prerequisite: Phys 132

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. 3 lectures, 1 laboratory. Prerequisites: 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

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 Heat (3)
Expansion of solids and liquids. Change of state of pure substances. Observable behavior of gases. Laws of thermal conduction and radiation. 3 lectures. Prerequisites: Phys 133 or 204 and Math 203

Phys 313 Advanced Electricity and Magnetism (3)
Principles of electrostatics, magnetostatics, and electrodynamics. Direct and alternating currents. Maxwell's equations. 3 lectures. Prerequisite: Phys 133 or 204, 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 in Physics 400 and Chemistry 400 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. Prerequisites: Phys 133 or 204 and Math 203

** Offered in even-numbered years.
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 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 development 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. 3 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 403 and graduate standing.

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 agricultural, engineering, and arts and sciences students by providing courses that give the necessary basic backgrounds in economics, history, political science, geography, psychology, sociology, and philosophy. In the area of general education, the department prepares the student to understand himself and others better and to participate in political, social, and economic affairs. The department seeks to provide the student with certain vocational and social abilities, skills, and habits which are prerequisite for successful living and effective citizenship.

The social sciences major is planned to prepare secondary school teachers of the social studies and to train students for entry jobs in civil service, business, industry, and social welfare, which require a bachelor's degree with a major in the social sciences. 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 preparing 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.

### CURRICULUM IN SOCIAL SCIENCES

#### Freshman

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<th>Course</th>
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<td>Freshman Composition (Eng 104, 105, 106)</td>
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<tr>
<td>History of Civilization (Hist 101, 102, 103)</td>
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<td>Physical Education (PE 141)</td>
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<td>Mathematics</td>
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<td>Introduction to the Social Sciences (Soc Sc 101)</td>
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<td>Health Education (PE 107)</td>
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#### Sophomore

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<tr>
<td>Principles of Sociology (Soc 201, 202, 203)</td>
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<td>Physical Education (PE 141)</td>
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<td>Introduction to Philosophy (Phil 201)</td>
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<td>Natural Sciences</td>
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<td>Principles of Economics (Ec 201, 202, 203)</td>
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<td>American Civilization (Am Civ 301)</td>
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1 To be taken from the General Education list.
Junior

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<tr>
<td>History of the United States (Hist 301, 302, 303)</td>
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<td>Literature</td>
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<td>History of the Far East (Hist 311)</td>
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<td>History of Southwest Asia and Africa (Hist 312)</td>
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<td>History of Latin America (Hist 313)</td>
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<td>Economic Geography (Geog 312)</td>
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<td>Business Law (Bus 301)</td>
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Senior

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<tr>
<td>Inter-American Relations (Pol Sc 411)</td>
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<td>International Relations (Pol Sc 412)</td>
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<td>Comparative Government (Pol Sc 413)</td>
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<td>Economics</td>
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<td>Senior Project (Soc Sc 461, 462)</td>
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<td>State and Local Government (Pol Sc 401) or History of California (Hist 112)</td>
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<td>Social Psychology (Psy 401)</td>
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<td>Undergraduate Seminar (Soc Sc 463)</td>
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<td>Electives</td>
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**DESCRIPTION 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.

**DESCRIPTION OF COURSES IN ANTHROPOLOGY**

Ant 301, 302  Principles of Anthropology  (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; implications of cultural differences for the social worker. 3 lectures.

**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 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

1 To be taken from the General Education list.
2 Am Civ 302 or 303 may not be substituted for any part of this requirement.
3 Teaching majors elect Psy 306, Psy 312, Ed 301, and Ed 403 in junior and senior years.
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 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 (5)
Purpose, organization, and development of the public school in America. Emphasis on the elementary and secondary school curriculum through intensive study and school visitations. 5 lectures.

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 observation in secondary schools. Classroom planning co-ordinated with public school practice. 5 lectures. Prerequisites: Psy 312, Ed 301, and/or permission of instructor.
*Ed 420, 421, 422 Materials and Methods in Elementary Education (5) (5) (5)
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. 5 lectures.

* Ed 421, 422, 431 not offered 1962-63.
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 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 prior to registration for this course.

**DESCRIPTIONS OF COURSES IN GEOGRAPHY**

**Geog 221  Elements of Geography**  (3)

Elements of geography primarily for the elementary school teacher; map reading and making; the effect of geography upon industry and agriculture. 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; world trade. Supporting power of geographical environment. 3 lectures.

**Geog 312  Economic Geography**  (3)

Physical environment as it affects the economic well-being of the individual. Analysis of the geographical location of agriculture and industry both domestic and international, emphasizing the economic interdependence of geographical areas and the availability and use of resources. 3 lectures. Prerequisite: Ec 201

**DESCRIPTIONS OF COURSES IN HISTORY**

**Hist 101, 102, 103  History of Civilization**  (3) (3) (3)

Development of civilization from earliest times to the present. Political, economic, social, intellectual, and religious contributions of the various peoples to contemporary life. 3 lectures.

**Hist 112  History of California**  (3)

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 301, 302, 303  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: Hist 303 or Am Civ 302

**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: Hist 303 or Am Civ 302

**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: Hist 303 or Am Civ 302

* Ed 421, 422, 431 not offered 1962-63.
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: Am Civ 303 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: Am Civ 303 or permission of the 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: Am Civ 303 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 to Philosophy (3)
Introduction to the science of correct and accurate thinking and reasoning, a survey of prevalent philosophical theories and their application in the contemporary world. 3 lectures.

Phil 202 Logic (3)
The rules of valid inferences. The elements of reasoning, methods of reasoning or argumentation, fallacies in reasoning. 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.

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. Prerequisites: 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.

DESCRIPTIONS OF COURSES IN POLITICAL SCIENCE

Pol Sc 401 State and Local Government (3)
The structure, function, and problems of state, county, municipal, and district governments. 3 lectures. Prerequisite: Am Civ 302

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: Am Civ 301, 302, or Hist 303
**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: Am Civ 301, 302, or Hist 303

**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: Pol Sc 412 or permission of instructor.

**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. Prerequisites: Am Civ 302 and junior standing.

**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: Am Civ 303

**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 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 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 304  Human Relations (3)**
The problems of everyday human relations in face-to-face groups, particularly in job situations. Development of skill in dealing with others through participation in case studies, role playing, and class discussions. 3 lectures. 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 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.

Psy 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. Prerequisite: Graduate standing.

DESCRIPTIONS OF COURSES IN THE SOCIAL SCIENCES

Soc Sc 101 Introduction to the Social Sciences (2)
The social sciences in their relationship to modern living; an overview of the contributions of social sciences to cultural, social, and economic development. 2 lectures.

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 the 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.

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)
Social and psychological backgrounds of the family in our culture. The development of family living in western society. Preparation for marriage and marital adjustment. 3 lectures.

**Soc 221, 222, 223**  Introduction to Social Work (3) (3) (3)
Case work, social group work and community welfare organizations, their functions and orientations. Social work 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: Soc 201, 202, 203

* **Soc 321, 322, 323**  Special Fields of Social Work (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 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.

* Not offered 1962-63.
# DEPARTMENT HEADS AND CHAIRMEN
## BY DIVISIONS
### SAN LUIS OBISPO
#### AGRICULTURAL DIVISION

<table>
<thead>
<tr>
<th>Department</th>
<th>Chair</th>
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<tbody>
<tr>
<td>Agricultural Business Management</td>
<td>Daniel C. Chase</td>
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<tr>
<td>Agricultural Engineering</td>
<td>James Merson</td>
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<tr>
<td>Animal Husbandry</td>
<td>Lyman Bennion</td>
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<tr>
<td>Crops</td>
<td>Corwin M. Johnson</td>
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<tr>
<td>Dairy Husbandry and Manufacturing</td>
<td>Harmon Toone</td>
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<td>Farm Management</td>
<td>Edgar Hyer</td>
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<tr>
<td>Food Processing</td>
<td>DeWitt F. Sampson</td>
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<tr>
<td>Ornamental Horticulture</td>
<td>Howard C. Brown</td>
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<tr>
<td>Poultry Industry</td>
<td>Richard Leach</td>
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<td>Soil Science</td>
<td>Logan Carter</td>
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<td>Veterinary Science</td>
<td>John Allen</td>
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#### ENGINEERING DIVISION

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<tr>
<td>Aeronautical Engineering</td>
<td>Charles P. Davis</td>
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<tr>
<td>Air Conditioning and Refrigeration Engineering</td>
<td>James McGrath</td>
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<tr>
<td>Architectural Engineering</td>
<td>George J. Hasslein</td>
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<td>Electrical Engineering</td>
<td>Fred W. Bowden</td>
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<td>Electronic Engineering</td>
<td>Clarence Radius</td>
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<td>Industrial Engineering</td>
<td>Millard J. Potter</td>
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<tr>
<td>Machine Shop</td>
<td>Francis F. Whiting</td>
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<tr>
<td>Mechanical Engineering</td>
<td>Leon F. Osteyee</td>
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<tr>
<td>Welding and Metallurgical Engineering</td>
<td>Richard C. Wiley</td>
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#### APPLIED ARTS DIVISION

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<tr>
<td>Business</td>
<td>Roy E. Anderson</td>
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<tr>
<td>Education</td>
<td>Walter P. Schroeder</td>
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<tr>
<td>English and Speech</td>
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<tr>
<td>Home Economics</td>
<td>Marjory E. Martinson</td>
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<tr>
<td>Music</td>
<td>Harold P. Davidson</td>
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<tr>
<td>Physical Education</td>
<td>Robert A. Mott</td>
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<tr>
<td>Printing Engineering and Management</td>
<td>A. M. Fellows</td>
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<td>Technical Journalism</td>
<td>Clyde H. Hostetter</td>
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#### APPLIED SCIENCES DIVISION

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<tbody>
<tr>
<td>Biological Sciences</td>
<td>Glenn A. Noble</td>
</tr>
<tr>
<td>Mathematics</td>
<td>Milo E. Whiston</td>
</tr>
<tr>
<td>Military Science and Tactics</td>
<td>Lt. Col. William M. Boyce</td>
</tr>
<tr>
<td>Physical Sciences</td>
<td>Woodford E. Bowls</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>A. Norman Cruikshanks</td>
</tr>
</tbody>
</table>
KELLOGG CAMPUS
AGRICULTURAL DIVISION
Agricultural Engineering................................................. Haven Q. Conard
Agricultural Business Management...................................... William P. Rowley, Acting
Agricultural Services and Inspection.................................... Edward C. Appel, Jr.
Agronomy............................................................................ Robert L. Procsal
Animal Husbandry.............................................................. Harry B. McLachlin
Fruit Industries..................................................................... Albert E. Canham
Landscape Architecture....................................................... Howard O. Boltz
Ornamental Horticulture...................................................... Oliver A. Batcheller
Soil Science......................................................................... Harry V. Welch, Jr.

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
Accounting............................................................................ George E. Carlberg
Biological Sciences............................................................... Jerome E. Dimitman
Business Administration....................................................... Clarence H. Jackman, Acting
Language Arts........................................................................ Ben Siegel
Marketing................................................................................
Mathematics.......................................................................... Wallace A. Raab
Music.................................................................................... Lowell K. Weeks
Physical Education............................................................... V. Barney Anooshian
Physical Sciences................................................................. G. Thomas Moran, Acting
Social Sciences...................................................................... Hugh O. LaBounty
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
E. D. Graf, Jr., Asst. Chief of Bureau....Room 413, State Education Bldg., Sacramento
K. B. Cutler, Regional Supervisor........809-C California State Bldg., Los Angeles
S. L. Barrett, Regional Supervisor......Room 413, State Education Bldg., Sacramento
Donald Wilson, Regional Supervisor
   California State Polytechnic College, San Luis Obispo
W. J. Maynard, Regional Supervisor......809-C California State Bldg., Los Angeles
R. H. Pedersen, Regional Supervisor.....Room 4064, 1111 Jackson St., Oakland
G. A. Hutchings, Regional Supervisor   Room 5044, State Bldg., 2550 Mariposa St., Fresno
J. E. Walker, Regional Supervisor..........47 Warner Street, Chico
H. H. Burlingham, Teacher Trainer       California State Polytechnic College, San Luis Obispo
S. S. Sutherland, Teacher Trainer       University of California, College of Agriculture, Davis
George P. Couper, Special Supervisor   California State Polytechnic College, San Luis Obispo
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 work, University of Southern California.
Experience: Lecturer, University of Southern California.

* 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 bibliotherapist; instructor, College of William and Mary, Pomona College, La Verne 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 Co. of N.J.; instructor, mechanical engineering, Oregon State College; research assistant, industrial sales engineer, Union Oil Co. of Cal. Registered professional engineer, California.

ALEXANDER, WILLIAM M. (1958) Political Science
B.S., Oregon State College, 1949; M.S., 1951; M.A., Pennsylvania State University, 1953; additional study at University of Stockholm, George Washington University, and University of Oregon.
Experience: Management assistant, U.S. Geological Survey; teaching fellow, University of Oregon; instructor, Oregon State College.

ALLEN, FRANCIS S. (1949) College Librarian
Litt.B., Xavier University, 1933; B.S. in L.S., University of Illinois, 1941.
Experience: Librarian, Seattle College; officer, U.S. Army; librarian, Shriverham American University, England; assistant circulation librarian, Oregon State College.

ALLEN, JOHN K. (1952) Veterinary Science
D.V.M., Iowa State College, 1934.

ALLEN, RAY (1955) Welding
B.A. in Industrial Education, Santa Barbara State College, 1942; additional graduate work, 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.

* Kellogg-Voorhis staff.
AMATO, ANTHONY J. (1955) Ornamental Horticulture
B.S., California State Polytechnic College, 1949; graduate work, California State Polytechnic College.
Experience: Instructor, Mt. San Antonio Junior College, Pomona; Oakland Junior College, Oakland; landscape architect and contractor, Walnut Creek, California; officer, U.S. Air Force.

* AMES, RALPH W. (1961) Biological Sciences
B.S. with honors, University of Wyoming, 1941; M.S., University of Wyoming, 1942; Ph.D., University of Illinois, 1950.
Experience: Assistant 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; Plant Pathologist, J. Harold Mitchell Company.

ANDERSEN, OLIVE M. (1958) Mathematics
Experience: Teacher, Stanes European High School, Coonoor, India; Baldwin Girls' High School, Bangalore, India.

ANDERSON, ELIZABETH B. (1958) English
B.S. in Journalism, Ohio University, 1938; M.A., California State Polytechnic College, 1959.

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.

ANDERSON, RICHARD A. (1947) Coordinator, Men's Physical Education
B.S. in Education, University of Southern California, 1942; M.S. in Education, 1947; additional graduate work, University of California, 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) Head, Business Department
A.B., Pacific Lutheran College, 1940; M.A., Stanford University, 1948; M.B.A., 1952; additional graduate work, Stanford University.
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, RUSSELL K. (1955) Animal Husbandry
B.S., University of Minnesota, 1948; M.S., Iowa State College, 1950; Ph.D., Iowa State College, 1956.
Experience: U.S. Air Force; instructor, Animal Husbandry Department, Iowa State University, Ames, Iowa.

ANDERSON, WARREN R. (1946) Electrical Engineering
B.S. in agriculture, University of Minnesota, 1939; B.S. in EE., Louisiana State University, 1944; graduate work, Central Signal Corps School, Camp Crowder, Missouri.

* Kellogg-Voorhis staff.
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.

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; graduate work, San Jose State College, Stanford University, University of Nevada.
Experience: Instructor, Summerville High School, Tuolomne County; coach and instructor, Modesto High School.

APPEL, 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 work, 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
A.B., Whitman College, Washington, 1940; M.S., University of Southern California, 1947; Ed.D., University of Southern California, 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.

* Kellogg-Voorhis staff.
ASHMAN, NOLAN E. (1961) Psychometrist (Counseling and Testing)
A.S., College of Southern Utah, 1957; B.S., University of Utah, 1959; M.S., Utah State University, 1962.
Experience: Counselor, Cache County Schools, Logan, Utah; Examiner, Bureau of Educational Research, Utah State University.

AVARY, J. D. (1954) Economics
B.A., University of Texas, 1944; M.A., 1948; additional graduate study, University of California at Los Angeles.
Experience: Farm operator; Social Science Analyst, Bureau of Agricultural Economics, U.S.D.A.; research assistant, Federal Reserve Bank, Dallas; instructor, Texas Christian University; teaching assistant, U.C.L.A.; teacher, Long Beach State College.

BABB, JAMES H. (1959) Printing Engineering and Management
Experience: Fifteen years experience in printing, 6 1/2 of which was as owner of Visalia Printing Service.

* BALLANCE, CLAFLIN A. (1961) Landscape Architecture
B. of Arch., University of Southern California, 1961.

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.

* BATCHELLER, OLIVER A. (1946) Head, Ornamental Horticulture Department
B.S., Oregon State College, 1936; graduate work, Oregon State College.
Experience: Assistant farm adviser, Oregon; branch manager, California Nursery Company, California; 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.

* BEARDMORE, ROBERT L. (1958) Mechanical Engineering
B.S.M.E., 1951; M.S.M.E., 1952, University of Illinois.

BEATIE, GEORGE C. (1959) Music
A.B., University of California at Santa Barbara, 1949; M.A., California State Polytechnic College, 1956; 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.

* Kellogg-Voorhis staff.
BECK, CARL G. (1932) Farm Management  
B.S., Colorado A. & M. College, 1921. Additional study, Colorado A. & M. and University of California at Berkeley and Davis.  
Experience: Director of vocational agriculture, Del Norte Union High School, Colorado; Middletown Union High School and Colusa Union High School, California; principal, Del Norte Union High School, Colorado; U. S. Army.

* BELCHER, MELVIN B. (1958) Electronic Engineering  
B.S.E.E., 1951, University of California, Berkeley; A.A., 1948, Modesto Junior College; additional study in nuclear power, atomic defense, power system engineering.  
Experience: Test engineer, analytical engineer, manager Southern Nevada Area, General Electric, Schenectady, and Las Vegas, Nevada; service engineer, Western Audiograph, Los Angeles.

*BELLMAN, SAMUEL IRVING (1957) English  
B.A., University of Texas, 1947; M.A., Wayne University, 1951; Ph.D., the Ohio State University, 1955; University Fellow, the Ohio State University, 1953.  
Experience: Assistant instructor, the Ohio State University; columnist, the Fresno Guide; instructor, Fresno State College, San Luis Obispo Campus of California Polytechnic College; instructor, San Luis Obispo Adult School.

BENNION, LYMAN L. (1938) Head, Animal Husbandry Department  
B.S. from 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.

* BERNE, JOHN R. (1960) Housing Coordinator  
B.S., University of Southern California, 1958; additional graduate work, University of Southern California.  
Experience: Counselor of Men's Organizations, University of Southern California.

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; additional work, California State Polytechnic College.  
Experience: Feed and milking supervision, Union Stock Farms, Blythe, California.

BISHOP, CHESTER O. (1957) Mechanical Engineering  
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.

*Kellogg-Voorhis staff.
BLAIR, FOREST E. (1960) Civil Engineering
B.C.E., Cornell University, 1951.

BLINKHERN, LOUISE (1955) Librarian
B.A., University of California, 1929; Certificate in Librarianship, 1931.
Experience: Librarian, San Marino Public Library, San Marino, California; cataloger and audiovisual assistant, Arcadia Unified School District, Arcadia, California.

BLOOM, EMMETT A. (1946) Animal Husbandry
B.S. Agriculture, 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.

* BOGD, CAMERON C. (1955) Mathematics
B.A., University of Redlands, 1943; M.A., University of Michigan, 1947.
Experience: Occidental Life Insurance Company, Los Angeles, California; instructor, Eliot Junior High School, Altadena, California.

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 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.

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
Magyar Kiralyi Hadaprod Iskola; Technische Hochschule; University of Freiburg; University of California at Los Angeles; B.A., U.C.L.A., 1956.
Experience: Teaching assistant, U.C.L.A., 1956-58; associate in humanities, University of California at Riverside.

* Kellogg-Voorhis staff.
BOWDEN, FREDERICK W. (1949) Head, Electrical Engineering Department
B.S., California Institute of Technology, 1932; M.S. in E.E., 1933; additional
graduate work, 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,
California.

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.

BOYCE, WILLIAM M., LT. COL., U.S.A. Head, Military Science and Tactics
B.S., University of Connecticut, 1938; Command and General Staff College, 1945;
Special Weapons Officers' Course, Sandia Base, New Mexico, 1953.
Experience: Inspector General Far East Command; Battalion Commander, School
Brigade, Fort Benning, Georgia; J4, Office of Joint Chiefs of Staff (Korea); Deputy
Commander 2nd Battle Group, Korea; Instructor and Chairman of Logistics Com-
mand U.S.A. Infantry School.

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.

BRADLEY, HENRY, Master Sergeant, U.S. Army (1954)
Military Science and Tactics
Experience: Warrant Officer, U.S. Army: Armored Battalion Supply Officer;
Unit Administrator; administrative assistant to special service officer, Camp Hunter
Liggett and Fort Ord, California; Sergeant Major and Personnel Sergeant Major,
Training Center, Fort MacArthur, California.

BRANNUM, THOMAS P. (1952) Animal Husbandry
B.S., California State Polytechnic College, 1948.
Experience: Dos Pueblos Ranch, Goleta, California; U.S. Army Air Force; agri-
culture instructor, Santa Ynez High School.

BRECKAN, ERLING A. (1958) Special Studies
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, Neomatic, 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.

BRINER, THOMAS A. (1961) Architectural Engineering
B. Arch., Carnegie Institute of Technology, 1958; M. Arch., Massachusetts Institu-
tute of Technology, 1960.
Experience: Damon, Worley, Samuels and Assoc., Architects, Cleveland, Ohio;
John Pekruhn, Architect, Pittsburgh, Pa.; Campbell and Greene, Architects and
Engineers, Sewickley, Pa.

BROMLEY, J. PHILIP (1947) Curriculum Supervisor
B.S., University of Southern California, 1934; M.S., 1936; graduate work at
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; U.C.L.A.; Los Angeles State College.
Experience: General machinist, Hanson Manufacturing Company, Pomona; pro-
duction and experimental machinist, H. W. Loud, Pomona; experimental machinist, Glenn Jones Machinists, Ontario, California.

BROWN, HOWARD C. (1946) _______ Head, Ornamental Horticulture Department
B.S., California State Polytechnic College, 1943; M.S., Ohio State University, 1954.
Experience: U.S. Army Air Force; instructor, Ohio State University.

* BROWN, HOWARD S. (1948) __________ Botany
B.A., 1943, University of California at Los Angeles, M.A., 1948; Ph.D., Claremont Graduate School, 1960.
Experience: Teaching assistant, University of California at Los Angeles; officer, U.S. Marine Corps.

BROWN, WILLIAM H. (1957) __________ Architectural Engineering
B. Arch., University of Florida, 1954; graduate study, University of Florida.
Experience: Draftsman, Trend Associates, L. C. Kingscott & Associates, Kalama-
zoo, Michigan; Viking Products Co., Vicksburg, Michigan; Valley Metal Products Co., Plainwell, Michigan; instructor, University of Florida; designer, John E. Piercey, Architect, Gainesville, Florida.

BRUNK, ATHOL J. D. (1957) __________ Physics
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; mathe-
matics instructor, Atascadero, California.

BRYSON, PAUL R. (1956) __________ Physics
A.B., Pacific Union College, 1941; M.A., University of Southern California, 1949;
additional graduate work, University of Southern California.
Experience: Instructor and administrator, California College of Medical Tech-
nicians; instructor in physics, Reedley High School and College.

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.

BURLINGTON, HERBERT H. (1948) __________ Agricultural Education and Teacher Training
B.S., Oregon State College, 1929; graduate work, University of California.
Experience: Executive student, Swift and Company; director of agriculture, Willis Junior-Senior High School; director of agriculture and critic teacher, Madera Union High School; director of agriculture and critic teacher, 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; additional graduate work.
Experience: Marine engineering and naval architecture, Kaiser Co., and others; teaching, Portland Public Schools, Gresham Union High School; instructor, Multonah 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., 1933, Syracuse University; M.A., 1938, University of Southern California; Ph.D., 1959, University of California at Los Angeles.
Experience: Instructor in English, University of Nevada; Assistant Professor of Science (USAF), University Southern California; Staff Officer, United States Air Force.

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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.

* CANHAM, ALBERT E. (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.

CARDANI, JOSEPH C. (1959)  Business
Experience: Owner chain of retail stores and wholesale company; State Department Offices for Voice of America; Fiscal Officer, U.S. Army, Psychological Warfare Branch; District Manager, Arizona Office of Emergency Management.

* CARLBERG, GEORGE E. (1949)  Head, Accountancy Department
B.S., University of California, 1947; graduate work, 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.

CARRINGTON, JAMES H. (1943)  Agricultural Engineering
Special Vocational Arts Credential, University of California, Los Angeles, 1940; Special Vocational Arts Credential, University of California, Berkeley, 1941 and 1942.
Experience: Auto mechanic, Los Molinos Garage, Los Molinos; auto shop instructor, Los Molinos High School, Los Molinos.

* CARSON, GEORGE W. (1961)  Mathematics
A.B., Hanover College, 1927; M.A., University of Illinois, 1935; University of Pittsburgh; Stanford.
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 work, University of Missouri, 1947.
Experience: Teacher, Nebraska and Iowa; instructor, Stephens College; assistant professor, Grinnell College.

CHAFFEE, WALTER R. (1958)  Education and Audiovisual
Michigan State University, 1946-53.

CHANDLER, EVERETT M. (1951)  Dean of Students
A.B., University of California, 1939; additional graduate work, University of California.

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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.

CHOU, TEH-LOH (1961) Electronic Engineering
B.S., Chinese National Chikiang 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.

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, Broadview Research Corporation, Burlingame, 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
B.S., University of Colorado, 1955.

* 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.

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.

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., Agriculture, University of California, 1925.
Experience: Agriculture instructor, Middletown, Calistoga, and Livermore high schools.

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COMPTON, MEL D. (1958) Welding
Engineering courses, University of Southern California and University of California at Los Angeles; education courses, 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.

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; co-ordinator of navigation instruction, U.S. Naval Flight Preparatory School; registrar; chairman, Mathematics Department, California State Polytechnic College.

COOK, EDWARD P. (1958) Welding
Special courses at Burbank Technical Institute, 1942, and 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; Arizona State University, Tempe; Roger Wagner Choral Workshop.
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 work, 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) Head, Social Sciences
A.B., University of California, 1931; M.A., Stanford University, 1933; Ed.D., Stanford University, 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; graduate work, University of Pennsylvania, 1935-37; Ph.D., Yale University, 1940.
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.

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CUMMINS, CARL C. (1958) Dean of 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.

* DAUGHERTY, RAYMOND C. (1960) Physical Education
B.S., State University of New York, 1951; M.S., 1956; additional graduate work 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 work, University of Southern California.
Experience: Head of Music Department, Emerson Junior High School, Pomona; master training teacher, Claremont College.

DAVIES, GEORGE R., II, MAJOR, U.S.A. Military Science and Tactics
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, 5th Howitzer Battalion, Korea.

DAVIS, CHARLES P. (1958) Head, Aeronautical Engineering Department
B.S., Mechanical Engineering, Rensselaer Polytechnic Institute, 1948.
Experience: Instructor and assistant professor, Rensselaer Polytechnic Institute; development engineering and product engineer leader, General Electric Company.

* DAVIS, DONALD F. (1957) Poultry
B.S., Pennsylvania State College, 1933.
Experience: Manager, Poultry and Egg Department, Swift & Company, Wilkes-Barre, Pennsylvania; manager, Pennsylvania egg-laying test; district manager, feed division, the Quaker Oats Company; manager, Feed Sales, California Milling Corp., Los Angeles.

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.

* 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.

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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, 1946; 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.

DILLION, JERRY L. (1954) Electronic Engineering
B.S., in Electronic Engineering and Mathematics, California State Polytechnic College, 1954.

DILTS, RALPH W. (1944) History and Political Science
A.B., Montana State University, 1936; M.A., 1938; graduate study, University of California, 1940-1941.
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.

* 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) Institutional Studies Specialist
B.S., Iowa State University, 1947, M.S., 1948; graduate work, University of Southern California, 1949-51.
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; additional studies Oregon State College, California State Polytechnic College. USNRMS Columbia University, Naval Diesel School, Cornell University.
Experience: Engineering Officer USNR, Wholesale Farm Machinery 10 years, Retail Farm Machinery 4 years. California State Polytechnic Instructor 1948-1952.

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.

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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.

* DUTRA, RAMIRO C. (1959) Physical Science
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., 1941, Santa Barbara State College; graduate work, University of Southern California, Los Angeles.
Experience: Project engineer, Shaffer Oil Tool Works, Brea, California; designer, University of Southern California Engineering Center, Los Angeles, California; process engineer, B. H. Hadley Co., Pomona, California; instructor, engineering, drafting, etc., Mount San Antonio College, Pomona, California.

ECKROTE, LAWRENCE H. (1955) Printing
Experience: Foreman, Mail of Woodland and San Bernardino Orange Belt News; machinist, Santa Barbara News-Press and San Luis Obispo Telegram-Tribune Co. Over 30 years of experience in the printing industry.

EILERS, PATRICIA (1956) Graduate Nurse
R.N., San Diego County Hospital, 1936.
Experience: San Luis Obispo County General Hospital.

ELSTON, CHARLES A. (1947) Mathematics
A.B., Santa Barbara State College, 1932; M.S., University of Southern California, 1940.
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 of Agriculture
B.S., University of California, Berkeley, 1939.
Experience: Director of vocational agriculture, Reedley Union High School and Junior College, Reedley, California; head, crops department, California State Polytechnic College, Voorhis Unit.

* EPPS, MAX (1960) Mechanical Engineering
B.S. in chemical engineering, University of Southern California, 1934; M.S. in chemical engineering, 1935.
Experience: General Petroleum Corporation, Los Angeles; chief automotive engineer, Socony Vacuum, Paulsboro, N.J.; assistant supervisor of engine laboratories, Fairchild Aircraft, Ranger Engine Division, Farmingdale, N.Y., assistant to chief engineer. Registered professional chemical engineer, California.

ERICSON, CHRISTINE (1955) Library
Experience: Beloit, Wisconsin, Public Library; Whiting, Indiana, Public Library; Post Library, Fort Riley, Kansas.

ERNATT, EDWARD T. (1958) Education
A.B., Wayne State University, Detroit, 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 California, Santa Barbara College; district superintendent, West Park School District, Fresno, California.

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ERSPAMER, JACK L. (1956) Botany
B.S., University of Washington, 1941; Ph.D., University of California, 1953.
Experience: Teaching assistant, University of Washington, University of California; research assistant, University of California, Citrus Experiment Station, Riverside.

ESSIG, FREDERICK M. (1946) Biological Sciences
A.B., University of California, 1917; Ph.D., 1920; B.D., University of Southern California, 1927.
Experience: Teaching assistant, University of California; instructor, University of California at Los Angeles; professor, Asbury College, Kentucky; chaplain, U.S. Army.

FALKENSTERN, OSWALD J. (1953) Mathematics
B.S., Montana State College, 1939; additional graduate work, University of Colorado and Colorado A. & M. College; M.S., San Jose State College, 1952.
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 Husbandry
B.S., University of Minnesota, 1947; M.S., 1950; Ph.D., 1953.
Experience: U.S. Air Force; Associate Professor and head, animal husbandry department, Northwest Experiment Station, University of Minnesota, Crookston Minnesota; secretary-treasurer Red River Valley Aerial Sprayers, Inc., Crookston Minnesota.

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, California; Hughes Aircraft Company, Fullerton, California; lecturer, Pomona College, University of Southern California; instructor, San Diego State College; associate professor, Chapman College, Orange, California.

* FILLHART, DANIEL (1961) Metal Processes
A.A. in Mach. Tech., 1953, Pasadena City College.

FISHER, CLYDE P. (1947) Dean of Applied Sciences
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.

FLANAGAN, JAMES ROBERT (1959) Animal Husbandry
B.S., California State Polytechnic College, 1959.
Experience: Rancher.

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FLYNN, THOMAS J. (1959) Mathematics
B.S., United States Naval Academy, 1927; United States Naval Postgraduate School, Ordnance Engineering, 1935; Advanced Management Program, Harvard Business School, 1951; M.S., Purdue University, 1959.
Experience: United States Navy; Bureau of Ordnance, Navy Department, Research and Development and Production.

FOOTE, ALVIN (1956) English
Colorado College, 1926-29; A.B., 1948; M.A., 1949; additional graduate study, Tulane University.
Experience: U.S. Army instructor, Colorado College; instructor, Centenary College; instructor, Tulane University.

FOLSOM, VOLMAR A. (1946) Mathematics
B.S., Iowa State College, 1934; M.E., Colorado University, 1937; additional graduate work, Southern Methodist University.
Experience: High school and junior college teaching; officer, U.S. Navy; assistant professor, mathematics, Southern Methodist University.

* FORREST, WILLIAM M. (1957) Building Program Coordinator
A.B., University of California, 1956; M.S.L.S., University of Southern California, 1957.

FOSDICK, LEE G. (1957) Technical Assistant, Biological Sciences
B.S., California State Polytechnic College, 1957.
Experience: Research Assistant, Radiation Biology Laboratory, University of Washington; Research associate, Department of Zoology, University of Washington; Fisheries Biologist, Department of Fisheries, Washington.

FOTTER, MILLARD J. (1954) Head, Industrial Engineering Department
B.S. in Mechanical Engineering, 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., California State Polytechnic College, 1957.
Experience: Director of Vocational Agriculture, Lassen Union High School, Susanville, California.

* FOXEN, MILDRED E. (1955) Supervising Nurse
R.N., Womens Christian Association, 1943.
Experience: Resident nurse, College of Wooster, Wooster, Ohio; Intercommunity Hospital and office nurse, Medical Center, Covina, California.

* FRANCIS, JOHN W. (1960) Assistant Foundation Manager, Kellogg Campus
Experience: Teacher, Los Angeles City Schools.

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FRANCK, MICHEL N. (1956) History and Political Science
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 (St. Louis), 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) English
Université de Clermont, 1931; B.S., New York University, 1932; University of Paris, 1934; M.A., Columbia University, 1936; Ruprecht-Karl-Universitat, Heidelberg, Germany, 1936; Deutsche Akademie, 1937; 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; director of publications, 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.

FROST, ROBERT H. (1953) Physics
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; U. S. Naval Post Graduate School; M.S., Harvard University, 1930; George Washington University.
Experience: Officer, U. S. Navy (Retired); instructor, George Washington University; associate professor, Valparaiso University.

* FULBECK, JOHN F. (1958) English
Tusculum College, Greenville, Tenn., 1937; Upsala College, East Orange, New Jersey, 1938; A.B., University of Southern California, 1951; Ph.D., 1960.
Experience: Scholastic Magazine, New Jersey state representative; Independent Press, advertising manager, Bloomfield, New Jersey; U. S. Navy; Southwest News Press, The South End Bee, editor, 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.

FURIMSKY, 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.

* GAINES, MARILYN (1961) Activities Adviser
A.B., Mills College, 1960; additional study, University of Upsala.
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.

GARTLAND, THOMAS E. (1956) Mathematics
A.B., M.A., Creighton University, 1933; additional graduate work, University of Arizona, University of Minnesota, and State University of Iowa; evening and extension courses, Hastings College, UCLA, and Chaffey College.
Experience: Teacher-administrator, Nebraska; instructor Air Corps cadets, Butler University; St. Thomas Military Academy; teacher, Arizona, and Riverside, California; chairman education department and mathematics instructor, St. Ambrose College.

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; additional work 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.

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.

GESLER, JACK T. (1957) Animal Husbandry
B.S., California State Polytechnic College, 1952; M.S., Kansas State College, 1956; graduate study, State College of Washington.
Experience: Instructor in meats, State College of Washington; assistant meats instructor, Kansas State College.

B.S., California State Polytechnic College, 1947.
Experience: Horse trainer, Ed Wright Stables and 1001 Ranch, Riverside, California; horse trainer and horseshoer, San Luis Obispo; employee, Humphrey Meat Packing Company, San Miguel, California; Pacific Valley Cattle Company, King City, California; U.S. Marine Corps.

GIBSON, J. CORDNER (1949) Assistant Dean of Agriculture
B.S., University of California, 1937; M.S., University of Southern California, 1935.
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.

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GILBERT, JOHN R. (1961) Coordinator, Special Services
B.S., California State Polytechnic College, 1957; M.S., 1959; additional graduate work, Oklahoma State University.
Experience: U.S. Navy; Mathematics Instructor, California State Polytechnic College; Research Engineer, Lockheed Missile & Space Company, Vandenberg AFB.

* GIMPLE, GLENN W. (1959) Manager, Horse Breeding Program
B.S., California State Polytechnic College, 1959; graduate study, California Polytechnic College.
Experience: Foreman, 3 D Ranch, Fairfield, California; trainer, Brooks Ranch, Napa, California; trainer, J. B. Lynch Ranch, Napa, California; public training stable, Napa, California.

* GLASER, 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; free-lance artist.

GLIDDEN, WALLACE F. (1961) Veterinary Science
B.S., California State Polytechnic College, 1952; B.S., University of California, Davis, 1955; D.V.M., University of California, Davis, 1961.
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 work, University of California.
Experience: U.S. Army; library, University of California; audio-visual librarian, California State Polytechnic College; research assistant, University of California.

GOODE, JESSE B. (1956) Mathematics
B.S., U.S. Naval Academy, 1919; U.S. Naval Academy Post Graduate School; M.S., Columbia University, 1926.
Experience: United States Navy; instructor, Clinch Valley College, University of Virginia, Wise, Virginia.

* GOODFRIEND, HARVEY J. (1960) Social Sciences
B.S., San Diego State College, 1957; M.S., 1960; additional graduate study, Claremont Graduate School, University of California at Los Angeles.
Experience: Research assistant, San Diego State College; Office manager, San Diego Janitor Supply.

* 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.

* Kellogg-Voorhis staff.
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.

* GRAVES, GEORGE (1958) Aerospace Engineering
B.S., 1955, Marquette University, Milwaukee, Wisconsin.

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, THEODORE 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 Collage.

GREGORY, C. HEROLD (1950) Printing Engineering and Management
B.S., California State Polytechnic College, 1952.

* GREGORY, VERNON L. (1953) Biological Science
B.S., University of Miami, 1941; M.A., DePauw University, 1947; additional graduate work, 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.

* GRIEVER, GERHARDUS E. (1958) Mechanical Engineering
B.S., Middlebare Technische School, Leeuwarden, Holland, 1924.

* GRIFFIN, JAMES M. (1949) Ornamental Horticulture
B.S., California State Polytechnic College, 1949; M.A., 1952.

GUSTAFSON, LESTER W. (1947) Aeronautical Engineering
B.S., Aeronautical Engineering, University of Minnesota, 1932; graduate work, University of Minnesota, 1933.
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.

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HAGMANN, FRIEDA B. (1961) English
B.E., Whitewater State Teachers College, Wisconsin, 1945; M.A., University of Denver, 1954; graduate study, University of Chicago and University of Wisconsin.
Experience: English instructor and librarian, Milwaukee Public Schools, Wisconsin; German instructor, Milwaukee Vocational and Adult Schools; special services librarian, U. S. Army, Germany; reference librarian, University of Denver; head librarian, Inglewood, California; documents librarian, California State Polytechnic College.

HAILE, JOHN R. (1959) Industrial Engineering
B.S., U. S. Naval Academy, 1930. Graduate work, University of Southern California and California State Polytechnic College.
Experience: Officer, U. S. Navy; personnel and production engineering, Lockheed Aircraft; director, personnel training, Consolidated Steel Corp.; field engineer and research associate, National Defense Research Council; civil and highway engineering, City and State Engineering Departments, California.

* 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., Aeronautical Engineering, California State Polytechnic College, 1932; 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.

* HALLBERG, DALE M. (1962) Landscape Architecture
B.S., Landscape Architecture, University of California, 1955; B.A. Art, B.A. Education, Eastern Washington College of Education, 1956; graduate study, Claremont Graduate School.
Experience: Landscape architect, private practice; teacher, La Habra and Fullerton High Schools.

HAMMITT, LEWIS E. (1946) Physics

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.

* 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.

* HANSON, LAWRENCE E. (1961) Mathematics
A.B., Los Angeles State College, 1957; M.A., University of California at Davis, 1959; University of Oregon.
Experience: Instructor, Chico State College; instructor, University of Oregon.

HARDEMAN, SARAH A. (1960) Home Economics
B.S., Tennessee College, 1930; M.S., Iowa State University, 1946; additional graduate work at University of Tennessee (Martin Branch), Iowa State University.
Experience: Vocational Home Economics teacher, high schools in Tennessee.

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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.

HARLAN, OWEN (1961) .................................. Technical Arts
B.E., Eastern Illinois State Teachers College, 1941; M.A., University of Minnesota, 1945; Ed.D., University of Missouri, 1953.
Experience: Industrial Arts instructor in secondary schools, Illinois; instructor, Navy Air Technical Training Center, Norman, Oklahoma; instructor, Navy Ship Yards, Mare Island, California; industrial designer, Hohl Speciality and Conveyor Co.; assistant professor, State University of New York; consultant on Industrial Arts to the Union of Burma, under Fulbright Program; head of Practical Arts Division, Nebraska State Teachers College.

* 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., M.S., Utah State Agricultural College, 1954; additional research work.
Experience: American Packing and Provision Company, Swift and Co., Ogden, Utah; meatcutter, U.S. Army; breeding herdsmen, Sincrest Hereford Ranch, Springerville, Arizona; Gibbs Quarter Horse and Hereford Ranch, Mackay, Idaho; assistant livestock husbandman, U.S.A.C. farm, Logan, Utah.

* 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.

HASSLEIN, GEO. JOHANN (1949) .......................... Head, 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 Wurdeman 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., University of California at Los Angeles, 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, Md.

* HAUGH, CHARLES R. (1961) ............................ Landscape Architecture

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HAYES, HAROLD P. (1952) Dean of Engineering
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) Office Administration
B.S., State Teachers' College, Salem, Massachusetts, 1950; M.S., Oklahoma State University, 1952; additional 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, California.

HEINE, GERHARD T. (1961) Industrial Engineering
Gauss Engineering Institute, Berlin, Germany, graduated 1943; B.S., Industrial Engineering, Washington University, 1956.
Experience: Production engineer, Allgemeine Elektrizitats Gesellschaft, Berlin; tool designer, Knapp Monarch; chief tool designer, Chevrolet-Shell Division of GMC; mechanical engineer, Lewin-Mathes Co.; design and manufacturing development engineer, General Dynamics/Convair Division.

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; T. B. Bourne Associates, Inc.; DeWitt and Swank, Architects; Hugo Gibbs and E. McCoy, Architects; Hal Roach Motion Picture Studios; Anglo-Iranian Oil Co.; Urbanization Commission, Lithuania; Warsaw Municipal Power Station; architect, Spanish Architect-Engineer Companies; Técnicos Españoles Asociados; instructor, University of Nebraska; University of Oklahoma; Navy Orientation School; E. B. Badger Co.; draftsman, Warsaw Cooperative Building Society.

* HENDRICKSON, JOHN R. (1961) English
Experience: Teaching assistant, Florida State University; instructor, Middle Tennessee State College.

HENDRIKS, HAROLD J. (1952) Electronic Engineering
B.S., Iowa State College, 1940; M.S., 1941; graduate study, University of Colorado, 1949.
Experience: Engineer, Collins Radio Company, Cedar Rapids, Iowa; engineer, U.S. Naval Ordnance Test Station, Inyokern; industrial experience program, Westinghouse Electric Corporation, East Pittsburgh, Pa.; associate professor, electrical engineering, University of Nevada, Reno, Nev.

HENSEL, DONALD W. (1960) History and Political Science
B.S., University of North Dakota, 1949; M.A., University of Colorado, 1953; Ph.D., 1957.
Experience: Instructor, public schools in Colorado, New Mexico, Arizona; graduate assistant, University of Colorado, Boulder; instructor in history and coordinator of Arts and Sciences instruction, University of Colorado, Denver.

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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.

* HESSE, WALTER H. (1956) Physical Science
B.S., California State Polytechnic College, 1952; M.S. Agronomy, Cornell University, 1953; Ph.D. Agronomy, 1955.
Experience: Research assistant, Cornell University; teaching and research, University of Nevada; research, California Institute of Technology; engineering officer USNR and Merchant Marine.

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.

* 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 work 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) Horticultural 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, 1931; 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; additional study, Long Beach State College.
Experience: Summer camp counselor, Long Beach Public Schools; teacher, Owens Valley Unified School District, Independence, California; employment security officer, Department of Employment, State of California, Sacramento, California.

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HOLMQUIST, ROBERT E. (1946) .................................................. Physics
B.A., University of Oregon, 1932; M.A., Oregon State College, 1936; additional graduate work, 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) .............................................................. Physics
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
Experience: Project engineer, Aerojet Corp., Azusa; project engineer, Baker Engineering Corp., Los Angeles; engineer, Carrier Corp., Chicago; engineer, U.S. Naval Air Missile Test Center, Point Mugu, California; 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, California.

HONEGG, HARRY H. (1961) ................................................ Metallurgical Engineering
Experience: Welder, Oregon Shipyards; U.S. Army; Laboratory supervisor, Metallurgical Engineers, Inc. Registered professional engineer, Oregon.

HOOVER, RALPH W. (1948) ................................................. Animal Husbandry and Agricultural Mechanics
Experience: Instructor in horseshoeing and blacksmithing, U.S. Army; horseshoer, Porterville, California.

HOOVER, ROBERT F. (1946) ................................................ Biological Science
B.A., Stanford University, 1934; M.A., University of California, 1935; Ph.D., University of California, 1937.
Experience: Teaching assistant and research assistant, University of California; instructor, Yakima Valley Junior College; U.S. Army.

HOSTETTER, H. CLYDE (1958) ............................................ Department Head, Technical Journalism
B.J., University of Missouri, 1949; additional 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.

HOUK, A. L. (1946) ............................................................ Chemistry
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) .................................................. Physics and Chemistry
B.S., California State Polytechnic College, 1958; graduate study, California State Polytechnic College.

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* HOUSE, HENRY (1947)..............................................Associate Dean (Activities)
B.S., California State Polytechnic College, 1943; additional graduate work, 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 work, 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.
Experience: Assistant, newspaper plant; instructor-co-ordinator, Stout Institute; Racine Vocational School; U.S. Air Corps; editor and publisher, The Dial, Wisconsin.

HUGHES, LeROY BARRY (1950)......................................Physical Education and Athletics
B.S., University of Oregon, 1931; M.A., Stanford University, 1950.

* 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.

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., University of Florida, 1957.
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; graduate work, University of California at Los Angeles.
Experience: Instructor, Claremont Unified Schools, Claremont, California; Starr Commonwealth 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, California.

* JACKMAN, CLARENCE H. (1960)..................................Acting Head, Business Administration
Experience: Instructor, Spencerian College, Monmouth (Illinois) High School, University of Illinois; associate professor and assistant director of Evening Division, Bradley University; General Manager, Schafer Feed and Grain Company; intern, Arthur Young & Company; officer, U.S. Air Force Auditor General.

JACINTO, MARY (1957)................................................Graduate Nurse
R.N., Mary's Help Hospital, San Francisco, 1955.
Experience: King's General Hospital, Hanford.

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* JACKSON, ROBERT C. (1961) Mechanical Engineering
B.S.M.E., University of Southern California, 1959; A.A., Pasadena City College, 1956; M.S.M.E., University of Southern California, 1961.
Experience: Design engineer “B”, project engineer asst., Aerojet-General, Azusa; engineer assistant, General Electric, Los Angeles; USMC, sgt., Oceanside.

* JACKSON, LEON S. (1961) Physical Education
B.S., 1960, California State Polytechnic College, General Secondary, 1961, California State Polytechnic College.

JAMES, ARTHUR F. (1956) Medical Officer
M.D., University of Chicago, 1953; B.A., University of California at Los Angeles.

JENKINS, JOHN L. (1956) Home Economist
University of Wisconsin, 1923; University of California, 1956.
Experience: Own decorating business; instructor; adult education, various California schools.

JENKINS, STARR (1961) English
Oberlin and Baldwin-Wallace Colleges, Ohio; B.A. with distinction, University of New Mexico, 1948; M.A., Stanford University, 1959.

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, California; track coach and guidance assistant, Menlo Junior College, Menlo Park, California; U.S. Navy; track coach and instructor in health and physical education, San Francisco Junior College, California.

JENSEN, ROBERT P. (1954) Mechanical Engineering
B.S. in Industrial Education, The Stout Institute, 1932; M.S., 1938.
Experience: Instructor, Orange Coast College; instructor, College of the Sequoias; assistant professor, Kansas State Teachers College; instructor, Maryland high schools; operation sheet writer in production engineering, Pratt Whitney Corp., 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 work, 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.

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JOHNSON, MILES B. (1957) English
B.A., Gustavus Adolphus College, 1947; M.A., University of Minnesota, 1951; M.A., University of Denver, 1953. Additional work at the University of Washington, Seattle. Private study at the University of Southern California.
Experience: Presidential Assistant, Johnson Wholesale and Manufacturing Co.; 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; additional graduate work in meteorology, 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) Accounting Officer
Riverside College, 1934; Riverside Business College, 1936; Certificate, International Accountancy Society, 1942.

JONES, JOHN R. (1961) Business
B.S., University of Minnesota, 1931; graduate work, University of Washington, 1932; LL.B, George Washington University, 1938.
Experience: Head, Social Science Department, Sedro Woolley, Washington Union High School, 1931-34; Identification Division, FBI, 1934-38; Special Agent, Public Works Administration, 1938-40; Special Agent, FBI, 1940-61.

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, California; 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.

KABAT, HERBERT R. (1952) Physics
B.S., United States Naval Academy, 1938; M.A., Stanford University, 1951; additional graduate work, 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.

* Kellogg-Voorhis staff.
KACHUN, JOSEPH (1959) -------- Mathematics
B.A., University of Pittsburgh, 1940; graduate work, University of Pittsburgh.
Experience: Assistant professor of Mathematics, University of Pittsburgh, 1950-59; Lieutenant, United States Navy, instructing Navigation, 1943-46; instructor, Duquesne University, Pittsburgh, Penn State University; National Science Program, summer, 1940.

KARCH, GEORGE P. (1958) -------- Physics
B.A., University of Iowa, 1926; Ed.M., University of Oklahoma, 1940; additional graduate work in physics, University of Iowa and Oregon State College.
Experience: Teacher, Bartlesville Junior College and College High School; research, Phillips Petroleum Company; officer, U.S. Navy.

KAUFMAN, LOUIS (1961) -------- Business Administration
Experience: Instructor, U.S.C.; 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 College, 1949.
Experience: Sales and applications engineer, designer-draftsman, J. M. O'Connor Company, Oklahoma City.

KELLY, EDWARD M. (1957) -------- Physical Science
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
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) -------- Chemistry
B.S., University of Kentucky, 1944; M.S., Purdue University, 1946; additional graduate work, Purdue University and University of Southern California; 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 Husbandry
B.S., University of Idaho, 1946; M.S., Purdue University, 1956; Ph.D., 1958.
Experience: U.S. Air Force; assistant agricultural extension agent, Bannock Company, Pocatello, Idaho; research assistant, Purdue University.

* Kellogg-Voorhis staff.
KENYON, PAUL (1957)----------------------------------------- Business
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.

* KESSLER, 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, California; sales engineer, Service Equipment Supply Company, Rocklin, California.

* KING, DONALD W. (1961) ....------------------ Head, Civil Engineering Department
Experience: Instructor, Stanford University, and San Jose State College; Lockheed Aircraft, engineer, Sunnyvale; Aerojet-General, engineer, Covina; engineer, Western Knapp Engineering Co., New York; Hydrocarbon Research, engineer, New York; engineer superintendent, Peter Kiewit Sons' Co., Arcadia.

* KING, LOUIS J. (1958) ------------------- Psychology
A.A., Santa Monica City College, 1941; B.A., University of California, Los Angeles, 1943; M.S.W., University of Southern California, 1954; Ed.D., University of Southern California, 1958. 
Experience: Marriage counselor, American Institute of Family Relations, Los Angeles, California; personnel counselor, Los Angeles, California; vocational & personal counselor, University of Southern California, Veterans Administration; instructor, Los Angeles City Schools, Torrance City Schools, Santa Ana Junior College; assistant superintendent, attendance & welfare, Los Angeles City Schools.

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 Altamont, 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, WFJA, 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.

* Kellogg-Voorhis staff.
* 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.

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; U.S. Navy Finance and Supply School, 1936;
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 Cali-
fornia, 1958.
Experience: Electrical engineer, Los Angeles Department of Water and Power;
junior design engineer, North American Aviation, Inglewood, California; relay
engineer, Gulf States Utilities, Beaumont, Texas. Registered professional engineer,
California.

KRAHLING, BUREN W. (1960) — Medical Officer
Pre-medical education, Augustana College, Sioux Falls, South Dakota, 1944; B.S.,
M.D., State University of Iowa Medical College, 1947; Internship, Saint Mary's
Hospital, Duluth, Minnesota.
Experience: Private Practice, Orland, Iowa; Member, American Academy of
General Practice.

* KRIEGE, KENNETH B. (1957) — Mathematics
B.S., California State Polytechnic College, 1951; M.A., 1951; University of South-
ern California; University of California at Los Angeles.
Experience: Teacher, San Luis Obispo Junior High School; Teacher, Pomona
High School.

KROUTIL, WAYNE F. (1960) — Agricultural Engineering
B.S., Oklahoma State University, 1954; graduate work, Oklahoma State University.
Experience: Engineering draftsman, John Deere Company; design engineer, Inter-
national Harvester Co.; district sales manager, Modern Tractor and Supply Co.;
teaching assistant, Oklahoma State University.

* LA BOUNTY, HUGH O. (1953) — Head, Social Sciences Department
Experience: Teacher-administrator, Citrus High School and Junior College; chair-
man, English Department and Building Coordinator, California State Polytechnic
College.

* LACY, MILO G. (1959) — Agricultural Business Management
B.S., University of Oregon, 1938; additional work, University of California, Los
Angeles.
Experience: Instructor, Long Beach City College; Instructor, Pasadena City
College; Retail Marketing Specialist, USDA, Washington, D.C.; General Manager,
Richards Market, Newport Beach, California.

* Kellogg-Voorhis staff.
**LAMIMAN, JOHN F. (1946)**

Biological Sciences

B.S., Entomology, University of California, 1922; M.S., Entomology, 1924; Ph.D., Entomology, 1931; additional work, University of California, 1939-1940.

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)**

Assistant to the Dean of the College


Experience: Instructor, U. S. Army; Explosive Ordnance Disposal, U. S. Army; College Personnel Officer, California State Polytechnic College.

**LANDYSHEV, ALEXANDER (1956)**

Electrical Engineering

E.E. Degree, University of Vladivostok, Russia, 1927.

Experience: Electrical engineer, Donez 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.

**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.

**LASSWELL, MARCIA E. (1961)**

Social Sciences

A.A., University of California, 1947; B.A., University of California, 1949; M.A., University of Southern California, 1952.

Experience: George Pepperdine College, instructor; 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 work, University of Oregon, 1956.

Experience: Instructor, Ordnance Department, United States Army; teacher, California high schools; instructor, Adult Evening College, Chico.

**LAW, HUGH E. (1957)**

Economics

B.B.A., Baylor University, 1952; M.S., 1953; Ph.D., Louisiana State University, 1959.

Experience: Industrial, managerial and merchandising; Teaching assistant and instructor, Louisiana State University; Navigator, U. S. Army.

**LAWRENCE, HAROLD T. (1955)**

Mathematics

B.S., Colorado Agricultural College, 1935; M.A., University of Chicago, 1939; additional graduate work, University of Denver, University of Arizona, University of California at Los Angeles.

Experience: Teacher-principal in Illinois; science teacher in Arizona and California schools; instructor, Citrus Junior College.

**LAWSON, JOHN D. (1951)**

Associate Dean (Activities)

B.S., University of California, Berkeley, 1938; M.Ed., University of California at Davis, 1955.

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., Mechanical Engineering, Michigan State University, 1953; M.S., Mechanical Engineering, 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.

LEDYARD, ROBERT M. (1961) __________________ Agricultural Business Management
B.S., Business Administration, Miami University, 1942; B.S., Agriculture, Colorado State University, 1949.
Experience: Loan Officer, First National Bank of Arizona. Farm real estate sales experience in Arizona. Graduate studies at California State Polytechnic College. 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 Sciences
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.

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 Broski; officer, U.S. Navy; counselor, San Francisco Unified School District; Associate Dean (Counseling and Testing), California State Polytechnic College, San Luis Obispo.

LEWIS, VANCE D. (1946) __________________________ Physics
A.B., University of California, 1933; M.A., 1940; Ph.D., University of Southern California, 1954; post doctoral work in nuclear physics, 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.

* LICHTENSTEIN, STANLEY B. ____________ Audio-Visual
1933, Barre School of Memorial Art; 1954, Stone Business College; B.S., California State Polytechnic College, Pomona, 1961; graduate work at USC.
Experience: Teaching Fellowship at USC, 1960.

LINDAMOOD, CHARLES H. (1958) __________________________ English
Indiana University, 1946-1948; B.A., University of Minnesota, 1949; M.A., Columbia University, 1951; additional graduate work, University of Minnesota, Stanford University, 1957.
Experience: Teacher, high school, Salinas, California; instructor, University of Minnesota, College of Puget Sound, and Taft College, Ft. Ord, Ft. Lewis and McChord Field, Washington.

* LINT, HAROLD L. (1947) __________________________ Botany
B.A., University of California at Los Angeles, 1940; M.A., 1942.
Experience: Inspector, United States Food and Drug Administration.

* LISOWSKI, MARTIE L. (1959) ____________ Librarian
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.

* Kellogg-Voorhis staff.
*LLOYD, ROBERT E. (1956)-----------------Agricultural Business Management
B.S., University of British Columbia, 1940; B.Com., 1948; M.S., 1950.
Experience: Placement officer, Veterans Affairs Department, Canada; California
representative, Washington Co-operative Farmers Association; district representa-
tive, San Joaquin Valley Poultry Producers Association; sales representative, C. U.
McClellen Laboratories; manager, Sonoma County Co-operative Growers Associ-
ation; farming, Sonoma County; senior research assistant, University of California,
Davis; Royal Canadian Air Force.

LONBORG, REYNOLD H. (1946)-----------------Truck Crops
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.

LOPER, WILLARD H. (1955)-----------------Agricultural Engineering
B.S., New York College of Agriculture, Cornell University, 1953.
Experience: Dairy and general farming, New York; machinist, Westinghouse
Electric Corp., Buffalo, New York; mechanic-welder, New York State College of
Agriculture, Cornell University; student assistant instructor, Cornell University;
salesman, Holz Co., Ukiah, California; journeyman welder, draftsman, Cochran
Equipment Company, Salinas, California.

LOUGHRAN, BERNICE B. (1958)-------------------Education
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, Cali-
fornia, and Redwood City, California; elementary art teacher, Irvington, New
Jersey; art instructor, Johnson Teachers College, University of Connecticut and
Danbury Teachers College.

LOVETT, EARL DEAN (1951)------------------College Physician
B.S., M.D., University of Iowa, 1934; additional graduate work, Cook County,
Post Graduate School of Medicine, Chicago; University Hospital, Iowa City.
Experience: Rockford City, Illinois, Hospital; Mary’s Help Hospital, San Fran-
cisco; Yocom Hospital, Chariton, Iowa; Cherokee State Hospital, Cherokee, Iowa;
Virginia Gay Hospital, Vinton, Iowa; private practice, Vinton, Iowa; established
Lovett Clinic, Vinton, Iowa.

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 Founda-
tion of Agricultural Economics, University of California; instructor, Agricultural
Economics; subject matter specialist, Bureau of Agricultural Education, State De-
partment of Education (California); Assistant to the President, Dean of Instruc-
tion, California State Polytechnic, Administrative Dean, Instruction.

*McCORMIC, RALPH C. (1959)-----------------English and Speech
B.A., Oklahoma State University, 1947; M.A., Stanford University, 1950; addi-
tional graduate study, Stanford University.
Experience: Temporary instructor, Oklahoma State University; instructor, San
Francisco State College; assistant professor, University of Texas; Command Entertain-
tment Director, United States Army in Europe; technical director, Actor's
Workshop of San Francisco.

* Kellogg-Voorhis staff.
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
California Polytechnic, 1935-1938; B.A., Santa Barbara College, 1941; graduate work, Claremont College; M.A., California State Polytechnic College, 1953.

* McGRATH, THOMAS H. (1956) Dean of Students
California Polytechnic, 1936-39; B.A., Santa Barbara College, 1941; M.A., Claremont Graduate School, 1946; additional graduate work, Claremont Graduate School and 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) Mathematics
A.B., University of California, 1948; M.A., 1950; additional graduate work.
Experience: Mathematics and physics teacher, Richmond Union High School; U. S. Navy.

B.S., Agriculture, North Dakota State College, 1930.
Experience: Extension service, extension animal husbandman, North Dakota; U.S. Navy; ranch management, Sacramento Valley.

McLINN, DOROTHY (1956) Accounting
C. P. A. Review Course, University of California at Santa Barbara, 1953; licensed as certified public accountant, 1955.
Experience: Accountant, Grand Central Airport, Glendale, California, general and special accounting, including systems and audits.

McMEEEN, GEORGE H. (1960) Mathematics
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.

MACH, GEORGE R. (1954) Mathematics
B.A., Iowa State Teachers College, 1950; M.S., State University of Iowa, 1951.
Experience: 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 (1949) ........................................ Architectural Engineering

MAGUR, LEON W. (1958) ........................................ Physics
A.A., Contra Costa Junior College; B.S., California State Polytechnic College, 1958; graduate study, California State Polytechnic College.
Experience: Electronic technician.

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) ........................................ Librarian
A.B., University of Washington, 1940; B.L.S., University of California, Berkeley, 1953.
Experience: U.S. Army Air Force; 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 work at 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) ........................................ History, Political Science
A.B., University of California, Los Angeles, 1943; M.A., Claremont Graduate School, 1951; Ph.D., University of California, Los Angeles, 1953; Will Rogers Fellow, 1949-1953.
Experience: Teacher and counselor, Webb School of California; teaching assistant, University of California, Los Angeles; instructor, University of California, Extension Division, Los Angeles.

MARTINSON, MARJORY E. (1955) ........................................ Head, Home Economics Department
B.S., University of Missouri, 1931; M.A., 1939; additional graduate work 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.

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; Allis Chalmers, dealer and sales, Point Arena, California.

* MAURER, ROBERT L. (1948) ........................................ Acting 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.

* Kellogg-Voorhis staff.
MAY, FRANCES M. (1961) Library
B.A., Russell Sage College, Troy, N.Y., 1946; additional graduate work, University of California.
Experience: United Nations, Secretary to R. K. Nehru; Assistant to Executive Director, San Francisco Advertising Club; Secretary to Senator G. J. O’Gara, San Francisco; Education advisor, U.S. Army in Germany.

MEACHAM, VERNON H. (1929) Agricultural Engineering
B.S., University of California, 1924.
Experience: Agricultural instructor, Gilroy and Manteca High Schools.

MEALS, CHARLES F. (1957) Marketing
B.S., University of Illinois, 1924.
Experience: Account executive, McCann-Erickson, Inc., San Francisco; advertising manager, statistician, corporate secretary, California Walnut Growers Assn., Los Angeles.

MELLARD, GEORGE A. (1957) Electronic Engineering
B.S., Kansas State College, 1947; M.S., Kansas State College, 1952.
Experience: Instructor, Kansas State College; senior resident engineer, Convair, Pomona; engineer, Sylvania, Mountain View, California; officer, U.S. Naval Reserve.

MERRIAM, JOHN L. (1958) Agricultural Engineering
B.S., California Institute of Technology, 1938; graduate work, 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. in Education, San Jose State College, 1932; additional graduate work, University of California and Colorado State College.
Experience: Instructor, agricultural mechanics, Dos Palos and Santa Rosa High Schools.

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.

MILLER, ALLEN D. (1960) Mathematics
B.S., Iowa State University, 1945; M.S., 1948; Ph.D., 1953.
Experience: Mathematics teacher, Jefferson High School, Jefferson, Iowa; Central High School, Omaha, Nebraska; associate professor of mathematics, Long Beach State College; associate professor of mathematics, Northern Illinois University; Hughes Aircraft Company School and Industry Science and Engineering Program for College Professors; National Science Foundation Institute for College Professors at Stanford University.

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.

* Kellogg-Voorhis staff.
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.

MONTGOMERY, DAVID H. (1956) ........................... Biological Sciences
B.S., California State Polytechnic College, 1954; M.A., College of the Pacific,
1956; graduate work, Friday Harbor Laboratories, University of Washington.
Experience: Laboratory assistant and teaching assistant California State Poly-
technic College; teaching fellow, College of the Pacific; staff, Pacific Marine
Biological Station, Dillon Beach, California.

* MOORE, DOUGLAS H. (1958) ................................... Mathematics
A.B., 1942; M.A., 1948; Ph.D., 1962, University of California.
Experience: U.S. Air Force, instructor, University of California, West Coast
University, Los Angeles; research engineer, North American Aviation, Hughes Air-
craft Company, Los Angeles.

* MORALES, RAY (1961) .................................. Civil Engineering
M.S. in Civil Hydraulic, Stanford University, 1961; B.S. in Civil, Loyola Uni-
versity, 1960; A.A. in Mechanical and Electrical, Los Angeles City College, 1957.
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.

* MORAN, GABRIEL T. (1948) .................. Acting Head, Physical Sciences Department
B.A., Whittier College, California, 1942; graduate work, Whittier College.
Experience: Chemist, American Potash and Chemical Company, Trona, California;
Thompson Products, Bell, California; Paul Dickerson, Chemistry Laboratory; Dis-
trict Agricultural Laboratory, Whittier, California.

MOTT, ROBERT A. (1946) .................................. Head, Physical Education Department
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 Cali-
fornia; visiting professor University of Colorado.

MOUNTS, BILLY W. (1956) ............................ Medical Officer
M.D., Cum Laude, Georgetown University, Washington, D.C., 1950.
Experience: Internship, Fitzsimons General Hospital, Denver; residency, San Luis
Obispo General Hospital; four years private practice, Pismo Beach, California.

* MOWATT, WARREN P. (1961) .......................... Mechanical Engineering
B.S. in Engineering, U.S. Naval Academy, Annapolis, 1925; studied marine en-
gineering at University of California, Berkeley, and U.S.N.A. Post Graduate School,
Annapolis, Maryland; heat and power, University of Wisconsin, Madison, Wisconsin,
1959.
Experience: Assistant professor, Tennessee Polytechnic Institute, Cookeville,
Tenn.; Captain (retired) United States Navy.

* MULDER, GEORGE (1960) .......................... Counselor
B.A., Long Beach State College, 1956; M.A., 1957; additional graduate work, Uni-
versity of Southern California.
Experience: Teacher, Excelsior Union High School District; counselor-instructor,
Cerritos College; Electronic technician, U.S. Army Ordnance; drafting, tool de-
sic, and technical illustration, Goodyear Tire and Rubber and Shaffer Tool Com-
pány.

* Kellogg-Voorhis staff.
MURPHY, WALTER (1958)  
Experience: Machine shop instructor, Arroyo High School; El Monte High School; Glendora High School. Lathe operator and experimental machinist, Vard Inc.

* MURRAY, MARY ETTA B. (1956)  
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.

Military Science and Tactics  
Experience: Platoon Sergeant, Infantry Regiment in Korean Campaign; Platoon Sergeant in Germany during occupation duty; Platoon NCO, Battle Group, Fort Lewis, Washington.

* MYLANDER, 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.

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, Manhattan, Kansas, 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; U.S. Public Health Service, dairy inspection; U.S. Army.

NELSON, DONALD S. (1943)  
Business Manager  
A.B., Stanford, 1930.  
Experience: California State Department of Finance, Budgets and Accounts; Comptroller, Fresno State College, Fresno.

* NELSON, EDWARD A. (1958)  
Animal Husbandry  
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., Brigham Young University, 1957; Ph.D., State University of Iowa, 1960.  
Experience: Teaching assistant, Brigham Young University and State University of Iowa; research associate in radiation biology, State University of Iowa.

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NELSON, RICHARD T. (1961) Business Administration
Experience: Operations Control Analyst, Aerojet-General Corporation; Management & Traffic Consultant; Assistant Traffic Manager, Treesweet Products Company; Proprietor of Retail Grocery.

NEWELL, LLOYD A. (1956) Agricultural Services and Inspection 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; other study, Stanford-N.B.C. Radio Institute; advanced graduate work 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 work, 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.

NOBLE, GLENN A. (1947) Head, Biological Sciences Department
A.B., M.A., University of California, 1931-1933; 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; professor of parasitology, Seoul National University, Korea; Fulbright professor of parasitology, Philippines and Taiwan.

NOLAN, THOMAS F. (1949) History and Political Science
B.S., University of Wisconsin, 1935; M.A., University of Southern California, 1940; additional 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, Valparaiso, Chile.

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) Physics
B.S., Northern Michigan College, 1955; M.S., Iowa State University of Science and Technology, 1957; additional graduate work, 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.

OHARA, JOHN J. (1960) Electronic Engineering
B. of E.E., Brooklyn Polytechnic Institute, 1955; additional graduate work, University of Maryland.

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OLDHAM, CHARLES E. (1961) ........................................ Civil Engineering
B.S.C.E., Tufts University, Medford, Massachusetts, 1947.
Experience: structural engineer, Russ Connors Assoc., Downey; structural engineer, E. D. Birnbaum, Los Angeles; associate civil engineer, Los Angeles County Flood Control, Los Angeles; civil engineer associate, Los Angeles County Engineers; junior engineer, Jackson and Moreland, Boston, Mass. Registered Civil and Structural Engineer, California.

O'LEARY, MICHAEL J. (1951) .................. Sociology and Political Science

OSTEYEE, LEON F. (1957) ................. Head, Mechanical Engineering
B.M.E., Rensselaer Polytechnic Institute, 1945; M.M.E., 1957.
Experience: Instructor, Rensselaer Polytechnic Institute; designer, General Electric Company; American Locomotive Co.; ship superintendent, U.S. Naval Shipyard, Bremerton, Washington; head of Mechanical Engineering Department, California State Polytechnic College; Registered Professional Engineer, California and New York.

OVERMEYER, PHILIP H. (1958) .............................. Business
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, WCLC 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-ordinator of instruction, Golden Gate College, San Francisco, California; Professional Lecturer.

* PARISH, RUSSELL (1958) .................. Chairman, Metal Processes Department
B.S., 1932, Oshkosh State Teacher's College, Oshkosh, Wisconsin; Extension Courses, University of Wisconsin, University of Michigan.

PASSONS, CLARENCE L. (1961) ...................... Architectural Engineering
B.Arch., Tulane University, 1959.
Experience: Draftsman, various architectural firms, New Orleans, La.; design-delineation, Hogan Bros. Construction Co.; assistant to planning consultant, Fargo, N.D.; urban renewal preparatory drawings, City of Southwest Fargo; instructor, North Dakota State University.

* PAUGSTAT, WILLIAM C. (1956) ................. Mathematics
A.A., Upland College, 1950; 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, California, 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; C.P.A., 1958; additional graduate study, City College of New York, University of Washington.

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PAUTZ, ROLAND K. (1959) .............................. Poultry
A.A., Clark College, 1955; B.S., Oregon State College, 1957; graduate study at Oregon State College.

PEDERSON, WILLARD M. (1961) ........................ English
A.B., Colorado Western State College, 1937; M.A., Colorado State College, 1938; additional graduate work at Colorado State College, 1939; Western Reserve University, 1947; Colorado State University, 1960.
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) ........................ Social Sciences
Experience: United States Army; Mexican Army; Cataloger, University of Chicago Library; junior librarian, Alameda County Library, Oakland, California; cataloger and head of Technical Processes, Fresno State College Library; assistant professor, University of Southern California.

* 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 supervisor, Airite Products, Inc.

PERELLO, DOMINIC B. (1954) ............................ Economics
A.B., University of California, Santa Barbara College, 1951; M.S., University of Wisconsin, 1952; additional graduate study, University of California at Los Angeles.
Experience: Officer, U.S. Air Force; partner, Perello and Sons; teaching assistant, University of California at Los Angeles.

* PETTEM, FREDERICK D. (1953) ........................ Agronomy
B.S., University of British Columbia, 1949; M.S., 1951; Ph.D., Rutgers University, 1953.
Experience: Wheat farming, Saskatchewan; plant breeder, Robinson Seed Company, Gridley, California; research assistant, Department of Farm Crops, Rutgers University; teaching and research assistant, University of British Columbia; officer, Royal Canadian Air Force.

* PFUEGER, 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.

PHILBIN, LEO F. (1948) .............................. Aeronautical Engineering
B.S., California State Polytechnic College, 1944.
Experience: Aircraft instructor, Naval Flight Preparatory School; aircraft instructor, Fourth Air Force Headquarters, San Francisco; civilian training administrator, 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 Psychology 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 of Philosophy, Cerritos College; instructor in Education, University of California Extension.

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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.

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;
rangernaturalist, Crater Lake National Park; Associate Professor, University of
California Extension Nature Study Institute at Santa Barbara, 1958, and instructor
since 1954; lecturer, National Science Foundation Summer Science Program.

PITKIN, WILLIS L., JR. (1961) ........................................... English
A.B., University of Southern California, 1958; M.A., University of Southern Cali-
fornia, 1961.
Experience: Teaching assistant and lecturer, University of Southern California.

POLLEY, RUDOLPH A. (1952) ........................................... Architectural Engineering
A.B., Architecture, 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, California. Registered archi-
tect, California.

POULSEN, SVEN AGERBEK (1960) ........................................... Air Conditioning and Refrigeration
M.S., Technical University of Denmark, 1952.
Experience: Instructor, Ohio University; engineer, Danish American Gulf Oil
Co., Danish Committee for Fire Prevention, the BP Oil Company.

PRICE, BYRD L. (1957) ........................................... English
B.A., Baylor University, 1927; M.A., 1932; additional graduate work, 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.M.E., 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.

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* 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 tech-
  nician, W. C. Robinette Co.; special project engineer, Consolidated Engineering,
  Pasadena; draftsman, Master Engineer, Detroit.

* PYE, EARL L. (1961)  Physical Science
  A.B., Chico State College, 1958; M.S., University of California, Davis, 1961.
  Experience: Teaching assistant and laboratory technician, University of Cali-
  fornia; laboratory technician, Standard Oil Company of California; insurance in-
  vestigator, Retail Credit Company, and self-employed, dba Statistical Research.

* QUANEY, ROBERT (1959)  Industrial Engineering
  B.S.I.E., Stanford University, 1954; additional studies, University of California.
  Experience: Manufacturing engineer, R.C.A., Los Angeles; manufacturing plan-
  ner, Lockheed Missile, Van Nuys; co-ordinator of engineering planning, manufac-
  turing research engineer and production planning supervisor, Lockheed Missile,
  Sunnyvale, California.

* 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 Dyn-
  amics Corporation.

RADIUS, CLARENCE (1946)  Head, Electronic Engineering Department
  B.S., University of Chicago, 1932; graduate work in electronics and communica-
  tions at University of Chicago, Stevens Institute of Technology.
  Experience: Engineer, Radiomarine Corp. of America; head, Department of
  Audio-Video Technology, RCA Institutes, N.Y.; lecturer in television for NBC in
  New York, Chicago, Hollywood; registered professional engineer, California.

RAPP, JOHN B. (1959)  Electronic Engineer
  B.S., University of California, 1940.
  Experience: Engineer, General Electric Company, Collins Radio Company,
  United Fruit Company; instructor, Princeton University.

  Experience: Librarian, College of the Holy Cross, Worcester, Mass.; Librarian,
  Charity Hospital School of Nursing, New Orleans; Cataloger, California State

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; agri-
  cultural 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.

REECE, ROBERT HOWELL (1946)  Mechanical Engineering
  B.S., in mechanical engineering, University of Illinois, 1920.
  Experience: Steel plate work estimator, Joseph T. Ryerson & Son, Chicago; City
  of Chicago water filter plant; Skidmore, Owings and Merril, Architects and En-
  gineers, Chicago and New York; officer, U.S. Navy; Wurdeman and Becket,
  Architects and Engineers, Los Angeles, California; senior engineer, Bechtel Corpo-
  ration, San Francisco.

* Kellogg-Voorhis staff.
REMUND, CLIVE O. (1946) Agricultural Engineering
B.S., Agriculture, 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 work, University of Pittsburgh and University of Southern California.
Experience: Assistant educational adviser, Civilian Conservation Corps; weight engineer, Douglas Aircraft Co.; 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; instructor (part time) UCLA; engineering designer, Hughes Aircraft Co.; consulting work in tool design and machine design.

RHOADS, HOWARD (1956) Crops
B.S., Montana State College, Bozeman, Montana, 1951; M.S., 1952.
Experience: Fieldman, Great Western Sugar Co., Billings, Montana; instructor and assistant, Montana State College, Bozeman, Montana.

* RICE, ELMER H. (1959) Chemistry
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.

RICH, GLENN W. (1953) Agricultural Engineering
B.S., California State Polytechnic College, 1953.
Experience: Assistant instructor, California State Polytechnic College, San Luis Obispo; 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) Physics and Chemistry
B.A., Luther College, 1922; M.S., Iowa State College, 1940; graduate work, University of St. Louis, 1942-1943.
Experience: Superintendent of schools and director of Science Department at Rolla, North Dakota; Omemee, North Dakota; Lansing, Iowa; electronics instructor, Advanced Radar School, Trux Field, Madison, Wisconsin.

RICKARD, HERMAN E. (1959) Dairy
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) Accounting
B.A., San Jose State College, 1951; graduate study, Golden Gate College, University of California, Los Angeles, University of Southern California; CPA, 1957.
Experience: Instructor, Golden Gate College, Los Angeles Metropolitan College, University of California Extension; tax department, Perkins & Trousdale, CPA's; staff accountant, Arthur Young & Company, CPA's.

* Kellogg-Voorhis staff.
RIDER, ROL W., JR. (1960) --------------------------------- Business
B.A., University of California, 1941.
Experience: U.S. Naval Aviation (Reserve); Flight operations and airport management, Pan American Airways; National Sales Manager, Royal Rinse, Inc.; Divisional Product-Advertising Manager, Carnation Co., Inc.; Account Executive, N. W. Ayer & Son, Inc.; Account Supervisor, Management and Marketing Consultant, Young & Rubicam, Inc.

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 work, 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 & Co.; professional writing.

*RITCHIE, RALPH W. (1957) --------------------------------- Electronic Engineering
B.A., University of California, Santa Barbara; M.A., Claremont Graduate School, 1958; Electronic Material School, U.S. Navy, Treasure Island; additional studies, U.C.L.A.
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 work, University of California, Berkeley.
Experience: Bookkeeper, J. J. Elmore Co., Brawley; broker's clerk, Dean Witter & Co., Los Angeles; purchasing, War Department, USAF, Trinidad, B. W. I.; U.S. Navy; instructor, social sciences; Administrative Assistant for Personnel, Office of the President, California State Polytechnic College.

*ROBERTS, CONWAY H. (1960) --------------------------------- Aerospace Engineering
B.S.M.E., B.S.A.E., University of Texas, 1958.
Experience: Design engineer, test pilot, Convair, Palmdale; design engineer, North American Aviation; captain, leader, pilot, Texas National Guard; lieutenant flight commander, U.S. Air Force.

*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.

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.

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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, ARTHUR H. (1961)                             Counselor
A.B., University of California at Los Angeles, 1949; M.A., City College of New York, 1951; Ph.D., University of Denver, 1956.
Experience: Psychology Intern, Lincoln State School, Lincoln, Illinois; Clinical Psychologist, U.S. Army Hospital, Camp Carson, Colorado; Clinical Psychologist, Jacksonville State Hospital, Jacksonville, Illinois; Clinical Psychologist, Mental Health Center, Quincy, Illinois.

ROGERS, LEO E. (1954)                                Machine Shop
B.S., in Aeronautical Engineering, California State Polytechnic College, 1950.
Experience: Instructor, San Luis Obispo High School; engineering aid, Division of Highways, San Luis Obispo.

ROSEN, ARTHUR Z. (1953)                              Physics
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.

* ROWLEY, WILLIAM P. (1958)                          Acting Head, Agricultural Business Management Department
A.B., University of California at Los Angeles, 1933; graduate work, 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.

* R UETHER, HERMAN J. (1961)                         Social Sciences
B.S., Xavier University, 1952; M.A., Xavier University, 1961; Cand., Claremont Graduate School, Haynes Fellow Claremont Graduate School, 1959-60.
Experience: Teacher, Cincinnati Public Schools; instructor in Military Police Duties and Procedures, Army; Social Worker, San Bernardino County Welfare Department.

* RYAN, HELEN R. (1958)                              Librarian
B.A., University of California, Berkeley, 1955; M.S.L.S., University of Southern California, 1958.
Experience: Librarian, U.S. Naval Hospital, Corona, California.

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

SANKOFF, LEO (1946)                                  Agricultural Engineering and Poultry Industry
B.S., Agriculture, California State Polytechnic College, 1942; M.A., California State Polytechnic College, 1956.
Experience: Agricultural instructor, Fillmore High School.

* Kellogg-Voorhis staff.
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., University of California, 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) English
A.A., Los Angeles City College, 1940; B.A., University of Redlands, 1949; M.A., University of Southern California, 1955; additional graduate study, University of Southern California.
Experience: Teacher, San Bernardino City Schools; editorial writer, San Bernardino Teacher; editor for personnel department, Convair-Pomona; bandsman, U.S. Army.

* SCHEUERMANN, J. CLAUDE (1957) Business Manager
Experience: Budget analyst, California State Department of Finance, Budget Division.

* SCHMITZ, GEORGE W. (1961) Soil Science
B.S., University of Arizona, 1948; M.S., 1950; Ph.D., 1952, Ohio State University.
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

* SCHNEIDER, KENNETH J. (1961) Mechanical Engineering
Experience: Research engineer, Convair, Physics Group; research and design engineer, Aerojet, Ordnance Div.; design engineer, C. F. Braun, Alhambra. Registered engineer, California.

* SCHNITZER, A. WALLACE (1958) Electronic Engineering
B.A., Occidental College, 1947; post graduate study, California Institute of Technology.
Experience: Sales engineer, Gerald B. Miller Company, Hollywood; research physicist, Fluor Corporation; instructor, Chemical Analysis, Department of Defense; instructor, electronics, U.S. Navy, Monterey; self-employed, consulting physicist, Inglewood; manager, space science activities, Consolidated Systems Corporation.

B.S., University of Wisconsin, 1957; certificate, Radio-Television Technician, Milwaukie School of Engineering, 1952.

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.

* Kellogg-Voorhis staff.
SCHWARTZ, KENNETH E. (1952)  Architectural Engineering
B. of Arch., University of Southern California, 1952.

SCHWARZOTT, WILHELM (1961)  Music
Diploma from Oslo Music-Conservatory, Certificates from State Academy of Vienna (equivalent to M.A. degree). Diploma from University of Vienna.
Experience. Concert artist since 1935. Concerts and broadcasts throughout Norway, Sweden, Denmark, Finland, Austria and U.S.A. Member of Oslo Chamber Trio for fifteen years. Director of Klaverakademiet, Oslo, Norway, 1950-55. Director of Schwarzott Piano and Art Institute, Oslo, Norway, 1955-57. Head of Piano Department, University of Denver, 1957-61. Listed in Scandinavian and European music dictionaries and encyclopedias.

* 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.

SEEBER, GLENN E. (1954)  Welding
Experience: Instructor in biology and welding, Lassen Union High School and Junior College; welder and foreman, Interstate Steel Co., Chico, California; welder, Anderson's Welding Shop, Chico; welder and foreman, Pollock Shipbuilding Corp., Stockton; locomotive fireman, Western Pacific Railroad.

SERVATIUS, OWEN L. (1947)  Business
B.S., California State Polytechnic College, 1959.

SHAFER, PAULINE (1961)  Home Economics
Experience: Southern Counties Gas Company, Ventura, California; Dietician, California State Polytechnic College.

SHARPE, NORMAN (1937)  Air Conditioning and Refrigeration
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
A.B., Ohio University, 1949; M.S., 1950.

* Kellogg-Voorhis staff.
SHIELDS, FERN A. (1958) Library
A.B., Stanford University, 1944; B.L.S., University of California, 1948.
Experience: San Jose State College Library; Army librarian, Europe; Modesto Junior College Library.

*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
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, Kansas.

SIMMONS, ORIEN W. (1961) Metallurgical Engineering
Experience: Metallurgist, Carnegie-Illinois Steel Co.; Packard Motor Car Co.; instructor, Rose Polytechnic Institute; officer, U.S. Navy; Research engineer, Battelle Memorial Institute; senior research engineer, Frankford Arsenal; Rem Cru Titanco Co. and Crucible Steel Co.; Climax Molybdenum Co. 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.
Experience: Assistant Professor, Virginia Polytechnic Institute; Professor, Michigan State University; Engineer, Douglas Aircraft Company, Boeing Aircraft Company, Reo Motors Company, National Iron Company, Northwestern Railroad.

*SKOUSEN, OWEN K. (1960) Electronic Engineering
B.A., University of California, Los Angeles, 1949; M.S., Stanford University, 1950; E.E., 1952; 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 Co., Palo Alto, Calif.; 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.S.L.S., University of Denver, 1954.
Experience: Catalog Librarian, Order Librarian, Assistant Librarian, Technical Processes, University of Idaho.

* Kellogg-Voorhis staff.
* SMEDLEY, DONALD B. (1959) ................................................. Electronic Engineering
B.S.E.E., University of Oklahoma, 1956; graduate work, UCLA.
Experience: Electrical engineer, Advanced Guidance Group, Convair, Pomona; lab instructor, University of Oklahoma; engineering draftsman, Douglas Aircraft, Tulsa.

* SMITH, DUDLEY R. (1957) ................................................. Agricultural Engineering
B.S., Cornell University, 1954; additional study, Cornell University.
Experience: Instructor of agricultural engineering, State University of New York, Morrisville.

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 Theatre; President, The Knitter Co. (Mfg.), Denver, Colorado; staff director, Pasadena Playhouse; officer, U.S. Marine Corps Reserve.

SMITH, M. EUGENE (1946) ................................................. History
A.B., University of California, 1934; M.A., 1937; Ed.D., University of Oregon, 1958.
Experience: Instructor and coach, Piedmont High School, Piedmont, California; graduate assistant, Universities of California and Oregon; officer, U.S. Army.

* SMITH, RICHARD H. (1960) ................................................. Office Administration
B.S., Massachusetts Institute of Technology, 1948; M.B.A., Northwestern University, 1954; additional study in systems and procedures, computers, and accounting.

SMITH, WARREN T. (1952) ................................................. Dean of Agriculture
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.

SPINK, ROBERT (1960) ................................................. Graduate Manager
B.S., California State Polytechnic College, 1937.
Experience: Clarkson College of Technology, College Union Director, Potsdam, New York.

* STANSEL, DOYLE J. (1958) ................................................. Counselor, Test Officer
B.A., Pepperdine College, 1954; M.A., 1958; additional graduate work, University of Southern California.
Experience: Teaching assistant, acting test officer, Pepperdine College; psychometrist, Pepperdine Psychology-Speech Clinic; psychological intern, John Tracy Clinic, Los Angeles.

STECHMAN, JOHN V. (1960) ................................................. Soil Science
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; graduate study, U.S. Naval Post Graduate School and University of California, Berkeley; M.S., Purdue University, 1957.
Experience: Captain, U.S. Navy (retired); instructor, Purdue University; marine engineering and naval construction, Bureau of Ships, Navy Department.

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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 profes-
sional engineer, California.

STEWART, DAVID A. (1961) .................................................. Mathematics
B.A., Dalhousie University, 1932; M.A., Toronto University, 1933; Marburg Uni-
versity, Germany, 1935; Queens University, 1936; Ph.D., Toronto University, 1939; 
Edinburgh University, 1951.
Experience: Teaching fellow, Queens, 1935-36; Head of Department of Philo-
sophy and student counselor, University of New Brunswick, 1945-54; clinical psy-
chologist, 1955-present, Toronto, Los Angeles and San Luis Obispo.

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.

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; Robert-
shaw-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) .................................................. Home Economics and Education
A.B. Brigham Young University, 1947; M.S. University of Utah, 1950; Ph.D Uni-
versity of Utah, 1952.
Experience: Director, Industrial Psychological Services, California Test Bureau;
Assistant Professor (Personnel and Guidance), Brigham Young University; Con-
sultant, 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 ship-
building, Electric Boat Co.; repair and construction superintendent, Mare Island
Shipyard; production officer, Long Beach Naval Shipyard.

STOKEY, ELLEN T. (1961) .................................................. Home Economics and Education
B.S., University of Illinois, 1943; M.A., 1950; additional graduate work at 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 
Homemaking Education, California State Department of Education.

STRASSER, J. EDWARD (1960) .................................................. Technical Arts
B.S., California State Polytechnic College, 1958.
Experience: Sales engineer, O'Brien Machinery, Inc., Los Angeles; Tool and Die 
Maker, Arrowsmith Tool & Die Corp., Los Angeles; draftsman, I.D.S., Inc., Glen-
dale; experimental machinist, MEFCO Mfg., Glendale; construction mechanic, Pa-
cific Electric Company, Anchorage, Alaska.
STRAUSS, L. HARRY (1961) 
Library
B.S., George Williams College, Chicago, 1935; M.A., Graduate Library School, University of Chicago, 1942; additional graduate work, 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.

*STULL, ROBERT B. (1947) 
Physical Education and Athletics
A.B., Whittier College, 1941; M.A., 1947; additional graduate work, University of Southern California.

*SUTHERLAND, RODNEY D. (1960) 
Aerospace Engineering
B.S., University of California, Los Angeles, 1952; M.S., 1953; additional graduate work, Massachusetts Institute of Technology.
Experience: Rocket design and chemical engineer, U. S. Naval Ordnance Test Station, Inyokern, Calif.; senior thermodynamics and propulsion engineer, Convair, Pomona.

*SUTTON, ARTHUR W., JR. (1961) 
Electronic Engineering
B.S.E.E., Rose Polytechnic Institute, 1956; graduate work at University of Louisville, Indiana University, and Ohio State University.
Experience: Project engineer, Wright Air Development Division, Dayton, Ohio.

*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
Pozmany Peter University, Budapest; Ph.D. in Law, 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.

Mechanical Engineering Department
B.A., Stanford University, 1923; graduate work, Massachusetts Institute of Technology, 1923-24, 1934.

TELEWE, FUAD H. (1960) 
Economics
B.S., College of Commerce and Economics, Baghdad, Iraq, 1950; M.A., University of Southern California, 1954; Ph.D., University of Southern California, 1959.
Experience: Accountant, Engineering Department, Iraqi State Railways; supervisor, Testing Bureau, University of Southern California; teaching assistant and lecturer, University of Southern California.

* Kellogg-Voorhis staff.
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; (Certificate-Medical Technician); nature and biology, Carnegie Museum, University of Pittsburgh and Pittsburgh City Parks; Community House, Kingsley House, Pittsburgh; Grade and High School, Phoenix and Peoria, Arizona; Exeter High School, Exeter, California.

THOMAS, WILLIAM O. (1960) Electronic Engineering
B.S., New Mexico State University, 1951.
Experience: Distribution engineer, estimator, Southern California Edison; communications 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, Honolulu Star-Bulletin; Hawaii field representative, Dudley-Anderson-Yutzy; technical writer-editor, Institute of Transportation and Traffic Engineering, University of California, Richmond Field Station.

THOMPSON, DWIGHT C. (1961) Agronomy and Agricultural Engineering
B.S., University of California, 1935.
Experience: Director Vocational Agriculture, Sutter Union High School and Brawley Union High School; Instructor, California State Polytechnic College, Voorhis Campus; Vegetable Farming, Imperial County; Irrigation Department, Imperial Irrigation District.

THOMSON, DAVID H. (1946) Biological Sciences
B.S., University of Arizona, 1944; M.A., Claremont Graduate School, 1948; additional graduate study, Oregon State College and University of Oregon.
Experience: Laboratory instructor, Pomona College; ranger-naturalist, Sequoia National Park.

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, University 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.

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, California; 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: Teacher, West Linn High School and Beaverton High School in Oregon; instructor, University of Idaho; teacher, Pacific High School; city recreation work, counselor at Camp Tamarac.

* Kellogg-Voorhis staff.
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., Agriculture, 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. in Printing, 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. in Education, 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.

VAN DE VANTER, GORDON L. (1960) Crops
B.S., California State Polytechnic College, 1953.
Experience: Vegetable grower for seven years.

VOKOUN, ARLENE (1960) Associate Dean (Women)
B.A., University of Wisconsin, 1944; Graduate work, University of New Mexico, 1960.
Experience: National Group Work School, Y.W.C.A., 1945; Public Relations Staff, Goodyear Tire & Rubber Company; Director of Industrial Girls Activities, Chicago, Ill., Y.W.C.A.; Director of Young Adult Activities, Cleveland, Ohio, Y.W.C.A.; Teacher, Albuquerque Public School System, Albuquerque, New Mexico.

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 State 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, Pomona College.

VROOMAN, C. W. (1961) Farm Management
B.A.A., University of British Columbia, 1934; M.S.A., 1936; Ph.D., Oregon State College, 1949.
Experience: Feedlot operator, Burns & Co.; Stockyards foreman and Livestock 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.

* Kellogg-Voorhis staff.
WALKER, CLIFFORD L. (1957) Medical Officer
Experience: Internship, Los Angeles County Hospital; residency, San Mateo County General Hospital; military service, U.S. Army and U.S. Public Health Service; private practice, Half Moon Bay, California; member, American Academy of General Practice.

WALKER, HOWARD (1957) Chemistry
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.

* WANG, MARTIN I. (1959) Audiovisual Coordinator
B.A., University of Southern California, 1949; M.S. in Education, University of Southern California, 1950; additional graduate work, University of Southern California.
Experience: Instructor, Torrance, California, Long Beach, California; instructor, El Camino College; teaching assistant and instructor, Audiovisual Education, University of Southern California.

WARD, CLINTON E., S/SGT. (1960) Military Sciences and Tactics
Graduate of Army Language School, Presidio of Monterey (Mandarin Chinese); attended Supply School, Fort Benning, Ga.

WARD, WESLEY S. (1954) Architectural Engineering
B. of Arch., University of Southern California, 1953.
Experience: Engineering assistant, Pacific Telephone and Telegraph Co.; officer U.S. Air Force; surveyor, City of Santa Ana; design draftsman, Benedict Beckler and Kocher, 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 Resources.

* WARHURST, DONALD E. (1957) Physical Education
A.B., University of California, 1943; M.S., University of Southern California, 1951; additional graduate work, 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.

* WASSEL, GUSTAV N. (1961) Electronic Engineering
B.S.E.E., California Institute of Technology, 1960.
Experience: Graduate research assistant, California Institute of Technology, junior development engineer, Norden Division United Aircraft, Costa Mesa; machinist, Reuland Electric Co., Alhambra; electrical systems instructor, U.S. Air Force.

* WEEKS, LOWELL K. (1947) Chairman, Music Department
B.A., University of New Mexico, Albuquerque, New Mexico, 1938; graduate work, University of New Mexico, University of Southern California, and Claremont Graduate School.
Experience: Music and English teacher, Los Lunas, New Mexico; Air Force Band Leader, U.S. Army at Albuquerque, New Mexico, Palm Springs, California and Long Beach, California.

* WELCH, HARRY V., JR. (1947) Head, Soil Science Department
B.S., University of California at Los Angeles, 1941; M.S., 1953.
Experience: University of California Citrus Experiment Station, Riverside; Farm Security Administration.

* Kellogg-Voorhis staff.
WELLS, HAROLD F. (1954) College Librarian  
Experience: Reference assistant, Eastern Washington College of Education; junior librarian, Fresno State College.

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, 1922; M.A., 1932. Additional graduate work: College of Pacific, Stanford University, University of Washington, Oregon State College, University of California.  

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) Chemistry  
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.

WHITTING, FRANCIS F. (1946) Chairman, Machine Shop Department  
B.S., Stout Institute, 1931; M.A., University of Minnesota, 1938.  
Experience: Teacher, Eau Claire, Wisconsin; teacher, Minneapolis, Minnesota; instructor, Kent State University, Kent, Ohio; assistant professor, University of Minnesota; officer, U.S. Navy.

* WHITTLEY, MARY E. (1961) Accounting  
B.S., Northeastern State College, 1946; Oklahoma State University, 1954; 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) Physics  
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.

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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.

WIGHT, HEWITT G. (1952) Chemistry
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. Navy.

WILEY, J. BARRON (1956) Education
B.S. in Com., University of Denver, 1940; M.B.A., 1948; graduate study, University of Colorado; 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; Eaton and Smith, contracting engineers; utilities department of the City of Palo Alto; instructor in welding, Sacramento Junior College; Palo Alto, San Francisco, and San Jose school systems; senior welding engineer, Joshua Hendy Iron Works, Sunnyvale, California; welding inspector, Bechtel Corp., San Francisco, California.

* 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 instructor, 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; surveyor and designer, Pacific Engineers; Griffith Construction Co.

WILLIAMSON, WALTER G. (1960) Physical Education and Athletics
Experience: Teacher, El Monte Union High School District; professional football, Washington Redskins, Pittsburgh Steelers.

WILLSON, IRWIN A. (1958) Elementary Education
B.A., University of North Dakota, 1930; M.A., University of Denver, 1940; 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, California; superintendent of schools, Fall River Mills, California; assistant professor, San Diego State College; associate professor, chairman of the division of education and psychology, director of teacher education, Westmont College.

* WILSON, HAROLD O. (1936, 1946) Dean, Educational Services
B.S., University of California, 1932; additional study, Fresno State College; graduate study, University of California at Los Angeles.
Experience: Director of agriculture, Excelsior Union High School, Norwalk; instructor of agriculture and head, Swine Department at California Polytechnic; regional supervisor, agricultural education, State Department of Education, California; dean, Voorhis Unit.

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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, Vermont, 1926; M.A., Claremont Graduate School, 1959; additional graduate work, George Washington University, Washington, D.C.; United States Army Command and General Staff School, United States Air Force Staff School.
Experience: Director of Procurement and Production, and Comptroller in United States Air Force.

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 Science
B.A., University of California, Berkeley, 1957; additional graduate work at 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; additional graduate study, Oregon State College.
Experience: Teaching fellow in mathematics, Oregon State College; instructor, Multnomah College, Portland, Oregon; radar officer, U.S. Army.

* 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; professional engineer license, University of the State of New York, 1937; additional studies, University of California at Los Angeles.
Experience: Engineer, Bell Telephone Laboratories; Bendix; Hughes Aircraft Company; National Defense Research Committee; independent consultant; Foundation Field Representative, Research Corporation.

WOODWORTH, JOHN A. (1949) Mathematics
A.B., Hastings College, 1939; M.S., University of Southern California, 1948; additional graduate work, 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.

WORK, LLOYD J. (1958) Physics
B.S., California State Polytechnic College, 1954; graduate work, California State Polytechnic College.

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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.

* WYMER, JOSEPH P. (1961) ................................................ Head, Industrial Engineering
B.S.I.E., Virginia Polytechnic Institute, 1947, and graduate study.
Experience: Industrial engineer, Boeing Airplane Co., Seattle; chief industrial engineer, Micamold Corp. of Virginia, Tazewell; chief industrial engineer, O'Sullivan Rubber Corp., Winchester; manufacturing engineer, Convair, Fort Worth; senior industrial engineer, RCA Victor, Pulaski; motion and time study engineer, Brunswick, Marion; instructor, Virginia Polytechnic Institute, Blacksburg.

YEATON, ROBERT K. (1958) .............................................. English and Speech
B.A., University of California, 1937; graduate study, Los Angeles State College, University of Southern California, Yale, Vienna; Ph.D., Innsbruck, 1950; visiting scholar: Columbia, Teachers College, University of Chicago.
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.

YEWDALL, WALTER, JR., CAPT., USAR (1959) ................................ Military Science and Tactics
B.S., University of California at Berkeley, 1955; Graduate Ordnance Officers Course, Aberdeen Proving Grounds, Maryland.
Experience: Company Officer, Company Commander, Ordnance Company, Germany; Instructor, Military Assistance Advisory Group, Rome, Italy.

* YORK, RICHARD G. (1961) ................................................ Registrar
B.S., California State Polytechnic College, 1950; additional graduate work California State Polytechnic College.
Experience: Director Vocational Agriculture, Simi Union High School, California; Ranch Manager, Perris and Santa Ana, California; Production Superintendent, Spiniform Mfg. Co., El Monte, California; Pilot, U. S. Air Force.

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) ................................................ Chemistry
A.B., Colorado College, 1936; M.S., 1938; Ph.D., University of California, Berkeley, 1941; additional graduate study, Washington University, St. Louis, Missouri.

* ZACHARIS, JOHN C. (1960) .............................................. English and Speech
B.S., Emerson College, 1958; M.S., 1959, additional graduate study University of Indiana.
Experience: Debate coach, graduate assistant, Emerson; teaching assistant, University of Indiana.

* 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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