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Walk around the Cal Poly campus and look into the corners. Look into the classrooms, labs, studios and barns. You find Cal Poly students reading, studying, attending class, of course. But that’s not all. You find them working — rolling up their sleeves and getting their hands dirty. You find them testing the strength of beams, raising livestock, publishing a newspaper, designing structures, caring for young children, writing computer programs, performing music. You find them machining metal, testing aircraft, auditing books, developing experiments, building all manner of things. In a word, you find them getting experience as part of their education.
From row crops to computers, Cal Poly believes the best way for someone to learn something is to do it. That's been the school's philosophy since it began.

"Learn by doing," the university calls it.

Cal Poly students gain invaluable first-hand experience both on campus and off. Course work emphasizes it, with a high proportion of lab work, field work and special projects culminating in a senior project. On-campus opportunities such as the daily student-run newspaper and real-world agricultural enterprise projects make hands-on learning a daily reality, not just a catch phrase. Off-campus work with government agencies and major national corporations — for both academic credit and a salary — is available through various programs that include the largest Cooperative Education Program in the Western United States. Many student activities are designed to give students an additional chance to apply what's learned in the classroom.

Cal Poly is one of 20 campuses in The California State University, the nation's largest four-year university system. Each campus in the CSU system is given considerable freedom in developing its programs, and each has its own special qualities and strengths.

The CSU's emphasis is undergraduate instruction. And Cal Poly's specialty is preparing undergraduates — and preparing them exceptionally well — for careers in applied technical and professional fields.

Unlike most universities, Cal Poly requires every prospective student to apply for a particular major field of study, whether seeking to enter from high school or as a transfer student from a community college or another university. Instruction in the major begins on the first day of class.
The difference shows also in the programs. Of the 57 undergraduate majors offered, 12 are available within the CSU system only at Cal Poly, and another 11 are offered at only one other CSU campus. The university’s career orientation is evident in its programs in agriculture, architecture, business, design, education, engineering, graphic communication, home economics and journalism. Those and other professional programs are offered in addition to curricula in the arts, sciences, mathematics and humanities.

And those programs are state-of-the-art education. Twenty-six are accredited or recognized at the national level by independent reviewing bodies. That’s one of the highest levels of accreditation in The CSU.

Yet even as it believes in the importance of a practical education, Cal Poly firmly believes that such useful, realistic knowledge must be put into the hands of men and women who possess the maturity, awareness and wisdom to use it well.

Career education at Cal Poly is taught within the framework of a thorough general education that helps students develop fully as educated individuals, not just as trained professionals. Curricula are designed to teach students to think logically, judge critically and communicate clearly. They help give students a sense of responsibility to society – both national and international – and an understanding of their own and other cultures. Just as students in scientific and technical fields learn about the humanities, humanities majors study science and technology.
Overseas study, which can immeasurably broaden a student's knowledge and outlook, is available through year-long CSU programs in 16 countries, Cal Poly's spring- and summer-quarter London Study Program, a fall-quarter program in Paris, and a variety of special study programs organized by Cal Poly departments and professors. The university also continues to expand its international involvement through programs involving faculty and staff as well as students.

In all aspects of education, Cal Poly is committed to excellence. But to measure the quality of its programs, the university doesn't rely on its reputation, national ranking, facilities, applicant test scores or other secondary measures. It looks to the yardstick of educational effectiveness – how good it is at helping students learn, at instilling an appreciation for learning, at developing all of a student's talents, at assessing and improving its teaching. By that measure, as by the others, Cal Poly stands out.

An essential element in helping people learn is getting them involved in what they're learning. From the hands-on orientation of academic courses to the student responsibility built into student activities, Cal Poly evinces a true commitment to student involvement.
A university's teachers, of course, are the ones who put the institution's educational principles into practice. Cal Poly's faculty is especially well-chosen to deliver an effective practical education. It's a teaching faculty. Professors give students top priority and individual attention. And Cal Poly faculty members have proved their competence, and continue to develop it, in the world outside academia as well - in research, in development, in industry, in the marketplace.

When it selects its faculty, Cal Poly doesn't look at academic qualifications alone. It seeks men and women who are interested in teaching undergraduates, who have records of successful teaching, who are committed to making their teaching even more effective, and whose professional experience shows they have met and mastered the working world their students will face.
With its approach to education and success in applying it, Cal Poly has built a solid statewide and national reputation. The proof of success is the eagerness of recruiters from business and industry to hire Cal Poly graduates, the support well-known corporations have given its programs, and the loyalty of its alumni. The quality of the university’s programs attracts students from throughout California and has helped make Cal Poly one of the most popular campuses in the state.
Cal Poly is at San Luis Obispo, a pleasant, progressive city of about 41,000 on California's Central Coast, midway between San Francisco and Los Angeles. The city and university share a neighborly, small-campus, small-town feeling and one of the finest natural environments anywhere. Sparkling-clear air and a climate that's temperate year-round blend with majestic peaks, quiet valleys and the nearby ocean to create an exhilarating environment that's ideal for learning and growing.

It's a pleasure to walk around Cal Poly's compact, 400-acre central campus, with its sweeping views of the nearby peaks and valleys. To the north of the academic core is an additional 5,651 acres of rolling campus devoted to student farming, experimental architecture and other outdoor laboratory study, making Cal Poly's one of the largest campuses in the nation.
Instructional facilities are as diverse, specialized and lab-oriented as the instructional programs, and Cal Poly never stops developing new facilities and adapting old ones to include the latest technology in those continually evolving curricula. A prime example is the multimillion-dollar Computer-Aided Productivity Center, funded and equipped in large part by generous donations from industry. It's one of numerous computing facilities available daily to students at all levels in all programs. Two other examples are an Engineering Building completed in 1985 – one of the most up-to-date engineering facilities in the CSU – and a new Agricultural Sciences Building completed in 1988.

The university's spacious, modern library contains about 739,000 books and 94,000 bound periodicals, as well as a highly rated government documents collection and other special collections.

Students live both off campus and on. Cal Poly has more residence halls – and more-popular residence halls – than any other CSU campus. They offer a variety of living arrangements for about 2,800 students. Off-campus housing is varied also, including fraternities, sororities and large student-apartment complexes as well as private homes.

Food is available on campus to suit almost any taste and any budget – at two cafeterias, a snack bar, a burger bar, a sandwich shop, a pizza take-out, an ice cream parlor, and a full-service restaurant with a splendid view.
A modern Health Center assures attention to students' medical problems and conducts a variety of preventive programs.

Possibilities for recreation and other activities are limitless. Cal Poly students join in music, dance, drama, films, fine arts, rodeo, outings, student government and many other opportunities to develop skills and interests. More than 11,000 of Cal Poly's 17,500 students are involved in 350-plus student organizations. And on Pacific beaches, along coastal dunes and ridges, in forests and at nearby lakes, students can enjoy almost any type of recreation, or just relax in an unspoiled natural setting.

Headquarters for on-campus activity is the award-winning University Union. And if you take a close look inside the Union, you might be surprised to find that, to a great extent, students are in charge. At Cal Poly, students bear much of the responsibility for planning and managing activities.

Student-run activities have earned enviable reputations even outside of California. A good example is the animated Rose Parade float designed and built jointly by students from Cal Poly and Cal Poly Pomona. Cal Poly floats consistently have won some of the most-coveted prizes in that New Year's Day event.
As for athletics, Cal Poly men compete in nine intercollegiate sports; women compete in eight. In the campus intramurals program, more than 860 teams participate in 19 sports open to both men and women. Students also can join more than 20 clubs involved in more-exotic sports like rugby, crew and ultimate Frisbee. Extensive athletic and other recreation facilities are available until late at night.

Cal Poly has long been known as a friendly campus that welcomes visitors. Parking permits and campus maps are available on weekdays at the information center at the campus's Grand Avenue entrance and at the information desk in the Administration Building lobby. The University Union lobby is the starting point for guided campus tours, offered several times a week. For tour days and times, call (805) 756-1111 or 756-2792, or write to the Relations with Schools office. Special group tours can be arranged. On weekends, campus maps are available in the University Union (weekend parking doesn't require a permit).
On a cold rainy day in December of the gold-rush year of 1849, a young West Point drop-out got off a ship in San Francisco and went looking for a job. He’d spent his last cent getting there.

All night he slogged through the muddy streets. But the next morning a man hailed him:

"Say, boy, do you want a job?"

"Yes, sir!"

"Get up on that building and nail on those shingles. I'll give you $8 a day."

The young man paused.

"Mister, I never drove a nail in my life."

Someone else got the job.
The young man was Myron Angel. By the 1890s he had become a prominent San Luis Obispo resident and chronicler of the county’s history, but he hadn’t forgotten that inauspicious December morning.

“I could have told the man a great deal I had learned in books,” Angel recalled, “but nothing about building a house.”

Angel was a leader in a campaign that at first aimed to establish a state “normal” school (a teachers’ training school) at San Luis Obispo. But when that prospect dimmed, he shifted his support to the idea of a polytechnic institute, an idea suggested by the district’s state senator, Sylvester C. Smith of Bakersfield.

Looking back to his arrival in San Francisco, Angel made an eloquent case for a technical school, and in the same stroke articulated the institution’s future: He envisioned a school that would “teach the hand as well as the head, so that no young man or young woman will be sent off in the world to earn their living as poorly equipped for the task as I when I landed in San Francisco in 1849.”

In 1901 San Luis Obispo was a farm and rail town of just over 3,000 people. The Southern Pacific had just completed the last link in its coast line. What’s now the Cal Poly campus was farm land some distance north of town. And it was on March 8 of that first year of the 20th century that legislation founding the California Polytechnic School was signed into law after six years of debate.

The mandate was clear: “To furnish to young people of both sexes mental and manual training in the arts and sciences, including agriculture, mechanics, engineering, business methods, domestic economy, and such other branches as will fit the students for non-professional walks of life.”
Much has changed in the ensuing years – including the definition of “professional” – as Cal Poly has grown from a vocational high school into a major university. But the essence of that original charge is still part of state law, and Cal Poly has never lost sight of the purpose for which it was created.

Cal Poly’s style was clear from the beginning, too.

When 15 young men and women showed up on the first day of class, Oct. 1, 1903, the main building wasn’t finished. Construction debris still littered the dormitory. But Director Leroy Anderson, Mrs. Anderson and the students moved in, set to work, and set the example that others are still following.

As the school’s director until 1908, Anderson emphasized learning by doing and earning while learning and established once and for all Cal Poly’s hands-on approach to its polytechnic subject matter.

During its first three decades, Cal Poly evolved into the equivalent of a junior college, and governance was transferred from a local board of trustees to the state Board of Education. Then the Depression hit, and hit hard. The Legislature considered abolishing the institution.

But in 1933 Cal Poly got a new start. Julian A. McPhee, chief of the California Bureau of Agricultural Education, agreed to become the school’s president. McPhee assumed leadership of what had been reorganized as a two-year technical college offering instruction in agriculture and industrial fields. Enrollment had been limited to men as of 1929.

During the next 33 years, until his retirement in 1966, McPhee guided Cal Poly’s transformation. A third year of instruction was added in 1936, a fourth in 1940. Cal Poly’s first baccalaureate exercises were held May 28, 1942.
During World War II, the campus was the site of a Naval Flight Preparatory School. After the war, a wave of practical-minded veterans using the G.I. Bill helped inject fresh vigor into the college’s programs. The curriculum, facilities and enrollment expanded rapidly.

Cal Poly’s name caught up with reality in 1947, as California State Polytechnic School became California State Polytechnic College. In those postwar years the first graduate-level programs were added to the curriculum, and in 1956, coeds returned to the campus.

It was in 1961 that the college became part of the newly formed California State Colleges system (now The California State University). The last years of McPhee’s presidency also witnessed new initiatives in several areas, such as in the fledgling field of computing, and an acceleration of international programs. Steadily rising enrollments reached 7,740 in 1966, McPhee’s last year at the helm.

It was also in 1966 that Cal Poly’s campus at Pomona, founded in 1938 as a branch of the San Luis Obispo school, was made a separate state college by the Legislature.

Rapid development continued under the 12-year presidency of McPhee’s successor, Robert E. Kennedy. The college’s popularity and reputation grew as it built solid programs on the solid philosophy of its founders. In 1970 Cal Poly’s current organization into seven academic schools was accomplished. Then the Legislature recognized what the institution had become: In 1972 California State Polytechnic College was renamed California Polytechnic State University.

When Cal Poly’s current president, Warren J. Baker, succeeded Kennedy in 1979, the student body had reached 16,000. The challenges facing the university had become the challenges of broadening and refining
As Cal Poly nears the end of its first century, it remains clear in its purpose and proud of its achievements, but never satisfied that it can't be better. It remains a continually evolving institution, but also true to the original vision of a school to "teach the hand as well as the head."

And as Cal Poly rises among the ranks of major American universities, time continues to test and prove the worth of a Cal Poly education. Cal Poly graduates possess the knowledge and skills not just to nail on some shingles as Myron Angel couldn't, but to step right into careers of planning, designing, building, operating and improving whole structures and entire communities, of managing farms and businesses, of developing minds and expanding knowledge – of helping to build a better life in our nation and the world.
SCHOOL OF ARCHITECTURE AND ENVIRONMENTAL DESIGN
SCHOOL OF PROFESSIONAL STUDIES AND EDUCATION
SCHOOL OF SCIENCE
AND MATHEMATICS
THE PHOTOGRAPHS (All clockwise from top right)

SCHOOL OF AGRICULTURE — Left page: 1/Analysis and interpretation lab in natural resources management. 2/Computerizing dairy herd management records. 3/Evaluating meat yield. 4/Students in the Animal Sciences and Industry Department’s equestrian program. 5/Agricultural Sciences Building. (1, 2, 5 by Joseph Codispoti; 3, Marnie Woodward; 4, Inta Butkus) Right page: 1/FFA state finals at Cal Poly. 2/Evaluating flow control in agricultural engineering's irrigation delivery system. 3/Student-produced dairy products. 4/Campus beef herd. 5/Ornamental horticulture class in bonsai culture. (All by Joseph Codispoti)

SCHOOL OF ARCHITECTURE AND ENVIRONMENTAL DESIGN — Left page: 1/Architecture and Environmental Design Building. 2/Analyzing a project site in a landscape architecture lab. 3/Professor and student discussing a computer design project. 4/Student construction project. 5/Model for a student-built reinforced-concrete project. (All by Dale Flynn) Right page: 1/Building a model in architecture design lab. 2/Architecture “staircourt.” 3/Class in basic architectural engineering taking a break. 4/Finding the right slide in the school’s Instructional Resources Center. 5/Evaluating a structural model. 6/Discussing an architectural design presentation in the school’s Gallery. (All by Dale Flynn)

SCHOOL OF BUSINESS — Left page: 1/Business Administration and Education Building. 2/Business students selected as Poly Royal Ambassadors. 3/The SAM Stage, Poly Royal. 4/American Marketing Association conference. 5/Model of business building addition to be completed in 1992. 6/Marketing class. (1, 5, 6 by Joseph Codispoti; 2, 3 Stephen Hughes) Right pages: 1/Outdoor conference. 2/Alumna guest speaker at annual Women’s Symposium. 3/Planning a class schedule in the school’s Advisement Center. 4/Business-architecture plaza. 5/Professor and student discussing an economics assignment. 6/Panel of industry experts at a school symposium. (2, 3, 5, 6 by Stephen Hughes; 4, Joseph Codispoti)

SCHOOL OF ENGINEERING — Left page: 1/Engineering Building. 2/Record-setting human-powered helicopter Da Vinci III. 3/Reviewing plans in civil engineering. 4/Robotic manufacturing lab, engineering technology. 5/Basic electrical circuits lab. 6/Preparing pedal-powered helicopter for first flight. (1, 3-5 by Joseph Codispoti; 2, Douglas Johnson; 6, Bob Anderson) Right page: 1/Studyng thermo-mechanical processing with a “Gleeble” in materials engineering. 2/Learning manufacturing automation in industrial engineering. 3/Computer work with “fractals” (certain types of complicated shapes). 4/Computer-aided design. 5/Working on an assignment. 6/Award-winning human-powered submarine. (1, 3, 4 by Joseph Codispoti; 2, 5, Douglas Johnson; 6, Chuck Sheldon)

SCHOOL OF LIBERAL ARTS — Left page: 1/Cal Poly Symphonic Band concert. 2/Dance performance in the Cal Poly Theatre. 3/Practice in the language lab. 4/Art and Design Department photo lab. 5/Theatre program’s world premiere of “Pirandello’s Wife.” 6/Group discussion in political science class. (1-3, 5 by Joseph Codispoti; 4, T. Shane Gilman; 6, Douglas Johnson) Right page: 1/University Art Gallery, Dexter Building. 2/Art class. 3/Flutists in concert. 4/Shaping blown glass. 5/Cal Poly radio station KCPR-FM on the air. 6/Class in Afro-American history. (1, 2 by T. Shane Gilman; 3, 5, 6, Joseph Codispoti; 4, Juli Reiten)

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SCHOOL OF SCIENCE AND MATHEMATICS — Left page: 1/Working with DNA in a biotechnology lab. 2/Physics Department observatory. 3/Biochemical analysis with a UV-visible spectrophotometer. 4/Projecting a microscope slide onto a video screen. 5/Analyzing organic mixtures with a gas chromatograph-mass spectrometer. 6/Discussing a math assignment with the professor. (All by Douglas Johnson) Right page: 1/Experiment in organic chemistry. 2/Setting up a hologram experiment in a physics lab. 3/Vertebrate field zoology lab. 4/Biotechnology tomato plants in a plant tissue culture lab. 5/Statistics class. 6/West courtyard of Fisher Science Hall. (All by Douglas Johnson)

“INTRODUCING CAL POLY” design by Dean Crawford Jr.; text, C. Robert Anderson; photos, Joseph Codispoti (p. 5, 8, 9, 11, 12), Marnie Woodward (p. 7), Ron Bass (p. 13), Darrel Miho (p. 14 top), University Archives (p. 15-17). Photo pages design by Dean Crawford Jr.
GUIDE TO USING THE CATALOG
A GUIDE TO USING THE CATALOG

Academic terminology and a university catalog can be confusing to someone first entering the university. This section explains some of the jargon you will quickly come to know and explains briefly how the catalog is organized.

SCHOOLS AND DEPARTMENTS

The faculty of Cal Poly is organized into 50 academic departments, and the departments are grouped into seven schools. Pages 143-417 of this catalog describes all of the degree programs offered by the university. Sections for each school follow in alphabetical order. Departments are arranged alphabetically within the appropriate school.

DEGREES AND MAJORS

A degree is an academic rank which the university confers on a student who satisfactorily completes a designated curriculum, or program of study. Cal Poly grants undergraduate degrees – also called baccalaureate degrees – and master's degrees, the first of two graduate degrees.

At the undergraduate level, Cal Poly grants the Bachelor of Arts (B.A.), the Bachelor of Science (B.S.), and the Bachelor of Architecture (B.Arch.) degrees. At the graduate level, Cal Poly grants the Master of Arts (M.A.), Master of Science (M.S.), Master of Business Administration (M.B.A.), and Master of City and Regional Planning (M.C.R.P.) degrees. Cal Poly doesn't offer doctorate-level programs leading to a Ph.D. degree.

A major is a program of study that provides students with the knowledge, skills and experience necessary to pursue a specific career or advanced study and leads to a degree in that subject. Each major is offered in a particular academic department (or departments) and the department that administers your major will become your main point of contact at the university.

Cal Poly students select a major at the time they apply for admission. There are 57 undergraduate majors to choose from. A complete listing of majors, arranged by school and department, may be found on pages 43-48.

General requirements for bachelor's degrees are given on pages 106-129, and for master's degrees on pages 132-141. The specific requirements for a particular degree program are listed under the academic department that offers the degree.

The curriculum display for each bachelor's degree program shows the suggested order for taking courses and groups them into the traditional four years for an undergraduate program (five years for the Bachelor of Architecture). These curriculum displays are useful guides, but many students find, for a variety of reasons, that they need more than four years to complete their bachelor's programs. In planning their programs, students should rely on the academic advising available in their departments, as well as on the information in this catalog.
COURSES

The courses in a bachelor's degree curriculum can be classified as major courses, support courses, general education and breadth courses, and electives. Major and support courses are identified on curriculum evaluation sheets, which are available in the Evaluations Office. Descriptions of Cal Poly courses are located in the back half of the catalog, arranged alphabetically by course prefix (an abbreviation that represent the subject). The numbering system is explained on page 422.

Major courses are designed to provide competence in the professional field in which a degree is given. They are usually offered by the academic department in which the degree program is offered, but they may include courses from other departments.

Support courses provide background needed for major courses and are usually offered by departments other than the department in which the major is offered. For example, most majors in engineering and in the sciences require support courses in mathematics.

General Education and Breadth (GEB) courses provide a common foundation of knowledge for all undergraduate programs. Cal Poly's GEB course requirements are described in detail on pages 114-119.

Electives are courses that students can choose simply to pursue their own interests.

CONCENTRATIONS AND SPECIALIZATIONS

A concentration is a group of courses designed to provide specialized knowledge within a bachelor's degree program. A specialization is a similarly specialized group of courses in a master's degree program. Completion of a concentration or specialization will be noted on the student's transcript, but not shown on the diploma.

MINORS

A minor is a group of courses designed to give a student knowledge in an area outside the major. A minor is not required for a degree. For more information and a list of available minors at Cal Poly, see page 112.

QUARTERS AND QUARTER UNITS

Cal Poly's academic calendar consists of four quarters – Fall, Winter, Spring and Summer. Cal Poly's academic year consists of Fall, Winter and Spring quarters. The university year includes, and begins with, Summer Quarter.

Each course offered by the university carries a value in quarter units, often referred to simply as units or credits.

To convert semester units to quarter units, multiply by 1.5. For example, 6 semester units $\times 1.5 = 9$ quarter units.
Please note: This is not intended to be construed as an employee work calendar.

**SUMMER QUARTER 1990**

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<thead>
<tr>
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<td>Summer quarter classes begin</td>
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<tr>
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### SUMMER QUARTER 1991

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### FALL QUARTER 1991

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<td>Friday</td>
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<td>October 7</td>
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<tr>
<td>October 11</td>
<td>Friday</td>
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<tr>
<td>November 8</td>
<td>Friday</td>
<td>Last day to late register and pay late registration fee</td>
</tr>
<tr>
<td>November 11</td>
<td>Monday</td>
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<td>November 27–December 1</td>
<td>Wednesday–Sunday</td>
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<td>Friday</td>
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<td>December 9–13</td>
<td>Monday–Friday</td>
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<td>Academic holiday—Veterans' Day Observance</td>
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WINTER QUARTER 1992

January 6
Monday
Beginning of winter quarter
Winter quarter classes begin
January 17
Friday
End of second week of instruction
January 20
Monday
Academic holiday–Martin Luther King, Jr.
Birthday Observance
January 21
Tuesday
Last day to drop a class
January 24
Friday
Last day to add a class
February 17
Monday
Academic holiday–George Washington’s
Birthday Observance
February 21
Friday
End of seventh week of instruction
March 13
Friday
Last day of classes
March 16–20
Monday–Friday
Final examination period
March 20
Friday
End of winter quarter
March 21–29
Saturday–Sunday
Academic holiday

SPRING QUARTER 1992

March 30
Monday
Beginning of spring quarter
Spring quarter classes begin
April 10
Friday
End of second week of instruction
April 13
Monday
Last day to drop a class
April 17
Friday
Last day to add a class
May 15
Friday
End of third week of instruction
May 25
Monday
Academic holiday–Memorial Day
June 5
Friday
End of seventh week of instruction
June 8–12
Monday–Friday
Final examination period
June 13
Saturday
Spring Commencement
June 14–21
Sunday–Sunday
End of spring quarter
Academic holiday

SUMMER QUARTER 1992

June 22
Monday
Beginning of university year
Beginning of summer quarter
Summer quarter classes begin
July 3
Friday
Academic holiday–Independence Day Observed
July 6
Monday
End of second week of instruction
July 7
Tuesday
Last day to drop a class
July 10
Friday
Last day to add a class
August 7
Friday
Last day to late register and pay late registration fee
August 28
Friday
End of third week of instruction
August 31–September 4
Monday–Friday
Census date
September 4
Friday
End of seventh week of instruction
September 5–13
Saturday–Sunday
End of summer quarter
Academic Holiday
## ACADEMIC PROGRAMS

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<tr>
<th>Schools and Departments</th>
<th>Curricula with Concentrations/Minors</th>
<th>Degrees</th>
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School of Professional Studies and Education

Minors:
- Gerontology
- Packaging
- Integrative Technology

Education Department
- Counseling
- Education
- Specializations:
  - Computer Based Education
  - Counseling and Guidance
  - Curriculum and Instruction
  - Educational Administration Services
  - Reading
  - Special Education

Graphic Communication Department
- Graphic Communication
- Concentrations:
  - Computer Graphic Communication
  - Design Reproduction Technology
  - Printing Management
  - Printing Technology

Home Economics Department
- Home Economics
- Concentrations:
  - Interior Design
  - Textiles and Clothing/Merchandising

Industrial Technology Department
- Industrial and Technical Studies
- Industrial Technology
- Concentrations:
  - Industrial and Technology Education
  - Industrial Management

Vocational Education B.V.Ed.

Liberal Studies
- Liberal Studies

Military Science Department

Physical Education and Recreation Administration Department
- Physical Education
- Concentrations:
  - Commercial/Corporate Fitness
  - Health Education
  - Teaching
- Physical Education
- Recreation Administration
- Concentrations:
  - Private/Commercial Recreation
  - Therapeutic Recreation

Psychology and Human Development Department
- Human Development
- Concentrations:
  - Applied Developmental Psychology
  - Early Childhood Education
  - Family Studies
- Minor: Psychology

Degrees
- M.S.
- M.A.
- B.S.
### School of Science and Mathematics

**Minor: Biotechnology**

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## Enrollment in Programs by School and Major, FALL 1989

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<td>65</td>
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<tr>
<td>Industrial Engineering</td>
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<td>Materials and Metallurgical Engineering</td>
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<tr>
<td>Mechanical Engineering</td>
<td>792</td>
<td>706</td>
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<td><strong>Totals</strong></td>
<td>3,868</td>
<td>3,354</td>
<td>629</td>
<td>3,983</td>
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</tr>
</tbody>
</table>
## Enrollment in Programs by School and Major, FALL 1989 (Continued)

<table>
<thead>
<tr>
<th>Schools and Major Curricula</th>
<th>Undergrad.</th>
<th>Grad.</th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
</thead>
</table>

### School of Liberal Arts
- **Applied Art and Design**
  - Undergrad.: 219
  - Grad.: 44
  - Men: 104
  - Women: 115
  - Total: 219
- **English**
  - Undergrad.: 269
  - Grad.: 44
  - Men: 96
  - Women: 217
  - Total: 313
- **History**
  - Undergrad.: 176
  - Grad.: 44
  - Men: 116
  - Women: 60
  - Total: 176
- **Journalism**
  - Undergrad.: 252
  - Grad.: 44
  - Men: 81
  - Women: 171
  - Total: 252
- **Political Science**
  - Undergrad.: 315
  - Grad.: 44
  - Men: 189
  - Women: 126
  - Total: 315
- **Social Sciences**
  - Undergrad.: 304
  - Grad.: 44
  - Men: 118
  - Women: 186
  - Total: 304
- **Speech Communication**
  - Undergrad.: 185
  - Grad.: 44
  - Men: 50
  - Women: 135
  - Total: 185

**Totals**
- Undergrad.: 1,720
- Grad.: 44
- Men: 754
- Women: 1,010
- Total: 1,764

### School of Professional Studies and Education
- **Child and Family Development**
  - Undergrad.: 111
  - Grad.: 47
  - Men: 5
  - Women: 106
  - Total: 111
- **Counseling**
  - Undergrad.: –
  - Grad.: 44
  - Men: 7
  - Women: 40
  - Total: 47
- **Education**
  - Undergrad.: –
  - Grad.: 409
  - Men: 106
  - Women: 303
  - Total: 409
- **Graphic Communication**
  - Undergrad.: 334
  - Grad.: 44
  - Men: 168
  - Women: 166
  - Total: 334
- **Home Economics**
  - Undergrad.: 362
  - Grad.: 44
  - Men: 6
  - Women: 356
  - Total: 362
- **Human Development**
  - Undergrad.: 350
  - Grad.: 44
  - Men: 35
  - Women: 315
  - Total: 350
- **Industrial Arts**
  - Undergrad.: 1
  - Grad.: 44
  - Men: 1
  - Women: 0
  - Total: 1
- **Industrial and Technical Studies (M.A.)**
  - Undergrad.: –
  - Grad.: 7
  - Men: 6
  - Women: 1
  - Total: 7
- **Industrial Technology**
  - Undergrad.: 321
  - Grad.: 44
  - Men: 276
  - Women: 45
  - Total: 321
- **Liberal Studies**
  - Undergrad.: 430
  - Grad.: 44
  - Men: 47
  - Women: 383
  - Total: 430
- **Physical Education**
  - Undergrad.: 329
  - Grad.: 33
  - Men: 164
  - Women: 198
  - Total: 362
- **Recreation Administration**
  - Undergrad.: 173
  - Grad.: 44
  - Men: 53
  - Women: 120
  - Total: 173
- **Vocational Education**
  - Undergrad.: 0
  - Grad.: 44
  - Men: 0
  - Women: 0
  - Total: 0

**Totals**
- Undergrad.: 2,411
- Grad.: 496
- Men: 874
- Women: 2,033
- Total: 2,907

### School of Science and Mathematics
- **Biochemistry**
  - Undergrad.: 169
  - Grad.: 44
  - Men: 92
  - Women: 77
  - Total: 169
- **Biological Sciences**
  - Undergrad.: 514
  - Grad.: 44
  - Men: 241
  - Women: 292
  - Total: 533
- **Chemistry**
  - Undergrad.: 94
  - Grad.: 6
  - Men: 57
  - Women: 43
  - Total: 100
- **Environmental and Systematic Biology**
  - Undergrad.: 125
  - Grad.: 44
  - Men: 62
  - Women: 63
  - Total: 125
- **Mathematics**
  - Undergrad.: 291
  - Grad.: 44
  - Men: 169
  - Women: 135
  - Total: 304
- **Microbiology**
  - Undergrad.: 81
  - Grad.: 6
  - Men: 24
  - Women: 57
  - Total: 81
- **Physical Science**
  - Undergrad.: 28
  - Grad.: 110
  - Men: 16
  - Women: 12
  - Total: 28
- **Physics**
  - Undergrad.: 121
  - Grad.: 44
  - Men: 110
  - Women: 11
  - Total: 121
- **Statistics**
  - Undergrad.: 42
  - Grad.: 30
  - Men: 30
  - Women: 12
  - Total: 42

**Totals**
- Undergrad.: 1,465
- Grad.: 38
- Men: 801
- Women: 702
- Total: 1,503

**Campus Totals**
- Undergrad.: 16,519
- Grad.: 970
- Men: 9,969
- Women: 7,520
- Total: 17,489
The university is fully accredited by the Western Association of Schools and Colleges. The Commission for Teacher Credentialing has authorized the university to recommend for a number of teaching credentials as described in the catalog section on "Teacher Preparation Programs." In addition, some degree programs are accredited by discipline-related accrediting agencies.

- **Architecture (bachelor's degree)** – National Architectural Accrediting Board
- **Business Administration (undergraduate and graduate)** – American Assembly of Collegiate Schools of Business
- **City and Regional Planning (undergraduate degree)** – Planning Accreditation Board of the American Institute of Certified Planners
- **Computer Science (undergraduate)** – Computing Sciences Accreditation Board, Computer Science Accreditation Commission
- **Construction Management** – American Council for Construction Education
- **Engineering Technology (undergraduate concentrations: Electronic Technology, Manufacturing Processes Technology, Mechanical Technology, and Welding Technology)** – Accreditation Board for Engineering and Technology, Technology Accreditation Commission
- **Industrial Technology** – National Association of Industrial Technology
- **Interior Design (undergraduate concentration, Home Economics)** – Foundation for Interior Design Education Research
- **Landscape Architecture** – American Society of Landscape Architects
- **Nutritional Science** – American Dietetics Association
- **Recreation Administration** – National Recreation and Parks Association/American Association of Leisure and Recreation
POLICIES ON THE RIGHTS OF INDIVIDUALS

NONDISCRIMINATION POLICY

Sex
The California State University does not discriminate on the basis of sex in the educational programs or activities it conducts. Title IX of the Education Amendments of 1972, as amended, and the administrative regulations adopted thereunder prohibit discrimination on the basis of sex in education programs and activities operated by California Polytechnic State University, San Luis Obispo. Such programs and activities include admission of students and employment. Inquiries concerning the application of Title IX to programs and activities of California Polytechnic State University, San Luis Obispo may be referred to Carl Wallace, Director, Judicial Affairs, Office of Student Affairs, the campus officer assigned the administrative responsibility of reviewing such matters or to the Regional Director of the Office of Civil Rights, Region 9, 221 Main Street, 10th Floor, San Francisco, California 94103.

Handicap.
The California State University does not discriminate on the basis of handicap in admission or access to, or treatment or employment in, its programs and activities. Section 504 of the Rehabilitation Act of 1973, as amended, and the regulations adopted thereunder prohibit such discrimination. E. Douglas Gerard, Executive Dean, has been designated to coordinate the efforts of California Polytechnic State University, San Luis Obispo to comply with the Act in its implementing regulations. Inquiries concerning compliance may be addressed to him. Where student discrimination occurs, referral may be made to either Disabled Student Services or the Office of Student Affairs.

Race, Color, or National Origin
The California State University complies with the requirements of Title VI of the Civil Rights Act of 1964 and the regulations adopted thereunder. No person shall, on the grounds of race, color, or national origin be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program of The California State University. Referral may be made to the Office of Student Affairs.

Age, Marital Status, Religion, or Sexual Preference
The California State University does not discriminate on the basis of age, marital status, religion, or sexual preference. Referral may be made to the the Office of Student Affairs.

SEXUAL HARASSMENT POLICY

Cal Poly is committed to creating and maintaining an environment in which faculty, staff and students work together in an atmosphere of mutual respect and unconstrained academic interchange. In the university environment, all faculty, staff and students are entitled to be treated on the basis of their qualifications, competence and accomplishments without regard to gender. Individuals are entitled to be treated on the basis of their qualifications, competence and accomplishments without regard to gender. Individuals are entitled to benefit from university programs and activities without being discriminated against on the basis of their sex. Sexual harassment violates university policy, seriously threatens the academic environment, and is illegal. The policy of the campus is to eliminate sexual harassment and to provide prompt and equitable relief to the extent possible.

Sexual harassment includes such behavior as sexual advances, request for sexual favors and other verbal or physical conduct of a sexual nature directed towards an employee, student or applicant when one or more of the following circumstances are present:

- Submission to or toleration of the conduct is an explicit or implicit term or condition of employment, admission or academic evaluation;
- Submission to or rejection of such conduct is used as a basis for a personnel decision or academic evaluation affecting an individual;

- Submission to or rejection of such conduct is used as a basis for a personnel decision or academic evaluation affecting an individual;
• The conduct has the purpose or effect of interfering with an employee’s work performance, creating an intimidating, hostile, offensive or otherwise adverse working environment;

• The conduct has the purpose or effect of interfering with a student’s academic performance creating an intimidating, hostile, offensive or otherwise adverse learning environment or adversely affecting any student.

Sexual harassment will not be tolerated by the university and may result in disciplinary action. Each school/division of Cal Poly has designated a sexual harassment adviser. Sexual harassment coordinators are available to answer questions or handle complaints by students, employees, student applicants or employee applicants. The names and office locations of sexual harassment advisers and coordinators are available in the Personnel Office and the Dean of Students’ Office.

Formal complaints alleging sexual harassment of employees or applicants for employment should be made to the Director of Personnel and Employee Relations, Administration 110, 756-2844. Complaints involving sexual harassment of students should be made to the Associate Dean of Students, Administration 209, 756-1521. Such complaints will be investigated without delay and appropriate action taken in accordance with applicable collective bargaining agreements; Chancellor’s Office Executive Order No. 345, dated June 1, 1981; and Executive Order 419, “Prohibition of Sexual Harassment Systemwide Governance Procedures,” dated July 1, 1983; and/or AB 72-4.
The individual California State Colleges were brought together as a system by the Donahoe Higher Education Act of 1960. In 1972 the system became The California State University and Colleges and in 1982 the system became The California State University. Today, all 20 campuses have the title "university."

The oldest campus—San Jose State University—was founded as a Normal School in 1857 and became the first institution of public higher education in California. The newest campus—California State University, San Marcos—will begin admitting students in fall 1990.

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

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

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

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

System enrollments total more than 360,000 students, who are taught by some 20,500 faculty. Last year the system awarded over 50 percent of the bachelor's degrees and 30 percent of the master's degrees granted in California. More than 1.2 million persons have been graduated from the 19 campuses since 1960.
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Appointments are for a term of eight years, except for a student Trustee, alumni Trustee, and faculty Trustee whose terms are for two years. Terms expire in the year in parentheses. Names are listed in order of appointment to the Board.

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Correspondence with Trustees should be sent:
c/o Trustees Secretariat
The California State University
400 Golden Shore, Suite 322
Long Beach, California 90802-4275

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The California State University
400 Golden Shore, Suite 322
Long Beach, California 90802-4275
(213) 590-5506

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800 North State College Blvd., Fullerton, California 92634 (714) 773-2011

California State University, Hayward ..................................... Dr. Ellis E. McCune, President
Hayward, California 94542 (415) 881-3000

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3801 West Temple Avenue, Pomona, California 91768 (714) 869-7659

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6000 J Street, Sacramento, California 95819 (916) 278-6011

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5500 University Parkway, San Bernardino, California 92407 (714) 880-5000

San Diego State University .................................................. Dr. Thomas B. Day, President
5300 Campanile Drive, San Diego, California 92182 (619) 594-5000

Imperial Valley Campus
720 Heber Avenue, Calexico, California 92231 (619) 357-3721

San Francisco State University .................................. Dr. Robert A. Corrigan, President
1600 Holloway Avenue, San Francisco, California 94132 (415) 338-1111

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One Washington Square, San Jose, California 95192 (408) 924-1000

California Polytechnic State University, San Luis Obispo ........ Dr. Warren J. Baker, President
San Luis Obispo, California 93407 (805) 756-1111

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820 West Vallecitos Blvd., San Marcos, California 92069 (714) 471-4119

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1801 East Cotati Avenue, Rohnert Park, California 94928 (707) 664-2880

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801 West Monte Vista Avenue, Turlock, California 95380 (209) 667-3122
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SPECIAL PROGRAMS AND RESOURCES

ALUMNI ASSOCIATION

Cal Poly's Alumni Association is the most important organization linking the university and the 150,000 students who have attended Cal Poly. To keep in touch with former students, the Alumni Association coordinates a variety of alumni functions both educational and social, on and off campus, throughout California and across the nation.

The Alumni Association is governed by a president, a president elect, a secretary-treasurer, and a board of directors representing all areas of California and various parts of the United States. The Office of Alumni Relations, which coordinates the activities of the association, is located on campus in the Alumni House. The association has more than 30 active alumni chapters including ones in Alaska, Arizona, the District of Columbia, Hawaii, Texas and Washington. Those chapters offer social and educational events for Cal Poly alumni in their areas, and create a rallying point for alumni activities.

Members of the Alumni Association enjoy opportunities to participate in group travel, insurance plans and many other unique alumni-sponsored programs such as Homecoming and special events during Poly Royal.

The Cal Poly Alumni Association has a keen interest in student activities, hosting special events for students and parents and sponsoring special student groups, such as a Student Alumni Council known as Poly Reps.

COMPUTING AT CAL POLY

Information technology plays an increasingly important role in determining the ultimate success of the university in the accomplishment of its goals. It touches every academic discipline and administrative service provided by the university. Cal Poly students encounter information systems and services from the moment they contact the university by telephone until their eligibility for graduation is computed and their degree awarded. With basic computer literacy a fundamental requirement at Cal Poly, students invariably encounter computers in the classroom. Computer technology is used extensively in advanced technology fields such as architecture and engineering. However, less technical fields, such as the arts and humanities, are integrating computers at an astonishing rate. Actual techniques and systems used by professionals are simulated as much as possible in the university classroom. Research grants, special projects and equipment donations from industry are used to supplement existing campus resources. Five separate and distinct departments serve the university community.

**Academic Computing Services** consults with and supports faculty users on centrally supported hardware and software systems; plans, manages and implements new academic systems and related policies; and monitors and controls access to campuswide academic resources.

**Administrative Services** consults with and trains administrative users regarding available administrative applications; monitors and controls access to the central administrative data; analyzes, designs and implements new administrative systems; and facilitates daily production of class lists, grades, and other reports.

**Communications Services** plans, coordinates, facilitates, implements, maintains and manages all campuswide communication resources, including telephones, broadband and baseband data, television, satellite, radio, paging, voice amplification, visual presentation, and alarm/life safety support systems. Audio-Visual Services is a subunit within Communications Services.

**Computer Operations** ensures continuous operation of the campuswide computing systems; orders routine and emergency maintenance; plans, manages and controls access to the machine room facilities; monitors machine performance and environmental conditions; and orders routine supplies and services.
The Computer-Aided Productivity Center is a CSU specialty center devoted to the support of academic programs in the areas of computer-aided drawing, design, and engineering analysis. The primary software products utilized stem from an IBM university grant which include an IBM main-frame, high resolution graphics terminals and a number of specialty software products. The Center's resources are open to all academic programs, with past usage primarily from engineering and architecture. The Center's resources are being expanded to meet other critical academic needs within the CSU, including support for schools of business and K–12 education. It is under the auspices of the CSU/IBM Academic Mainframe Specialty Center (AMSPEC).

Resources and Facilities

Current hardware systems include an IBM/3090/400E supercomputer, Sequent Balance 8000, Sun network, DEC VAX 750, and Pyramid 98XE. While some of the computers run specialized academic applications, many are available for use by all Cal Poly students. Cal Poly's mainframe is linked by a systemwide network to computing resources at other CSU campuses, large data bases, national networks and information services.

There are several microcomputer and terminal lab facilities at Cal Poly for classroom instruction, independent study, and research and development. Apple Macintosh, Hewlett Packard, IBM and other systems are generally available for student use. These labs are designed to serve general campus needs as well as unique academic purposes. The campus library uses a computerized on-line public access catalog system. An integrated campuswide on-line administrative and student information system on the IBM mainframe facilitates administrative processes such as admissions and records, financial aids, class scheduling, fiscal operations and human resource management. These resources are tied together through a campuswide data communications network.

CONFERENCES AND WORKSHOPS

The Conference Coordinating Center is responsible for the coordination of university facilities and services for conferences, professional meetings, workshops and other special programs related to the university's educational objectives. Assistance with planning, budgeting, advertising, registration, meeting rooms, housing, food services, transportation, and specialized services, on campus and in the community, is provided by the Housing and Conference Services staff for faculty, staff and students. Utilization of university equipment, facilities, and/or services for non-sponsored activities are also coordinated through the Housing and Conference Services office.

Academic and professional credit may be arranged for through the office of Extended Education along with publicity through extension media and instructional support.

EXTENDED EDUCATION

The university's extended education programs provide a variety of services to residents of San Luis Obispo, Santa Barbara, and southern Monterey Counties. Extended education programs are self-supporting through student enrollment fees or agency funding. An up-to-date catalog describing the programs and course schedule is available free from the Extended Education Office.

Extension Programs

The extension program provides a way to earn college credit, acquire skills, enhance career opportunities, or broaden awareness of today's world. Extension courses are offered on campus and at various locations throughout the tri-counties. Enrollment does not imply formal admission to the university. The maximum extension credit which may be accepted toward the bachelor's degree is 36 quarter units. No more than 13 quarter units may be counted toward the master's degree.

Many extension courses are short seminars or workshops and longer courses that do not provide college credit, but that offer opportunity for professional development or personal development for working people and members of the central coast community of all ages. Some of these seminars and workshops are parts of larger programs that lead to a certificate of completion. The programs are also described in the Extended Education catalog.
Extended Education provides support for the educational aspects of conferences and special programs, such as arrangements for academic or professional credit, recruiting and compensation of seminar leaders and instructors, and publicity through extension media. Short courses are administered by and applications may be obtained from the Extended Education Office. Programs are scheduled throughout the year with the major concentration during the summer.

**Concurrent Enrollment**

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

**THE FOUNDATION**

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

- To provide the fiscal means and management procedures that enable the university to carry on activities providing those instructional and service aids not normally furnished by the state.
- To provide effective operation of key support services which would not otherwise be available due to legal, purchasing, and other fiscal restrictions.
- To provide fiscal procedures and management systems that foster effective coordination of the auxiliary activities with the university in accordance with sound business practices.

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

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

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

The Foundation Board holds regular meetings which are open to the public and are regularly attended by representatives of the university’s faculty, staff, and student association officials.

**HEALTH SCIENCES-PREPROFESSIONAL PREPARATION**

**Choosing a Major**

There is no “best” major to prepare you for professional school, as long as you meet the prerequisites for your chosen profession. Your major should be chosen on the basis of interest and as preparation for an alternate career. Typically at Cal Poly, students major in Biological Sciences or Biochemistry if interested in dental or medical school; major in Animal Science, Biological Sciences, Dairy Science or Poultry Industry if interested in veterinary medicine; and major in Biochemistry, Biological Sciences or Microbiology if interested in medical technology. Students interested in professional schools which do not generally require a baccalaureate degree for entrance (chiropractic, nursing, optometry, pharmacy, or physical therapy) choose a wide variety of majors on campus.

Since specific requirements vary for each professional school, students should contact the schools directly or consult with the Chairman of the Health Professions Guidance and Evaluation Committee.
Preprofessional Advising

Students applying to professional schools in the health sciences (e.g., dental, medical, veterinary school) have need of current information in order to be competitive for admission. A Health Professions Guidance and Evaluation Committee has been established to assist students, regardless of their major, in all phases of their preparation. It helps identify the appropriate health profession, suggests the necessary preparatory courses, and develops the proper strategy for entrance. The committee lends advising materials, critiques personal statements connected with applications, interviews in order to write letters of evaluation, and helps prepare students for interviews at professional schools. If necessary, alternate careers are suggested.

The Committee consists of 14 faculty from the departments of Animal Sciences and Industry, Biological Sciences, Chemistry, Mathematics, Physical Education and Recreation Administration, and Physics and a staff member from the Counseling Center. For more information about the pre-health professions program at Cal Poly, contact the departments noted above or: Chairman of the Health Professions Guidance and Evaluation Committee, School of Science and Mathematics, Cal Poly, San Luis Obispo, CA 93407; phone (805) 756-2226.

Chiropractic

Students only need to complete two years of preprofessional work prior to admission to chiropractic school. All accredited programs require identical course work. For more information consult the latest edition of "Chiropractic State of the Art" published by the American Chiropractic Association (1916 Wilson Blvd., Arlington, VA 22201). The following Cal Poly courses meet the minimum preparation:

- CHEM 127, 128, 129, 316, 317, 318
- ENGL 114, 125, 215/218
- PHYS 121, 122, 123
- PSY 201/202, 304
- ZOO 131, 132, 237, 300
- 2 courses in Social Science or Humanities

Dentistry

Students complete three to four years of preprofessional course work prior to admission to dental school. For exact prerequisites check individual catalogs or the latest edition of "Admissions Requirements of U.S. and Canadian Dental Schools" published by the American Association of Dental Schools (1625 Massachusetts Avenue, N.W., Washington, D.C. 20036). The Dental Aptitude Test (DAT) should be taken at least one year prior to the projected date of admission. Students usually apply to 8-12 schools. The following Cal Poly courses meet the minimum preparation:

- CHEM 127, 128, 129, 316, 317, 318
- ENGL 114, 125, 215/218
- PHYS 121, 122, 123
- PSY 201/202, 307
- ZOO 131, 132, 133

Medical Technology (Clinical Laboratory Technology)

Students need to complete a baccalaureate degree, which includes the specified course work in order to qualify for the required twelve-month medical technology traineeship. The microbiology major (medical technology concentration) offers excellent preparation for a traineeship and faculty in the Biological Sciences Department serve as knowledgeable advisers. The following Cal Poly courses meet the minimum preparation:

- BACT 224, 225, 423
- BOT 121
- CHEM 127, 128, 129, 326, 328, 331
- PHYS 121, 122, 123
- ZOO 131, 426, 428

Medicine (Allopathic, Osteopathic, Podiatric)

Students generally complete three to four years of preprofessional course work prior to admission to medical school. For exact prerequisites, check individual catalogs or for allopathic medicine, the latest edition of the "Medical School Admissions Requirements, U.S.A. and Canada" published by the Association of American Medical Colleges (One Dupont Circle, N.W., Washington, D.C. 20036) or for osteopathic medicine, the latest edition of "The Education of the Osteopathic Physician," published by the American Association of Colleges of Osteopathic Medicine (6110 Executive Blvd., Suite 405, Rockville, MD 20852). There is no similar general publication for podiatric medical colleges. For allopathic and osteopathic schools the Medical College Admissions Test (MCAT) must...
Special Programs and Resources

be taken at least one year prior to the projected date of admission. However, for some podiatric schools, the MCAT can be taken as late as the Spring of the year of projected admission. Students usually apply to 8-30 allopathic schools, or 3-6 osteopathic schools or 2-6 podiatric schools. The following Cal Poly courses meet the minimum preparation:

- CHEM 127, 128, 129, 316, 317, 318
- ENGL 114, 125, 215/218
- MATH 141, 142
- PHYS 121, 122, 123
- ZOO 131, 132, 133

Nursing

Two years are usually required to complete prerequisites prior to transferring to community college, hospital diploma, or baccalaureate nursing programs. Prerequisites vary greatly from program to program and students should consult individual catalogs or the latest edition of “Baccalaureate Education in Nursing: Key to a Professional Career in Nursing” published by the National League for Nursing (10 Columbus Circle, New York, N.Y. 10019). A professional exam may be required for entrance. The following Cal Poly courses meet the minimum preparation:

- BACT 221
- CHEM 127, 128, 326, 328
- ENGL 114, 125
- FSN 210
- PSY 201/202
- SOC 105
- ZOO 131, 237, 331, 332, 340

Occupational Therapy

Professional training occurs at one of three California institutions, Loma Linda University (B.S. program), San Jose State University (B.S. program) and University of Southern California (B.S. and M.S. program). Depending upon the type of program, applicants generally complete two to four years of preprofessional course work. Individual schools should be contacted for their specific requirements. Applicants are expected to be proficient in arts and crafts activities as well as to have experience in the field. The following Cal Poly courses meet the minimum preparation:

- PSY 201/202
- SOC 105 or ANT 201
- ZOO 131, 237, 331, 332, 340

Optometry

Students generally complete three to four years of preprofessional course work prior to acceptance to optometry school. The Optometry Admissions Test (OAT) is required for entrance. For exact prerequisites, check individual catalogs or the latest edition of “Admissions to Schools and Colleges of Optometry” published by the American Optometric Association (243 N. Lindbergh Blvd., St. Louis, MO 63141). The following Cal Poly courses meet the minimum preparation:

- BACT 221
- CHEM 127, 128, 129, 316, 317,
- ENGL 114, 125, 215/218
- MATH 141, 142
- PHYS 121, 122, 123
- PSY 201/202
- STAT 211, 212
- ZOO 131, 132, 133, 237, 331, 332, 326
- 1 year of Social Science

Pharmacy

Students generally complete two to three years of preprofessional course work prior to admission to pharmacy school. The Pharmacy College Admissions Test (PCAT) may be required. For exact prerequisites, check individual catalogs or the latest edition of “Pharmacy School Admission Requirements” published by the American Association of Colleges of Pharmacy (4630 Montgomery Ave., Suite 201, Bethesda, MD 20814). Students usually apply to 2 to 3 schools. The following Cal Poly courses meet the minimum preparation:

- BACT 221
- CHEM 127, 128, 129, 156, 316, 317, 318, 331
- ECON 211, 212
- ENGL 114, 125, 215/218
- MATH 120, 141, 142
- PHYS 121, 123
- PSY 201/202, 301
- SPC 201/202
- ZOO 131, 132, 133

Physical Therapy

Currently professional training occurs at either the Certificate, Baccalaureate or Graduate level. There is no one publication that lists the general requirements for all Physical Therapy schools;
therefore, applicants should consult individual catalogs. Applicants are expected to have considerable experience in the field. Graduate programs require satisfactory scores on the Graduate Record Examination (GRE). The following Cal Poly courses meet the minimum preparation:

**BACT 221**
**CHEM 127, 128, 129, 326**
**CSC 110**
**PE 302, 303, 402**
**PHYS 121, 122, 123**

**Physician Assistant**

Physician Assistant (P.A.) programs generally require one to two years of undergraduate course work and one to two years of patient care experience. Each school has its own special requirements, thus students should consult individual catalogs or the latest edition of the “National Health Practitioner Program Profile” published by the Association of Physician Assistant Programs (2341 Jefferson Davis Highway, Suite 700, Arlington, VA 22202). The following Cal Poly courses meet the minimum preparation:

**BACT 221**
**ENGL 114**
**MATH 118**

**Veterinary Medicine**

Students generally complete three to four years of preprofessional course work prior to admission to veterinary school. In the past, only the veterinary school at U.C. Davis accepted applicants from California, but recently California residents have been accepted to several out-of-state veterinary schools, both public and private. For exact prerequisites and residency requirements, check individual catalogs or the latest edition of “Veterinary Medical School Admission Requirements in the United States and Canada” published by Betz Publishing Company, Inc. (P.O. Box 34631, Bethesda, MD 20817). Generally, the veterinary colleges expect applicants to have at least two months of veterinarian supervised experience preferably with both large and small animals. A professional exam is usually required for entrance. The following Cal Poly courses meet the minimum preparation:

**ASCI 111/112/113/114, 202**
**BACT 221**
**BIO 303**
**CHEM 127, 128, 129, 316, 317, 318**

**INSERVICE TRAINING IN AGRICULTURE**

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

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

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

**RESEARCH AND PROJECT INVOLVEMENT**

Faculty actively seek grants and contracts for research and development activities. These sponsored projects enhance the educational program by bringing to the campus state-of-the-art equipment and hundreds of thousands of dollars for undergraduate and graduate student research support.
Students who wish to become involved in significant applied research and development activities on the leading edge of their disciplines are advised to contact faculty members in their programs who have won grants and contracts and seek to be included as a part of the project team.

ROBERT E. KENNEDY LIBRARY

The Robert E. Kennedy Library provides a variety of comfortable and attractive environments for study, research, and browsing. The building features an interior courtyard design, open stack accessibility, and individual study stations. The Library collection contains over two million bibliographic items. The 700,000-volume book collection is supplemented by periodicals, art prints, nearly 1,500,000 microforms, senior projects, government documents, maps, audio visual materials, and various special collections.

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

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

The Learning Resources and Curriculum Department contains a variety of collections: the library’s audiovisual collection which consists of study prints, fine art prints, color slides, audio and video cassettes, video discs, and other non-print media; computer software; the children’s book collection; standardized tests; elementary and secondary textbooks; curriculum materials. The department houses the Instructional Materials Display Center of textbooks used in California’s public schools and the Curriculum Microcomputer Center.

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

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

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

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

RELATIONS WITH SCHOOLS

The Relations with Schools Office promotes Cal Poly’s academic programs, student services, and educational opportunities to prospective students and their parents, high school and community college counselors, and the general public through extensive statewide travel, on-campus special programs, outreach publications, and individual counseling and assistance. Prospective students, parents, and counselors seeking information about Cal Poly or planning to visit the campus may contact this office at (805) 756-2792 regarding materials, appointments or campus tours.
SERVICES TO VOCATIONAL AGRICULTURE

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

Other services to vocational agriculture are rendered by Communications Media Production through the Vocational Education Productions Department which produces and distributes educational materials through catalog sales to teachers nationwide.

STUDY ABROAD PROGRAMS

C.S.U. International Programs

Now in its 26th year of continuous operation, the California State University (CSU) International Programs offers students the opportunity to continue their studies overseas for a full academic year while they remain enrolled at their home CSU campus. The International Programs' primary purposes are to enable selected students to gain a firsthand understanding of other areas of the world and to advance their knowledge and skills within specific academic disciplines in pursuit of established degree objectives. Since its inception, the International Programs has enrolled nearly 9,500 CSU students.

A wide variety of academic majors may be accommodated by the 34 foreign universities cooperating with the International Programs in 16 countries around the globe. The affiliated institutions are: the University of Queensland (Australia), the University of Sao Paulo (Brazil), the universities of the Province of Quebec (Canada); the University of Copenhagen, (through DIS Study Program); the University of Provence (France); the Universities of Heidelberg and Tübingen (Germany); the Hebrew University of Jerusalem (Israel); the University of Florence (Italy); Waseda University (Japan); the Iberoamericana University (Mexico); Massey University and Lincoln University College (New Zealand); the Catholic University of Lima (Peru); National Chengchi University (Republic of China/Taiwan); the Universities of Granada and Madrid (Spain); the University of Uppsala (Sweden); Bradford, Bristol, Sheffield, and Swansea Universities and Kingston Polytechnic (the United Kingdom). Information on academic course offerings available at these locations is in the International Programs Bulletin which may be obtained from the International Programs representative on campus.

To be selected to participate, students must have upper division or graduate standing at a CSU campus by the time of departure, possess a cumulative grade point average of 2.75 or 3.00, depending on the program, for all college level work completed at the time of application, and have completed required language or other preparatory study where applicable. Selection is competitive and is based on home campus recommendations and the applicant's academic record. Final selection is made by the Office of International Programs in consultation with a statewide selection committee.

The International Programs pays all tuition and administrative costs overseas for each of its participants to the same extent that such funds would be expended to support similar costs in California. Students assume responsibility for all personal costs, such as transportation, room and board, and living expenses, as well as for home campus fees. Because they remain enrolled at their home CSU campus while studying overseas, international Programs students earn full resident credit for all academic work completed while abroad and remain eligible to receive any form of financial aid (other than work-study) for which they can individually qualify.
Many Cal Poly departments support the concept of international education and encourage students to investigate opportunities for overseas study. Information and application materials may be obtained from the International Programs Office, Administration Building 317, or by writing to The California State University International Programs, 400 Golden Shore, Long Beach, California 90802-4275. Applications for the 1991-92 academic year overseas must be submitted by February 1, 1991.

**Cal Poly International Programs**

**London Study Program**
The university sponsors a London Study Program as a means to enrich the General Education and Breadth experience. Students and Cal Poly faculty live in London while they use the city’s cultural resources as a laboratory for their study of the arts, humanities, and social sciences. Interested students are encouraged to discuss with their advisers a plan for meeting 12–15 units of GEB Area C and D requirements in a spring or summer quarter, preferably in the sophomore or junior year. Detailed information is included in brochures available at the University Union Information Desk.

**Paris Study Program**
The curricular focus of the Paris Program is on French language and culture. Typically, instruction is offered in intermediate and advanced language, in a French culture course, and in a general education humanities course in art or literature. Students live with French families during their fall quarter in Paris. Detailed information is available from the Foreign Languages and Literatures Department.

**TEACHER PREPARATION PROGRAMS**

Cal Poly is authorized by the Commission for Teacher Credentialing to prepare candidates and recommend for the following credentials:

- Multiple Subjects Instruction (as commonly practiced in California elementary schools)
- Single Subject Instruction (as commonly practiced in California high schools and most junior high schools)
- Adapted Physical Education Specialist
- Agriculture Specialist
- Administrative Services
- Pupil Personnel Services
- Reading Specialist
- Special Education (Learning Handicapped Specialist, Severely Handicapped Specialist, and Resource Specialist Certificate)
- Multiple Subjects Credential Bilingual Emphasis (Spanish)

The Teacher Education Credential Program consists of the coursework and field experiences, including student teaching, required to obtain the Preliminary and Professional Clear Teaching Credentials. Guidelines for credentials are established by the State of California’s Commission on Teacher Credentialing (CTC). Admission to the university does not guarantee admission to the teacher education program.

For more information regarding Teaching Credentials, please refer to the Education Department, page 348.

**TWO-YEAR TECHNICAL CURRICULA IN AGRICULTURE**

Candidates for a technical certificate complete 98 quarter units of courses approved by the department granting the certificate, are in residence at least two quarters immediately preceding graduation, earn not less than 32 quarter units in residence, and earn a total number of grade points at least equal to twice the number of units attempted. For more information, see page 147.
UNIVERSITY DEVELOPMENT

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

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

Several advisory groups provide valuable help in meeting university needs. Members of the President’s Cabinet and the Major Giving Societies are active in developing financial support from individuals and corporations. Advisory councils of the various schools of the university provide additional assistance.

The athletic development program is designed to assist in funding athletic scholarships and other athletic program needs such as equipment purchases, recruiting expenses, and special recognition activities not included in the university’s budget. To facilitate this effort, the Mustang Boosters has been formed. The primary purpose of this statewide organization is to provide funds from private contributions for scholarships and other needs of student athletes. Mustang Boosters membership is open to all alumni, friends, businesses, corporations or individuals interested in Cal Poly athletics. The Boosters organization is administered by a board of directors with assistance from staff of the University Relations Office.
Student Activities and Services

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STUDENT ACTIVITIES

THE ASSOCIATED STUDENTS INC.
Making Things Happen

The Associated Students, Inc. is a nonprofit corporation, owned and operated by students. All Cal Poly students are shareholders in the ASI by virtue of the fees they pay each quarter. This fee helps support recreational activities, campus entertainment, the Children's Center, and the multitude of cultural, educational and leisure activities available to students.

Any student interested in working with the corporation is invited to do so by: running for the position of ASI President, Chairman of the Board, Board of Directors or School Council representative; applying for appointment to the Executive Staff, Finance or Personnel Policy Committees, Union Executive Committee, or a host of university-related committees; or joining organizations such as Program Board, Rose Float, Poly Royal, or special-interest clubs.

CAMPUS ORGANIZATIONS

There are over 350 clubs and organizations available at Cal Poly, encouraging students to become active in campus life, including departmental and professional organizations, hobby-interest clubs, honor societies, service clubs, student government, sororities and fraternities, residence groups, ethnic groups, religious faith groups and more.

CHILDREN'S CENTER

The Cal Poly Children's Center provides child care and family services for student families. Under the auspices of the Associated Students, Inc., the center offers two programs—the Infant-Toddler Program and the Preschool Program. Both programs are designed to provide a comfortable, caring environment for children and their families. Child care services, health screening, nutritious meals, parent participation, education programs, family referral, and social services are available. The center also serves as a resource for campus academic programs.

FRATERNITIES AND SORORITIES

Twenty-two national fraternities, nine national sororities, and two local fraternities have chapters at Cal Poly.

Fraternities

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<tr>
<th>Fraternity</th>
<th>Alpha Epsilon Pi</th>
<th>Alpha Gamma Rho</th>
<th>Alpha Phi Alpha</th>
<th>Beta Theta Pi</th>
<th>Delta Chi</th>
<th>Delta Sigma Phi</th>
<th>Delta Tau</th>
<th>Delta Upsilon</th>
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<tr>
<td>Kappa Alpha Psi</td>
<td>Kappa Sigma</td>
<td>Lambda Chi Alpha</td>
<td>Nu Alpha Kappa</td>
<td>Omega Psi Phi</td>
<td>Phi Beta Sigma</td>
<td>Phi Delta Theta</td>
<td>Phi Kappa Alpha</td>
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<tr>
<td>Phi Kappa Psi</td>
<td>Sigma Alpha Epsilon</td>
<td>Sigma Chi</td>
<td>Sigma Nu</td>
<td>Sigma Phi Epsilon</td>
<td>Sigma Pi</td>
<td>Tau Kappa Epsilon</td>
<td>Theta Chi</td>
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Sororities

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<th>Sorority</th>
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<th>Alpha Kappa Alpha</th>
<th>Alpha Omicron Pi</th>
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<td>Alpha Phi</td>
<td>Delta Sigma Theta</td>
<td>Gamma Phi Beta</td>
<td></td>
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<tr>
<td>Kappa Alpha Theta</td>
<td>Sigma Kappa</td>
<td>Zeta Tau Alpha</td>
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</tbody>
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Most of the fraternities and sororities own or lease buildings near the Cal Poly campus. Some fraternities provide lodging and meals for their members and pledges; the sororities house approximately fifteen members each. Students interested in seeking affiliation with a sorority or fraternity should contact the Coordinator for Greek Affairs at the Student Life and Activities Department.
ROSE FLOAT

When the estimated 300-million viewers watch the Tournament of Roses Parade each year, they get a glimpse of the talent and ingenuity of Cal Poly students. Working cooperatively with students from Cal Poly, Pomona, members of the Rose Float Committee do everything from designing, constructing, and decorating the float to driving it down the parade route. The Cal Poly entry, although the only float produced solely by students, has won awards for 36 of their past 39 entries.

THE PROGRAM BOARD

Fun and Entertainment

Entertainment and leisure activities are some of the special services of the Associated Students Inc., handled through an organization known as the Program Board. Below is a listing of the Board’s committees that make entertainment opportunities available at Cal Poly. All are run by students and welcome new members.

- Films Committee brings movies, both old and new, to campus in a theatre setting.
- Special Events Committee sponsors a diverse program including concerts, comedy shows, acrobats and general entertainment. They also feature local talent weekly during University Hour.
- Speakers Forum arranges for speakers and panels to explore political, cultural, religious, technical and environmental issues.
- Concerts Committee books nationally and internationally-known touring groups, ranging from rock to jazz, to country and alternative sounds.
- Fine Arts Committee brings the classics to the campus in the form of professional musical ensembles, theatre and dance productions, and art exhibitions.
- Cultural Advisory Committee strives to create an environment of sensitivity and awareness to cultural diversity.
- Television Programming provides video entertainment, and members can get hands-on experience using cameras and producing programs.
- Craft Center provides a place to learn and do crafts of all kinds.
- Outings lets you get away from studying by hosting trips, helping you plan your own and providing low-cost rental equipment.

RECREATIONAL SPORTS

The Recreational Sports department offers students, faculty and staff a variety of recreational and competitive sport programs. These are designed to enrich the university experience by providing the opportunity for you to exercise, socialize and, as a result, stay healthy. Offerings in the following areas provide something for just about everyone:

Intramural Team Sports provide competitive and structured league play in over 16 sports each year in women’s, men’s and coed divisions at varying competitive levels.

Recreation Facilities are open evenings, weekends and noon hours to allow participants to develop their own self-paced and directed recreation and fitness programs. Use of these facilities is free to students with a valid I.D. card.

Indoor and outdoor swimming pools 2 weight rooms
6 volleyball courts 6 racquetball courts
14 outdoor tennis courts 1 400-meter track
3 indoor basketball courts 3 fields for soccer,
16 outdoor basketball courts softball, football
Student Activities

Fitness and Leisure Programs provide instructional opportunities in a number of non-credit classes, ranging from aerobics and swimming to massage and sign language.

Special Events and Tournaments allow students to test their skills at almost any competitive level each quarter in a variety of individual, dual and team sport areas.

Sport Clubs are organized by students to provide in-depth sport experience for all interested athletes. Twenty-seven sport clubs currently provide instructional, recreational and/or competitive team opportunities in activities such as bowling, fencing, sailing, scuba, cycling, volleyball, ultimate frisbee, water polo, martial arts, crew, soccer, lacrosse, rugby, windsurfing, skiing.

STUDENTS SERVING IN THE COMMUNITY

Cal Poly strongly encourages students to develop a sense of social responsibility by being involved in community service activities as part of the university's educational and developmental experience. Students who contribute 120 hours or more of service while enrolled at Cal Poly are eligible for notations documenting service on their official university transcripts.

A significant number of students are working to help improve the quality of life in the community. Many combine service with their academic programs in a wide variety of ways through class projects, internships, senior projects, and special problems courses as well as through involvement in academic centers and institutes.

Through Student Community Services and other student-sponsored service activities, volunteers become special PALS to kids from single-parent homes, work with developmentally disabled people and assist with Special Olympics. They tutor children in grades K through 12 in many subject areas and help adults learn to read and write. They "adopt" senior citizens, help out in programs for people who are homeless, raise funds for local human service agencies and lend a hand in large and small emergencies.

Students obtain information about community service opportunities available to individuals and to groups through the Community Connection in the Office of Student Life and Activities located in the University Union. This computerized data base helps them find jobs of interest to them at the local, national and even international level.

THE UNIVERSITY UNION

The Julian A. McPhee University Union is a place for students, faculty, staff, alumni and guests to meet, relax and exchange ideas. It also provides a number of vital campus services including eating establishments, the Information Desk, Galerie, Travel Center, Games Area, Craft Center, Second Edition (copy center), Escape Route, T.V. Lounge, Ticket Office, conference rooms, check cashing, Polywood (video tape and equipment rentals), Chumash Auditorium, Office of Student Life and Activities, Student Executive Offices, and the ASI and University Union Business Office.

Craft Center

Students can use, for little or no charge, equipment such as a potter's wheel, ceramic glazes, batik waxes and dyes, darkroom facilities, wood lathes, and hand and power tools. Between 10 and 20 low-cost courses are offered each quarter, such as woodworking, stained glass, batik, silkscreening, lapidary, bike repair, calligraphy and ceramics. An extensive library with information on a variety of leisure crafts and skills is also available.

Escape Route

Opportunities for outdoor activities are offered by the ASI Outings Committee through the Escape Route. An extensive collection of books, information on state and national parks, and topographical maps, are available as are resources on snow camping, bicycle touring, back-packing, canoeing, rock climbing, and other activities. Outdoor equipment such as tents, sleeping bags, cross country skis and even ice cream makers can be rented at minimal cost.
The Galerie
The Galerie is a non-profit, educational arts facility which offers the first-hand experience of contemporary and historical works of art in a variety of media. The Galerie program is considered to be an integral part of education at the university, providing direct involvement in the arts through education, cultural and social interaction, interdisciplinary programs, and student employment.

Multi-Cultural Center
The Multi-Cultural Center is a place for students to celebrate their heritage and connect with people from diverse cultural backgrounds. As a student center the MCC provides multi-cultural programs, a library of international newspapers and magazines, assistance to 20 ethnic clubs on campus, and a place for students to drop in, read, and learn more about themselves and the world around them.

Travel Center
The Travel Center is a full service agency that can assist with all travel arrangements including air, train, cruises, passport applications, Eurail passes, American Youth Hostel Cards, International ID cards and much more. Student travel counselors can help you plan trips to just about anywhere in the world.

WEEK OF WELCOME
WOW stands for Week of Welcome—Cal Poly’s unique orientation program. The program is planned and operated by students for students, with a peer-helping method that creates a fun, comfortable atmosphere during the orientation. Week of Welcome takes place before classes begin in September. Unlike many universities’ programs which deal strictly with academics during their orientations, WOW also assists new students with the social and emotional transition to university life. Tours of the campus and surrounding areas are provided so that, by the end of the week, students feel very much at home.

WOMEN’S WEEK
Cal Poly hosts Women’s Week each year during Winter Quarter. The week has come to include lectures, debates and dialogues on historic and contemporary issues, as well as music, art and dramatic presentations. Women’s Week is a university-wide event in which faculty, staff and students work as planners and presenters or simply enjoy attending the events.
STUDENT SERVICES

Cal Poly provides a number of programs and services designed to assist students to gain the most from their college experience. Some of the services are directed toward group activities, others toward helping students on an individual basis. Programs and services aid students in overcoming difficulties, while supporting and encouraging intellectual and personal development.

COOPERATIVE EDUCATION AND PLACEMENT SERVICES

A centralized service is available to all students and alumni of the university. The C.E.P.S. staff, faculty and instructional departments work together in assisting students to obtain the most suitable employment consistent with their preparation and experience. To this end, a full complement of programs and services are available under the categories of Student Employment, Cooperative Education and Career Placement.

Student Employment

On campus and off campus part-time and summer employment opportunities are available to all currently enrolled students. Students who are taking a quarter off or alumni may also be eligible for services. All opportunities, as well as specialized job seeking skills workshops, are available on a first-come, first-serve basis throughout the year. In addition to the walk-in, self-selection service, a special effort is made to place students in career related part-time and/or summer employment through the Work Experience and Summer Employment programs. Job information and listings from throughout California and the Western United States are available to students along with a limited number of on-campus interviews. Because of the developmental impact this service has on a student's future career direction, students are encouraged to participate as early in their college experience as possible.

Cooperative Education

Cooperative Education is designed to meet unique educational needs of students by providing practical work experience directly related to academic fields of study and career objectives through alternating classroom study with on-site work experience in business, industry and governmental agencies throughout the nation. Students participating in Cooperative Education are given the opportunity to work with professionals in their fields of study and to explore career choices from the vantage point of the work place. It is especially beneficial for students who wish to expand their employment opportunities after graduation while at the same time help to finance a portion of their formal education at Cal Poly. Students who participate earn academic credit, receive competitive wages, gain marketable knowledge, and develop a sense of maturity and self confidence. Generally, assignments are six months in duration.

Students with a GPA of 2.0 or higher and who have completed their freshman year (or one quarter in residence for transfer students) are eligible to register and begin the Co-op job search process. Opportunities for students are primarily located in California and the Western States; however, placement is not limited to this region. Students may choose to consider other parts of the United States or even abroad. Staff and faculty continually seek new contacts in order to provide appropriate employment for interested students. Students will receive on-the-job evaluations by their immediate supervisors and by the university Co-op coordinator, write a term paper, do a task analysis, maintain a log of activities, and attend a debriefing session with their Co-op coordinator at the conclusion of their assignment.

It is a goal to enable all students to benefit from the Cooperative Education experience. Interested students should stop by the C.E.P.S. Center for further information.
Career Placement

Every prospective graduate of Cal Poly should register with C.E.P.S. no later than the first quarter of their senior year. Teaching credential candidates should register at least one quarter prior to the initial student teaching assignment. Through workshops and individual advisement, students are guided through the development and implementation of a job search strategy that includes clarifying the career objective, how to identify, research and contact potential employers, preparation of the resume and Educational Placement File, Basic and Advanced Interview preparation, as well as many other aspects of the job search. Employer contacts may be generated through the very popular on campus interview program, weekly vacancy announcements, career and job fairs, as well as professional directories and publications geared toward the hiring of new college graduates. Students also are encouraged to take advantage of the Employer Resource Library which contains a variety of career opportunity brochures, annual reports on the placement of graduates, a summary of job listings by major, current salary offer information, and occupational trend reports.

COUNSELING SERVICES

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

Faculty and staff can consult with the Center for help with such areas as group communication, organizational and group processes, career education, learning styles, test construction and other skills which will improve the learning environment for students. Counseling, Testing, and Career Services are located in Jespersen Hall, next to Mustang Stadium. The Learning Assistance Center is located in Chase Hall across the street from Jespersen.

FOOD SERVICE

Foundation Food Service prepares nutritious and delicious meals for Cal Poly's 2,800 residence hall students and nearly 6,000 other campus customers. With eleven food operations located throughout the campus, Food Service offers everything from snacks to full meals to campus-grown produce. Four dining facilities (University Dining Room, Vista Grande Cafeteria, the Sandwich Plant and the Snack Bar) provide full meal service to meal plan and cash customers. Other cash areas include the Burger Bar, Julian's, the Campus Store, the Snak Stop, The Cellar, and vending areas. Vista Grande Restaurant offers elegant sit-down service and Campus Catering is available for special events.

Meal Programs

All residence hall students and off-campus customers enjoy the flexibility of purchasing a 19- or 14-meal plan. See page 94 for meal plan requirement for residence hall students. A "4 lunch" or "Pick any 6" meal plan is available for our off-campus customers.

HEALTH SERVICES

The mission of the Student Health Center is to support the physical and mental well being of all students attending Cal Poly. The fine staff and facilities help minimize class time lost because of illness or injury. This support is provided through outpatient medical care and health education programs. These services are available to all students at no additional cost, as described below.

Basic outpatient care is available Monday through Friday, year round, 8:00 a.m. to 5:00 p.m. and includes physician and nursing services, women's health care, laboratory and x-ray services. Pharmacy items are available at cost.

Health education programs are provided by staff professionals and students trained as peer health educators. Programs include nutrition counseling, sexuality, alcohol use/abuse, oral health, and lifestyle wellness. Also available are self-help clinics on hayfever, colds, acne, and stress reduction.

Additional services are also available either by purchasing a Health Card or by paying a small fee for each service. Services include care on weekends, allergy injections, optometry, podiatry, physical therapy, physical exam, oral health, and subsidy for ambulance and emergency room. These extra services are available during fall, winter and spring quarters.
Major medical insurance coverage is strongly recommended since major medical/surgical problems cannot be treated at the Student Health Center.

HOUSING SERVICES

Residence Halls

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

The respective living groups are each facilitated by a full-time professional Coordinator of Student Development who serves as the on-site departmental representative. The Coordinators provide assistance in counseling, crisis intervention, general referral, judicial actions, and activity advising as well as supervising the hall team of student resident advisers.

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

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

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

1. New undergraduate students, summer or fall quarter, including students who have resided in campus housing for only one quarter, that being the previous spring quarter, and students designated as hardship cases by the Director of Housing, as follows:
   a. physically handicapped
   b. close relatives, i.e., a brother who has a younger brother coming to campus
   c. economic situations verified by Financial Aid
   d. educational reasons verified by academic departments

2. Returning students by class level (determined by units completed), as follows:
   a. previous year freshmen
   b. previous year sophomores
   c. previous year others

3. Students who are 30 years of age or older may be offered housing by permission of the Director of Housing.

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

Living Expenses for Students Living in Campus Residence Halls

(Since Change)

Room (academic year) annual license required (double occupancy) $1,941–2,038
Board, annual (mandatory) (academic year) 1,701–1,953
Housing security deposit (payable prior to occupancy) 20
Room and board payable in advance. Installments may be made and a service fee shall be charged.

Students furnish their own bed spreads and study lamps.
Two meal plans are available. On-campus residence hall students must choose one of these two plans. The 19-meal plan provides a maximum of 19 meals per week at an approximate cost of $1,755 prepaid for the academic year. The 14-meal plan provides for a maximum of 14 meals per week at an approximate cost of $1,626 prepaid for the academic year. Students may change from one meal plan to another if written notification is given prior to an installment due date to be effective the following academic quarter.

Community Housing

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

STUDENT ACADEMIC SERVICES

Through Student Academic Services, eligible students can utilize a network of academic services, advisers and activities, as well as referrals to additional campus resources. The goal of this department is to ensure academic success and graduation for students from backgrounds that have traditionally been underrepresented within the California State University system. Student Academic Services incorporates the offices of the Educational Opportunity Program, Disabled Student Services, Minority Engineering Program, Student Affirmative Action, Student Support Services, Summer Institute and Upward Bound.

Student Academic Services is a comprehensive program of outreach, transition and retention services that are all designed to support academic excellence at Cal Poly. Through developmental and community college outreach, Student Academic Services staff assist students in academic planning, preparation and application for admission to Cal Poly. Once accepted to the university, eligible students may attend new student academic orientations for assistance with registration and academic advisement, as well as seminars with academic deans, financial aid, housing and other university offices.

The Summer Institute provides a transitional college environment for a group of selected students to preview or review key academic coursework prior to the first quarter of enrollment.

Academic advisers work with each of the seven academic schools to fulfill a unique role for eligible students in the achievement of academic excellence, providing assistance with class scheduling, the diagnosis of academic skills, graduation planning, career clarification and related personal specialized learning and study skills. Specialized instructional and tutorial assistance is available in a variety of small group and individual study settings.

Students with permanent or temporary disabilities are eligible to receive support services through Disabled Student Services, following an intake interview and necessary verification.

Additionally, Student Academic Services is useful as a referral center for students’ academic and personal questions and concerns.
Intercollegiate Athletics is administered as a separate department, though students participating on its teams receive academic credit for their efforts in courses offered through the Physical Education and Recreation Administration Department.

All the teams, with the exception of wrestling and women’s volleyball, compete at the NCAA Division II level. Wrestling and women’s volleyball compete at the Division I level. The football program is a member of the Western Football Conference. Wrestling and women’s volleyball compete in the Big West Conference. The balance of the women’s and men’s programs are in the California Collegiate Athletic Association (CCAA). Through the end of the 1984-85 year, Cal Poly has won 23 NCAA Division II team titles.
Admissions

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

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

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

Undergraduate Application Procedures

Prospective students, applying for part-time or full-time programs of study, in day or evening classes, must file a complete application as described in the admissions booklet. The $55 nonrefundable application fee should be in the form of a check or money order payable to “The California State University” and may not be transferred or used to apply to another term. Applicants need file only at their first choice campus. An alternative choice campus and major may be indicated on the application, but applicants should list as an alternative campus only that campus of The California State University that they can attend. Generally, an alternative major will be considered at the first choice campus before an application is redirected to an alternative choice campus unless the alternative major is impacted. Applicants will be considered automatically at the alternative choice campus if the first choice campus cannot accommodate them.

IMPACTED PROGRAMS

The CSU designates programs to be impacted when more applications are received in the first month of the filing period than the spaces available. Some programs are impacted at every campus where they are offered; others are impacted at some campuses but not all. You must meet supplementary admissions criteria if applying to an impacted program.

The CSU will announce before the opening of the fall filing period which programs are impacted and the supplementary criteria campuses will use. That announcement will be published in the CSU School and College Review, distributed to high school and college counselors. We will also give information about the supplementary criteria to program applicants.

You must file your application for admission to an impacted program during the first month of the filing period. Further, if you wish to be considered in impacted programs at two or more campuses, you must file an application to each. Nonresident applicants are given lower priority than residents for admission to impacted programs.

Supplementary Admission Criteria

Each campus with impacted programs uses supplementary admission criteria in screening applicants. Supplementary criteria may include ranking on the freshman eligibility index, the overall transfer grade point average, and a combination of campus-developed criteria. If you are required to submit scores on either the SAT or the ACT, you should take the test no later than November if applying for fall admission.

The supplementary admission criteria used by the individual campuses to screen applicants appear periodically in the CSU School and College Review and are sent by the campuses to all applicants seeking admission to an impacted program.
Unlike unaccommodated applicants to locally impacted programs who may be redirected to another campus in the same major, unaccommodated applicants to systemwide impacted programs may not be redirected in the same major but may choose an alternative major either at the first choice campus or another campus.

Application Filing Periods

<table>
<thead>
<tr>
<th>Terms in 1989-90</th>
<th>Applications First Accepted</th>
<th>Filing Period Duration</th>
<th>Student Notification Begins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer Qtr. 1990</td>
<td>Feb. 1, 1990</td>
<td>Each campus accepts applications until capacities are reached. Many campuses limit undergraduate admissions in any enrollment category because of overall enrollment limits. If applying after the initial filing period, consult the campus admissions office for current information.</td>
<td>April 1990</td>
</tr>
<tr>
<td>Fall Qtr. 1990</td>
<td>Nov. 1, 1989</td>
<td></td>
<td>Feb. 1989</td>
</tr>
<tr>
<td>Winter Qtr. 1991</td>
<td>June 1, 1990</td>
<td></td>
<td>Aug. 1990</td>
</tr>
</tbody>
</table>

Application Acknowledgment

You may expect to receive an acknowledgment of your application from your first choice campus within two to four weeks of filing the application. A notice that space has been reserved for you will also include a request that you submit the records necessary for the campus to evaluate your qualifications. You may be assured of admission if the evaluation of your qualifications indicates that you meet CSU and campus admission requirements. Such a notice is not transferable to another term or to another campus.

Hardship Petitions

The campus has established procedures for consideration of qualified applicants who would be faced with extreme hardship if not admitted. Petitioners should write the Admissions Office regarding specific policies governing hardship admission.

Undergraduate Admission Requirements

FRESHMAN REQUIREMENTS

You will qualify for regular admission as a first-time freshman if you

(1) are a high school graduate,

(2) have a qualifiable eligibility index (see section on Eligibility Index), and

(3) have completed with grades of C or better the courses in the comprehensive pattern of college preparatory subject requirements (see “Subject Requirements” and “Phase-in of the Subject Requirements” on page 86 of this catalog). Courses must be completed prior to the first enrollment in The California State University.

Eligibility Index

The eligibility index is the combination of your high school grade point average and your score on either the American College Test (ACT) or the Scholastic Aptitude Test (SAT). Your grade point average is based on grades earned during your final three years of high school (excluding physical education and military science) and bonus points for approved honors courses (see “Honors Courses” on page 86 of this catalog). CSU may offer you early, provisional admission based on your work completed through the junior year of high school and planned for your senior year.
Admissions

You can calculate the index by multiplying your grade point average by 800 and adding your total score on the SAT. Or, if you took the ACT, multiply your grade point average by 200 and add ten times the ACT composite score. If you are a California high school graduate (or a resident of California for tuition purposes), you need a minimum index of 2800 using the SAT or 694 using the ACT; the Eligibility Index Table illustrates several combinations of required test scores and averages.

If you neither graduated from a California high school nor are a resident of California for tuition purposes, you need a minimum index of 3402 (SAT) or 842 (ACT).

Applicants with grade point averages of 3.00 or above (3.60 for nonresidents) are exempt from the test requirement. Cal Poly, San Luis Obispo, however, requires test scores from all freshman and lower division applicants.

You will qualify for regular admission when the university verifies that you have a qualifiable eligibility index and will have completed the comprehensive pattern of college preparatory subjects and, if applying to an impacted program, meet supplementary criteria. You will still qualify for regular admission, on condition, if you are otherwise eligible but are missing a limited number of the required subjects (see "Phase-in" section on page 87 of this catalog). "Conditional admission" is an alternative means to establish eligibility for regular admission. Please consult a counselor if you have questions.

Graduates of secondary schools in foreign countries must be judged to have academic preparation and abilities equivalent to applicants eligible under this section.

Sample Eligibility Index Table for California High School Graduates or Residents of California

<table>
<thead>
<tr>
<th>GPA</th>
<th>ACT Score</th>
<th>SAT Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.00*</td>
<td>1200</td>
<td>30</td>
</tr>
<tr>
<td>2.20</td>
<td>1040</td>
<td>26</td>
</tr>
<tr>
<td>2.40</td>
<td>880</td>
<td>22</td>
</tr>
<tr>
<td>2.60</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>2.80</td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>3.00**</td>
<td></td>
<td>720</td>
</tr>
<tr>
<td></td>
<td></td>
<td>560</td>
</tr>
</tbody>
</table>

* Below 2.00 does not qualify for regular admission.
** 3.00 and above qualifies with any score.

Honors Courses

Grades, in up to eight semester courses designated as honors courses in approved subjects and taken in the last two years of high school, receive additional points in grade point average calculations. Each unit of A in approved courses will receive a total of 5 points; B, 4 points; C, 3 points; D, 1 point; and none for F grades.

Subject Requirements

The California State University requires that first-time freshman applicants complete, with grades of C or better, a comprehensive pattern of college preparatory study totaling 15 units. A "unit" is one year of study in high school.

- English, 4 years.
- Mathematics, 3 years: algebra, geometry, and intermediate algebra.
- U.S. history or U.S. history and government, 1 year.
- Science, 1 year with laboratory: biology, chemistry, physics, or other acceptable laboratory science.
- Foreign language, 2 years in the same language (subject to waiver for applicants demonstrating equivalent competence).
- Visual and performing arts, 1 year: art, dance, drama/theater, or music.
- Electives, 3 years: selected from English, advanced mathematics, social science, history, laboratory science, foreign language, visual and performing arts, and agriculture.
Phase-In of the Subject Requirements

The CSU is phasing in the freshman subject requirements and during the phase-in period will admit, on condition, applicants who meet all other admission requirements but are missing a limited number of the required subjects. Students admitted on condition must make up missing subjects after enrolling in the CSU.

The phase-in schedule is:

Fall 1990 - Summer 1991: at least 12 of the required 15 units, including at least 3 of the units required in English and 2 of the units required in mathematics.

Fall 1991 - Summer 1992: at least 13 of the required 15 units, including at least 3 of the units required in English and 2 of the units required in mathematics.

Fall 1992 and later: full implementation of the 15-unit requirement expected.

Waiver of Foreign Language Subject Requirement

The foreign language subject requirements may be waived for applicants who demonstrate competence in a language other than English equivalent to or higher than expected of students who complete two years of foreign language study. Consult with your school counselor or any CSU campus admissions or relations with schools office for further information.

Subject Requirement Substitution for Students with Disabilities

Disabled student applicants are strongly encouraged to complete college preparatory course requirements if at all possible. If an applicant is judged unable to fulfill a specific course requirement because of his or her disability, alternative college preparatory courses may be substituted for specific subject requirements. Students who are deaf and hearing impaired, are blind and visually impaired, or have learning disabilities, may in certain circumstances qualify for substitutions for the foreign language, laboratory science and mathematics subject requirements. Substitutions may be authorized on an individual basis after review and recommendation by the applicant’s academic adviser or guidance counselor in consultation with the director of a CSU disabled student services program. Although the distribution may be slightly different from the course pattern required of other students, students qualifying for substitutions will still be held for 15 units of college preparatory study. Students should be aware that course substitutions may limit later enrollment in certain majors, particularly those involving mathematics. For further information and substitution forms, please call the director of disabled student services at your nearest CSU campus.

TRANSFER REQUIREMENTS

You will qualify for admission to the CSU as a transfer student if you have a grade point average of 2.0 (C) or better in all transferable units attempted, are in good standing at the last college or university attended and meet any of the following standards:

1. You will meet the freshman admission requirements in effect for the term to which you are applying (see “Freshman Requirements” section on page 85 of this catalog).

2. (a) You were eligible as a freshman at the time of high school graduation and have been in continuous attendance at an accredited college since high school graduation, or

   (b) You were eligible as a freshman at the time of high school graduation except for the subject requirements, have made up the missing subjects, and have been in continuous attendance in an accredited college since high school graduation.

3. You have completed at least 56 transferable semester (84 quarter) units and have made up any missing subject requirements (see “Making Up Missing College Preparatory Subjects” section). Nonresidents must have a 2.4 grade point average or better.

For this requirement, transferable courses are those designated for that purpose by the college or university offering the courses.
Making Up Missing College Preparatory Subject Requirements

Undergraduate transfer applicants who did not complete the subject requirements while in high school may make up missing subjects in any of the following ways:

1. Complete appropriate courses with a C or better in adult school or high school summer sessions.
2. Complete appropriate college courses with a C or better.
3. Earn acceptable scores on specified examinations.
4. Applicants with 56 or more semester (84 quarter) units may complete, with a C or better in each course, one of the following alternatives:
   (a) 1987 or earlier high school graduates: the CSU general education requirements in communication in the English language (at least 9 semester units) and mathematics (usually 3 semester units);
   (b) 1988 and later high school graduates: complete a minimum of 30 semester (45 quarter) units to be chosen from courses in English, arts and humanities, social science, science, and mathematics of at least equivalent level to courses that meet general education or transfer curriculum requirements. Each student must complete all CSU general education requirements in communication in the English language (at least 9 semester units) and mathematics (usually 3 semester units) as part of the 30 unit requirement.

Please consult with any CSU admissions office for further information about alternative ways to satisfy the subject requirements.

TEST REQUIREMENTS

Freshman and transfer applicants who have fewer than 56 semester or 84 quarter units of transferable college work must submit scores from either the Scholastic Aptitude Test of the College Board (SAT) or the American College Testing Program (ACT). You may get registration forms and the dates for either test from school or college counselors or from a campus testing office. Or, you may write to:

American College Program (ACT)  The College Board (SAT)
Registration Unit, P.O. Box 168  Registration Unit, P.O. Box 592
Iowa City, Iowa 52240  Princeton, New Jersey 08541

TOEFL Requirement

All undergraduate applicants, regardless of citizenship, who have not attended schools at the secondary level or above for at least three years full time where English is the principal language of instruction must present a score of 550 or above on the Test of English as a Foreign Language.

Other Admissions Information

ADULT STUDENTS

As an alternative to regular admission criteria, an applicant who is twenty-five years of age or older may be considered for admission as an adult student if he or she meets one of the following conditions:

- Possesses a high school diploma (or has established equivalency through either the Tests of General Educational Development or the California High School Proficiency Examination).
- Has not been enrolled in college as a full-time student for more than one term during the past five years.
- If there has been any college attendance in the past five years, has earned a C average or better.

Consideration will be based upon a judgment as to whether the applicant is as likely to succeed as a regularly admitted freshman or transfer student and will include an assessment of basic skills in the English language and mathematical computation.
California Residents Sixty Years of Age or Older

California residents who are sixty years of age or older may enroll in regular session courses without payment of certain specified fees and with reduction in levels of others under the provisions of this alternative to regular admissions. Enrollment is subject to the following conditions:

- Persons enrolled shall be eligible for admission as set forth in Title 5 of the California Code of Regulations.
- Persons enrolling shall be registered after regular students, on a space-available basis.

For information regarding application procedures and admissions, contact the Admissions Office.

HIGH SCHOOL STUDENTS

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

INTERNATIONAL (FOREIGN) STUDENT ADMISSION REQUIREMENTS

The CSU must assess the academic preparation of foreign students. For this purpose, "foreign students" include those who hold U.S. visas as students, exchange visitors, or in other nonimmigrant classifications.

The CSU uses separate requirements and application filing dates in the admission of foreign students. Verification of your English proficiency (see section on TOEFL Requirement for undergraduate applicants, page 88 of this catalog), financial resources, and academic performance are all important considerations in your admission. Academic records from foreign institutions must be on file at least eight weeks before registration for the first term and, if not in English, must be accompanied by certified English translations.

GRADUATE ADMISSION

For information regarding graduate application procedures and admissions, see "Graduate Studies" section of this catalog.

DETERMINATION OF RESIDENCE FOR NONRESIDENT TUITION PURPOSES

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

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

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

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

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

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

An alien may establish his or her residence, unless precluded by the Immigration and Nationality Act from establishing domicile in the United States. An unmarried minor alien derives his or her residence from the parent with whom the minor maintains or last maintained his or her place of abode.

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

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

- **Fall** ............................................................. September 20
- **Winter** .............................................................. January 5
- **Spring** ............................................................... April 1
- **Summer** ............................................................. July 1

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

There are exceptions from nonresident tuition, including:

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

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

The California State University
Office of General Counsel
400 Golden Shore
Long Beach, California 90802-4275

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

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

STATE UNIVERSITY FEE
In September 1984 the Board of Trustees adopted major new policies with regard to state required registration fees. Under the new policy, the Student Services Fee was combined with the State University Fee. The combined fee is identified as the State University Fee which is divided into two categories depending on the number of units for which a student is registered. Students may register for up to six units at the lower rate. The higher rate is charged if the total units taken exceeds six. State University Fee increases are limited to a maximum of 10% in any one year.

SCHEDULE OF FEES
Fees listed below were in effect at the time this catalog was printed and are for informational purposes only. This list is not to be used as a schedule of current fees. Unless otherwise noted, fees indicated are per quarter. Fees and tuition are subject to change without advance notice by the Trustees of The California State University. Please consult the current Class Schedule for the fees that are applicable to the quarter in which you are registering. If your check is returned by the bank for any reason, your registration may be cancelled and you will be charged a returned check processing fee.

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

Registration Fees Per Quarter
All regularly enrolled students, both undergraduate and graduate, pay registration fees determined by the number of units per quarter. Legal residents of California are not charged tuition. In addition to registration fees, nonresident and foreign students pay tuition fees.

<table>
<thead>
<tr>
<th>Units</th>
<th>0-6.0 Units</th>
<th>More than 6 Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>State University Fee</td>
<td>$142.00</td>
<td>$248.00</td>
</tr>
<tr>
<td>Associated Students Fee</td>
<td>19.00 *</td>
<td>19.00 *</td>
</tr>
<tr>
<td>Facility Fee</td>
<td>2.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Instructionally Related Activities Fee</td>
<td>8.00</td>
<td>8.00</td>
</tr>
<tr>
<td>University Union Fee</td>
<td>56.00 *</td>
<td>56.00 *</td>
</tr>
</tbody>
</table>

Total registration fees per quarter | $227.00 | $333.00 *

Late Registration
Late registration fee (See Class Schedule for dates when this fee will be assessed.) | $25.00 |

Tuition for Nonresident Students
Nonresident tuition per quarter unit | $126.00 |

Health Services, Room and Board (On-Campus)
Health fee (for optional services): Academic year | $20.00 |

* Fall quarter fee. Fees for other quarters may be slightly lower.
Room, annual license, double occupancy. Fee indicated does not include deposit or installment charge.

- Academic year: $1,941.00–2,038.00
- Summer quarter: $647.00
- Housing security deposit (payable prior to occupancy): $20.00

Meals (approximate cost)
- 19 meals per week, academic year: $1,953.00
- 14 meals per week, academic year: $1,701.00

Parking Fees
- Less than 4-wheel vehicle, 25% of listed fee:
  - Quarterly: $36.00
  - Quarterly pool (2 or more vehicles), each pool: $36.00
  - Daily permits: $1.50
  - Weekly permits: $3.60

Miscellaneous Fees
- Application fee (nonrefundable): $55.00
- Campus services card fee (Photo I.D. card, first time and replacement charge): $5.00
- Check returned for any cause: $10.00
- Extension course fees (per quarter unit):
  - Lecture and discussion: $54.00
  - Activity: $66.00
  - Laboratory: $90.00
  - Administrative (contract): $18.00
- Failure to meet administratively required appointment or time limit: $2.00 to $10.00
- Library fees: see schedule in library
- Special examination fee (per examination): cost to $25.00
- Sponsored Student Fee (per quarter): $250.00
- Summer session fee (per quarter unit): $56.00
- Thesis binding fee: $7.50
- Transcript of record (cost varies with number ordered): $4.00

REFUND OF FEES
Details concerning fees which may be refunded, the circumstances under which fees may be refunded, and the appropriate procedure to be followed in seeking refunds may be obtained by consulting Section 41803 (parking fees), 41913 (nonresident tuition), 42019 (housing charges), and 41802 (all other fees) of Title 5, California Code of Regulations. In all cases it is important to act quickly in applying for a refund. Information regarding which fees may be refunded and the appropriate procedures to follow is published in the quarterly Class Schedule in the section entitled “Additional Registration Information.” Additional information concerning any aspect of the refund of fees may be obtained from the Records Office or the University Cashier.

DEBTS OWED TO THE UNIVERSITY

Should a student or former student fail to pay a debt owed to the university, the university may withhold permission to register, to use facilities for which a fee is authorized to be charged, to receive services, materials, food or merchandise or any combination of the above from any person owing a debt” until the debt is paid (see Title 5, California Code of Regulations, Sections 42380 and 42381). For example, the university may withhold permission to receive official transcripts of grades from any person owing a debt. If a student believes that he or she does not owe all or part of an unpaid obligation, the student should contact the campus business office. The business office, or another office on campus to which the student may be referred by the business office, will review the pertinent information, including information the student may wish to present, and will advise the student of its conclusions with respect to the debt.
CREDIT CARDS
VISA and Master Charge bank credit cards may be used for the purchase of meal tickets from the University Foundation, theatre tickets from the Cal Poly Theatre Box Office, health cards from the University Health Center, Bookstore purchases and for Extended Education fees. No other use of credit cards is authorized.

PROCEDURE FOR THE ESTABLISHMENT OF A STUDENT BODY FEE
The law governing The California State University provides that a student body fee may be established by student referendum with the approval of two-thirds of those students voting. The current rate schedule for the Student Body Fee (also called the Associated Student Fee or ASI Fee) was established at California Polytechnic State University, San Luis Obispo on February 27, 1987 by Executive Order Number 503 after approval by a majority vote of students in a referendum conducted for that purpose. The same fee can be abolished by a two-thirds approval of students voting on a referendum called for by a petition signed by 10% of the regularly enrolled students (Education Code, Section 89300). The level of the fee is set by the Chancellor. An increase in the student body fee may be approved by the Chancellor only following a referendum on the fee increase approved by a majority of students voting. Student body fees support a variety of cultural and recreational programs, child care centers, and special student support programs.
FINANCIAL AID
FINANCIAL AID

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

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

The deadline for filing the Student Aid Application for California (SAAC) with the processor is March 2. Applicants must send the appropriate filing fee along with the SAAC to the processor.

TYPICAL STUDENT EXPENSES

Following is an estimate of typical expenses per quarter for the average California resident student living in campus residence halls. Charges for room and board are payable in advance or in installments. Nonresident students should be prepared to pay tuition and fees. For the 1990-91 school year nonresident tuition is $126 per unit. Please see the “Fees and Expenses” section of this catalog for more information. All State fees are subject to change upon approval by the Board of Trustees of The California State University.

Estimated Expenses per Quarter:

<table>
<thead>
<tr>
<th>Expense</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registration fees</td>
<td></td>
</tr>
<tr>
<td>Health fee (academic year)</td>
<td>333</td>
</tr>
<tr>
<td>Room and board with 14-meal ticket</td>
<td>1,402</td>
</tr>
<tr>
<td>Books and supplies (estimated)</td>
<td>158</td>
</tr>
<tr>
<td>Personal expenses and transportation</td>
<td>477</td>
</tr>
<tr>
<td>Estimated total per quarter</td>
<td>$2,390</td>
</tr>
</tbody>
</table>

ALAN PATTEE SCHOLARSHIPS

Children of deceased public law enforcement or fire suppression employees, who were California residents and who were killed in the course of law enforcement or fire suppression duties, are not charged fees or tuition of any kind at any California State University campus, according to the Alan Pattee Scholarship Act, Education Code Section 68121. Students qualifying for these benefits are known as Alan Pattee scholars. For further information contact the Admissions/Registrar’s Office, which determines eligibility.

UNIVERSITY SCHOLARSHIPS

General Information

Over 1100 scholarships a year are awarded or confirmed by the Cal Poly Scholarship Committee. Applications are received by the Financial Aid Office for the Scholarship Committee. Members review each student’s financial need, scholastic ability, participation in school and community activities, honors and organizational affiliations, and educational objectives. Some Cal Poly scholarships have additional requirements which relate to a particular concentration or field of study, residential origin, class level, and project or design portfolios.

† Beginning engineering and architecture students should be prepared to pay up to $200 in their first quarter for books and supplies.
Generally, a student must have at least an overall grade point average of 3.0 to be granted a scholarship. There are some scholarships, however, that are awarded to students with lower grade point averages if they meet certain criteria such as need, field of study, or high school. If you are in doubt about your eligibility or have not received word on your admission status to Cal Poly, be sure to apply by the filing deadline.

How to Apply

Annual Deadline Date: March 2 for the following academic year

The Cal Poly Scholarship Application (available in January from the Financial Aid Office) should be filled out completely. Two reference forms are included as part of the application and each one should be completed by an individual who can attest to the student's ability to profit from a college education, need for financial assistance, leadership abilities, and interest and participation in school activities. A parent or close relative cannot be considered as a reference. A Student Aid Application for California (SAAC) is also required and should be submitted to the processor (designating Cal Poly to receive a copy) well in advance of the March filing date, to ensure ample time for processing.

Scholarship Notifications

Typically, the Cal Poly Scholarship Committee meets in early spring to award and confirm scholarship awards. In late spring, scholarship award letters will be sent to recipients. Scholarship amount, disbursement and donor information are included. Recipients must maintain full-time enrollment status while receiving the scholarship. According to the donors' specifications, recipients of the Hessellund, Turner, VanDyke and Wrasse Scholarships will be required to have earned at least one-half the value of the scholarship during the previous year.

Scholarships are awarded for an academic year and are typically disbursed in increments each quarter. Non-attendance will result in cancellation or a prorated amount.

Unfortunately, there are not enough funds to be awarded to all students who apply for the Cal Poly scholarships. Students not selected will be notified, with the possibility of being named an alternate. Various scholarships may become available during the school year.

General Scholarships

Alumni Honor Scholarships
R. W. Andrews Scholarships
Paul and Barbara Bobberg Scholarship
Lulu Grumbles Bumphrey Scholarships
California Polytechnic State University Memorial Scholarships
California Polytechnic State University Women's Club Scholarship
Cal Poly Alumni-San Jose/South Bay Chapter Scholarships
Cal Poly Parents' Association Scholarship
California Rural Rehabilitation Scholarships
Felix Camacho-Betteravia Farms Scholarships
Herbert E. Collins Scholarships
Maurice E. Coulter Scholarship
CSU Graduate Equity Fellowship
Educational Equity Scholarships
Pat Elliot Memorial Award
Ford/EEOC Scholarships
Green and Gold Barbecue Scholarship
Regnar Hessellund Scholarships
Michelle Ann Jacobson Memorial Scholarship
Julian A. McPhee Award
Morro Bay Woman's Club Scholarships
National Pro-Am Youth Fund Scholarships
PEF/Flexible Packaging Association Scholarship
PEF Packaging Professionals Scholarship
Rose Parade Float Award
Army--ROTC
Helen V. Sandercock Scholarships
William and Adelaide Sandercock Scholarships
William B. Turner Scholarships
J. W. Van Dyke Memorial Scholarships
Mildred and Charles Wolverton Scholarships
Ed J. Zuchelli Memorial Scholarship

Agriculture

Catherine C. Adams Scholarships
Barling Memorial Scholarship
Paul L. Belveal Memorial Scholarships
Danny Bettencourt Memorial Scholarships
California Agri-Fair Scholarships
California Association of Nurserymen-Peninsula Chapter Scholarship
California Cattlewomen Scholarship
California Creamery Operators Association Scholarship
California Dairy Industries Association Scholarship
California PTA Scholarships
California State Grange Scholarships
Earl J. Cecil Educational Foundation Scholarships
Claire Davis Clark Scholarship
Rosario Curletti Scholarship
Dr. Arnold Dean Scholarship
General Dillingham Produce Industry Scholarships
Kenneth H. Easter Scholarship
Environment Industries, Inc.,— Lewis Sperber Memorial Scholarship
Paul Etchechury Memorial Scholarship
Rosemarie C. Facchini Scholarships
Gerald H. Fairbairn Scholarship
J. Cordner Gibson Scholarship
Ray Hansen Memorial Scholarships
William Randolph Hearst Foundation Scholarships
William (Ben) and Helen Holman Alumni Scholarship
Hoppy Hopkins Memorial Agricultural Sales Award
Harold G. Hull Graduate Assistantships
International Agriculture Fellowships
Corwin M. Johnson Scholarship
Richard F. Johnson Scholarship
Kings River Prune and Apricot Scholarships
Knight Brothers Scholarships
Knudsen Foundation Scholarship
E. C. Loomis and Son Scholarship
Los Angeles County Fair Association Scholarship
Lucky Stores Scholarships
William and Inez Mable Family Foundation Scholarship
Michael L. Martin Scholarship
Chester O. McCormick, Sr. Memorial Scholarship
Dr. Ole Meland Scholarship
Lou Merrill Scholarship
James F. Merson Memorial Scholarship
MoorMan's Scholarship
Bob Muegge, Jr. Memorial Scholarship
Natural Resource Management Scholarships
Don Nikkel Memorial Scholarship
Harry Parker Award
Charles and Helen Penwell Scholarships
Roger B. Peters Award
Pi Alpha Xi—Howard C. Brown Scholarship
Poultrymen's Cooperative Association Scholarship
Rain for Rent, Inc. Irrigation Scholarship in Memory of Paul Etchechury
Dante Righetti Scholarship
Rodeo Club Scholarships
Phillip Saaranzin Memorial Scholarship
Jean Eddy Sander Rodeo Queen Award
Fred and Marian Sandercock Scholarships
San Luis Obispo Lions Club/ Food Industries Scholarship
Mildred Shepard Scholarship
Louis H. and Stella S. Soares Achievement Award
South Bay Garden Club Scholarship
Herman M. Sperber Scholarship
Stardust Jersey Farm Scholarship
Harmon M. Toone Scholarship
Eric C. Twist Memorial Scholarships
Warren's Nursery Scholarship
War Veterans Scholarship
Richard A. (Alex) Wilson, Jr. Memorial Scholarship
Leopold Edward Wrasse Scholarships

Architecture and Environmental Design

Stephen O. Anderson Memorial Scholarship
Bechtel Affirmative Action Award
Bechtel Corporation Scholarships
Black Students in Architecture and Environmental Design Scholarships
Douglas W. Butzbach Memorial Scholarship
Thor Gulbran, AIA Memorial Scholarship
D. Stewart Kerr Scholarship
Kiewit-Pacific Scholarship
Landscape Architecture Scholarship and Award Fund
Alice C. Loh Competition Award
Warren Ludvigsen Memorial Scholarship
Dr. Glenn G. McRae Internship
Julia Morgan/Phoebe Hearst Architecture Assistantships
Oltmans Construction Company Scholarship
Professional Architects Scholarship
Women's Architectural League—Los Angeles Chapter Scholarships
Frederick Peter Young Scholarships
Business

Arthur Andersen & Co. Scholarship
Arthur Andersen Outstanding Junior Management Award
Mickie Burris Award
Central Coast Chapter of California Society of CPAs
Clorox Company Scholarship
Controller’s Roundtable of San Luis Obispo County Scholarship
Daryl Damon Memorial Scholarship

Ernst & Whinney Scholarship
Frank and Norma Exter Scholarship
Jeffrey W. Land University and Community Service Scholarship
Peat, Marwick, Main Scholarship
Price Waterhouse Scholarship
Larry Ratner Scholarship
Touche Ross Scholarship
Leopold E. Wrasse Scholarship

Engineering

Alcoa Foundation Scholarships
American Institute of Aeronautics and Astronautics Scholarships, Vandenberg Section
American Microsystems, Inc., Assistantships
American Society of Heating, Refrigeration and Air-Conditioning Engineers Scholarships (ASHRAE)
Sacramento Chapter
San Jose Chapter
Southern California Chapter
Arthur Andersen & Co. Outstanding Junior Award
Association of Old Crows Scholarship
Bechtel Corporation Scholarships
Boeing Company Scholarships
Chevron USA Inc. Scholarships
Comm-Air Energy Conservation Scholarship
Allan R. Davis Scholarship
Fluid Power Educational Foundation Scholarship
FMC Corporation Scholarship
William Squires Fowler Scholarship
Harold R. Frank—Applied Magnetics Corporation Scholarships
Karl Arne Gulbrand Memorial Scholarship
Glenn A. Hubbard Memorial Scholarship—Experimental Aircraft Association
Charles E. and Pearl P. Knott Memorial Scholarships
Litton Scholarships
Mechanical Engineering Scholarship
National Action Council for Minorities in Engineering Scholarships
Northrop Scholarship
Frank E. Pilling, Sr., Scholarship
Roy N. Poage Memorial Scholarships
Raychem Scholarships
Raytheon Company Scholarships
Jim and Merry Rodgers Scholarship
Society of Manufacturing Engineers Student Chapter—Leo E. Rogers Scholarships
Gregory Stines Memorial Scholarship
Morris P. Taylor Memorial Scholarship
Unocal Scholarships
Dutch and Gladys Van Harrweld Scholarships
Varian Scholarships
Andrew Wacht Scholarship
Charles Wiswell Scholarship
Ziatech Corporation Scholarship

Liberal Arts

John Bayliss Broadcast Scholarships
Central Coast Advertising Club Scholarship
H. S. Crocker–Roland Meyer Memorial Scholarship
Harold P. and Rosalie Davidson Award
Christopher Frair Scholarship
Ann and Gordon Getty Award
Evelyn V. Johnson Scholarship
Janet Lee Memorial Award
Darren E. Loyd Photography Scholarship
John H. Lynn Political Science Award
Music Department Memorial Award
Music Faculty Scholarship
Willard “Pete” Pederson Scholarship
Beatrice A. Rice Scholarship
Tomczak-Carter Scholarship
Ralph and Florence Welles Award
Professional Studies and Education

Arcata Graphics Scholarship
CAHPERD Scholarship in Honor of Robert A. Mott
California PTA Scholarships
California Retired Teachers Association—Laura E. Settle Scholarship
Child Development Scholarship
Sandra Crabtree Memorial Scholarship
H. S. Crocker—Roland Meyer Memorial Scholarship
Edward Ernatt—Special Education Scholarship

Science and Mathematics

Arthur Andersen and Company—Kappa Mu Epsilon Scholarship
Applegarth Biology Scholarships
Beta Beta Beta Biological Society Scholarships
Biological Sciences Scholarships
Dr. Clyde P. Fisher Memorial Scholarship
Volmar A. and Viola I. Folsom Scholarships
Hatfield Memorial Award
Robert E. Holmquist Memorial Scholarship
John David Jackman Memorial Scholarship
W. Boyd Judd Scholarship
Katrina J. Killgore Memorial Scholarship
KME Founders Award
George C. Laumann Scholarship
E. H. “Woody” Lehman Memorial—Natural History Scholarship

Athletics

Mickie Burris Award
Charles Daum Memorial Scholarship
Hall of Fame Scholarships

Other Scholarships

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

LOANS

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

The Perkins Loan (formerly National Direct Student Loan) is a five percent interest loan available to both undergraduate and graduate students. Annual amounts are based on the students’ need as determined by the Financial Aid Office. Repayment begins six to nine months after the student leaves school or ceases to be at least a half-time student. The government pays the interest while the student is in school and during the grace period. There are cancellation and deferment provisions. The application for this loan is the SAAC which must be submitted by March 2 for the upcoming school year.

Parent Loans (PLUS) and Supplemental Loans for Students (SLS)

Parent Loans and Supplemental Loans for Students were formerly California Loans to Assist Students. This program enables parents and independent students to obtain annually adjusted variable interest loans (not to exceed twelve percent) for educational costs through banks and other lending institutions. A PLUS loan goes into repayment 60 days after the loan is made, however, parents may defer repayment for periods during which a student is dependent and enrolled at least half-time. Full-time SLS borrowers may defer principal and interest payments until a change in enrollment status. To apply, contact the Financial Aid Office.

Stafford Student Loans

The Stafford Student Loan (formerly Guaranteed Student Loan) is an eight percent interest loan that enables students to borrow funds from banks and other lending institutions. Annual amounts are based on the students’ need as determined by the Financial Aid Office and federal limits. The federal government will pay the interest on the loan while the student is in school and there are deferment provisions. The SAAC must be on file in order to determine need. Stafford Student Loan applications are available from the Financial Aid Office.

University Emergency Student Loans

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

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

University Short-Term Emergency Loans are granted for unexpected emergency situations. A maximum of $200 may be borrowed during an academic year. Repayment is due at the end of the quarter in which the loan was received. A one percent service charge is deducted from the loan disbursement and 12 percent interest is charged on the unpaid balance.

University Emergency Student Loans include donations received from the following:

Agricultural Engineering Loan Fund
Alumni Loan Fund
American Society of Heating, and Air Conditioning Loan Fund
American Welding Society Loan Fund
Lamar Anderson Memorial Loan Fund
Student Architect Wives’ Club Loan Fund
Marie Van Aspersen Memorial Loan Fund
Bachino Loan Fund
Baer-Beck Loan Fund
Edgar E. Bilodeau Loan Fund
Jed S. Blake Memorial Loan Fund
CFFA/Agricultural Education Loan Fund
California Association of Agriculture Laboratories Loan Fund
California Association of Resource Conservation Districts Loan Fund
Cal Poly Women’s Club Fund
Marie Van Aspersen Memorial Loan Fund
California Retired Teachers’ Association Loan Fund
W. B. Camp Loan Fund
Financial Aid 103

C.A.R.S.E.S. Loan Fund
Logan S. Carter Loan Fund
Margaret Chase Memorial Loan Fund
Herbert E. Collins Loan Fund
Thomas J. Comer Memorial Loan Fund
Cooperative Education Loan Fund
Harlan Diessehrensen Memorial Loan Fund
Esther Biaggini Dugan Loan Fund
Environmental Protection Agency Loan Fund
1960 Football Team Memorial Loan Fund
Independent Order of Foresters Loan Fund
John Holley Memorial Loan Fund
Ralph Hoover Loan Fund
Horsehoeing and Animal Husbandry Loan Fund
Impact Publishers Loan Fund
International Students Loan Fund
Chris Jespersen Loan Fund
Fred Kimball Loan Fund
William Kirkpatrick Memorial Loan Fund
Alfred M. Kretzmann, Jr., Memorial Loan Fund
Lee Gird Levering Memorial Loan Fund
Lynn T. Lobaugh Memorial Loan Fund
Metal Heat Treating Association of California Loan Fund
Nissen Educational Loan Fund
Ornamental Horticulture Loan Fund
Janet Penfold Memorial Loan Fund
Mary T. Pollock Memorial Loan Fund
Rotary Loan Fund
San Fernando Valley Club of Printing House Craftsmen Loan Fund
George Schlemeyer Memorial Loan Fund
Sears Roebuck Loan Fund
Norma Sullivan Memorial Loan Fund
Telegram-Tribune Loan Fund
Todd Farm Loan Fund

GRANTS

Pell Grant

This is a Federal aid program designed to help undergraduates pay for their education after high school. The amount a student is eligible for depends on their Student Aid Index, the cost of education, full-time or part-time enrollment status, and how many quarters during the year they will be enrolled. Pell Grant eligibility is usually limited to 5 full years of undergraduate study. Eligibility may be extended for a sixth year if the undergraduate program requires more than four years to complete a bachelor's degree. Students applying for other aid through the use of SAAC may apply for the Pell grant at the same time. However, students applying for a Pell only should complete the Application for Federal Student Aid of the SAAC.

Supplemental Educational Opportunity Grant Program

The Supplemental Educational Opportunity Grant Program (SEOG) is a federally funded grant program to assist undergraduate students who have a substantial financial need and who, without this aid, could not attend college. To be considered for this grant, applicants must submit a Student Aid Application for California to the processor by March 2 for the upcoming school year.

College Work-Study Program

The College Work-Study Program (CWS) is a need-based, federally funded program which provides employment for students to assist them in completing their education. It is intended that work-study jobs not only assist the student financially but also provide pertinent work experience. Students awarded CWS can be referred to jobs located either on- or off-campus with approved departments/ agencies. Pay rates vary depending on the job requirements and the student's skills. To receive priority consideration for this program, applicants must submit the SAAC to the processor by March 2 for the upcoming school year.

STATE AID TO THE PHYSICALLY HANDICAPPED

The State Department of Vocational Rehabilitation provides financial assistance to students who have physical disabilities. This assistance equals the necessary school expenses and may include additional funds to help cover the cost of living. Students entitled to this assistance desiring more information and application procedures should contact the Department of Vocational Rehabilitation.
# Academic Requirements and Policies

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ACADEMIC REQUIREMENTS AND POLICIES

CHOICE OF CATALOG

Cal Poly issues a new catalog every two years, and the requirements for degree programs may change from one catalog to the next. Students have the right to choose the catalog they’ll use, as described in Section 40401 of Title 5 of the California Code of Regulations.

An undergraduate student remaining in attendance in regular sessions at any California State University campus, at any California community college, or any combination of California community colleges and campuses of the The California State University, may for purposes of meeting graduation requirements, elect to meet the requirements in effect at the campus from which the student will graduate either:

1. at the time the student began such attendance, or
2. at the time of entrance to the campus, or
3. at the time of graduation.

Campus authorities may authorize or require substitutions for discontinued courses. A campus may require a student changing his or her major or any minor field of study to complete the major or minor requirements in effect at the time of the change.

For purposes of this section, “attendance” means attendance in at least one semester or two quarters each university year. Absence due to an approved educational leave or for attendance at another accredited institution of higher learning shall not be considered an interruption in attendance, if the absence does not exceed two years. (Title 5 of the California Code of Regulations, Section 40401.)
ACADEMIC PLACEMENT

SYSTEMWIDE TESTS REQUIRED OF MOST NEW STUDENTS

The CSU requires new students to be tested in English and mathematics after they are admitted. These are not admissions tests, but a way to determine if students are prepared for college work and, if not, to counsel them how to strengthen their preparation. Students might be exempted from one or both of the tests if they have scored well on other specified tests or completed appropriate courses.

English Placement Test (EPT)

The CSU English Placement Test must be completed by all new undergraduates except those who present proof of one of the following:

- a score of 3, 4, or 5 on either the Language and Composition or the Composition and Literature examination of the College Board Advanced Placement Program;
- a score on the CSU English Equivalency Examination that qualifies a student for exemption from the English Placement Test;
- a score of 470 or above on the Verbal section of the College Board Scholastic Aptitude Test (SAT-Verbal);
- a score of 22 or above on the ACT English Usage Test;
- a score of 25 or above on the ACTE (enhanced) English Test;
- a score of 600 or above on the College Board Achievement Test in English Composition with essay; or
- for transfer students, completion and transfer to the CSU of an acceptable college course in English composition of four quarter units or three semester units with a grade of C or better.

Failure to take the English Placement Test, as required, at the earliest opportunity after admission may lead to administrative probation which, according to Section 41300.1 of Title 5, California Code of Regulations, and CSU Executive Order 393, may lead to disqualification from future attendance.

The results of the EPT will not affect admissions eligibility but will be used to identify students who need special help in reading and writing in order to do college-level work.

Cal Poly students may not enroll in ENGL 114 Writing: Exposition without taking the EPT or qualifying for an exemption from it.

Information bulletins and registration materials for the EPT will be mailed to all students subject to these requirements. The materials also may be obtained from the Testing Office or the Writing Skills Program Office.

Entry Level Mathematics (ELM) Test

All new undergraduate students must take the test and pass it before enrolling in a course that satisfies the college level mathematics requirement of the General Education-Breadth program. Cal Poly, satisfactory completion of the ELM Test is a prerequisite for all mathematics and statistics courses, with the exception of an ELM preparatory course. Exemptions from the test are given only to those students who can present proof of one of the following:

1 Undergraduates admitted with 56 or more transferable semester units and who are subject to a campus catalog or bulletin earlier than 1986-87 are not required to complete the EPT.
• a score of 3 or above on the College Board Advanced Placement mathematics examination (AB or BC);
• a score of 530 or above on the mathematics section of the Scholastic Aptitude Test (SAT-Math);
• a score of 23 or above on the ACT Mathematics Test;
• a score of 23 or above on the ACTE (enhanced) Mathematics Test;
• a score of 520 or above on the College Board Math Achievement Test, Level 1;
• a score of 540 or above on the College Board Math Achievement Test, Level 2; or
• for transfer students, completion and transfer to the CSU of a college course that satisfies the General Education-Breadth Requirement in Quantitative Reasoning, provided such course was completed with a grade of C or better.

Students are required to take the ELM examination before the end of their first two quarters of enrollment at Cal Poly. Failure to satisfactorily complete the ELM requirement by the end of the second year will lead to administrative probation, which, according to Section 41300.1 of Title 5 of the California Code of Regulations, and CSU Executive Order 393, may lead to disqualification from future attendance. The results of the ELM test will not affect admissions eligibility.

Information bulletins and registration materials may be obtained from the Testing Office, and the Mathematics Department.

**CAL POLY MATHEMATICS PLACEMENT EXAMINATION**

The Cal Poly Mathematics Placement Examination (MAPE) is a series of diagnostic examinations (intermediate algebra or pre-calculus level) used to place students in the appropriate mathematics course. Students who have satisfied the ELM requirement and who anticipate enrolling in MATH 116, 117, 118, 119, 120, 121, 131, 141, 201, or 221 are expected to take MAPE during the two-quarter period preceding enrollment. Students may also successfully pass a prerequisite course at Cal Poly. Failure to demonstrate a proficiency with prerequisite skills may delay enrollment in key mathematics courses.

Questions regarding the MAPE may be directed to the Mathematics Department, 756-2208.

**ADVANCED PLACEMENT**

Cal Poly grants credit toward its undergraduate degrees for successful completion of examinations of the Advanced Placement Program of the College Board. Students who present scores of three or better will be granted up to six semester units (nine quarter units) of college credit.

**CREDIT FOR NONCOLLEGIATE INSTRUCTION**

Cal Poly grants undergraduate degree credit for successful completion of noncollegiate instruction, either military or civilian, appropriate to the baccalaureate, that has been recommended by the Commission on Educational Credit and Credentials of the American Council on Education. The number of units allowed are those recommended in the Guide to the Evaluation of Educational Experience in the Armed Services and the National Guide to Educational Credit for Training Programs.

**Credit for Military Service**

Nine quarter units of elective credit will be allowed toward graduation to any student with an honorable discharge submitting evidence of satisfactory completion of one year of training in the military service of the United States. Credit is allowed in accordance with the recommendations by the Commission on Educational Credit and Credentials of the American Council on Education. The number of units allowed are those recommended in the Guide to the Evaluation of Educational Experience in the Armed Services.
Credit is not given for college level General Educational Development Tests. No grade points are assigned in connection with units of credit allowed for military service. The units allowed are not included in scholarship computations.

**CREDIT BY EXAMINATION**

Cal Poly grants credit to those students who pass examinations that have been approved for credit systemwide. These include the Advanced Placement Examinations, CSU English Equivalency Examination and some CLEP examinations.

Students may challenge courses by taking examinations developed at the campus. Credit shall be awarded to those who pass them successfully. A student may not petition for credit by examination during the same quarter that the student is enrolled in the course.

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

There are certain College Level Examination Program (CLEP) tests which are acceptable for credit when completed with an appropriate score. Information on which tests are acceptable, the amount of credit that will be given and how the credit will be applied for meeting degree requirements can be obtained from the Evaluations Office.

Credit for CLEP and other externally developed examinations will *not* be awarded if any of the following apply:

- examination previously taken within the past year;
- equivalent degree credit or duplicate credit has already been granted;
- credit has been granted for previous coursework or for a previously completed more advanced or higher level examination;
- total amount of credit awarded for externally developed tests exceeds 45 quarter units (Advanced Placement Examination credit excluded from this limit).

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

Detailed instruction for applying for credit by examination may be obtained from the Records Office.
GENERAL REQUIREMENTS FOR THE BACHELOR'S DEGREE

There are seven general requirements which all students must meet in order to earn the bachelor's degree from Cal Poly. The more you understand your progress toward meeting these requirements and relate them to the many programs available to you, the better your chance of creating an exciting educational experience and avoiding errors which may delay graduation.

The specific requirements for each of the degree programs are listed under the academic department offering the major and include a curriculum display which shows the suggested course sequence. Other useful guides to planning your curriculum are available: the Evaluations Office can give you a Curriculum Evaluation Sheet which lists major courses, support courses, general education and breadth courses and electives, and your department may have a flow chart which shows in detail the recommended sequence of courses leading to your degree.

You are responsible for meeting all requirements, though assistance is available from faculty advisers assigned through your major department, school advising centers, and the Evaluations Office.

Plan your degree program carefully and review it frequently with your academic adviser. The basic graduation requirements are as follows:

1. **Total Units**
   - Bachelor of Arts ................................................................. 186 units
   - Bachelor of Science ....................................................... 186–198 units
   - Bachelor of Science (Engineering programs) ......................... 198–210 units
   - Bachelor of Architecture .................................................. 248–263 units

2. **Grade Point Average (GPA)**
   You must have at least a 2.0 GPA in Higher Education (all college-level work), in Cal Poly cumulative and in your major (the courses listed in the major column of your Curriculum Evaluation Sheet). For a definition of GPA and quality points and hours, please refer to Grading, page 123.

3. **General Education and Breadth (GEB) Courses**
   You must complete the GEB requirements as indicated in your degree program and shown in the GEB section of this catalog (see page 114).

4. **Graduation Writing Requirement (GWR)**
   You must demonstrate competency in writing skills as described on page 111.

5. **Senior Project**
   A senior project is a formal report of the results of a study or experiment selected and completed under faculty supervision with a minimum of 30 hours of student work required per unit of credit. You must satisfactorily complete a senior project in order to receive your bachelor's degree.

6. **Academic Residence Requirements**
   You must earn no less than 50 quarter units in residence, and earn at least 30 of these units among the last 40 units counted toward the degree. Thirty-six of these units must be earned in upper division courses and 18 of the units must be in the major. (Title 5, Section 40403.) Extension credit or credit by examination may not be used to fulfill the residence requirement.
7. Evaluation for Graduation

You should request a graduation evaluation from the Evaluations Office approximately four quarters prior to your anticipated graduation date. The evaluation confirms remaining requirements for graduation and is a formal statement on the expected quarter of graduation. The actual date of graduation will be the end of the quarter when all requirements have been met. When all degree requirements have been completed, the Evaluations Office will place the order for the student’s diploma with the bookstore. The diploma will be mailed approximately four months after your degree has been awarded.

GRADUATION REQUIREMENT IN WRITING PROFICIENCY

All students must demonstrate competency in writing skills as a requirement for graduation. Information on currently available ways to meet this graduation requirement may be obtained from the Writing Skills Program Office, Agriculture Building (10), Room 130, 756-2067.

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

1. Pass the Writing Proficiency Exam.

2. Pass an approved 300-level composition course with a grade of C or better AND receive certification of proficiency in writing from the instructor based on a 500-word in-class essay.

3. Pass an approved 300-level literature course with a grade of C or better AND receive certification of proficiency in writing from the instructor based on a 500-word in-class essay.

The following courses may be taken to fulfill the Graduation Writing Requirement:

<table>
<thead>
<tr>
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<th>ENGL 310</th>
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Students must earn proficiency after reaching 90 units. Each student should review his or her curricular requirements to determine which option is appropriate. The GWR must be fulfilled at Cal Poly, not at another campus.

Other Information

HONORS

The Dean’s Honors List is compiled at the end of each quarter to honor undergraduate students who have completed 12 or more letter-graded units during the quarter with a 3.5 grade point average or better for that term. The President’s Honors List is compiled at the end of each university year to honor those undergraduate students who have demonstrated consistent achievement, as represented by being named to the Dean’s Honors List for any three of the four quarters of the university year. The university year begins with summer quarter.

Candidates for bachelor’s degrees with Cal Poly grade point averages indicated below will be awarded honors at graduation. The GPA is officially calculated at the time the student has completed graduation requirements.

The three honors categories are as follows:

- Summa cum laude – 3.85
- Magna cum laude – 3.70
- Cum laude – 3.50
MINORS

A minor is an integrated, coherent group of courses (24 to 30 quarter units) which gives the student knowledge in an area which lies outside of the major field of study. In a minor, at least half of the units must be upper-division (300- or 400-level) and at least half must be taken at Cal Poly. Not more than one-third of the courses in a minor can be graded Credit/No Credit (CR/NC), except for courses which have mandatory CR/NC grading. A minimum 2.0 GPA is required in all units counted for completion of the minor (foreign language minors must have a 2.75 GPA). A minor is not required for a degree.

The minor will be completed along with the requirements for the bachelor's degree. Courses in the minor may not be counted toward the major, but may be used to satisfy support and general education requirements. Selection of a major and a minor from the same discipline is not permitted.

Students who wish to complete a minor are to contact the department offering the academic minor as early as possible in the program and fill out the appropriate agreement form. The minor is declared when the student requests a graduation evaluation in the Evaluations Office. The completion of the minor will be noted on the student's transcript but will not be shown on the diploma. In no case will a diploma be awarded for the minor.

Information regarding course requirements may be found in this catalog under the listing for the department or school offering the minor.

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<td>Art</td>
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<tr>
<td>Biotechnology</td>
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<tr>
<td>Business</td>
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<td>Computer Science</td>
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<td>Economics</td>
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<td>English</td>
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<td>French</td>
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<tr>
<td>German</td>
<td>Foreign Languages &amp; Literatures Department</td>
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<tr>
<td>Gerontology</td>
<td>School of Professional Studies &amp; Education</td>
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<tr>
<td>History</td>
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<tr>
<td>Integrative Technology</td>
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<td>Plant Protection</td>
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<td>Psychology</td>
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<td>Public Administration</td>
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<td>Spanish</td>
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<td>Speech Communication</td>
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<td>Statistics</td>
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<td>Theatre</td>
<td>Theatre and Dance Department</td>
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<tr>
<td>Women’s Studies</td>
<td>School of Liberal Arts</td>
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</table>
DOUBLE MAJORS

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

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

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

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

SECOND BACHELOR'S DEGREE

A qualified student who holds a bachelor's degree from Cal Poly or from another accredited institution may be awarded a second bachelor's degree in a different major. Students must complete General Education and Breadth requirements in effect at the time of admission to the additional baccalaureate degree program and all of the courses for the new degree as specified by the department. A minimum of 45 units of coursework for Cal Poly graduates and 50 units for graduates from another accredited institution must be completed in residence after the requirements for the first degree have been fulfilled. A senior project is required for each bachelor's degree.

GRADUATE CREDIT TAKEN BY UNDERGRADUATES

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

Candidates for professional clear credentials (except Agricultural Education) may not use courses taken as an undergraduate in a planned 45-unit program.
General Education and Breadth (GEB) requirements in the CSU are so designed that, taken with the major depth program and elective units presented by the candidate for the bachelor's degree, they will assure that graduates from the several campuses in the system have made noteworthy progress toward becoming truly educated persons. Particularly, the purpose of the breadth requirements is to provide means whereby graduates:

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

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

At least 12 units of GEB shall be earned at the campus granting the degree.

At least 12 units of General Education and Breadth courses must be at the 300–400 level.

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

Students should consult departmental advisers, Curriculum Evaluation Sheets, and curriculum displays in this catalog for specific courses which may be required in the degree program.

In addition to the courses identified below, the current quarterly Class Schedule includes the most up-to-date listing of proved GEB courses.

**Distribution Area A**

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

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

1. ENGL 114 Writing: Exposition (4)  
   GEB A.1.

2. Select one: 
   - ENGL 125 Critical Thinking (3)  
     PHIL 125 Critical Thinking (3)  
     SPC 125 Critical Thinking (3)  
   GEB A.2.

3. Select one: 
   - SPC 201 Public Speaking  
     SPC 202 Principles of Speech Communication (3)  
   GEB A.3.

4. Select one: 
   - ENGL 215 Writing: Argumentation (4)  
     ENGL 218 Writing: Argumentation and Reports (4)  
   GEB A.4.
Distribution Area B

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

1. Physical and Life Sciences

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

(a) Physical Sciences

Courses may be selected as follows:
- ASTR Any lower division course
- CHEM Any lower division course except 106, 200, 252, 253
- GEOL Any lower division course except 211. GEOL 206 can be selected if GEOL 201 or 204 have been completed.
- PHYS Any lower division course except 100, 137, 200, 202, 206, 207, 256, 257
- PSC Any lower division course (only PSC 101 has a lab)
- Any 300-level physical science course (having one of the prefixes ASTR, CHEM, GEOL, PHYS or PSC prefix) and having one of the above as a prerequisite may also be selected with the exception of CHEM 350, PHYS 315, PHYS 363.

(b) Life Sciences

Courses may be selected as follows:
- BACT Any lower division course
- BIO Any lower division course except 100 and 253
- BOT Any lower division course except 238
- ZOO Any lower division course except 237
- Any 300-level life science course (having one of the prefixes BACT, BIO, BOT or ZOO prefix) and having one of the above as a prerequisite may also be selected with the exception of BIO 321, 322, 323, 324, 342.

2. Mathematics and Statistics

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

(a) Mathematics

Courses may be selected as follows:
- MATH 112 The Nature of Modern Mathematics (3)
- MATH 117 Pre-Calculus Algebra II (3) Note: MATH 116 is a prerequisite for MATH 117; MATH 116 and MATH 117 are equivalent to MATH 118 but are taught at a slower pace for those who need more review. MATH 117 satisfies GEB B.2.
- MATH 118 Pre-Calculus Algebra (4)
- MATH 119 Pre-Calculus Trigonometry (3)
- MATH 120 Pre-Calculus Algebra and Trigonometry (5)
- MATH 124 Finite Mathematics (3)
- MATH 131 Technical Calculus (4)
- MATH 141 Calculus I (4)
- MATH 221 Calculus for Business and Economics (4)
- MATH 328 Introduction to Mathematics (4)
- Any 100, 200, or 300 level MATH courses having one of the above as a prerequisite may also be chosen with the exception of MATH 300 and MATH 327.

(b) Statistics

Courses may be selected as follows:
- STAT 130 Introduction to Statistical Reasoning (3)
- STAT 211 Elementary Probability and Statistics (3)
- STAT 251 Statistical Inference for Management I (3)
- STAT 321 Statistical Analysis (3)
- Any 200 or 300 level STAT courses having one of the above as a prerequisite may also be chosen with the exception of STAT 200 and STAT 330.
Distribution Area C

A minimum of 18 quarter units among the arts and humanities, at least 3 units of which must be at the 300-400 level (Area C.3.).

1. Critical Reading

To increase students' experience in expository writing, GEB C.1. English courses have a composition component of 2500 words. A minimum of three lower division courses in literature and philosophy, at least one course in each, selected from the following:

- ENGL 230 Masterworks of British Literature: Through the Eighteenth Century (4)
- ENGL 231 Masterworks of British Literature: Romantic Period to the Present (4)
- ENGL 240 American Tradition in Literature (4)
- ENGL 251 Great Books of World Literature: Classical and Ancient World (3)
- ENGL 252 Great Books of World Literature: Middle Ages, Renaissance and Enlightenment (3)
- ENGL 253 Great Books of World Literature: Romanticism and the Modern World (3)
- FR 233 Critical Reading in French Literature (4)
- GER 233 Critical Reading in German Literature (4)
- PHIL 230 Philosophical Classics (3)
- PHIL 231 Philosophical Classics (3)
- SPAN 233 Critical Reading in Hispanic Literature (4)

2. Fine and Performing Arts

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

- ART 101 Fundamentals of Drawing (4)
- ART 108 Fundamentals of Sculpture (4)
- ART 111 Introduction to Art (4)
- ART 112 Survey of Art History (3)
- DANC 221 Dance Appreciation (3)
- MU 101 Introduction to Music Theory I (3)
- MU 120 Introduction to Music (4)
- TH 210 Introduction to Theatre (3)

3. Electives in Literature, Philosophy, and the Arts

Select a minimum of one 300-400 level course from the following list. Courses offered by the student's major department cannot be counted in the elective portion of Distribution Area C.

- ARCH 316 California Architecture and the California Dream (3)
- ARCH 317 History of Architecture (3)
- ARCH 318 History of Architecture (3)
- ARCH 319 History of Architecture (3)
- ART 312 Art History–Contemporary Art (4)
- ART 314 History of Photography (4)
- DANC 321 History of Dance (3)
- ENGL 330 British Literature: Medieval Period (4)
- ENGL 331 British Literature: The Renaissance (4)
- ENGL 332 British Literature: The Enlightenment (4)
- ENGL 333 British Literature: Romanticism (4)
- ENGL 334 British Literature: The Victorians (4)
- ENGL 335 British Literature: 20th Century (4)
- ENGL 339 Introduction to Shakespeare (3)
- ENGL 340 American Literature to 1860 (4)
- ENGL 341 American Literature: 1860-1914 (4)
- ENGL 342 American Literature: 1914 to the Present (4)
- ENGL 345 Women Writers (4)
- ENGL 346 Ethnic American Literature (4)
- ENGL 350 Modern Novel (3)
- ENGL 351 Modern Poetry (3)
- ENGL 352 Modern Drama (3)
- ENGL 370 World Cinema (4)
ENGL 372 Film Directors (4)
ENGL 380 Contemporary Literary Ideas (4)
FR 305 Significant Writers in French (4)
FR 405 French Literature in English Translation (4)
GER 305 Significant Writers in German (4)
GER 405 German Literature in English Translation (4)
HUM 302 Human Values in Agriculture (3)
HUM 310 Humanities in World Cultures (3)
HUM 402 Values and Technology (3)
MU 221 Jazz Styles (3)
MU 324 Music and Society (3)
PHIL 305 Judeo-Christian Religions (3)
PHIL 306 Asian Religions (3)
PHIL 308 Islamic Religions (3)
PHIL 311 History of Greek Philosophy (3)
PHIL 312 History of Medieval Philosophy (3)
PHIL 313 Continental Philosophy: Montaigne to Leibniz (3)
PHIL 314 British Philosophy: Bacon to Mill (3)
PHIL 315 German Philosophy: Kant to Nietzsche (3)
PHIL 316 Contemporary European Philosophy (3)
PHIL 317 Contemporary British and American Philosophy (3)
PHIL 321 Philosophy of Science (3)
PHIL 331 Ethics (3)
PHIL 333 Political Philosophy (3)
PHIL 334 Jurisprudence (3)
PHIL 335 Social Ethics (3)
PHIL 337 Professional Ethics (3)
PHIL 341 Philosophy of Art (3)
PHIL 342 Philosophy of Religion (3)
POLS 334 Jurisprudence (3)
SPAN 305 Significant Writers in Spanish (4)
SPAN 405 Hispanic Literature in English Translation (4)
SPC 330 Classical Rhetorical Theory (4)
TH 327 Theatre History and Literature (3)
TH 328 Theatre History and Literature (3)

Distribution Area D

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

1. **Title 5, Section 40404 Requirements:**
   - HIST 204 The History of American Ideals and Institutions (3)
   - POLS 210 American and California Government (3)

2. HIST 315 Modern World History (3)

3. Select at least one course:
   - ECON 201 Survey of Economics (3)
   - ECON 211 Principles of Economics (3)
   - ECON 222 Macroeconomics (4)

4. Select at least one course from each group:
   **Group a:**
   - ANT 201 Cultural Anthropology (3)
   - GEOG 150 Human Geography (3)
   - SOC 105 Introduction to Sociology (3)
Group b: Courses offered by the student’s major department cannot be counted as satisfying the requirements of this group.

- ANT 360 Human Cultural Adaptation (3)
- BUS 404 Governmental and Social Influences on Business (4)
- ECON 304 Comparative Economic Systems (3)
- ECON 325 Underdevelopment and Economic Growth (3)
- GEOG 308 Global Geography (3)
- POLS 370 Contemporary Global Political Issues (3)
- POLS 371 World Food Politics (3)
- SOC 309 World Social System and Its Problems (3)
- SOC 315 Race Relations (3)

Distribution Area E

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

1. Select one:
   - PSY 201 General Psychology (3)
   - PSY 202 General Psychology (3)

2. Select one:
   - BIO 220 Physiology and Biological Adaptation (4)
   - FSN 210 Nutrition (3)
   - HE 210 Nutrition (3)
   - PE 250 Health Education (2)
   - PSY 304 Physiological Psychology (3)
   - REC 100 Leisure Education and Lifestyle Management (2)

Distribution Area F

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

1. Computer Literacy
   Select at least one course from the following:
   - AG 250 Computer Application to Agriculture (3)
   - ARCH 250 Computer Applications (3)
   - CSC 110 Computers and Computer Applications (3)
   - CSC 111 Introduction to Computer Applications for the Sciences (3)
   - CSC 118 Fundamentals of Computer Science I (4)
   - CSC 120 Principles of Data Processing (4)
   - CSC 204 C and UNIX (3)
   - CSC 251 Digital Computer Applications (2)
   - CSC 410 Computer Fundamentals for Educators (3)

2. Select at least one course from the following:
   - AE 121 Agricultural Mechanics (2)
   - AE 340 Irrigation Water Management (3)
   - AERO 210 History of Aviation (3)
   - AG 301 Agriculture and American Life (3)
   - ARCH 312 Home and Community Design (3)
   - CE 221 Fundamentals of Transportation Engineering (4)
   - CONS 120 Fisheries and Wildlife Management (3)
   - CRP 211 Introduction to Urbanization (3)
   - CRP 212 Introduction to Urban Planning (3)
   - CRSC 230 General Field Crops (4)
   - DH 230 General Dairy Husbandry (4)
   - ENGR 301 Technology in the 20th Century (3)
   - ENVE 324 Introduction to Air Pollution (3)
   - ENVE 330 Environmental Quality Control (3)
Students in the Schools of Agriculture, Architecture and Environmental Design, and Engineering and the Departments of Home Economics and Industrial Technology are exempt from the requirements of this section (F.2). They may apply a maximum of 3 units from their major toward the satisfaction of the 12-unit upper division General Education requirement.
REGISTRATION

REGISTRATION

All students are required to enroll in courses by using the telephone voice response system named CAPTURE. The courses selected should meet the requirements specified for each student's major course of study.

Information concerning registration for classes and payment of fees is published in the Class Schedule which is on sale prior to the start of each term. Students should consult the Class Schedule for detailed registration procedures.

Credit for coursework completed is given only when the student is properly registered. A student is not properly registered until fees have been paid and enrollment in classes through the CAPTURE system has been confirmed. Individuals are not permitted to attend courses unless they are officially registered as regular students, as approved extension students, or as enrolled auditors (see Audit).

CLASS ATTENDANCE

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

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

HOLDING OF RECORDS

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

MAXIMUM UNIT LOAD

The maximum load for undergraduate students is 20 quarter units including audited courses and concurrent work at other colleges. Maximum load for graduate students is 16 units per quarter. Exceptions may be made with the advance approval of the student's major department head. A petition to carry an excess load is available from the Records Office. Maximum load requirements may be waived only on presentation of evidence of ability to carry successfully such a group of courses.

ADD/DROP (Change of Program)

Following registration, all changes to individual class enrollments become the responsibility of the student. The add/drop (change of program) period begins after the CAPTURE initial registration cycle has concluded and ends after the first two weeks of instruction of each term. During this period, the student has the opportunity to add new classes or voluntarily drop from existing classes. Specific dates for completing these transactions are published in the quarterly Class Schedule.

Adding

First class meeting: Students who add a class after the first class meeting must obtain the instructor's permission to remain in the class.

Time conflict: Students may not enroll in two classes which meet at the same time.
Eligibility: Students must meet prerequisite and Class Schedule footnote requirements and be in attendance at the first class meeting to remain enrolled in the class.

Late registration: Students registering late have until the end of the add/drop period to pay late registration fees and to register for classes through CAPTURE.

Dropping
Students have until the end of the second week of instruction to drop a class through CAPTURE and no entry will be made on their academic records. At the end of the regular add/drop period the instructor must assume that any student who has not dropped voluntarily remains officially enrolled in the class. For program changes after the end of the regular add/drop (change of program) period see Withdrawals from Courses.

First class meeting: An instructor may drop a student from a class for failure to attend the first class meeting.

Footnote requirement: An instructor may drop a student from a class if the footnote requirements, as stated in the Class Schedule, are not met.

Prerequisite missing: An instructor may drop a student from a class if the prerequisite requirements, as stated in the catalog course description, have not been completed.

Canceled classes: If a class is canceled, students will be automatically dropped and have no reporting responsibilities.

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

CHANGE OF MAJOR
Students who feel they have selected an inappropriate major for their interests and abilities should contact their adviser and the Career Counselor at the Counseling Center (756-2511) for advice and assistance in making curriculum changes. Students should contact the prospective major department for preliminary information regarding changing majors; requirements vary depending on major. Admission to a new curriculum will depend on the availability of space within the limitations imposed by budget, faculty, and facilities.

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

Changing from a Technical Program to a Degree Program
Students wishing to change from a two-year technical program in the School of Agriculture to a degree curriculum may be permitted to change subject to scholarship requirements and completion of the specified number of units in residence. Please contact the Dean's Office, School of Agriculture, for more information.

Changing from a Degree Program to a Technical Program
Cal Poly students changing from a degree program to a technical curriculum will have their records evaluated in terms of the technical curriculum. Courses completed prior to transfer which are applicable to the required courses in the technical curriculum will be transferred intact. The remaining courses completed prior to transfer must apply as electives up to, but not in excess of, the number of elective units specified in the technical curriculum. In the case of an excess of elective units, the student may choose which units shall apply.

CURRICULUM SUBSTITUTION
Although a curriculum is specified for each major, under certain conditions a student may be permitted some deviation from the established curriculum. Detailed instructions for applying for a curriculum substitution may be obtained from the Records or Evaluations Offices.
LEAVES OF ABSENCE

Students are permitted to take a Planned Educational Leave or a Medical Leave and be absent for up to two calendar years. A written request by the student and approval by campus officials are required. The general guidelines for determining eligibility and approving requests for leaves of absences are listed below.

1. A Planned Educational Leave must be for a purpose which contributes to the student's educational objective and is approved by the student's major department head or chair.
2. A Medical Leave provides time for the student to receive treatment or to recover from a disabling injury or other medical condition and is approved by either the campus' Director of Health Services, Counseling and Testing, or Disabled Student Services.
3. To be considered for an Educational Leave, the student must be eligible to enroll for the term in which the leave begins and not be on academic probation.
4. The application for Educational Leave must be initiated and approved before the leave begins and will not be granted retroactively; the Medical Leave begins the term following the student's last term in attendance and may be granted retroactively based on the student's personal situation.
5. A student on Educational or Medical Leave will be considered to be in continuous attendance with the purpose of returning to the same curriculum which was in effect when the leave began.
6. A student on Educational or Medical Leave will not be required to apply for readmission or pay an application fee provided that the student returns to the same major and within the time period agreed upon when the application was approved.
7. The student on leave may return and enroll for any term prior to the term when the leave is scheduled to end. Neither leave will be extended beyond the two-year limitation for any reason.
8. Any student on leave who fails to return and enroll within the time limits specified by the leave agreement will be required to reapply for admission, pay the reapplication fee, and may be held to any new curriculum requirements which may be in effect.
9. Students are eligible to obtain two Educational Leaves during their career at Cal Poly including graduate school.

Application forms and information concerning Leaves of Absence may be obtained from the Registrar's Office.

RETURNING STUDENTS

Matriculated students who have not registered for three consecutive quarters and have not been on an approved leave of absence must file an application for readmission. The application fee must accompany the application for readmission. To ensure that they get the registration priority to which they are entitled, they should apply for readmission at least three months before classes begin.

Matriculated students who have not registered for one quarter or two consecutive quarters will be entitled to their registration priority without applying for readmission. Summer Quarter is a regular quarter and is counted in determining the length of absence.

HEALTH SCREENING

All new and readmitted students admitted after September 1986 and, born after January 1, 1957, must present proof of measles and rubella immunizations. This is not an admissions requirement, but shall be required of students by the beginning of their second term of enrollment in the CSU. Proof of measles and rubella immunizations shall also be required for certain groups of enrolled students who have increased exposure to these diseases. These groups include:

- Students who live in campus residence halls;
- Students who obtained primary or secondary schooling outside the United States;
- Students enrolled in dietetics, medical technology, student teaching, or field work in a health care setting or involving preschool-age children; and
- Intercollegiate Athletes.

Registration will not be permitted until this requirement has been satisfied. Contact the Student Health Center for information concerning clearances or immunizations.
GRADING AND ACADEMIC STANDARDS

GRADING

DEFINITIONS

**Quality Hours** carry grade point value.

**Quality Points** are awarded for each course unit and are determined by multiplying course unit by the point value of the grade.

**Grade Point Average (GPA)** is determined by dividing Quality Points by Quality Hours.

Higher Education GPA is the grade point average of all college level work.

GRADING SYMBOLS

The following marking and grading system is in effect:

<table>
<thead>
<tr>
<th>Academic Grading Symbols Earned</th>
<th>Quality Points Earned</th>
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</thead>
<tbody>
<tr>
<td>A [Superior Attainment of Course Objectives]</td>
<td>4.0</td>
</tr>
<tr>
<td>A- [Superior Attainment of Course Objectives]</td>
<td>3.7</td>
</tr>
<tr>
<td>B+ [Good Attainment of Course Objectives]</td>
<td>3.3</td>
</tr>
<tr>
<td>B [Good Attainment of Course Objectives]</td>
<td>3.0</td>
</tr>
<tr>
<td>B- [Good Attainment of Course Objectives]</td>
<td>2.7</td>
</tr>
<tr>
<td>C+ [Acceptable Attainment of Course Objectives]</td>
<td>2.3</td>
</tr>
<tr>
<td>C [Acceptable Attainment of Course Objectives]</td>
<td>2.0</td>
</tr>
<tr>
<td>C- [Acceptable Attainment of Course Objectives]</td>
<td>1.7</td>
</tr>
<tr>
<td>† D+ [Poor Attainment of Course Objectives]</td>
<td>1.3</td>
</tr>
<tr>
<td>D [Poor Attainment of Course Objectives]</td>
<td>1.0</td>
</tr>
<tr>
<td>D- [Poor Attainment of Course Objectives]</td>
<td>0.7</td>
</tr>
<tr>
<td>F [Non-Attainment of Course Objectives]</td>
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<tr>
<td>CR [Credit]</td>
<td>-</td>
</tr>
<tr>
<td>NC [No Credit]</td>
<td>-</td>
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</table>

<table>
<thead>
<tr>
<th>Administrative Grading Symbols</th>
<th>Quality Points Earned</th>
</tr>
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<tbody>
<tr>
<td>AU [Audit]</td>
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</tr>
<tr>
<td>I [Incomplete (authorized)]</td>
<td>-</td>
</tr>
<tr>
<td>U [Incomplete (unauthorized)]</td>
<td>0</td>
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<tr>
<td>SP [Satisfactory Progress]</td>
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</tr>
<tr>
<td>RD [Report Delayed]</td>
<td>-</td>
</tr>
<tr>
<td>W [Withdraw]</td>
<td>-</td>
</tr>
</tbody>
</table>

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

A grade of AU indicates that a student was officially enrolled in class, participated in class, but was not required to be examined on course materials. Enrollment as an Auditor is subject to the permission of the instructor. Procedures for auditing courses are published in the quarterly Class Schedule.

An auditor is a student who is attending courses for no credit. The student must be registered with fees paid for the quarter in which the course is to be audited. A student may enroll to audit a course during the add/drop period and no later than the last day to add a course. A student may change from credit to audit not later than the last day to drop a course.

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

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

**INCOMPLETE (Authorized)**

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

A grade of I must be made up within one calendar year immediately following the end of the term in which it was assigned. An instructor may specify a time limitation of less than one year. This limitation prevails whether or not the student maintains continuous enrollment. Failure to complete the assigned work will result in the I being counted as equivalent to an F (or NC) for grade point average computation. All remaining grades of I will be changed to F (or NC) at the time the student's degree is awarded.

**INCOMPLETE (Unauthorized)**

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

**SATISFACTORY PROGRESS**

The grade of SP is used in connection with courses that extend beyond one academic term. It indicates that work is in progress and has been evaluated and found to be satisfactory to date, but that assignment of a grade must await completion of additional work. Reenrollment is permitted prior to the assignment of the final grade provided that the total permissible number of units for the course or courses is not exceeded. Work is to be completed within a stipulated time period. The SP symbol shall be replaced with the appropriate final grade within one year except for graduate degree theses for which the time may be up to two years, but may not exceed the overall time limit for completion of all master's degree requirements. Failure to complete the assigned work will result in an SP being counted as equivalent to an F for grade point average computation. Any extension of time limit must receive prior authorization by the dean of the school in which the student is a degree candidate. All remaining SP grade symbols will be changed to F or NC at the time the student's degree is awarded.

**CREDIT/NO CREDIT GRADING**

Some courses, as indicated in their catalog descriptions, are offered on a Credit/No Credit grading basis only.
The following conditions apply when a student elects to take for Credit/No Credit grading those courses which are not designated by the university as being graded on an exclusive Credit/No Credit basis.

a. Up to 2 courses (not to exceed 8 units) or one intensive language course (12-15 units) may be taken per student per quarter on a Credit/No Credit grading basis; a maximum total of 15 courses (not to exceed 45 units) may be elected per student for Credit/No Credit grading.

b. Students desiring to elect a course on a Credit/No Credit grading basis must be currently enrolled in the course and must complete the declaration form available from the Records Office. The form for Credit/No Credit grading must be filed not later than the end of the third week of instruction of the quarter. Students may not change from one grading system to the other after the end of the third week.

c. Undergraduate students will be given a grade of CR for accomplishment equivalent to a grade of C− or better. No credit will be given for D+ or lower grades. Graduate students will receive a grade of CR which is based on an evaluated grade of B− or higher and NC for assigned grades of C+ or lower. Instructors will submit conventional letter grades to the Registrar's Office where they will be converted to Credit/No Credit grades.

d. Major or support courses in the student's curriculum may not be elected for Credit/No Credit grading.

e. The applicant for a Credit/No Credit grade must have at least a 2.0 grade point average in cumulative Cal Poly work. This requirement is waived for first-time students.

f. Units earned in courses for which the grade was CR will count toward satisfaction of all degree requirements.

g. Grades of CR or NC are not included in calculating grade point averages.

h. Nonmatriculated students in the Extension Program, Summer Session, and Workshops must meet the same requirements as matriculated students to elect courses on a Credit/No Credit grading basis. (The 2.0 GPA requirement is waived in the case of nonmatriculated students having no previous coursework recorded at Cal Poly.)

**REPEATING A COURSE**

Students may enroll in a course more than once for improving the grade point average under the following conditions:

1. A course taken at Cal Poly or at another university or college in which a grade of D+ or less was received may be repeated here with the new grade recorded along with the prior grade. The grade earned by repeating the course will replace the quality points, quality hours, and earned hours which were previously earned.

2. The course may not be repeated for Credit/No Credit if the student has previously received a grade of D+ or less in that course. The course may be repeated for Credit/No Credit only if the student has previously received a grade of NC in that course. An original NC grade may be repeated for CR/NC or a letter grade, but not for improving grade point averages.

3. Undergraduate students may repeat up to 20 units for grade point average improvement. However, under the terms of this rule, the student must file a notice of intent to repeat a course with the Records Office prior to the end of the seventh week of instruction during the quarter in which the course is repeated.

4. Except where noted in the specific course description that the course may be repeated for credit, a student may not receive additional credit for any course in which a grade of C or higher, including CR has been received. If the student repeats a course in which a C+ or higher grade was earned, both grades will be calculated in the grade point average but the duplicate earned hours will not be counted toward the degree.

**WITHDRAWALS FROM COURSES**

The grade of W indicates that the student was permitted to withdraw from the course after the regular add/drop (change of program) period with the approval of the instructor and appropriate campus officials. It carries no adverse connotation of quality of student performance and is not used in calculating grade point averages.

Between the end of the regular add/drop period and the last day of instruction a student must request permission to withdraw from a course by processing a petition which is available at the Records Office. The petition will be approved and withdrawal authorized only if there are serious and compelling reasons for withdrawal in the judgment of the instructor and department head.
After the end of the 7th week of instruction withdrawals are permitted only if the withdrawal is based on an emergency situation clearly beyond the control of the student. In such cases a final or incomplete grade may be assigned for courses in which sufficient work has been completed to permit an evaluation to be made. The student must request permission to withdraw as specified above, or request grade assignment, both of which are subject to approval by designated campus officials. Any student who fails to provide notification or who fails to obtain formal approval to withdraw will be subject to failing grades (U or F).

WITHDRAWAL FOR THE TERM

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

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

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

ACADEMIC RENEWAL

Academic Renewal is a policy which permits the removal of previous academic work from bachelor's degree consideration. Under certain circumstances and upon request by the student, the university may disregard up to two semesters or three quarters of undergraduate coursework taken previously at Cal Poly or at another college. The sole purpose of this policy is to enable a student to graduate from Cal Poly in a timely manner; any request to disregard previous academic work for the purpose of improving grade point averages will not be considered under the terms of this policy.

The student may be eligible for Academic Renewal if the coursework to be disregarded is more than five years old and the student has since completed at least 22 units with a GPA of 3.00, 45 units with a 2.50, or 67 units with a 2.00 while enrolled at Cal Poly. Work completed at another institution cannot be used to satisfy this requirement. Other eligibility restrictions exist. Additional information and applications for Academic Renewal may be obtained from the Registrar's Office.

ACADEMIC STANDARDS

ACADEMIC OBLIGATIONS

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

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

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

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

Uniform standards for academic probation or disqualification, and for administrative-academic probation or disqualification, are in effect at all campuses of The California State University. Undergraduate students may be placed on academic probation and later be disqualified, or be placed on administrative-academic probation and later be disqualified, when they do not meet these standards.
Students who have been placed on academic probation, administrative-academic probation, or who have been notified of their disqualification may request review of such action by the dean of the school taking the action. Students who have been disqualified for inadequate progress or performance will not be readmitted until presentation of satisfactory evidence that they have improved their chances of academic success. The request for readmission will be referred to the dean of the school in which the student wishes to enroll.

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

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

**ACADEMIC PROBATION OR DISQUALIFICATION**

Both academic progress toward the degree objective and quality of academic performance are considered in the determination of a student's eligibility to remain enrolled. An undergraduate student becomes subject to academic probation or disqualification under the conditions shown below. For minimum scholarship standards applicable to graduate and postbaccalaureate students see the Graduate Studies section, page 135.

I. Academic Probation: An undergraduate student is subject to academic probation if at any time his or her higher education grade point average or the student's Cal Poly cumulative grade point average falls below 2.0 (C). Students are notified of probationary status by a message on individual grade reports. An undergraduate student will be removed from academic probation when the student's higher education grade point average and the student's Cal Poly cumulative grade point average is 2.0 (C) or higher.

II. Academic Disqualification: An undergraduate student on academic probation may be disqualified when his or her higher education grade point average or his or her Cal Poly cumulative grade point average is 7 or more quality points below 2.0 (C). Such a student on academic probation shall be subject to disqualification:

A. As a freshman or sophomore student (less than 90 quarter units of college credit completed) whose average falls 22½ or more quality points below a 2.0 (C) average on all higher education quality hours or in all quality hours at Cal Poly.

B. As a junior student (90 to 134 quarter units of college credit completed) whose average falls 13½ or more grade points below a 2.0 (C) average on all higher education quality hours or in all quality hours at Cal Poly.

C. As a senior student (135 or more quarter units of college credit completed) whose average falls 9 or more grade points below a 2.0 (C) average on all higher education quality hours or in all quality hours at Cal Poly.

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

**ADMINISTRATIVE-ACADEMIC PROBATION OR DISQUALIFICATION**

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

A. Withdrawal from all or a substantial portion of a program of studies in two successive terms or in any three terms.

B. Repeated failure to progress toward the stated degree or program objective when such failure appears to be due to circumstances within the control of the student.
C. Failure to comply, after due notice, with an academic requirement or regulation which is routine for all students or a defined group of students.

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

ELIGIBILITY FOR INTERCOLLEGIATE ATHLETICS

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

ELIGIBILITY FOR STUDENT ACTIVITIES

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

STUDENT GRIEVANCE PROCEDURES

The university, through the Office of Student Affairs, provides grievance procedures for students who feel aggrieved in their relationships with the university, its policies, practices, and procedures or its faculty and staff.

The Fairness Board

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

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

STUDENT CONDUCT AND DISCIPLINE

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

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

**STUDENT DISCIPLINARY PROCEDURES**

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

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

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

**Student Involvement in Disciplinary Procedures**

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

**PROCEDURAL DUE PROCESS**

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

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Academic Requirements and Responsibilities ...................... 135
GRADUATE STUDIES

Programs

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Agriculture, M.S.
Architecture, M.S.
Biological Sciences, M.S.
Business Administration, M.B.A.
Chemistry, M.S.
City and Regional Planning, M.C.R.P.
Civil and Environmental Engineering, M.S.
Computer Science, M.S.
Counseling, M.S.
Education, M.A.
Electronic and Electrical Engineering, M.S.
Engineering, M.S.
Engineering Management, MBA/MS
English, M.A.
Home Economics, M.S.
Industrial and Technical Studies, M.A.
Mathematics, M.S.
Physical Education, M.S.

Cal Poly offers studies leading to advanced degrees through the existing instructional departments. Graduate degree programs and undergraduate instruction share laboratories and other academic resources. The graduate student has an opportunity to work with all departmental faculty and students and to participate in all campus activities.

University policy governing graduate study emphasizes the need for maturity, responsibility and scholarly integrity of the student. Graduate students should have a command of the basic knowledge, techniques, and skills essential for independent and self-directed study.

In graduate courses students cope with more complex ideas, problems, techniques or materials than in undergraduate courses. Graduate study requires searching and exhaustive analysis, identification and investigation of theories and principles; application of theory to new ideas, problems, and materials; extensive use of bibliographic and other resource materials, with emphasis on primary sources for data; and demonstration of competence in scholarly presentation of the results of independent study.

Regulations governing fees, grading, and financial aid are located elsewhere in the catalog. This section of the catalog reviews university definitions of policy and minimum requirements governing graduate studies. It is not, however, all inclusive. Within these general requirements there are specific departmental requirements for each degree. These will be found in the descriptions of master's degree programs within each school description. It is important that graduate students, in consultation with their adviser, familiarize themselves with these requirements. Failure to do so may result in a substantial delay in progress towards the degree and graduation. It is the responsibility of the student to ascertain and comply with all university, school and departmental procedures and requirements.

APPLICATION

An application for graduate studies may be obtained from the Admissions Office of any CSU campus or from the graduate coordinator in the program to which you are applying at Cal Poly. The application form, Parts A and B, and transcripts should be sent directly to the Admissions Office at Cal Poly. Any supplementary information required should also be sent to the Admissions Office unless the departmental graduate coordinator has informed you otherwise.

Start early to complete your application. You must have all information on file before the closing periods listed below to ensure that your application package receives priority consideration. Informa-
Graduate Studies

Information about the specified GPA requirements and qualifying examinations such as the Graduate Record Exam (GRE) is contained in the catalog section describing requirements for individual graduate programs.

Filing Periods

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Application Acknowledgment

You may expect to receive an acknowledgment of your application from your first choice campus within two to four weeks of filing the application. A notice that space has been reserved for you will also include a request that you submit the records necessary for the campus to evaluate your qualifications. You may be assured of admission if the evaluation of your qualifications indicates that you meet admission requirements. Such a notice is not transferable to another term or to another campus.

Who Must Apply

All graduate and postbaccalaureate applicants (e.g., master’s degree applicants, those seeking credentials, and those interested in taking courses for personal or professional growth) must file a complete application as described in the admissions booklet. Applicants who completed undergraduate degree requirements and graduated the preceding term are also required to complete and submit an application and the $55 nonrefundable application fee. Since applicants for postbaccalaureate programs may be limited to the choice of a single campus on each application, redirection to alternative campuses or later changes of campus choice will be minimal. To be assured of initial consideration by more than one campus, it will be necessary for any applicant to submit separate applications (including fees) to each campus.

Completed Application Materials

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

Residency Status Determination

The campus Admissions Office determines the residence status of all new and returning students for nonresident tuition purposes. Responses to the Application for Admission and, if necessary, other evidence furnished by the student are used in making this determination. A student who fails to submit adequate information to establish a right to classification as a California resident will be classified as a nonresident. A detailed explanation of residence requirements appears on page 89.
POSTBACCALAUREATE AND GRADUATE ADMISSION REQUIREMENTS

Admission Requirements–Objective

Graduate and postbaccalaureate applicants may apply for a degree objective, a credential or certificate objective, or may have no program objective. Depending on the objective, the CSU will consider an application for admission in one of four categories:

- **Postbaccalaureate Unclassified.** You will qualify for admission as an unclassified postbaccalaureate student if you (1) hold an acceptable bachelor's degree from a regionally accredited institution or have equivalent preparation as determined by the campus, (2) have a grade point average (GPA) of at least 2.50 in the last 60 semester (or 90 quarter) units, and (3) are in good standing at the last college you attended. In unusual circumstances, a campus may make exceptions to these criteria.

If eligible for postbaccalaureate unclassified standing, you may qualify for:

- **Postbaccalaureate Classified** standing to enroll in a credential or certificate program provided you satisfy the additional professional, personal, scholastic, and other standards, including qualifying examinations, as the campus may prescribe; or

- **Graduate Conditionally Classified** standing to enroll in a graduate degree curriculum if in the opinion of the appropriate campus authority you can remedy any deficiencies by additional preparation; or

- **Graduate Classified** standing to enroll in a graduate degree curriculum if you satisfactorily meet the professional, personal, scholastic, and other standards, including qualifying examinations, as the campus may prescribe.

INTERNATIONAL (FOREIGN) STUDENT ADMISSION REQUIREMENTS

General Requirements

The CSU must assess the academic preparation of foreign students. For this purpose, “foreign students” include those who hold U.S. visas as students, exchange visitors, or in other nonimmigrant classifications.

The CSU uses separate requirements and application filing dates in the admission of foreign students. Verification of your English proficiency (see below), financial resources, and academic performance are all important considerations in your admission. Academic records from foreign institutions must be on file at least eight weeks before registration for the first term and, if not in English, must be accompanied by certified English translations.

Requirement for English Language Proficiency

All graduate and postbaccalaureate applicants, regardless of citizenship, whose preparatory education was principally in a language other than English must demonstrate oral and written competence in English. Those who do not possess a bachelor's degree from a postsecondary institution or in a country where English is the principal language must take the combined TOEFL and TWE examinations and receive a minimum score of 550 on the Test of English as a Foreign Language (TOEFL) and a minimum 4.5 on the Test of Written English (TWE).

Priority in admission is given to residents of California. There is little likelihood of nonresident applicants, including international students, being admitted to either impacted degree programs or to those with limited openings.

POST-ADMISSION HEALTH REQUIREMENT

All new and readmitted students, born after January 1, 1957, will be notified of the requirement to present proof of measles and rubella immunizations. This is not an admissions requirement, but shall be required of students by the beginning of their second term of enrollment in CSU. Proof of measles and rubella immunizations shall also be required for certain groups of enrolled students who have increased exposure to these diseases. See page 122 for more information.
ACADEMIC REQUIREMENTS AND RESPONSIBILITIES

The following conditions and requirements are common to all master’s degrees:

- A student shall take the standardized tests required in the area of the master’s degree objective on dates announced by the Testing Center of the university. These tests must be applied for by designated times, well in advance of testing, on forms supplied by the Testing Center. Payment of fees must accompany the form. If the specific tests required in the student’s master’s degree program have been taken elsewhere, the student must consult with the Testing Center to transfer the results to the Cal Poly Center as soon as possible and arrange with it for subsequent transfer of test results to the department concerned.

- All students shall attempt to satisfy the graduation writing requirement during the first quarter of enrollment.

- A student shall file an approved formal study plan before the twelfth unit of graduate study is completed.

- A student shall maintain a grade point average of 3.0 (grade of B on a scale where A = 4.0), or better, in all units attempted subsequent to admission to the program, as well as in all courses in the formal program of study. A course in which no letter grade is assigned shall not be used in computing the grade point average.

- A student shall maintain satisfactory scholarship and professional standards. Only those graduate students who continue to demonstrate a satisfactory level of scholastic competence and fitness, as determined by the appropriate university authorities, shall be eligible to continue in such curricula. Students whose performance is judged to be unsatisfactory by the authorities of the university may be required to withdraw from all graduate degree curricula offered by the university.

- A student shall be formally advanced to candidacy before being allowed to enroll for thesis or project units or to take the comprehensive examination.

- A student shall successfully complete a culminating experience (thesis, project and/or comprehensive examination).

- A student shall complete a minimum of forty-five quarter units of approved graduate work in the formal study plan within the seven-year period preceding the date when all the requirements for the degree have been met.

- A student may elect to meet the graduation requirements in effect in the catalog either at the time the student was admitted to graduate standing (conditional or classified) provided that continuous enrollment was maintained, or at the time of graduation. The student may be required to make substitutions for discontinued courses.

Academic Disqualification

A graduate or postbaccalaureate student shall be subject to disqualification if while on probation the student fails to earn sufficient grade points to be removed from probationary status. Disqualification may be either from further registration in the program or from further enrollment at the university as determined by the student’s school dean. Notification of disqualification will be made by the school’s dean.

Academic Probation

A student who is enrolled in a graduate degree program in conditionally classified or classified standing shall be placed on academic probation for failure to maintain a cumulative grade point average of at least 3.0 (grade of B on a scale where A = 4.0) in all units attempted subsequent to admission to the program.

A student who has been admitted as postbaccalaureate-classified in order to pursue a single subject credential program shall be subject to academic probation for failure to maintain a cumulative grade point average of at least 3.0 in all units attempted subsequent to admission to postbaccalaureate
standing. Please refer to the single subject department for specific requirements. A student pursuing a multiple subject credential program shall maintain a cumulative grade point average of at least 3.0 in all units attempted subsequent to admission to postbaccalaureate standing.

A postbaccalaureate classified student in any of the specialist credential programs shall be subject to academic probation for failure to maintain a cumulative grade point average of at least 3.0 in all units attempted subsequent to admission to postbaccalaureate standing.

A postbaccalaureate unclassified student (one who has not been admitted to either a credential or graduate degree program) shall be subject to academic probation for failure to maintain a cumulative grade point average of at least 2.5 in all units attempted subsequent to admission to postbaccalaureate standing.

A student must be placed on probation prior to disqualification. The student’s school dean will notify the student of disqualification.

Administrative Academic Disqualification

A graduate student may also be placed on probation or may be disqualified by appropriate campus authorities for unsatisfactory scholastic progress regardless of cumulative grade point average or progress points. Such actions shall be limited to those arising from repeated withdrawal, failure to progress toward an educational objective or noncompliance with an academic requirement, and shall be consistent with guidelines issued by the Chancellor’s Office.

Advancement to Candidacy

Advancement to candidacy recognizes that the student has demonstrated the ability to operate at and sustain a level of scholarly competence which is satisfactory for successful completion of the degree requirements. The student is then cleared for the final stages of the program which in addition to any remaining coursework will include the thesis, project, and/or comprehensive examination.

The student may request advancement to candidacy only after a formal program of study has been submitted, the graduation writing requirement has been satisfied, and sufficient coursework has been completed to allow the department to make a qualitative judgment, before the student may register for the thesis, project, or examination. The student must have been advanced to candidacy before he or she can enroll for the thesis or project report or sit for the comprehensive examination.

Advisement

As soon as possible after enrollment students should ask the department for the assignment of an adviser in the area of their study. Students should meet with their advisers prior to registration for information concerning prerequisites, courses to be taken, and to develop an informal study plan. An informal study plan is a projection of initial coursework, including prerequisites, that the student will undertake prior to filing a formal study plan, or in lieu of the formal program of study if the student is a postbaccalaureate student without credential or degree objective.

Departmental advisers and graduate coordinators share the responsibility for advising master’s degree students throughout their work on a degree. School or departmental graduate study committees approve completion of a master’s degree program on the recommendation of the advisers. Students are urged to maintain a personal file of transcripts and other records of all undergraduate and graduate work undertaken and to make this file available whenever they seek advisement.

Change of Postbaccalaureate Objective

If students wish to change their postbaccalaureate objective, they must formally file this intention. A form available from the Records Office is used to obtain the necessary approvals.

Comprehensive Examination

A comprehensive examination is a culminating experience for the master’s degree which assesses the student’s ability to integrate the knowledge of the area, show critical and independent thinking, and demonstrate mastery of the subject matter. The results of the examination show independent
thinking, appropriate organization, critical analysis and accuracy of documentation. A record of the examination questions and responses is maintained.

Courses Counting Towards Graduation

Only those letter-graded courses in which an A, B, or C is earned count towards satisfying the total unit requirement for the degree. Courses which are offered only on a credit/no credit basis will also satisfy the unit requirement if a credit grade is earned. The equivalent of an A or a B is required to earn credit in such courses.

Graduate students may elect to take courses which are not part of their formal program of study on a credit/no credit basis, subject to the conditions stated in this catalog on page 124.

Culminating Experience

The culminating experience for the granting of a graduate degree is the successful completion of a thesis, project or comprehensive examination. The quality of work accomplished, including the quality of the writing, is the major consideration in judging the acceptability of the thesis, project, or comprehensive examination. The student must successfully complete a culminating experience to be granted a graduate degree, although departments vary in the form required.

Enrollment in Graduate Courses

To enroll in 500-level graduate courses a student must have postbaccalaureate standing, graduate standing, or permission of the instructor.

Formal Study Plan

The student should make an appointment with the adviser before the 12th unit of work is completed to develop a formal program of study for the master's degree. A formal study plan is an agreement between the student and the school on the specific coursework to be completed in order to fulfill the requirements of the master's degree. A copy of the study plan must be submitted to the Graduate Studies Office for review and final approval.

It is university policy that only 400- and 500-level courses be allowed in the 45 units of an approved graduate plan of study. In those programs where specific 300-level courses may be essential for a student's success, the student may be conditionally accepted to the program contingent upon completing those 300-level courses. Those 300-level courses will not constitute any part of the approved 45 units in the plan of graduate study.

No fewer than 32 quarter units shall be completed in residence. A course taught "in residence" is normally a catalog offering or approved experimental course taught by a Cal Poly faculty member. Extension courses may not be used to fulfill the residence requirement. However, summer session courses and up to 12 units taken through concurrent enrollment can be counted as residence courses. Petitioned graduate courses taken at Cal Poly as an undergraduate count as taken in residence. Courses for which students received credit by examination may be petitioned to count as taken in residence. These situations are explained further below.

No more than 13 quarter units of approved extension courses shall be granted credit prior to the submission of a formal study plan. Concurrent enrollment courses are counted as residence credit.

No more than 12 quarter units of approved concurrent enrollment shall be granted credit prior to the submission of a formal study plan. Concurrent enrollment courses are counted as residence credit.

In addition to the above rules governing in-residence courses, the following apply to courses included on the formal study plan:
No fewer than one-half of the units required for the degree shall be in courses organized primarily for graduate students (500 level).

No more than nine quarter units shall be in student teaching.

No more than nine quarter units shall be allowed for a thesis or project.

No more than 12 quarter units of approved postbaccalaureate (unclassified) course credit will be accepted for the master’s degree.

Certain 400 series courses may be completed by the graduate student as part of the degree program when this is consistent with university requirements, departmental master’s degree specifications, and the candidate’s formal program of study. The student should always consult the adviser to make certain that only approved courses are selected since departmental requirements vary, and some courses are excluded.

Full-Time Graduate Student Status

A full-time graduate student is defined as one taking more than 8 units in a quarter. Students receiving financial aid may need to meet different requirements to be considered full-time and should consult with the Financial Aid Office. Normally students are not permitted to enroll in more than 16 units each quarter.

Grade Point Calculation for Graduate Degree

The base for calculation of the grade point average includes all university-level courses taken after you have been admitted to a postbaccalaureate program. This base includes graduate courses taken at other universities, graduate courses taken through extension, credential courses, university credit courses in postbaccalaureate status, and graduate courses taken for other graduate degree objectives. Students who take courses primarily for enrichment or to satisfy deficiencies may elect to take them credit/no credit. Repeating a failed course does not remove a lower letter grade from the overall GPA calculation.

Graduate Courses Taken by Undergraduates for Graduate Credit

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

Graduation

A student planning to graduate must request a final graduation evaluation from the Evaluations Office approximately two quarters prior to the anticipated date of degree completion. A student cannot graduate without this evaluation.

Those candidates for master’s degrees who attain a grade point average which is in the upper ten percent of their major and whose grade point average is 3.75 or better may upon the recommendation of the school dean be designated as “Graduating with Distinction.”

For information on diploma regulations, see page 111.

Graduation Requirement in Writing Proficiency

All students must demonstrate competency in writing skills as a requirement for graduation. Students may meet the graduation writing requirement through one of four options:

1. Passing the Writing Proficiency Exam.
2. Passing an approved 300-level composition course with a grade of C or better AND receiving certification of proficiency in writing from the instructor based on a 500-word in-class essay.
3. Passing an approved 300-level literature course with a grade of "C" or better AND receiving certification of proficiency in writing from the instructor based on a 500-word in-class essay.
4. Certifying that the graduate requirement was met as part of an undergraduate program of study at Cal Poly.

All graduate students must attempt to meet the Graduation Writing Requirement in the first quarter of residence. Each student should review his or her curricular requirements to determine which option is appropriate. The requirement must be met before the student can be advanced to candidacy. Questions should be addressed to the Writing Skills Office, Agriculture Building (10), Room 130, 756-2067.

Leaves of Absence

Students are permitted to take a Planned Educational Leave or a Medical Leave and be absent for up to two calendar years. A written request by the student and approval by campus officials are required. The general guidelines for determining eligibility and approving requests for leaves of absences are listed below.

1. A Planned Educational Leave must be for a purpose which contributes to the student's educational objective and is approved by the student's major department head or chair.
2. A Medical Leave provides time for the student to receive treatment or to recover from a disabling injury or other medical condition and is approved by either the campus' Director of Health Services, Counseling and Testing, or Disabled Student Services.
3. To be considered for an Educational Leave, the student must be eligible to enroll for the term in which the leave begins and not be on academic probation.
4. The application for Educational Leave must be initiated and approved before the leave begins and will not be granted retroactively; the Medical Leave begins the term following the student's last term in attendance and may be granted retroactively based on the student's personal situation.
5. A student on Educational or Medical Leave will be considered to be in continuous attendance with the purpose of returning to the same curriculum which was in effect when the leave began.
6. A student on Educational or Medical Leave will not be required to apply for readmission or pay an application fee provided that the student is returns to the same major and returns within the time period agreed upon at the time the application was approved.
7. The student on leave may return and enroll for any term prior to the term when the leave is scheduled to end. Neither leave will be extended beyond the two-year limitation for any reason.
8. Any student on leave who fails to return and enroll within the time limits specified by the leave agreement will be required to reapply for admission, pay the reapplication fee, and may be held to any new curriculum requirements which may be in effect.
9. Students are eligible to obtain two Educational Leaves during their career at Cal Poly including graduate school.

Application forms and information concerning Leaves of Absence may be obtained from the Registrar's Office.

Prerequisites

Each master's degree program has specific prerequisites, both in courses and in grade point average. Deficiencies in prerequisites must be removed prior to advancement to classified graduate status. Courses taken for this purpose normally will not count toward fulfillment of the unit requirement for the degree.

Registration

The schedule and instructions for CAPTURE registration and payment of fees is published quarterly in the Class Schedule which may be purchased from the El Corral Bookstore prior to each quarter. The Class Schedule includes registration instructions and lists classes offered for the quarter. Detailed descriptions of courses are found in the back of this catalog.

Repeating a Course

Students may enroll in a course for credit more than once only if the catalog course description states that the course may be repeated for credit. An exception to this policy allows the repeating of a course in cases where a grade of “D” or “F” was received. However, for graduate students both
grades will be reflected in the calculation of the grade point average. Graduate students are not eligible to repeat courses and remove the lower grade points from calculation of the GPA.

**Research Involving Special Conditions**

Research that involves the use of human subjects, vertebrate animals, or hazardous materials requires special campus review before the study begins. If your research involves any of these special conditions, check with your graduate coordinator for procedures.

**Returning Students**

Matriculated students who have not registered for three consecutive quarters and have not been on an approved leave of absence must file an application for readmission. The application fee must accompany the application for readmission. To ensure that they get the registration priority to which they are entitled, they should apply for readmission at last three months before classes begin.

Matriculated students who have not registered for one quarter or two consecutive quarters will be entitled to their registration priority without applying for readmission. Summer Quarter is a regular quarter and is counted in determining the length of absence.

**Second Master's Degree**

A student can earn only one master's degree in any of the graduate disciplines offered. A student who wishes to complete a second master's degree in another discipline or two master's degrees simultaneously must complete all the requirements for both degrees. Of the units required in common for each degree, no more than nine quarter units of coursework may be used to satisfy requirements in both master's degree programs.

**Thesis or Project Report Requirements**

A thesis is the written product of a systematic study of a significant problem. It identifies the problem, states the major assumptions, explains the significance of the undertaking, sets forth the sources for and methods of gathering information, analyzes the data, and offers a conclusion or recommendation. The finished product evidences originality, critical and independent thinking, appropriate organization and format, and thorough documentation. Normally, an oral defense of the thesis is required.

A project is a significant undertaking appropriate to the fine and applied arts or to professional fields. It evidences originality and independent thinking, appropriate form and organization, and a rationale. It is described and summarized in a written abstract that includes the project's significance, objectives, methodology, and a conclusion or recommendation. An oral defense of the project may be required.

The following are minimum requirements for a thesis/project report committee: 1) that the graduate student find a thesis/project report adviser who is a permanent full-time faculty member from the student's department; 2) that the thesis adviser and the student recommend, for approval by the graduate coordinator and/or department head, a thesis committee comprising at least three permanent full-time faculty members; 3) that two of these members, one of which will be the chair, will be from the student's department.

The student should consult the latest edition of the "Manual of Instructions for the Preparation and Submission of the Master's Thesis or Master's Project" for guidance before beginning a thesis or project. The manual may be obtained from the Graduate Studies Office.

If a thesis or project is required in a master's degree program, a committee-approved copy must be completed in accordance with university specifications. A copy of the thesis or project report must be received and reviewed by the Thesis Editor in the Graduate Studies Office. Upon completion of any required corrections, a copy ready for binding is filed with the Graduate Studies Office for submission to the University Library. These steps must be completed before the degree will be awarded.
Time Limit Extension
The university, at its option, may extend the seven-year time frame for students who pass an examination or who have sufficient advanced work in the relevant course or subject field. Students who wish to extend the time frame must file a graduate student petition for special consideration explaining the reasons why the extension is necessary and what explicit plans are made for completing the degree.
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The School of Agriculture offers programs reflecting the growing diversity of choices available and skills required in modern-day agriculture and its related professions. Undergraduate students may earn a Bachelor of Science degree in any of the following majors: agricultural engineering, agricultural engineering technology, agricultural business, agricultural science, animal science, crop science, dairy science, food science, fruit science, natural resources management, nutritional science, ornamental horticulture, poultry industry, or soil science. Graduate students may earn a Master of Science degree in Agriculture in one of the following specializations: agricultural engineering technology, general agriculture, food science and nutrition, international agricultural development, or soil science. The School of Agriculture offers minors in Agribusiness and Plant Protection.

The Master of Business Administration degree with an agribusiness specialization is offered by the School of Business in conjunction with the Agribusiness Department. For more information, see page 221.

The Agricultural Education Department provides an additional program to credential candidates who wish to become secondary school teachers of Vocational Agriculture. In partnership with the Brock Center for Agricultural Communication, the department also offers an agricultural information emphasis.

The Animal Sciences and Industry Department offers a 10-week certificate program in horseshoeing during the fall and spring quarters.

Students in the School of Agriculture take courses in their major field beginning with their first quarter of enrollment. This early exposure provides them with knowledge of immediate interest to supplement that gained in other coursework in basic sciences, language, mathematics and liberal arts. Moreover, it allows students to evaluate whether or not the curriculum selected is appropriate to their interests and abilities. Taking courses in the major throughout the academic program fosters personal contact with faculty and other students having common interests but varied backgrounds.

The students' early involvement in their major field, combined with the faculty's close contacts with schools, governmental agencies, private industries and nonprofit organizations provide unusual opportunities for student internships during the junior or senior years. Other opportunities which enhance education, provide financial assistance, and help prepare students for the job market include enterprise projects, scholarships, and work-study jobs.

Student clubs are active in every department. The 35 clubs, most of which are affiliated with national professional organizations, provide an excellent forum for student and faculty interactions. Active club members may practice leadership skills, and attend national, state and local professional meetings, as well as participate in a variety of professional and social events.

Faculty in the School of Agriculture are experts in their disciplines, and are dedicated to teaching. They are eager to help students learn, are readily available for consultation, and are proud of their close relationship with students.
FACILITIES

The School of Agriculture facilities include a 6,000 acre farm having beef cattle, dairy cattle, horse, sheep, swine and poultry units, rodeo and horse show arenas, a horse training track, vineyards, irrigated and non-irrigated fields for various crops, citrus groves, avocado and deciduous orchards, an arboretum, greenhouses, several micro computer laboratories, a market news information facility, an irrigation demonstration field, reservoirs, an agroforestry demonstration plot, laboratories with modern equipment for soil-plant-water testing, engineering testing and manufacturing shops, complete food processing units for dairy products, meats, fruit and vegetables, and more. The School of Agriculture also operates a 3,200 acre ranch and forest located on the Pacific Coast north of Santa Cruz and a 5,000 acre cattle and dryland farming operation near Bradley, California. All of these facilities are for student use. They provide students with unusual opportunities for hands-on experiences which augment the instruction received in the classroom.

COURSES

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

Courses in the major:
The required cluster of courses in which the student expects to graduate. These courses constitute the core of specific preparation for the student's major field in agriculture.

Support courses:
Courses in agriculture and closely allied fields which support and supplement the block of courses constituting the student’s major.

General Education and Breadth:
Courses are selected from the physical and life sciences, mathematics, communications, and from human, social, political, and economic development areas. These courses furnish the student with background and support for agricultural courses as well as providing cultural background for the students’ intelligent participation in a complex world society.

Electives:
Course selection in this area is designed to provide freedom for students to pursue interests of their choosing in any university department.

Recommended Preparation

In addition to pursuing the CSU mandated entrance requirements, high school and community college students are encouraged to participate in extra- and co-curricular activities as part of their preparation for admission to Cal Poly's School of Agriculture. These activities could include, but are not limited to, FFA, 4-H, leadership roles in school clubs, meaningful work experience and community organizations.

Laboratory Safety

Students are required to meet sanitation and safety regulations in laboratories. These regulations will be explained by the instructor at the first meeting of the class.

AGRICULTURAL ENTERPRISE PROJECT FACILITIES

The School of Agriculture utilizes the student enterprise program of the Cal Poly Foundation to provide practical experience which supplements the regular production courses. This enterprise program leads to a fuller understanding of important production and managerial problems in agriculture.

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

The Animal Sciences and Industry Department conducts student enterprise projects with beef cattle, swine, sheep, horses and poultry. The stock utilized by our students represents the best bloodlines in the nation.
The beef program includes registered herds of 150 cows, stocker programs averaging 200 head, a 300-head performance test facility, a 200-head feedlot, and 15-20 show steers. These cattle are managed in a variety of settings from environmentally controlled confinement to our 3,000 acre native range operation. The cattle are dispersed over six different ranches away from the campus core and four distinct areas on campus. These animals and facilities are utilized for student projects including cow-calf, feedlot, stocker, performance, and show cattle operations.

The sheep section includes purebred flocks of 70 Suffolk and 35 Hampshire ewes and a commercial range flock of 185 whiteface ewes. The sheep are housed on one ranch of 600 acres near, but not on campus, and a group of pastures and facilities closer in. Students become involved in commercial ewe, lamb feeding, range ram, ram test, and show lamb projects.

The swine herd consists of two major breeds—Yorkshires and Hampshires. The facilities include a 10-unit farrowing house and outside lots and pastures for the brood sows. In addition there are 24 feeder units for student projects with capacity for approximately 20 market hogs per unit. Between 400 and 500 market hogs are produced in student projects each year.

The Foundation horse herd is made up of the Thoroughbred and Quarter Horse breeds. An approximate total of 60 head of broodmares, foals, yearlings and riding stock are housed at the horse unit facilities. Currently standing at stud are three stallions: two Quarter Horses and one Thoroughbred. Emphasis is placed on basic horse handling and training procedures leading up to the breeding and training of two-year-olds for in-training sales. These sales expose students to professionals and their ideas and expose the industry to what we do at Cal Poly.

The poultry flocks comprise some 5,000 birds. Student projects involve mostly broiler production, started pullet production, and egg production—plus duck, geese, turkeys, and game birds on a limited basis. The equipment includes a modern incubator, egg-handling facilities, and brooding and rearing equipment. Students care for all of the operations under the supervision of technicians and faculty.

The Dairy Science herd includes purebred Jerseys and Holsteins. The dairy has all the necessary facilities for feeding, milking, calf and bull raising, artificial insemination, and management practices. A separate dairy located on campus provides an opportunity for students with dairy projects. A modern dairy plant is also available for milk processing and manufacturing by-products.

The Food Science and Nutrition Department is equipped with a food operation pilot plant and meat processing facilities. The laboratories contain many types of small scale commercial processing equipment. Students process foods under faculty supervision. Some examples are: jams, condiments, fresh and processed meats, baked goods and specialty products. All food products manufactured by student enterprise projects and class work are marketed in the Campus Store.

The Natural Resources Management Department has faculty expertise and facilities available for raising Christmas trees and for agroforestry. Students conducting forestry projects learn all aspects of tree farming from establishment to marketing. A large, well-equipped greenhouse facility is available for raising tree seedlings. Also, a large area of redwood and mixed hardwood forest land is available for student projects on the Swanton-Pacific Ranch near Santa Cruz.

The Ornamental Horticulture Department provides facilities consisting of fifteen greenhouses, six shade houses, extensive growing grounds, a sales area, a large plant tissue culture lab, disease and pest lab, and three large labs available for production. The unit has the latest equipment and machinery to facilitate student projects needs which encompass all phases of nursery and greenhouse work.

The Crop Science Department is well equipped with all types of machinery found on mechanized farms in California. All of the crop production and marketing operations are carried on under the supervision of the Crop Science Department through enterprise projects. Orchards, vineyards, crop land, fruit and vegetable packing facilities and marketing outlets are available for instructional purposes.

The Soil Science Department is equipped for the accurate analysis of soil and water with modern equipment and facilities. Under faculty supervision, Enterprise students have the opportunity to learn the management and operation of a soil and water testing program. The students provide soil and water data and information to home owners and growers for fertilizer practices in San Luis Obispo County.
TECHNICAL CURRICULA IN AGRICULTURE

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

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

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

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

Course or subject area requirements for each technical curriculum are shown in the accompanying table. Detailed curriculum information is available from the dean of the school and the department heads.

A student enrolled in the technical program may not transfer to a degree program except by following the approved university procedure for transfers as outlined in the Campus Administrative Manual, Section 414.

<table>
<thead>
<tr>
<th>TECHNICAL CURRICULA IN AGRICULTURE</th>
<th>Course or Subject Area Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required Courses or Subject Areas</td>
<td>Technical Curricula</td>
</tr>
<tr>
<td>Non-Agricultural Courses</td>
<td>ArSc</td>
</tr>
<tr>
<td>BOT 121 or BIO 101/105</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 114</td>
<td>4</td>
</tr>
<tr>
<td>POLS 210</td>
<td>3</td>
</tr>
<tr>
<td>HIST 204</td>
<td>3</td>
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<tr>
<td>MATH 102</td>
<td>3</td>
</tr>
<tr>
<td>PE 250</td>
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<tr>
<td>Courses in the Department</td>
<td>20</td>
</tr>
<tr>
<td>Agricultural Support Courses</td>
<td></td>
</tr>
<tr>
<td>Agricultural Engineering</td>
<td>8</td>
</tr>
<tr>
<td>Agribusiness</td>
<td>7</td>
</tr>
<tr>
<td>Crop Science</td>
<td>4</td>
</tr>
<tr>
<td>Soil Science</td>
<td>4</td>
</tr>
<tr>
<td>Other Agriculture</td>
<td>5</td>
</tr>
<tr>
<td>Non-Agricultural Support Courses</td>
<td>0</td>
</tr>
<tr>
<td>Electives in Major</td>
<td>11</td>
</tr>
<tr>
<td>Free Electives</td>
<td>20</td>
</tr>
<tr>
<td>Total Units</td>
<td>98</td>
</tr>
</tbody>
</table>

Full names of the technical curricula: animal science, crop science, dairy husbandry, dairy products technology, food science, fruit science, ornamental horticulture-floristry, ornamental horticulture-nursery, and poultry industry.
MASTER OF SCIENCE DEGREE-AGRICULTURE

Programs

M.S. Agriculture with Specializations in:

- Agricultural Engineering
- International Agricultural Development
- Food Science and Nutrition
- Soil Science
- General Agriculture

General Characteristics

Graduate studies in the School of Agriculture allow the student to pursue either a professional program designed to enhance the competencies of agricultural educators, or an academic program of graduate-level scholarly activities and research in one of several disciplines. The Master of Science degree program is intended to prepare graduates for (a) professional-level positions with private business and industry, government, and foreign service in agriculture and related fields; (b) agricultural teaching in secondary schools or community colleges; or (c) continued graduate work at other institutions. Although individual departments in the school do not offer advanced degrees, students may emphasize in their studies agricultural education, dairy products technology, international agriculture, agricultural engineering technology, soil science, crop science, food science and nutrition, natural and forest resources, or water resources. Applicants must select the specialization which is appropriate for the area of emphasis. The specializations are Agricultural Engineering Technology, Food Science and Nutrition, General Agriculture, International Agricultural Development, and Soil Science.

When to Apply

Application filing periods are given on page 133 of this catalog. To ensure adequate processing and full consideration, all application materials should be filed with the Cal Poly Admission’s Office before the dates given below; nevertheless, applicants are encouraged to file during the initial filing period.

- Fall Quarter: August 15
- Winter Quarter: November 15
- Spring Quarter: February 15
- Summer Quarter: May 15

Prerequisites

Consideration for admission to this program as a classified graduate student requires a minimum grade point average of 2.75 in the last 90 quarter units attempted. An applicant not meeting these academic standards, but who meets the basic university standard of a grade point average of 2.5 in the last 90 quarter units attempted may be considered for admission as a postbaccalaureate student; such admission does not constitute admission to graduate degree standing (refer to page 134). A change from postbaccalaureate status to graduate status requires application and additional processing through the university’s admissions office.

An applicant meeting the grade point requirement for classified graduate status, but who is deficient in background courses in agriculture, natural resources and/or related support disciplines may be considered for admission as a conditionally classified graduate student. Before such a student is advanced to classified graduate status, deficiencies in prerequisites must be removed and satisfactory academic performance in a graduate program must be demonstrated by the completion of no fewer than 12 units of specified courses with a minimum grade point average of 3.0. Courses taken to remove deficiencies in prerequisites will not count toward the unit requirement for the degree.
All applicants who do not speak and write English as their primary language are required to complete the Test of English as a Foreign Language (TOEFL), with a minimum score of 550, and the Test of Written English (TWE), with a minimum score of 4.5.

**Program of Study**

The School of Agriculture graduate program includes the following specializations: Agricultural Engineering Technology, Food Science and Nutrition, General Agriculture, International Agriculture Development, and Soil Science. These specializations are founded on a core of courses which include thesis (required of all except agricultural educators) or internship (required of agricultural educators), a research methods or educational program development course, and one of the graduate seminars offered in the school. Although the program offers several specializations, there is a single degree; students may not earn more than one Master of Science degree in the School of Agriculture.

The thesis is based on independent, supervised research; students should contact individual departments to determine the availability of funding support for their research. The final copy of the thesis must meet the standards explained in the "Manual of Instructions for the Preparation and Submission of the Master's Thesis or Master's Project" available from the Cal Poly Graduate Studies Office. At least one course in statistical methods and/or experimental design is required of students in a thesis curriculum.

Graduate students must file the formal program of study for the degree with the Graduate Studies Coordinator of the School of Agriculture by no later than the end of the quarter in which the 12th unit of approved courses is completed. The formal program of study must include at least 45 units of committee-approved graduate coursework; at least half of the minimum units required must be at the 500 level. Students should refer to the course descriptions in this catalog for credit limitations of individual courses; for example, total credit for AG 500, Individual Study, is limited to six units.

Students also should refer to the Graduate Program Guidelines obtainable from the school's Graduate Studies Coordinator.

All students must pass the graduation writing requirement by earning a score of 10 or higher (12 possible) on the Writing Proficiency Exam (WPE) or by completing ENGL 302 or ENGL 318 with a grade of A or B during their first quarter in residence. ENGL 302 or ENGL 318 may not be used to satisfy course or unit requirements in the Master of Science program.

All students are required to pass both a written and an oral comprehensive examination which normally are given during the final quarter of the program of study. Successful completion of the written comprehensive examination is required before the student may take the final oral comprehensive examination. For students in a thesis program, the final oral comprehensive examination will include, but not necessarily be limited to, a defense of the thesis.

Requirements of the various specializations are given in the curriculum display following this section. Please note that the General Agriculture Specialization is designed for either agricultural educators or others who seek graduate work (including thesis-directed research) in certain disciplines not having a specialized curriculum; these disciplines include crop science, natural and forest resources, and water resources.
### CURRICULUM FOR M.S. AGRICULTURE, SPECIALIZATION IN AGRICULTURAL ENGINEERING TECHNOLOGY

**Units**

<table>
<thead>
<tr>
<th>Category</th>
<th>Courses</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Core courses</strong></td>
<td>AG 599 Thesis (6)</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>400-500 level research methods course (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AE 581 Graduate Seminar in Agricultural Engineering (3)</td>
<td></td>
</tr>
<tr>
<td><strong>Required in the specialization</strong></td>
<td>AE 521, AE 522, AE 533</td>
<td>9</td>
</tr>
<tr>
<td><strong>Restricted electives</strong></td>
<td>At least 9 units must be in computer related coursework; remaining units shall be approved by the student’s Graduate Studies Committee. At least 6 units must be at the 500 level.</td>
<td>18</td>
</tr>
<tr>
<td><strong>Electives</strong></td>
<td>400-500 level courses approved by the student’s graduate committee.</td>
<td>6</td>
</tr>
</tbody>
</table>

### CURRICULUM FOR M.S. AGRICULTURE, SPECIALIZATION IN FOOD SCIENCE AND NUTRITION

**Units**

<table>
<thead>
<tr>
<th>Category</th>
<th>Courses</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Core Courses</strong></td>
<td>AG 599 Thesis (6)</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>FSN 581 Graduate Seminar (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SS 501 Scientific Investigations (3)</td>
<td></td>
</tr>
<tr>
<td><strong>Required in the specialization</strong></td>
<td>AG 500 Individual Study (3-6)</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>FSN 410 Nutritional Aspects of Food Processing (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FSN 501 Lipid Metabolism and Nutrition (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>STAT 512 Statistical Methods (3)</td>
<td></td>
</tr>
<tr>
<td><strong>Approved electives</strong></td>
<td>AE 425 Computer Controls in Agriculture (3)</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>AE 521 Engineering of Agricultural System (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AE 522 Agricultural Process Control/Microprocessors (4)</td>
<td></td>
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<td></td>
<td>BIO 431 Physiology I: General (4)</td>
<td></td>
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<tr>
<td></td>
<td>CHEM 435 Food Analysis (4)</td>
<td></td>
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<td></td>
<td>CHEM 436 Agricultural Chemicals (4)</td>
<td></td>
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<tr>
<td></td>
<td>CHEM 439 Instrument Analysis (5)</td>
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<tr>
<td></td>
<td>CHEM 528 Nutritional Biochemistry (3)</td>
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<tr>
<td></td>
<td>CHEM 572 Advanced Biochemistry (3)</td>
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</tr>
<tr>
<td></td>
<td>ED 555 Introduction to Counseling (3)</td>
<td></td>
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<tr>
<td></td>
<td>FSN 407 Food Composition Science (4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FSN 409 Sensory Evaluation of Food (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FSN 431 Advanced Meats (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FSN 437 Advanced Food Processing (4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PE 451 Nutrition for Fitness and Sport (3)</td>
<td></td>
</tr>
<tr>
<td><strong>Electives (400-500 level courses)</strong></td>
<td>400-500 level courses approved by the student’s graduate committee.</td>
<td>9</td>
</tr>
</tbody>
</table>
CURRICULUM FOR M.S. AGRICULTURE, SPECIALIZATION IN GENERAL AGRICULTURE

Core Courses ........................................................................................................................................ 12

Required of agricultural educators:
AG 539 Internship (6)
AGED 520 Program Development in Agricultural Education (3)
AGED 522 Instructional Programs in Agricultural Mechanics (3)
Written and oral comprehensive examination

Required of students other than agricultural educators:
AG 599 Thesis (6)
400- or 500-level research methods course (3)
Any 581 Graduate Seminar offered in School of Agriculture (3)

Restricted electives .................................................................................................................... 27

For agricultural educators:
Any approved 400- and 500-level agriculture courses. No less than 18 units must be at the 500 level.

For students other than agricultural educators:
Any 400- and 500-level courses approved by the student’s graduate committee. At least 12 units must be at the 500 level.

Electives .......................................................................................................................................... 6

Any 400- and 500-level course approved by the student’s graduate committee. All agricultural education students will required to complete one year of successful teaching or graduate level internship prior to the final examination.

CURRICULUM FOR M.S. AGRICULTURE, SPECIALIZATION IN INTERNATIONAL AGRICULTURAL DEVELOPMENT

The International Agricultural Development specialization is a management oriented program designed primarily for enhancing the technical skills of returning Peace Corp volunteers and individuals that seek specialized employment in developing countries.

Prerequisite: A bachelor’s degree with background courses that include macroeconomics, microeconomics, crop production, general soils, and agricultural irrigation. Students may complete prerequisite coursework at Cal Poly if necessary.

Core Courses .................................................................................................................................... 26

AG 599 Thesis (6)
AGB 510 World Agriculture Development (3)
AGB 515 International Agriculture Marketing (3)
AGB 516 Program Management in Developing Countries (3)
AGB 421/AGB 435/AGB 544 (4)
SS 453 Tropic Soils (4)
400-500 level research/statistical methods course (3)

Restricted electives to be selected with adviser’s approval .................................................................. 11

Courses to be selected from an area of emphasis in Agroforestry Technology, Cropping Systems Technology, or Irrigation Technology.

Global Requirement ......................................................................................................................... 6

Any suitable combination of 400-500 level courses from ECON, POLS, GEOG, ANT, and HIST.
To be approved by student’s graduate committee.

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

To be selected from any 400-500 level course approved by the student’s graduate committee.
CURRICULUM FOR M.S. AGRICULTURE,
SPECIALIZATION IN SOIL SCIENCE

Prerequisite: B.S. degree in Soil Science, related field or physical or biological sciences, or a B.A. degree with proficiency in the basic sciences (chemistry, physics, botany, biology, and statistics). A computer science or applied computer science course. Students may complete prerequisite courses at Cal Poly if necessary.

<table>
<thead>
<tr>
<th>Units</th>
<th>Core courses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SS 501 Scientific Investigation (3)</td>
</tr>
<tr>
<td></td>
<td>SS 581 Graduate Seminar in Soil Science (3)</td>
</tr>
<tr>
<td></td>
<td>SS 599 Thesis (6)</td>
</tr>
<tr>
<td></td>
<td>Required in the specialization</td>
</tr>
<tr>
<td></td>
<td>SS 508 Landscape Management for Erosion Control (3)</td>
</tr>
<tr>
<td></td>
<td>SS 521 Soil Genesis and Classification (3)</td>
</tr>
<tr>
<td></td>
<td>SS 522 Advanced Soil Fertility (3)</td>
</tr>
<tr>
<td></td>
<td>Electives</td>
</tr>
<tr>
<td></td>
<td>400-500 level courses approved by the student’s graduate committee. At least 6 units of electives must be from outside of the School of Agriculture.</td>
</tr>
</tbody>
</table>

For further information or advisement students should communicate with the Dean of the School of Agriculture.

Agribusiness Specialization in the MBA Program

The School of Business and the Agribusiness Department jointly offer an Agribusiness Specialization in the Master of Business Administration program. The program is part of the two-year MBA curriculum and requires the completion of six graduate classes taught by the Agribusiness Department (see page 221). Information and application materials may be obtained by writing to the MBA Coordinator, School of Business.
Agriculture Bldg. (10), Room 210
(805) 756-5000

Faculty

Department Head, M. LeRoy Davis

James J. Ahern
William H. Amspacher
Renny J. Avey
Daniel W. Block
Philip M. Douba
Arthur C. Duarte
Douglas G. Genereux

George J. Hellyer
Jack J. Herlihy
H. Clay Little
Robert E. McCorkle
Steven D. McGary
Nancy C. Ochs
Clay L. Robinson

John A. Rogalla
David J. Schaffner
Jack F. Scott
Kenneth C. Scott
Robert C. Thompson
Stanton G. Ullerich
Marlin D. Vix

Programs

B.S. Agricultural Business with Concentrations in:

- Agribusiness Finance and Appraisal
- Agribusiness Marketing
- Agribusiness Policy
- Farm and Ranch Management

Minor: Agribusiness

The Bachelor of Science degree in Agricultural Business emphasizes training in management for careers in agribusiness. The thrust of the program is to prepare students for careers in the management of firms that are part of the world’s food system. The food system encompasses all the direct functions such as inputs to producers, production, processing, distribution, and marketing. In addition, emphasis is placed on the support functions such as finance, domestic policy, and international policy. The curriculum is based on a solid background in production agriculture. \(^1\)

**CURRICULAR CONCENTRATIONS**

**Agribusiness Finance and Appraisal**
Graduates of this concentration find employment opportunities with a variety of agricultural lending institutions such as commercial banks, the Farm Credit System, Farmers Home Administration, and large insurance companies. Positions include loan officer, branch manager, in-house appraiser and product specialist. Other possible careers include those of fee appraiser, financial officer in a large agricultural firm, and agricultural real estate sales.

**Agribusiness Marketing**
Career placement opportunities for graduates of this concentration involve management operations of agribusiness firms providing supplies and service to farmers and by those firms engaged in

\(^1\) The Business Administration major is distinguished from the major in Agricultural Business. The major in Business Administration provides students with the knowledge and analytical skills essential for employment in all sectors of business and industry, as well as for managerial careers in governmental and other non-profit organizations. Opportunities for specialization are provided for students preparing for careers in accounting, financial management, marketing management, management information systems, international business management, general management, production and operations management, and human resources management.
marketing, distribution, and sales of farm products. These careers include sales representatives for agricultural chemical organizations and fertilizer companies and may lead into more responsible management positions. Other careers are found in fresh fruit and vegetable marketing, advertising, food chains, food processing, and agricultural county and district fairs.

**Agribusiness Policy**

This concentration prepares students for employment as policy analysts and lobbyists for public agencies as well as private firms and organizations. Typical employers include agribusiness, farm organizations, commodity associations, agribusiness trade associations, government regulatory agencies and federal and state legislatures. The curriculum has been designed to enable students to meet the need of these employers by acquiring abilities to analyze the impacts of U.S. and foreign farm, food, resource, and trade policies.

**Farm and Ranch Management**

The successful American family farm or ranch is large enough and sufficiently complicated to require its operator to be qualified through professional management training and experience. Many Farm and Ranch Management graduates return to the family farm and, after gaining the seasoning of further experience, carry the farm business to greater levels of success. Graduates without family farm connections may find employment as supervisors on a large scale farm or ranch and advance to greater responsibility.

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**CURRICULUM FOR B.S. AGRICULTURAL BUSINESS**

*Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.*

### Freshman

- **AGB 100** Orientation to Agribusiness Management .............................................................. 1
- **AGB 102** Introduction to Agricultural Economics ................................................................. 3
- **AG 250** Computer Applications to Agriculture (F.1.) ............................................................ 3
- **ASCI 230/DH 230/PI 230** ........................................................................................................ 4
- **CRSC 131 or 230/CRSC 131 or 230/VGSC 230** ................................................................. 4
- **ANT 201/GEOG 150/SOC 105** (D.4.a.) ............................................................................. 3
- **ENGL 114** Writing: Exposition (A.1.) .................................................................................. 4
- **ENGL 125/PHIL 125/SPC 125** Critical Thinking (A.2.) ...................................................... 3
- **MATH 118 - Pre-Calculus Algebra or MATH 221 Calculus for Business and Economics (B.2.)** 4
- **ENGL 125/PHIL 125/SPC 125** Critical Thinking (A.2.) ...................................................... 3
- **SPC 201** Public Speaking or SPC 202 Principles of Speech Communication (A.3.) .......... 3
- **BACT, BOT, or ZOO life science elective (with lab) (B.1.b.)** ........................................... 4
- **Agriculture electives** ........................................................................................................... 3
- **Electives** .............................................................................................................................. 3
- **Total Credits** ........................................................................................................................ 48

### Sophomore

- **AGB 201** Agribusiness Sales and Service ............................................................................. 3
- **AGB 203** Agribusiness Organizations .................................................................................. 3
- **AGB 212** Agricultural Economics .......................................................................................... 3
- **AGB 213** Agricultural Economic Analysis ............................................................................ 4
- **ACTG 211** Financial Accounting for Nonbusiness Majors ................................................. 4
- **CHEM 121** General Chemistry (B.1.a.) .............................................................................. 4
- **ECON 222** Macroeconomics (D.3.) .................................................................................... 4
- **ENGL 215** Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.) 4
- **HIST 204** History of American Ideals and Institutions (D.1.) ............................................. 3
- **STAT 211 and STAT 212 or STAT 251 and STAT 252** (B.2.) ........................................ 3,3
- **BACT, BOT, or ZOO life science elective (with lab) or CHEM 122 General Chemistry (B.1.)** 4
- **Critical reading elective (C.1.)** ............................................................................................ 3
- **Agriculture electives** ........................................................................................................... 3
- **Electives** .............................................................................................................................. 3
- **Total Credits** ........................................................................................................................ 51
### Junior

<table>
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<tr>
<th>Course Code</th>
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<td>AGB 301</td>
<td>Agricultural Marketing</td>
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<tr>
<td>AGB 310</td>
<td>Agribusiness Credit and Finance</td>
<td>3</td>
</tr>
<tr>
<td>AGB 312</td>
<td>Agricultural Policy</td>
<td>3</td>
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<tr>
<td>AE 340/FSN 230/CRSC 311</td>
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<tr>
<td>SS 121</td>
<td>Introductory Soil Science</td>
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<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
<td>3</td>
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<td>PHIL 230/PHIL 231</td>
<td>Philosophical Classics (C.1.)</td>
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<tr>
<td>POLS 210</td>
<td>American and California Government (D.1.)</td>
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<tr>
<td>PSY 201/PSY 202</td>
<td>General Psychology (E.1.)</td>
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<tr>
<td>BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100</td>
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<tr>
<td>AGB 212</td>
<td>Senior Project</td>
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<td>AGB 461</td>
<td>Senior Project</td>
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<tr>
<td>AGB 463</td>
<td>Undergraduate Seminar</td>
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<tr>
<td>BUS 207</td>
<td>Business Law</td>
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<tr>
<td>ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.)</td>
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<td>Arts and humanities elective (Area C)</td>
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<td>Fine and performing arts elective (C.2.)</td>
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<td>Literature, philosophy, arts elective (300-400 level) (C.3.)</td>
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### Senior

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<tr>
<td>AGB 401</td>
<td>Agribusiness Labor Relations and Personnel Management</td>
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<tr>
<td>AGB 460</td>
<td>Research Methodology in Agribusiness</td>
<td>1</td>
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<tr>
<td>AGB 461</td>
<td>Senior Project</td>
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<tr>
<td>AGB 462</td>
<td>Senior Project</td>
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<tr>
<td>AGB 463</td>
<td>Undergraduate Seminar</td>
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<tr>
<td>BUS 207</td>
<td>Business Law</td>
<td>4</td>
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<tr>
<td>ECON 337</td>
<td>Money, Banking, and Credit</td>
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<tr>
<td>AGB 212</td>
<td>Senior Project</td>
<td>2</td>
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<tr>
<td>AGB 400</td>
<td>Research Methodology in Agribusiness</td>
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<tr>
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</table>

### Electives

- MATH 116 and MATH 117 will substitute for MATH 118 and are taught at a slower pace for those who need more review. MATH 117 will satisfy GEB area B.2.
- To be selected in accordance with the General Education-Breadth requirements. (Please see page 114 of this catalog.)
- Electives must include 16 units to be selected in Agriculture with prefixes other than AGB or AGED. Of these units, 6-8 must be selected from the following courses: AE 340, AE 440, ASCI 302, ASCI 329, CRSC 221, CRSC 311, DH 301, FSN 333, OH 340, OH 425, SS 221, VS 203, VS 302. No more than 3 units can come from courses with AG prefix, i.e., AG 243, AG 339. No more than 3 units can come from Enterprise Projects, i.e., CRSC 100, FSN 100, etc.
- AGB 212 is the prerequisite for ECON 222 for AGB majors, not ECON 221.
- Only 2 units of AGB 400 can be used to satisfy the requirements of 6 units of AGB elective (300-400 level).

### Agribusiness Finance and Appraisal Concentration

(Add Courses Below to Basic Curriculum)

<table>
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<tr>
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<tr>
<td>AGB 322</td>
<td>Principles of Farm Management</td>
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<tr>
<td>AGB 324</td>
<td>Agricultural Property Management and Sales</td>
<td>4</td>
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<tr>
<td>AGB 326</td>
<td>Farm Appraisal</td>
<td>4</td>
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<tr>
<td>AGB 331</td>
<td>Farm Accounting</td>
<td>4</td>
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<tr>
<td>AGB 410</td>
<td>Management Practices in Agricultural Lending</td>
<td>3</td>
</tr>
<tr>
<td>ECON 337</td>
<td>Money, Banking, and Credit</td>
<td>4</td>
</tr>
</tbody>
</table>

### Notes

1. MATH 116 and MATH 117 will substitute for MATH 118 and are taught at a slower pace for those who need more review. MATH 117 will satisfy GEB area B.2.
2. To be selected in accordance with the General Education-Breadth requirements. (Please see page 114 of this catalog.)
3. Electives must include 16 units to be selected in Agriculture with prefixes other than AGB or AGED. Of these units, 6-8 must be selected from the following courses: AE 340, AE 440, ASCI 302, ASCI 329, CRSC 221, CRSC 311, DH 301, FSN 333, OH 340, OH 425, SS 221, VS 203, VS 302. No more than 3 units can come from courses with AG prefix, i.e., AG 243, AG 339. No more than 3 units can come from Enterprise Projects, i.e., CRSC 100, FSN 100, etc.
4. AGB 212 is the prerequisite for ECON 222 for AGB majors, not ECON 221.
5. Only 2 units of AGB 400 can be used to satisfy the requirements of 6 units of AGB elective (300-400 level).
### Agribusiness Marketing Concentration
(Add Courses Below to Basic Curriculum)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
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<tbody>
<tr>
<td>AGB 304</td>
<td>Agribusiness Marketing Management</td>
<td>3</td>
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<tr>
<td>AGB 318</td>
<td>Agricultural Trade Policies</td>
<td>3</td>
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<tr>
<td>AGB 323</td>
<td>Agribusiness Managerial Accounting</td>
<td>4</td>
</tr>
<tr>
<td>AGB 405</td>
<td>Agribusiness Marketing Research Methods</td>
<td>3</td>
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<tr>
<td>AGB 406</td>
<td>Agribusiness Marketing Communication</td>
<td>3</td>
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<tr>
<td>AGB 421</td>
<td>Agribusiness Operations Analysis or AGB 433 Agricultural Price Analysis</td>
<td>4/3</td>
</tr>
<tr>
<td>AGB 450</td>
<td>Agribusiness Strategy Formulation</td>
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### Agribusiness Policy Concentration
(Add Courses Below to Basic Curriculum)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tr>
<td>AGB 307</td>
<td>World Agricultural Resources</td>
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<td>AGB 315</td>
<td>Land Economics</td>
<td>3</td>
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<tr>
<td>AGB 317</td>
<td>Agriculture–Consumer Relationships or AGB 409 California Agricultural Law</td>
<td>3</td>
</tr>
<tr>
<td>AGB 318</td>
<td>Agricultural Trade Policies</td>
<td>3</td>
</tr>
<tr>
<td>AGB 323</td>
<td>Agribusiness Managerial Accounting</td>
<td>4</td>
</tr>
<tr>
<td>AGB 421</td>
<td>Agribusiness Operations Analysis or AGB 433 Agricultural Price Analysis</td>
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<tr>
<td>HIST 305</td>
<td>History of American Agriculture</td>
<td>3</td>
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### Farm and Ranch Management Concentration
(Add Courses Below to Basic Curriculum)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tr>
<td>AGB 321</td>
<td>Farm Records</td>
<td>4</td>
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<tr>
<td>AGB 322</td>
<td>Principles of Farm Management</td>
<td>4</td>
</tr>
<tr>
<td>AGB 331</td>
<td>Farm Accounting</td>
<td>4</td>
</tr>
<tr>
<td>AGB 413</td>
<td>Crop Management Problems</td>
<td>3</td>
</tr>
<tr>
<td>AGB 415</td>
<td>Livestock Management Problems or AGB 416 Dairy Management Problems</td>
<td>3</td>
</tr>
<tr>
<td>AGB 433</td>
<td>Agricultural Price Analysis or AGB 435 Linear Programming in Agriculture</td>
<td>3</td>
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</table>
In today's ever more complex, technology-driven world, it is a necessity for any graduate in agriculture to have some exposure to marketing, personnel management, financial management, budgeting, and economics if they are to succeed. The minor is designed to give students in the School of Agriculture this opportunity. Interested students must apply for acceptance into the minor through the Agribusiness Department.

The minor offers students two areas of emphasis. Agribusiness production management emphasizes management of the farm or ranch as an enterprise and agribusiness marketing focuses on sales and marketing of agricultural commodities.

### Units

<table>
<thead>
<tr>
<th>Required courses</th>
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<tbody>
<tr>
<td>AGB 212 Agricultural Economics (3)</td>
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<tr>
<td>AGB 301 Agricultural Marketing (3)</td>
<td></td>
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<tr>
<td>AGB 310 Agribusiness Credit and Finance (3)</td>
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<tr>
<td>AGB 401 Agribusiness Labor and Personnel Relations (4)</td>
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<tr>
<td>ACTG 211 Financial Accounting for Nonbusiness Majors (4)</td>
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</tbody>
</table>

Courses in area of emphasis: 10-11

Select one of the following areas of emphasis:

**Agribusiness Production Management (11)**

- AGB 321 Farm Records (4)
- AGB 322 Principles of Farm Management (4)
- AGB 413/AGB 415/AGB 416 (3)

**Agribusiness Marketing (10)**

- AGB 201 Agribusiness Sales and Service (3)
- AGB 304 Agribusiness Marketing Management (3)
- AGB 323 Agribusiness Managerial Accounting (4)
AGRICULTURAL EDUCATION DEPARTMENT

Agriculture Bldg. (10), Room 244
(805) 756-2803

Faculty

Department Head, Glen R. Casey
Robert A. Flores William C. Kellogg

Programs

B.S. Agricultural Science with Concentrations in:
Agricultural Mechanics Animal Production
Agricultural Products and Processing Ornamental Horticulture
Agricultural Resources Management Plant Production
Agriculture Supplies and Services

The primary function of the Agricultural Education Department is to provide for the preparation of teachers of agriculture for the public secondary schools of California. Specialized pre-professional and professional courses are offered for undergraduates and graduate students. The Agricultural Sciences major can also provide for professional preparation in Agricultural Information and Industry utilizing the Brock Center for Agricultural Communications or a minor in Agribusiness.

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

The department offers a Bachelor of Science degree in Agricultural Science which includes a credential preparation program providing for early field experience and undergraduate student teaching.

Student teaching may also become a part of the graduate program for agriculture majors. Candidates must complete a minimum of 45 quarter units of postgraduate course work necessary for the ‘clear’ teaching credential. For more information regarding the Teaching Credential Program, please see page 348.

Agricultural Education courses may be used to fulfill many of the units required for the Master of Science degree with a specialization in General Agriculture. Detailed information may be obtained in the office of the Dean of the School of Agriculture.

CURRICULAR CONCENTRATIONS

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

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

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

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

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

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

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

CURRICULUM FOR B.S. AGRICULTURAL SCIENCE

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

Freshman

AGED 202 Introduction to Agricultural Education .......................................................... 2
AE 121 Agricultural Mechanics ........................................................................... 2
AE 141 Agricultural Tractors and Equipment Skills .................................................. 3
ASC 230 General Animal Science ........................................................................... 4
Select two: CRSC 230/FRSC 230/VGSC 230 ............................................................. 4,4
DH 230 General Dairy Husbandry ........................................................................... 4
BOT 121 General Botany (B.1.b.) ........................................................................... 4
ENGL 114 Writing: Exposition (A.1.) .................................................................... 4
MATH 118 Pre-Calculus Algebra (B.2.) ................................................................. 4
ZOO 131 General Zoology (B.1.b.) ........................................................................... 4
Agriculture courses to complete major .................................................................... 11

Sophomore

AGED 303 F.F.A. Programs and Activities ................................................................. 2
AGED 339 Supervised Agricultural Experiences ....................................................... 2
AGBUS 201 Agribusiness Sales and Service ........................................................... 3
ETWT 144 Manufacturing Processes ..................................................................... 2
OH 230 Ornamental Gardening ............................................................................. 3
PI 230 General Poultry Production ....................................................................... 3
SS 121 Introductory Soil Science ............................................................................. 4
CHEM 121 General Chemistry (B.1.a.) ................................................................. 4
AG 250 Computer Application to Agriculture (F.1.) ........................................... 3
ECON 201/ECON 211/ECON 222 (D.3.) ................................................................. 3
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) ......................................... 3
ENGL 215 Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.) ................................................................. 4
SPC 201 Public Speaking or SPC 202 Principles of Speech Communication (A.3.) .... 3
Electives .................................................................................................................. 9

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Junior
AE 340 Irrigation Water Management ............................................................................. 4
AGB 301 Agricultural Marketing .................................................................................... 3
AGB 321 Farm Records .................................................................................................. 4
ANT 201/GEOG 150/SOC 105 (D.4.a.) ....................................................................... 3
HIST 204 History of American Ideals and Institutions (D.1.) .................................... 3
HIST 315 Modern World History (D.2.) ....................................................................... 3
POLS 210 American and California Government (D.1.) ......................................... 3
PSY 201/PSY 202 General Psychology (E.1.) ............................................................. 3
2 Critical reading elective (C.1.) ................................................................................. 3
2 Mathematics or statistics elective (B.2.) .................................................................. 3
3 Agriculture/AGED/ED/JOUR courses to complete major ....................................... 18

Senior
AGED 438 Instructional Processes in Agricultural Education ....................................... 3
AGED 461 Senior Project ............................................................................................... 2
AGED 462 Senior Project ............................................................................................... 2
AGED 441 Student Teaching Practicum or AGED 463 Undergraduate Seminar .......... 2
PHIL 230/PHIL 231 Philosophical Classics (C.1.) ...................................................... 3
2 ANT/BUS/ECON/GEOG/POLS elective (D.4.b.) ..................................................... 3
2 Arts and humanities elective (Area C) ..................................................................... 3
BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100 (E.2.) ....................................... 2
2 Critical reading elective (C.1.) ................................................................................. 3
2 Fine and performing arts elective (C.2.) ................................................................. 3
2 Literature, philosophy, arts electives (300-400 level) (C.3.) ................................. 3
3 Agriculture/AGED/ED/JOUR courses to complete major ....................................... 21

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

1 MATH 116 and MATH 117 will substitute for MATH 118 and are taught at a slower pace for those who need more review. MATH 117 will satisfy GEB area B.2.
2 To be selected in accordance with the General Education-Breadth requirements. (Please see page 114 of this catalog.)
3 Teacher credential candidates must select ED 302, ED 305, ED 403, ED 405.

Agricultural Mechanics Concentration
(Add Courses Below to Basic Curriculum)
AE 131 Agricultural Surveying or AE 237 Engineering Surveying ............................ 2
AE 133 Agricultural Drafting ....................................................................................... 3
AE 231 Agricultural Building Construction ................................................................ 3
AE 301 Closed Circuit Hydraulics ............................................................................. 3
AE 335 Agricultural Power ......................................................................................... 3
AE 342 Diesel Fuel Systems ...................................................................................... 3
ETWT 155 Industrial Welding Technology ................................................................ 1
AE electives (1 unit at 300-400 level) ....................................................................... 4

Agricultural Products and Processing Concentration
(Add Courses Below to Basic Curriculum)
DPT 230 General Dairy Manufacturing .................................................................... 4
FSN 211 Meats .......................................................................................................... 3
FSN 212 Meat Grading and Evaluation ................................................................... 2
VGSC 324 Harvesting and Packaging Vegetable Crops ............................................ 4
DPT/FSN electives (6 units at 300-400 level) ............................................................ 9

22
Agricultural Education

Agricultural Resources Management Concentration
(Add Courses Below to Basic Curriculum)
CONS 120/For 120 Fisheries and Wildlife Management ........................................ 3
CONS 207 Resource Survey .................................................................................... 3
NRM 101 Natural Resources Management and Society ........................................ 3
NRM 304 Ecology of Resource Areas .................................................................... 4
NRM electives (6 units at 300-400 level) .............................................................. 9

Agricultural Supplies and Services Concentration
(Add Courses Below to Basic Curriculum)
AGB 203 Agribusiness Organizations .................................................................... 3
AGB 302 Agricultural Cooperative Organization and Management ....................... 3
AGB 310 Agribusiness Credit and Finance ............................................................. 3
AGB 406 Agribusiness Marketing Communication ................................................ 10

Animal Production Concentration
(Add Courses Below to Basic Curriculum)
ASCI 202 Feeds and Feeding .................................................................................. 3
ASCI 240 Applied Feeds and Feeding ................................................................. 2
ASCI 226 Livestock Evaluation ............................................................................. 3
DH 133 Fitting and Showing Dairy Cattle ............................................................. 2
PI 305 Game Bird Propagation and Management .................................................. 1
PI 306 Game Bird Propagation and Management Laboratory .................................. 1
ASCI/DH/DPT/PI electives (6 units at 300-400 level) ............................................. 8

Ornamental Horticulture Concentration
(Add Courses Below to Basic Curriculum)
OH 125 Commercial Floral Design Practices ....................................................... 3
OH 133 Plant Propagation Fundamentals ............................................................. 4
OH 134 Landscape Maintenance Fundamentals ..................................................... 3
OH 324 Foliage Plant Culture ............................................................................... 4
OH electives (6 units at 300-400 level) ................................................................. 8

Plant Production Concentration
(Add Courses Below to Basic Curriculum)
CRSC 230, FRSC 230 or VGSC 230 ...................................................................... 4
CRSC 221 Weed Control ....................................................................................... 4
CRSC 311 Applied Insect Pest Management ......................................................... 4
SS 221 Fertilizers .................................................................................................. 4
CRSC/FRSC/VGSC electives (300-400 level) ........................................................ 6

Total: 22 Units
AGRICULTURAL ENGINEERING DEPARTMENT

Agricultural Engineering Bldg. (08), Room 110
(805) 756-2378

Faculty

Department Head, Edgar J. Carnegie
James Bermann, Robin R. Grinnell, Douglas W. Williams
Paul H. Dilger, Rollin D. Strohman, Mark A. Zohns
L. Joe Glass, Robert E. Walker

Programs

B.S. Agricultural Engineering
B.S. Agricultural Engineering Technology

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

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

Outdoor facilities include a field for evaluation of various irrigation systems including an operating linear move and land for experience in the production of farm products and operation of agricultural machinery.

Students are encouraged to participate in the student clubs of the department. The Agricultural Engineering Society is composed of Agricultural Engineering Technology and Agricultural Engineering majors and is involved in a broad range of activities and services including Homecoming, and Poly Royal displays. The student branch of the American Society of Agricultural Engineers and the Student Mechanization Branch offer an active program of professional and extracurricular activity.

AGRICULTURAL ENGINEERING MAJOR

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

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

The curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.
### CURRICULUM FOR B.S. AGRICULTURAL ENGINEERING

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

#### Freshman

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<tr>
<td>AE 128</td>
<td>Agricultural Mechanics</td>
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</tr>
<tr>
<td>AE 143</td>
<td>Power and Machinery</td>
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<td>Energy Systems for Agriculture</td>
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<td>AE 328</td>
<td>Measurements and Computer Interfacing</td>
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<td>AE 331</td>
<td>Irrigation Theory</td>
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|             | **Total**                                                  | **54** |

### Senior

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<td>Agricultural Structures Design</td>
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<td>AE 464</td>
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<td>(D.4.a.)</td>
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<td>History of American Ideals and Institutions</td>
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<td>Modern World History</td>
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<td>Literature, philosophy, arts elective (300-400 level)</td>
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|             | **Total**                                                  | **53** |

1 To be selected in accordance with the General Education-Breadth requirements. (Please see page 114 of this catalog.)
AGRICULTURAL ENGINEERING TECHNOLOGY MAJOR

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

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

Cal Poly offers a Master of Science degree in Agriculture with a specialization in Agricultural Engineering Technology. For information regarding this degree program, please refer to page 149 of this catalog.

CURRICULUM FOR B.S. AGRICULTURAL ENGINEERING TECHNOLOGY

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. Cal Poly follows the quarter system.

Freshman

AE 128 Agricultural Mechanics ................................................................. 3
AE 133 Agricultural Drafting ...................................................................... 3
AE 141 Agricultural Tractors and Equipment Skills .................................. 3
AE 142 Agricultural Power and Machinery Management ..................... 4
ETMP 144 Manufacturing Processes: Turning-Milling and ETMP 145 Manufacturing Processes ......................................................... 2,1
ETWT 144 Manufacturing Processes ....................................................... 2
ETWT 155 Industrial Welding Technology .................................................. 1
SS 121 Introductory Soil Science ................................................................. 4
ENGL 114 Writing: Exposition (A.1.) ....................................................... 4
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) ......................... 3
MATH 116 Pre-Calculus Algebra I ............................................................... 3
MATH 117 Pre-Calculus Algebra II (B.2.) .................................................. 3
MATH 119 Pre-Calculus Trigonometry ....................................................... 3
Animal production elective ....................................................................... 4
Plant production elective ......................................................................... 4
Electives .................................................................................................... 3

Sophomore

AE 134 Agricultural Electrification .......................................................... 3
AE 231 Agricultural Building Construction ............................................... 3
AE 234 Agricultural Power Transmission and Mechanics .................... 3
AE 237 Engineering Surveying I ................................................................. 2
AE 335 Agricultural Power ......................................................................... 3
AE 341 Gasoline Engine Diagnosis ............................................................ 3
ACTG 211 Financial Accounting for Nonbusiness Majors ...................... 4
AG 250/CSC 110/CSC 120 (F.1.) ............................................................... 3
ENGL 218 Writing: Argumentation and Reports (A.4.) ......................... 4
PHYS 121 College Physics (B.1.a.) ............................................................. 4
PHYS 122 College Physics (B.1.a.) ............................................................. 4
PHYS 123 College Physics (B.1.a.) ............................................................. 4
SPC 201 Public Speaking or SPC 202 Principles of Speech Communication (A.3.) 3
Electives .................................................................................................... 5
### Junior

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<td>AE 340</td>
<td>Irrigation Water Management</td>
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<tr>
<td>AE 342</td>
<td>Diesel Fuel Systems</td>
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<td>AE 343</td>
<td>Project Analysis</td>
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<tr>
<td>AE 344</td>
<td>Agricultural Equipment Projects</td>
<td>3</td>
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<tr>
<td>AE 347</td>
<td>Principles of Agricultural Machinery</td>
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<tr>
<td>BUS 201</td>
<td>Business Law Survey</td>
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<td>BIO 220</td>
<td>Physiology and Biological Adaptation (B.1.b., E.2.)</td>
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<td>CHEM 121</td>
<td>General Chemistry (B.1.a.)</td>
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<td>General Chemistry (B.1.a.)</td>
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<td>ECON 201</td>
<td>Survey of Economics or ECON 211 Principles of Economics (D.3.)</td>
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<tr>
<td>PHIL 230/PHIL 231</td>
<td>Philosophical Classics (C.1.)</td>
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<td>PSY 201/PSY 202</td>
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2 Critical reading electives (C.1.) .................................................. 6

### Senior

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<td>Principles of Agricultural Electrification</td>
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<td>AE 425</td>
<td>Computer Controls for Agriculture</td>
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<tr>
<td>AE 432</td>
<td>Agricultural Buildings</td>
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<td>AE 462</td>
<td>Senior Project</td>
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<tr>
<td>AE 463</td>
<td>Undergraduate Seminar</td>
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<td>AGB 312</td>
<td>Agricultural Policy</td>
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<td>History of American Ideals and Institutions (D.1.)</td>
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<td>American and California Government</td>
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2 ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) ........................................... 3

2 Arts and humanities elective (Area C) ................................................... 3

2 Fine and performing arts elective (C.2.) ............................................... 3

2 Literature, philosophy, arts elective (300-400 level) (C.3.) ....................... 3

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

1 MATH 118 will substitute for MATH 116 and MATH 117 which are taught at a slower pace for those who need more review. MATH 117 will satisfy GEB area B.2.

2 To be selected in accordance with the General Education-Breadth requirements. (Please see page 114 of this catalog.)
ANIMAL SCIENCES AND INDUSTRY DEPARTMENT

Agriculture Bldg. (10), Room 101
(805) 756-2419

Faculty

Department Head, John W. Algeo
Russell K. Anderson
Gene A. Armstrong
M. Steven Daugherty
James R. Flanagan
Wallace F. Glidden
Michael H. Hall
Max F. Hawkins
Roger M. Hunt
Michael W. Lund
Roland K. Pautz
William E. Plummer
Robert T. Rutherford
Kenneth C. Scotto
Dale A. Smith
Robert Spiller
John V. Stechman
Clifford A. Stokes
Robert R. Wheeler

Programs

B.S. Animal Science

B.S. Poultry Industry

The department offers the Bachelor of Science degree in Animal Science and the Bachelor of Science degree in Poultry Industry. The educational approach of this department is to provide students with instruction in theory and practical application of all phases of production.

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

Students in either major may complete a breadth of preveterinary science courses as a complement to their major fields of study. Through this training, students will enhance their qualifications for admission to schools of veterinary medicine throughout the United States.

An Agribusiness Minor is available to students in both majors. This minor allows for the combination of practical animal production expertise with agribusiness training and provides a unique preparation for graduates not only in technical farming and ranching, but also in allied businesses and industries.

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

ANIMAL SCIENCE MAJOR

The Bachelor of Science degree in Animal Science prepares men and women for occupations related to beef cattle, horse, sheep, and swine production. Graduates of the department are engaged in the livestock and farming business as well as being employed as ranch workers or managers.

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

Students are provided with instruction in theory and application of all phases of livestock production and range management. To this end the department maintains purebred and commercial instruction-
al herds of the chief meat animal species, and a brood mare band of thoroughbreds and quarter horses. The university herds and flocks are extensively used for laboratory and applied studies of management, feeding, breeding, and marketing techniques and procedures. More than 4000 acres of campus land are devoted to instruction in the animal sciences.

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

**CURRICULUM FOR B.S. ANIMAL SCIENCE**

*Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.*

**Freshman**

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<td>Market Beef Production</td>
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<td>ASCI 112</td>
<td>Elements of Swine Production</td>
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<td>ASCI 113</td>
<td>Elements of Sheep Production</td>
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<td>ASCI 114</td>
<td>Elements of Horse Production</td>
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<td>ASCI 241</td>
<td>Applied Beef Cattle Practices</td>
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<td>ASCI 242</td>
<td>Applied Swine Management Practices</td>
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<td>Applied Sheep Management Practices</td>
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<td>AE 121</td>
<td>Agricultural Mechanics</td>
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**Sophomore**

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<td>Survey of Organic Chemistry</td>
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<td>Forage Crops</td>
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<td>Meats</td>
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<td>Introductory Soil Science</td>
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<td>VS 123</td>
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<td>PSY 201/PSY 202</td>
<td>General Psychology (E.1.)</td>
<td>3</td>
</tr>
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</table>

1. Critical reading elective (C.1.) .................................................. 3
2. Fine and performing arts elective (C.2.) ........................................ 3
3. Literature, philosophy, arts elective (C.3.) .................................... 3
4. Electives .......................................................................................... 4

### Senior

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>ASCI 304</td>
<td>Animal Breeding</td>
<td>3</td>
</tr>
<tr>
<td>ASCI 401</td>
<td>Reproductive Physiology</td>
<td>4</td>
</tr>
<tr>
<td>ASCI 402</td>
<td>Animal Nutrition</td>
<td>4</td>
</tr>
<tr>
<td>ASCI 461</td>
<td>Senior Project</td>
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<tr>
<td>ASCI 462</td>
<td>Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>ASCI 463</td>
<td>Undergraduate Seminar</td>
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2. Animal Science electives ............................................................... 12
3. ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) ................................ 3
4. Arts and humanities elective (Area C) ........................................... 3
5. Electives and courses to complete major ......................................... 14

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1. To be selected in accordance with the General Education-Breadth requirements. (Please see page 114 of this catalog.)
2. To be selected with adviser's approval.
3. Seven units to be selected from 300-400 level courses in ASCI, DSCI, FSN, PI, or VS.
POULTRY INDUSTRY MAJOR

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

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

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

CURRICULUM FOR B.S. POULTRY INDUSTRY

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions" section of this catalog. Cal Poly follows the quarter system.

Freshman

<table>
<thead>
<tr>
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<tr>
<td>ASCI 101</td>
<td>Introduction to the Animal Sciences</td>
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<tr>
<td>ASCI 202</td>
<td>Feeds and Feeding</td>
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<tr>
<td>PI 121</td>
<td>Poultry Industry Development</td>
<td>4</td>
</tr>
<tr>
<td>PI 122</td>
<td>Replacement Programs and Broiler Production</td>
<td>4</td>
</tr>
<tr>
<td>PI 133</td>
<td>Poultry Incubation</td>
<td>3</td>
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<tr>
<td>BOT 121</td>
<td>General Botany (B.1.b.)</td>
<td>4</td>
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<tr>
<td>ENGL 114</td>
<td>Writing: Exposition (A.1.)</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 125/PHIL 125/SPC 125</td>
<td>Critical Thinking (A.2.)</td>
<td>3</td>
</tr>
<tr>
<td>MATH 118</td>
<td>Pre-Calculus Algebra (B.2.)</td>
<td>4</td>
</tr>
<tr>
<td>STAT 211</td>
<td>Elementary Probability and Statistics (B.2.)</td>
<td>3</td>
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<tr>
<td>ZOO 131</td>
<td>General Zoology (B.1.b.)</td>
<td>4</td>
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<tr>
<td>BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100 elective</td>
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Sophomore

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<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>PI 221</td>
<td>Poultry Selection and Egg Production</td>
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</tr>
<tr>
<td>PI 222</td>
<td>Poultry Products Processing and Marketing</td>
<td>3</td>
</tr>
<tr>
<td>PI 231</td>
<td>Poultry Anatomy and Physiology</td>
<td>3</td>
</tr>
<tr>
<td>PI 233</td>
<td>Poultry Plant Design and Equipment</td>
<td>2</td>
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<tr>
<td>BACT 221</td>
<td>General Bacteriology</td>
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<tr>
<td>BIO 303</td>
<td>Genetics</td>
<td>3</td>
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<tr>
<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
<td>Principles of Economics (D.3.)</td>
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<td>ECON 201</td>
<td>Survey of Economics or ECON 211</td>
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<td>ENGL 218</td>
<td>Writing: Argumentation and Reports (A.4.)</td>
<td>4</td>
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<td>PSY 201/PSY 202</td>
<td>General Psychology (E.1.)</td>
<td>3</td>
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<tr>
<td>SPC 201</td>
<td>Public Speaking or SPC 202</td>
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<tr>
<td>Management elective</td>
<td>Agricultural Engineering or welding elective</td>
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Electives .............................................................................................. 6
### Junior

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<tr>
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<tbody>
<tr>
<td>PI 322</td>
<td>Poultry Business Organization</td>
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<tr>
<td>PI 323</td>
<td>Poultry Diseases and Hygiene</td>
<td>4</td>
</tr>
<tr>
<td>PI 331</td>
<td>Turkey Industry</td>
<td>3</td>
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<tr>
<td>PI 333</td>
<td>Applied Poultry Feeding and Nutrition</td>
<td>4</td>
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<tr>
<td>AGB 212</td>
<td>Agricultural Economics or ECON 212 Principles of Economics</td>
<td>3</td>
</tr>
<tr>
<td>AGB 321</td>
<td>Farm Records or ACTG 211 Financial Accounting for Nonbusiness Majors</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 121</td>
<td>General Chemistry</td>
<td>4</td>
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<tr>
<td>CHEM 122</td>
<td>General Chemistry</td>
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<tr>
<td>CHEM 326</td>
<td>Survey of Organic Chemistry</td>
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<tr>
<td>HIST 204</td>
<td>History of American Ideals and Institutions (D.1.)</td>
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<td>POLS 210</td>
<td>American and California Government (D.1.)</td>
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1. Fine and performing arts elective (C.2.)                              | 3     |
2. Agricultural Engineering elective                                     | 3     |
3. Electives                                                             | 3     |

### Senior

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>PI 422</td>
<td>Advanced Poultry Enterprise Supervision</td>
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<tr>
<td>PI 431</td>
<td>Applied Poultry Breeding</td>
<td>4</td>
</tr>
<tr>
<td>PI 461</td>
<td>Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>PI 462</td>
<td>Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>PI 463</td>
<td>Undergraduate Seminar</td>
<td>2</td>
</tr>
<tr>
<td>AGB 401</td>
<td>Agribusiness Labor Relations and Personnel Management</td>
<td>4</td>
</tr>
<tr>
<td>ASCI 402</td>
<td>Animal Nutrition</td>
<td>4</td>
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<tr>
<td>CHEM 328</td>
<td>Biochemistry (B.1.a.)</td>
<td>4</td>
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<tr>
<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
<td>3</td>
</tr>
<tr>
<td>PHIL 230/PHIL 231</td>
<td>Philosophical Classics (C.1.)</td>
<td>3</td>
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</tbody>
</table>
1. Arts and humanities elective (Area C)                                  | 3     |
2. Computer science elective                                             | 3     |
3. Literature, philosophy, arts elective (300–400 level) (C.3.)           | 3     |
4. Management elective                                                    | 3     |
5. Electives                                                              | 2     |

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

1. MATH 116 and MATH 117 will substitute for MATH 118 and are taught at a slower pace for those who need more review. MATH 117 will satisfy GEB area B.2.  
2. To be selected in accordance with the General Education-Breadth requirements. (Please see page 114 of this catalog.)  
3. To be selected from BUS 201, MGT 118, MGT 311.
CROP SCIENCE DEPARTMENT

Agricultural Sciences Bldg. (11), Room 229
(805) 756-1237

Faculty

Department Head, George G. Gowgani

Edgar H. Beyer
A. Charles Crabb
H. Paul Fountain
James S. W. Greil
Louis W. Harper

Robert J. McNeil
Wesley J. Mueller
Gene P. Offermann
John C. Phillips

Edwin C. Seim
Mark D. Shelton
David L. Warfield
Jo Ann C. Wheatley

Programs

B.S. Crop Science
B.S. Fruit Science
Minor: Plant Protection

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

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

The department has 70 acres of productive citrus, avocados, grapes, deciduous orchard, and berries with over 100 varieties represented. Additional nonbearing acreage for instructional use exists and new plantings are under way. About 300 acres are devoted to student production enterprises in field and vegetable crops. An additional 200 acres of campus farm crop land provide opportunities to gain experience through part-time employment. All departmental majors are encouraged to gain experience and earn income by participation in the Enterprise Project program or by working for the campus farm.

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

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

CROP SCIENCE MAJOR

A student in the Crop Science major must elect to specialize in agronomy or vegetable science and may select the Plant Protection minor in the junior and senior years. Employment opportunities for students graduating in the Crop Science major include private or corporate crop production and management, sales and service, positions with commercial pest control firms, government regulatory agencies, and agriculturally related organizations, and as agronomists and horticulturists with government or industry.
CURRICULUM FOR B.S. CROP SCIENCE

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

**Freshman**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>CRSC 100/VGSC 100/FRSC 100</td>
<td>Enterprise Project</td>
<td>3</td>
</tr>
<tr>
<td>CRSC 101</td>
<td>Orientation to Crop Science</td>
<td>1</td>
</tr>
<tr>
<td>CRSC 131</td>
<td>Introduction to Crop Science</td>
<td>4</td>
</tr>
<tr>
<td>CRSC 132</td>
<td>Grain Crops</td>
<td>4</td>
</tr>
<tr>
<td>CRSC 133</td>
<td>Row Crops</td>
<td>4</td>
</tr>
<tr>
<td>AG 250</td>
<td>Computer Application to Agriculture (F.1.)</td>
<td>3</td>
</tr>
<tr>
<td>BOT 121</td>
<td>General Botany (B.1.b.)</td>
<td>4</td>
</tr>
<tr>
<td>BOT 123</td>
<td>Introductory Plant Taxonomy</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 125/PHIL 125/SPC 125</td>
<td>Critical Thinking (A.2.)</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 215</td>
<td>Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 118</td>
<td>Pre-Calculus Algebra (B.2.)</td>
<td>4</td>
</tr>
<tr>
<td>BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100 elective</td>
<td>(E.2.)</td>
<td>2</td>
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<tr>
<td>Agricultural Engineering elective</td>
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<td>Electives</td>
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**Sophomore**

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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>CRSC 221</td>
<td>Weed Control</td>
<td>4</td>
</tr>
<tr>
<td>CRSC 231</td>
<td>Commercial Seed Production and Conditioning</td>
<td>4</td>
</tr>
<tr>
<td>VGSC 232</td>
<td>Vegetable Crops Production</td>
<td>4</td>
</tr>
<tr>
<td>SS 121</td>
<td>Introductory Soil Science</td>
<td>4</td>
</tr>
<tr>
<td>SS 221</td>
<td>Fertilizers and Plant Nutrition</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 121</td>
<td>General Chemistry (B.1.a.)</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 122</td>
<td>General Chemistry (B.1.a.)</td>
<td>4</td>
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<tr>
<td>CHEM 126</td>
<td>Survey of Organic Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>ECON 201</td>
<td>Survey of Economics or ECON 211 Principles of Economics (D.3.)</td>
<td>3</td>
</tr>
<tr>
<td>PSY 201/PSY 202</td>
<td>General Psychology (E.1.)</td>
<td>3</td>
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<tr>
<td>SPC 201</td>
<td>Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
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</tr>
<tr>
<td>STAT 211</td>
<td>Elementary Probability and Statistics (B.2.)</td>
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<tr>
<td>Electives</td>
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**Junior**

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<tr>
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<tbody>
<tr>
<td>CRSC 311</td>
<td>Applied Insect Pest Management</td>
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<tr>
<td>CRSC 411</td>
<td>Experimental Techniques and Analysis</td>
<td>4</td>
</tr>
<tr>
<td>FRSC 230</td>
<td>California Fruit Growing</td>
<td>4</td>
</tr>
<tr>
<td>AGB 321</td>
<td>Farm Records</td>
<td>4</td>
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<td>CHEM 328</td>
<td>Biochemistry</td>
<td>4</td>
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<tr>
<td>ANT 201/GEOG 150/SOC 105</td>
<td>(D.4.a.)</td>
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<tr>
<td>HIST 204</td>
<td>History of American Ideals and Institutions</td>
<td>3</td>
</tr>
<tr>
<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
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<tr>
<td>POLS 210</td>
<td>American and California Government (D.1.)</td>
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<tr>
<td>Agribusiness elective (300-400 level)</td>
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<tr>
<td>Adviser approved electives</td>
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</tr>
</tbody>
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1 MATH 118 Pre-Calculus Algebra (B.2.)
2 Critical reading electives (C.1.)
3 Adviser approved electives
### Crop Science

**Senior**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>CRSC 304</td>
<td>Plant Breeding</td>
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<tr>
<td>CRSC 410</td>
<td>Crop Physiology</td>
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</tr>
<tr>
<td>CRSC 461</td>
<td>Senior Project</td>
<td>3</td>
</tr>
<tr>
<td>CRSC 462</td>
<td>Senior Project</td>
<td>3</td>
</tr>
<tr>
<td>CRSC 463</td>
<td>Undergraduate Seminar</td>
<td>2</td>
</tr>
<tr>
<td>BIO 303</td>
<td>Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BOT 323</td>
<td>Plant Pathology</td>
<td>4</td>
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<tr>
<td>PHIL 230/PHIL 231</td>
<td>Philosophical Classics (C.1.)</td>
<td>3</td>
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<tr>
<td>ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.)</td>
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<tr>
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<tr>
<td>Fine and performing arts elective (C.2.)</td>
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<tr>
<td>Literature, philosophy, arts elective (300-400 level) (C.3.)</td>
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<td>Adviser approved electives</td>
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<td></td>
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<td>49</td>
</tr>
</tbody>
</table>

1 MATH 116 and MATH 117 will substitute for MATH 118 and are taught at a slower pace for those who need more review. MATH 117 will satisfy GEB area B.2.
2 To be selected in accordance with the General Education-Breadth requirements. (Please see page 114 of this catalog.)
3 At least four courses to be selected with the approval of the adviser, three of which must be 300-400 level courses.

### FRUIT SCIENCE MAJOR

The Fruit Science major qualifies graduates for orchard or vineyard management or for related employment in packing houses, cooperatives, canneries, sales and service businesses, pest control firms, government regulatory agencies, fruit tree nurseries, research stations, and produce-marketing companies. Instruction includes deciduous fruits, nut crops, citrus, avocados, grapes, berries, tropical and subtropical fruits, and minor fruit species.

### CURRICULUM FOR B.S. FRUIT SCIENCE

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

**Freshman**

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>CRSC 101</td>
<td>Orientation to Crop Science</td>
<td>1</td>
</tr>
<tr>
<td>FRSC 100/VGSC 100/CRSC 100</td>
<td>Enterprise Project</td>
<td>3,3</td>
</tr>
<tr>
<td>FRSC 131, FRSC 132, FRSC 133</td>
<td>Pomology</td>
<td>4,4,4</td>
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<tr>
<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
<td>Pomology</td>
<td>3</td>
</tr>
<tr>
<td>BOT 121</td>
<td>General Botany</td>
<td>4</td>
</tr>
<tr>
<td>BOT 123</td>
<td>Introduction to Plant Taxonomy (B.1.b.)</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 114</td>
<td>Writing: Exposition (A.1.)</td>
<td>4</td>
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<tr>
<td>ENGL 125/PHIL 125/SPC 125</td>
<td>Critical Thinking (A.2.)</td>
<td>3</td>
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<tr>
<td>ENGL 215</td>
<td>Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.)</td>
<td>4</td>
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<td>MATH 118</td>
<td>Pre-Calculus Algebra (B.2.)</td>
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### Sophomore

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<tbody>
<tr>
<td>FRSC 231</td>
<td>Viticulture</td>
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<tr>
<td>FRSC 342</td>
<td>Citrus and Avocado Fruit Production</td>
<td>4</td>
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<tr>
<td>CRSC 221</td>
<td>Weed Control</td>
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</tr>
<tr>
<td>SS 121</td>
<td>Introductory Soil Science</td>
<td>4</td>
</tr>
<tr>
<td>SS 221</td>
<td>Fertilizers and Plant Nutrition</td>
<td>4</td>
</tr>
<tr>
<td>BOT 323</td>
<td>Plant Pathology (B.1.b.)</td>
<td>4</td>
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<td>CRSC 411</td>
<td>Experimental Techniques and Analysis</td>
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<td>FRSC 331</td>
<td>Advanced Viticulture or FRSC 424</td>
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<td>Fruit Plant Propagation</td>
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<td>FRSC 436</td>
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<td>General Vegetable Crops or CRSC 230</td>
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1. MATH 116 and MATH 117 will substitute for MATH 118 and are taught at a slower pace for those who need more review. MATH 117 will satisfy GEB area B.2.
2. To be selected with adviser's approval.
3. To be selected in accordance with the General Education-Breadth requirements. (Please see page 114 of this catalog.)
CURRICULUM FOR PLANT PROTECTION MINOR

This program emphasizes both plant protection and crop production. Within the plant protection field of study, the student will be exposed to a broad range of pest management subjects including economic entomology, plant pathology, weed control and vertebrate pest control. Within the production area the student may emphasize either fruit production, crop production, ornamental horticulture, or natural resource management.

<table>
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<th>Units</th>
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</table>

### Required courses

- BOT 325 Plant Nematology (4)
- CRSC 327 Vertebrate Pest Management (4)
- CRSC 405 Advanced Weed Science (4)

### Courses in area of emphasis

- Students must select an emphasis based on their major (either plant production or non-plant production). For purposes of this minor plant production majors include Crop Science, Fruit Science, Natural Resources Management (Forestry Concentration) and Ornamental Horticulture.

#### Emphasis for Plant Production Majors

1. ENT 220 Agricultural Entomology (4) or ENT 326 General Entomology (4)
2. Select three of the following (courses used to fulfill requirements for the major cannot also be counted for the minor):
   - BOT 323 Plant Pathology (4)
   - BOT 431 Advanced Plant Pathology (4)
   - CRSC 221 Weed Control (4)
   - CRSC 311 Applied Insect Pest Management (4)
   - CRSC 431 Advanced Insect Pest Management (4)

#### Emphasis for Non-Plant Production Majors

1. Select one of the groups below for 12 units:
   - CRSC 131 Introduction to Crop Science (4)
   - CRSC 132 Grain Crops (4)
   - CRSC 421 Oil and Fiber Crops (4)
   - FRSC 131 Pomology (4)
   - FRSC 231 Viticulture (4)
   - CRSC 331 Advanced Viticulture (4) or FRSC 342 Citrus and Avocado Fruit Production (4)
   - CRSC 131 Introduction to Crop Science (4)
   - VGSC 232 Vegetable Crops Production (4)
   - VGSC 326 Advanced Vegetable Production (4)
   - OH 131 Fundamentals of Ornamental Horticulture I (4)
   - OH 133 Plant Propagation, Fundamentals III (4) or OH 243 Turf Management (4)
   - OH 324 Foliage Plant Culture (4) or OH 424 Wholesale Nursery Management (4)
   - FOR 208 Dendrology (4)
   - FOR 303 Forest Protection (5)
   - FOR 407 Silviculture (4)

2. Select one of the following courses:
   - BOT 323 Plant Pathology (4)
   - CRSC 431 Advanced Insect Pest Management (4)
   - ENT 220 Agricultural Entomology (4)
   - ENT 326 General Entomology (4)

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

Agriculture Bldg. (10), Room 140
(805) 756-2560

Faculty

Department Head, Eugene E. Starkey
Leslie S. Ferreira
William T. Gillis
Timothy J. LaSalle
Gary D. Reif
Herman E. Rickard

Adjunct Professors, Dairy Center:
Wayne G. Geilman
Phillip S. Tong

Programs

B.S. Dairy Science with Concentrations in:

Dairy Husbandry
Dairy Products Technology

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

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

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

CURRICULAR CONCENTRATIONS

Dairy Husbandry

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

Dairy Products Technology

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

Graduate Program

Cal Poly offers a Master of Science degree in Agriculture. For information regarding this degree program, please refer to page 148 of this catalog.
CURRICULUM FOR B.S. DAIRY SCIENCE

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

### Freshman

| DH 101 Dairy Feeds and Feeding                                      | 4 |
| DH 121 Elements of Dairying                                       | 4 |
| DPT 134 Introduction to Dairy Products Technology                | 4 |
| AGB 102 Introduction to Agricultural Economics                   | 3 |
| CHEM 121 General Chemistry (B.1.a.)                              | 4 |
| CHEM 122 General Chemistry (B.1.a.)                              | 4 |
| ENGL 114 Writing: Exposition (A.1.)                              | 4 |
| ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.)               | 3 |
| ZOO 131 General Zoology (B.1.b.)                                 | 4 |
| BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100 elective (E.2.)     | 2 |
| Mathematics electives (B.2.)                                     | 3 |
| MATH or STAT elective (B.2.)                                     | 3 |
| Electives and courses to complete major                           | 8 |

### Sophomore

| DH 221 Milk Production                                           | 4 |
| DPT 233 Milk Processing and Marketing                           | 4 |
| BACT 221 General Bacteriology                                   | 4 |
| CHEM 326 Organic Chemistry                                      | 4 |
| CHEM 328 Biochemistry                                           | 4 |
| PHYS 104/PHYS 121/BIO 303                                       | 4-3 |
| ECON 201 Survey of Economics or ECON 211 Principles of Economics (D.3.) | 3 |
| ENGL 215 Writing: Argumentation (4) or ENGL 218 Writing: Argumentation and Reports (A.4.) | 4 |
| PHIL 230/PHIL 231 Philosophical Classics (C.1.)                 | 3 |
| SPC 201 Public Speaking or SPC 202 Principles of Speech Communication (A.3.) | 3 |
| Computer literacy elective (F.1.)                               | 3 |
| Critical reading electives (C.1.)                               | 6 |
| Fine and performing arts elective (C.2.)                        | 3 |
| Electives and courses to complete major                         | 2-3 |

### Junior

| DPT 234 Dairy Foods Evaluation                                   | 2 |
| DPT 332 Dairy Inspection                                        | 3 |
| ACTG 211 Financial Accounting for Nonbusiness Majors            | 4 |
| AGB 212 Agricultural Economics                                  | 3 |
| POLS 210 American and California Government (D.1.)             | 3 |
| PSY 201/PSY 202 General Psychology (E.1.)                       | 3 |
| Computer literacy elective                                      | 3 |
| Literature, philosophy, arts electives (300-400 level) (C.3.)   | 3 |
| Electives and courses to complete major                         | 25 |

50 51 49
Senior
DH 432 Dairy Herd Management or DPT 433 Dairy Plant Management .......... 4
DH 461 Senior Project ........................................................................... 2
DH 462 Senior Project ........................................................................... 2
DH 463 Undergraduate Seminar ............................................................. 2
AGB 401 Agribusiness Labor Relations and Personnel Management .......... 4
ANT 201/GEOG 150/SOC 105 (D.4.a.) .................................................. 3
HIST 204 History of American Ideals and Institutions (D.1.) ..................... 3
HIST 315 Modern World History (D.2.) .................................................. 3
1 ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) ......................... 3
1 Arts and humanities elective (Area C) .................................................. 3
Electives and courses to complete major ................................................. 19

To be selected in accordance with the General Education-Breadth requirements. (Please see page 114 of this catalog.)

Dairy Husbandry Concentration
(Add courses below to basic curriculum)

Freshman
DH 133 Fitting and Showing Dairy Cattle .............................................. 2
DH 142 Dairy Cattle Selection ................................................................ 2

Sophomore
DH 222 Commercial Dairy Herd Management ....................................... 4

Junior
DH 301 Advanced Dairy Cattle Feeding .................................................. 3
DH 323 Breeds, Pedigrees and Management ......................................... 4
DH 330 Artificial Insemination ................................................................ 3
SS 121 Introduction to Soils or CRSC 123 Forage Crops ....................... 4
VS 123 Anatomy and Physiology ........................................................... 3
VS 302 Animal Hygiene ........................................................................ 3

Senior
DH 422 Breeding and Selection of Dairy Cattle ....................................... 4
ASCI 402 Animal Nutrition .................................................................... 4

Dairy Products Technology Concentration
(Add courses below to basic curriculum)

Freshman
FSN 217 Fundamentals of Food Processing Operations ......................... 4

Sophomore
DPT 222 Frozen Dairy Foods .................................................................. 4

Junior
DPT 326 Fermented Dairy Foods ............................................................ 3
DPT 331 Concentration and Fractionation of Dairy Fluids ....................... 3
DPT 334 Technology of Cheese Manufacture ......................................... 4
DPT 336 Drying and Butter Technology .................................................. 3
BACT 322 Dairy Bacteriology .................................................................. 4
FSN 331 Principles of Food Plant Sanitation ......................................... 3

Senior
DPT 401 Physical and Chemical Properties of Dairy Foods .................... 3
FSN 332 Statistical Quality Control ....................................................... 3
MGT 311 Industrial Management ........................................................... 4
FOOD SCIENCE AND NUTRITION DEPARTMENT

Agricultural Sciences Bldg. (11), Room 212
(805) 756-2660

Faculty

Department Head, Joseph Montecalvo, Jr.

Sarah E. Burroughs  
Hany M. Khalil  
Wanda M. Koszewski

Krishnakumar S. Morey  
O. Robert Noyes  
Mary E. Pedersen

Patricia A. Saam  
Robert D. Vance  
Rudy A. Wooten

Programs

B.S. Food Science  
B.S. Nutritional Science

The Food Science and Nutrition Department offers two degrees designed to prepare graduates for employment in the general areas of human nutrition and commercial food processing. Graduates in Nutritional Science find rewarding health service careers in hospitals, business, industrial plants, government institutions and education. Food Science graduates take responsible positions in commercial food processing and manufacturing, sales, services and government regulation. Opportunities for private consulting and business are available to graduates in both majors, depending on personal interests and initiative.

The department is equipped with a food processing operations pilot plant and meat processing facilities. The laboratories are designed for teaching courses in nutrition, food service management, sensory evaluation, functional components of foods, and quality control as well as other food processing systems. Classroom and laboratory instruction is personalized as much as possible, and faculty adhere to the university’s learn-by-doing philosophy. Through the student enterprise program, students can manufacture and market various food products. Enterprise projects are designed to simulate industry and business practices. Students are further encouraged to gain industry experience by working during the summer months or by participating in one of the university co-op or internship programs.

There are two departmental clubs—Nutrition Club and Food Science Club. Club activities involve a wide range of social, professional and service projects. Clubs provide opportunity for leadership training and participation in professional societies and organizations.

Graduate Program

Cal Poly offers a Master of Science degree in Agriculture with a specialization in Food Science and Nutrition. For information regarding this degree program, please refer to page 148 of this catalog.

Packaging Minor

For information regarding the Packaging Minor, please see page 337.
FOOD SCIENCE MAJOR

The Bachelor of Science degree in Food Science is designed to prepare students for employment in the commercial food processing industry. Principal areas of instruction are in fruit and vegetable processing, cereal and snack food manufacture and red meat processing. Instruction qualifies graduates for careers in line production, quality control, food technology, marketing and management. The curriculum is approved by and is in compliance with minimum standards established by the Institute of Food Technologists, an international scientific society.

CURRICULUM FOR B.S. FOOD SCIENCE

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. Cal Poly follows the quarter system.

Freshman

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<td>Meats</td>
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<td>FSN 217</td>
<td>Fundamentals of Food Processing Operations</td>
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<td>CHEM 326</td>
<td>Survey of Organic Chemistry</td>
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<td>CHEM 328</td>
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<td>General Bacteriology (B.1.b.)</td>
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<td>Unit Processing Operations I</td>
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<td>Principles of Food Plant Sanitation</td>
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<td>Statistical Quality Control</td>
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<td>FSN 339</td>
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<td>FSN 407</td>
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<td>FSN 409</td>
<td>Sensory Evaluation of Food</td>
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<td>BACT 421</td>
<td>Food Microbiology</td>
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1 MATH 116 and MATH 117 will substitute for MATH 118 and are taught at a slower pace for those who need more review. MATH 117 will satisfy GEB area B.2.
2 Refer to departmental list of courses which satisfy Plant Science, Animal Science and Business electives.
3 Seven of these elective units must be chosen from departmental list of approved electives (see adviser).
4 To be selected in accordance with the General Education-Breadth requirements. (Please see page 114 of this catalog.)
Nutritional Science

The Nutritional Science curriculum prepares graduates for careers in various areas of nutrition, dietetics, and food administration. The Bachelor of Science degree program in Nutritional Science is an American Dietetic Association-approved Plan IV program and fulfills the academic requirements for eligibility for admission to a dietetic internship or equivalency which must be completed before qualifying for registration as a dietitian with the American Dietetic Association. Hospitals, educational institutions, governmental agencies, and industry employ graduates with positions in food systems management, nutrition services and education. Graduates are also prepared to pursue advanced degrees in nutrition, foods, dietetics, public health and institution management.

CURRICULUM FOR B.S. NUTRITIONAL SCIENCE

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

Freshman

<table>
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<tr>
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<th>Title</th>
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<tbody>
<tr>
<td>FSN 101</td>
<td>Orientation to Food Science and Nutrition</td>
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<tr>
<td>FSN 210</td>
<td>Nutrition (E.2.)</td>
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<tr>
<td>ANT 201</td>
<td>Cultural Anthropology</td>
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<tr>
<td>HE 121</td>
<td>Fundamentals of Food</td>
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<tr>
<td>CHEM 121</td>
<td>General Chemistry (B.1.a.)</td>
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<td>CHEM 122</td>
<td>General Chemistry (B.1.a.)</td>
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<tr>
<td>ECON 201</td>
<td>Survey of Economics (D.3.)</td>
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<td>ENGL 114</td>
<td>Writing: Exposition (A.1.)</td>
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<tr>
<td>ENGL 125</td>
<td>Critical Thinking (A.2.)</td>
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<tr>
<td>MATH 118</td>
<td>Pre-Calculus Algebra</td>
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<td>POLS 210</td>
<td>American and California Government (D.1.)</td>
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<tr>
<td>SOC 105</td>
<td>Introduction to Sociology (D.4.a.)</td>
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Sophomore

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<tr>
<td>FSN 209</td>
<td>Meat Procurement and Use</td>
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<tr>
<td>FSN 230</td>
<td>Elements of Food Processing</td>
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<td>ACTG 211</td>
<td>Financial Accounting for Nonbusiness Majors</td>
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<tr>
<td>BACT 221</td>
<td>General Bacteriology</td>
<td>4</td>
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<tr>
<td>CHEM 326</td>
<td>Survey of Organic Chemistry</td>
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<tr>
<td>MGT 206</td>
<td>Principles of Purchasing</td>
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<tr>
<td>AG 250</td>
<td>Computer Application to Agriculture or CSC 110</td>
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<tr>
<td>ENGL 215</td>
<td>Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.)</td>
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<td>HIST 204</td>
<td>History of American Ideals and Institutions (D.1.)</td>
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<td>PSY 201/PSY 202</td>
<td>General Psychology (E.1.)</td>
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<td>SPC 201</td>
<td>Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
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<tr>
<td>STAT 211</td>
<td>Elementary Probability and Statistics (B.2.)</td>
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<tr>
<td>ZOO 131</td>
<td>General Zoology (B.1.b.)</td>
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# Food Science and Nutrition

## Junior

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<tr>
<td>FSN 310</td>
<td>Maternal and Child Nutrition</td>
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<tr>
<td>FSN 315</td>
<td>Nutrition in Aging</td>
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<tr>
<td>FSN 328</td>
<td>Advanced Nutrition I</td>
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<tr>
<td>FSN 329</td>
<td>Advanced Nutrition II</td>
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<tr>
<td>CHEM 328</td>
<td>Biochemistry</td>
<td>4</td>
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<tr>
<td>ED 305</td>
<td>Teaching and Learning Processes</td>
<td>3</td>
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<tr>
<td>HE 321</td>
<td>Meal Management</td>
<td>3</td>
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<tr>
<td>MGT 312</td>
<td>Organization and Management Theory</td>
<td>4</td>
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<tr>
<td>MGT 314</td>
<td>Human Resources Management</td>
<td>4</td>
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<tr>
<td>ZOO 237</td>
<td>Human Anatomy</td>
<td>3</td>
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<tr>
<td>ZOO 331</td>
<td>Human Physiology</td>
<td>3</td>
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<tr>
<td>ZOO 332</td>
<td>Human Physiology</td>
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<tr>
<td>PHIL 230/231</td>
<td>Philosophical Classics (C.1.)</td>
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2 Critical reading electives (C.1.) ............................................... 6
Electives ................................................................................................. 2

## Senior

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>FSN 412</td>
<td>Experimental Nutrition</td>
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<td>FSN 415</td>
<td>Methods of Teaching Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>FSN 416</td>
<td>Community Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>FSN 425</td>
<td>Quantity Food Preparation</td>
<td>3</td>
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<tr>
<td>FSN 426</td>
<td>Food Systems Management</td>
<td>3</td>
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<tr>
<td>FSN 427</td>
<td>Equipment and Layout</td>
<td>3</td>
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<tr>
<td>FSN 429</td>
<td>Diet Therapy</td>
<td>5</td>
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<tr>
<td>FSN 461</td>
<td>Senior Project</td>
<td>3</td>
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<td>FSN 462</td>
<td>Senior Project</td>
<td>3</td>
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<tr>
<td>FSN 463</td>
<td>Undergraduate Seminar</td>
<td>2</td>
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<tr>
<td>BACT 421</td>
<td>Food Microbiology</td>
<td>4</td>
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<tr>
<td>HE 421</td>
<td>Cultural and Aesthetic Aspects of Food</td>
<td>3</td>
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<tr>
<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
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</table>

2 ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .................................. 3
2 Arts and humanities elective (Area C) ............................................ 3
2 Fine and performing arts elective (C.2.) ....................................... 3
2 Literature, philosophy, arts elective (300-400 level) (C.3.) ............. 3

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

1 MATH 116 and MATH 117 will substitute for MATH 118 and are taught at a slower pace for those who need more review. MATH 117 will satisfy GEB area B.2.

2 To be selected in accordance with the General Education-Breadth requirements. (Please see page 114 of this catalog.)
The Bachelor of Science degree program in Natural Resources Management prepares students for important careers in the protection, management, and development of our forest and natural resources. The forest and natural resources management program at Cal Poly prepares students for professional positions in the field of forestry, forest resources and natural resources management.

Students may elect to emphasize important forest and land management disciplines, such as recreation management; urban forestry; environmental management; watershed, chaparral and fire management; hardwood management; fish and wildlife management.

Students are strongly encouraged to complete a period of natural resources related work experience equivalent to one quarter of full-time work. This can be accomplished by a seasonal job, volunteer work, or the completion of FOR 339, AG 339 or COOP 486. Work experience for academic credit must be documented by work supervisor and approved by student’s academic adviser.

Graduates qualify for such positions as forester, environmental interpreter, urban forester, environmental specialist, park administrator, resource manager, park ranger, resource planner, watershed manager, and fire management specialist.

Cal Poly graduates are employed throughout the world: establishing, managing and regenerating forests and urban wildland areas; providing opportunities for recreation use of forests; teaching; extension; research; harvesting forest crops; developing, processing and marketing wood products; and protecting and managing the environment.

Cal Poly provides the practical and analytical skills to meet the demands of tomorrow and helps students develop a strong foundation in forest and natural resources management principles.

Forest and natural resources facilities assist in the development of field skills. Special campus sites include Christmas tree plantations, weather station, greenhouses, woodlots, biomass energy plants, logging competition arena, experimental watershed and reservoirs. The forest at Swanton-Pacific, an off-campus site near Santa Cruz, offers many educational opportunities for coursework and special studies on its 3150 acres of forests, wildlands and agricultural land areas. The site includes hardwood and redwood forest types, diverse ecosystems, streams and riparian habitat zones. In addition, the 70-acre Atlee School Forest and other nearby private resource areas, regional and State parks, and National Forests also provide opportunities for practical field experiences.
The curriculum provides a full range of courses in the humanities and the basic sciences and requires the completion of a concentration in a field of specialization to meet professional and employment requirements. Pregraduation employment in a natural resources area and internships reinforce classroom and laboratory experiences, and enhance opportunities for employment after graduation.

Opportunities for graduate studies are also available. Students may choose to develop thesis programs with an emphasis in selected fields of forest and natural resources, such as watershed and fire management, forest management, recreation, chaparral and hardwood ecosystem management, urban forestry, and environmental studies. The Master of Science degree is awarded with a specialization in General Agriculture. In addition, an agroforestry study program can be developed through the Master of Science degree program with a specialization in International Agricultural Development. For additional information, see page 148.

Cal Poly is a candidate institution for accreditation by the Society of American Foresters. Also, employment as a forester with the Federal Government is recognized by the U.S. Office of Personnel Management.

CURRICULAR CONCENTRATIONS

The forest and natural resources concentrations prepare students for entry into the profession of forestry and natural resources. Students are able immediately to apply forest and natural resources management principles learned at Cal Poly. The curriculum provides broad training in forest and natural resource management with emphasis in urban forestry, watershed, chaparral and fire management, hardwood management, parks and forest recreation, environmental management, and wood energy systems. Extensive field training occurs concurrently with classroom instruction.

Environmental Management

The environmental management concentration prepares students for employment as professionals in the fields of forestry and natural resources management planning, environmental impact assessment and evaluation, and environmental policy analysis. Individual student programs are developed.

Forest Resources—Management

Specialized areas of study are available through an emphasis in Hardwood Management or Wood Utilization.

Individualized studies are also available in agroforestry, environmental studies, fish and wildlife management, parks and outdoor recreation, computer science, journalism, business administration, Spanish, and marketing.

Hardwood Management: The protection, utilization, and regeneration of hardwood communities as well as the principles of hardwood management that are necessary to meet the rising demand for the multiple use of hardwood forests and oak woodlands are studied.

Wood Utilization: This emphasis prepares students to design, implement, manage, and evaluate wood industry and utilization systems. Topics of study include harvesting, utilization, energy development and marketing processes. Wood product conversion and utilization of residue from commercial forestry operations is also included.

Forest Resources—Urban Forestry

Management problems resulting from the continued trend of urbanization into the urban-wildland interface are studied. Urban Forestry focuses on the urban ecosystem including lesser vegetation, wildlife, and open space, as well as the trees. The curriculum emphasizes the application of forestry skills for management of urban forest ecosystems.

Forest Resources—Watershed, Chaparral and Fire Management

Students examine all aspects of water resource management in various forest ecosystems. The effects of watershed and fire management practices in chaparral and other Mediterranean-type ecosystems are studied in particular.
Parks and Forest Recreation
The parks and forest recreation concentration prepares students for employment in the planning, interpretation, development, and management of governmental and private resource-based parks and other recreational lands.

OTHER CONCENTRATIONS AVAILABLE
The Fisheries and Wildlife concentration offered by the Biological Sciences Department is available to Natural Resources Management majors and prepares students for employment in the fish and wildlife areas of law enforcement, management, and production. NRM majors following this concentration will meet the Wildlife Society’s certification education requirements. Prerequisite courses in zoology are required of students entering this concentration. Students in the Fisheries and Wildlife concentration may deviate up to 17 units of designated courses toward prerequisites with prior written approval of adviser. See concentration description in Biological Sciences for curricular requirements (page 394).

CURRICULUM FOR B.S. NATURAL RESOURCES MANAGEMENT
Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

**Freshman**
- FOR 201 Forest Resources .................................................. 3
- NRM 112 Parks and Outdoor Recreation .................................. 3
- SS 121 Introductory Soil Science ............................................. 4
- ANT 201/ GEOG 150/SOC 105 (D.4.a.) ................................ 3
- BOT 121 General Botany (B.1.b.) ........................................... 4
- CSC 110 Computers and Computer Applications or CSC 111 Introduction to
  Computer Applications for the Sciences (F.1.) .......................... 3
- ENGL 114 Writing: Exposition (A.1.) ...................................... 4
- ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .......... 3
- MATH 120 Pre-Calculus Algebra and Trigonometry (B.2.) ....... 5
- POLS 210 American and California Government (D.1.) ......... 3
- PSY 201/202 General Psychology (E.1.) .................................. 3
- BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100 elective (E.2.) 2
- Fine and performing arts elective (C.2.) ................................. 3
- Courses to complete concentration ......................................... 3
- Electives .................................................................................. 3

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**Sophomore**
- FOR 208 Dendrology ........................................................... 4
- NRM 304 Ecology of Resource Areas ..................................... 4
- AE 237 Engineering Surveying I ............................................. 2
- CHEM 121 General Chemistry (B.1.a.) ................................... 4
- ECON 201 Survey of Economics or ECON 211 Principles of Economics (D.3.) ....................................................... 3
- ENGL 218 Writing: Argumentation and Reports (A.4.) ......... 4
- HIST 204 History of American Ideals and Institutions (D.1.) ... 3
- PHIL 230/PHIL 231 Philosophical Classics (C.1.) .................. 3
- SPC 201 Public Speaking or SPC 202 Principles of Speech Communication (A.3.) .................................................. 3
- STAT 201 Elementary Probability and Statistics (B.2.) ......... 3
- STAT 212 Statistical Methods ................................................... 3
- Adviser approved science course sequence (B.1.a or B.1.b.) .... 8
  (BOT 123, BOT 326/BOT 333 or CHEM 122, CHEM 326 or ZOO 131, PHYS 104/PHYS 121)
- Courses to complete concentration ......................................... 4

48
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<td>FOR 305</td>
<td>Forest Harvesting</td>
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<tr>
<td>FOR 314</td>
<td>Forest Mensuration</td>
<td>5</td>
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<tr>
<td>FOR 316</td>
<td>Growth and Yield</td>
<td>3</td>
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<tr>
<td>LA/FOR/NRM 318</td>
<td>GIS Application of Natural Resource Information</td>
<td>2</td>
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<tr>
<td>NRM 302</td>
<td>Natural Resources Policy</td>
<td>3</td>
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<td>NRM 406</td>
<td>Natural Resources Administration</td>
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<tr>
<td>AE 345</td>
<td>Photogrammetry</td>
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<td>ASCI 331</td>
<td>Applied Range Management</td>
<td>2</td>
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<td>CSC 207 or STAT 313 or College calculus</td>
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<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
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<td>Literature, philosophy, arts elective (300-400 level) (C.3.)</td>
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**Senior**

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<tr>
<td>FOR 407</td>
<td>Silviculture and Vegetation Management</td>
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<tr>
<td>FOR 415</td>
<td>Forest Valuation</td>
<td>3</td>
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<tr>
<td>FOR 417</td>
<td>Forest Management and Multiple-Use Planning</td>
<td>4</td>
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<tr>
<td>FOR 440</td>
<td>Watershed Management</td>
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<tr>
<td>FOR 442</td>
<td>Watershed Protection</td>
<td>2</td>
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<td>NRM 401</td>
<td>Natural Resource Economics</td>
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<td>NRM 403</td>
<td>Environmental Impact Analysis</td>
<td>3</td>
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<td>FOR 461/NRM 461</td>
<td>Senior Project</td>
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<td>FOR 463/NRM 463</td>
<td>Undergraduate Seminar</td>
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<td>Arts and humanities elective (Area C)</td>
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</table>

1 MATH 118 and MATH 119 will substitute for MATH 120 and are taught at a slower pace for those who need more review. Also, MATH 116 and MATH 117 will substitute for MATH 118 for those people who need extra review. Students are advised to take the Mathematics Placement Exam (MAPE) prior to enrolling in Math classes.

2 To be selected in accordance with the General Education-Breadth requirements. (Please see page 114 of this catalog.)

3 Courses to be chosen with prior written approval of the adviser. Concentration contracts must be approved and filled out in junior year.

**Environmental Management Concentration**

(Add Courses Below to Basic Curriculum)

<table>
<thead>
<tr>
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<th>Course Title</th>
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<tr>
<td>FOR 339</td>
<td>Internship in Forest and Natural Resources or FOR 400</td>
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<tr>
<td>NRM 405</td>
<td>Applied Resource Analysis</td>
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<tr>
<td>NRM 407</td>
<td>Environmental Law</td>
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<td>NRM 408</td>
<td>Water Resource Law and Policy</td>
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<td>POLS 314/POLS 404/POLS 405</td>
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<td>3</td>
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<tr>
<td>NRM 417</td>
<td>Resource Recreation Planning</td>
<td>3</td>
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<tr>
<td>ENVE 330</td>
<td>Environmental Quality Control</td>
<td>3</td>
</tr>
<tr>
<td>CRP 212</td>
<td>Introduction to Urban Planning</td>
<td>3</td>
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<tr>
<td>SS 433</td>
<td>Land Use Planning</td>
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</table>
Forest Resources–Management Concentration
(Add Courses Below to Basic Curriculum)

Students may select courses in an area of emphasis such as hardwood management, wood utilization, or other specialized area.

- FOR 332 Forest Products .................................................. 3
- FOR 333 Hardwood Management ........................................ 3
- FOR 342 Fire Ecology ..................................................... 3
- FOR 345 Chaparral Management ....................................... 3
- FOR 434 Tree Growth and Wood Properties ......................... 3
- Restricted electives with prior written approval of adviser ........ 14

Forest Resources–Urban Forestry Concentration
(Add Courses Below to Basic Curriculum)

- FOR 325 Woodlot Management ........................................ 3
- FOR 333 Hardwood Management ........................................ 3
- FOR 342 Fire Ecology ..................................................... 3
- FOR 350 Urban Forestry .................................................. 3
- FOR 450 Community Forestry .......................................... 3
- NRM 311 Environmental Interpretation ................................ 4
- OH 421 Arboriculture ................................................... 4
- OH 422 Advanced Arboriculture ...................................... 2
- SS 310 Urban Soils ....................................................... 3
- Restricted elective with prior written approval of adviser ......... 1

Forest Resources–Watershed, Chaparral, and Fire Management Concentration
(Add Courses Below to Basic Curriculum)

- FOR 204 Resource Fire Control ........................................... 2
- FOR 250 Survey and Management of Mediterranean Ecosystems .................................................. 2
- FOR 340 Resource Fire Management ................................... 2
- FOR 342 Fire Ecology ..................................................... 3
- FOR 345 Chaparral Management ....................................... 3
- FOR 350 Urban Forestry or FOR 450 Community Forestry ........ 3
- FOR 441 Forest and Range Hydrology .................................. 3
- AE 445 Remote Sensing .................................................. 3
- SS 440 Forest and Range Soils ........................................... 4
- 1 STAT 313 Applied Experimental Design and Regression Models .................................................. 3
- Restricted elective with prior written approval of adviser ........ 1

1 Students in this concentration must take STAT 313. If taken as part of the core, FOR/NRM restricted elective may be selected with prior written approval of adviser.
### Parks and Forest Recreation Concentration

*(Add Courses Below to Basic Curriculum)*

<table>
<thead>
<tr>
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<tr>
<td>FOR 342</td>
<td>Fire Ecology</td>
<td>3</td>
</tr>
<tr>
<td>FOR 350</td>
<td>Urban Forestry/FOR 450 Community Forestry</td>
<td>3</td>
</tr>
<tr>
<td>NRM 203</td>
<td>Resource Law Enforcement</td>
<td>3</td>
</tr>
<tr>
<td>NRM 311</td>
<td>Environmental Interpretation</td>
<td>4</td>
</tr>
<tr>
<td>NRM 410</td>
<td>Resource Recreation Management</td>
<td>4</td>
</tr>
<tr>
<td>NRM 417</td>
<td>Resource Recreation Planning</td>
<td>3</td>
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<tr>
<td>CONS 120/FOR 120</td>
<td>Fish and Wildlife Management</td>
<td>3</td>
</tr>
<tr>
<td>LA 363</td>
<td>Recreation and Open Space Planning and Design</td>
<td>3</td>
</tr>
<tr>
<td>REC 210</td>
<td>Programming for Leisure</td>
<td>3</td>
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</tbody>
</table>

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

Agricultural Sciences Bldg. (11), Room 244
(805) 756-2279

Faculty

Department Head, Ronald D. Regan
Stephen F. Angley  Winton H. Frey  Daniel E. Lassanske
Patricia H. Breckenridge  Timothy A. Gaskin  William E. Noble
Charlotte B. Burns  Robert L. Gordon  Virginia R. Walter
James A. D'Albro  David W. Hannings  Michael D. Zohns
Thomas E. Eltzroth

Programs

B.S. Ornamental Horticulture with Concentrations in:
Floriculture and Nursery Production  Landscape Industry
Horticulture Sales and Services

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

Graduates of the Ornamental Horticulture Department are in demand for management and sales positions within the dynamic nursery and floriculture industries, as well as the large and diverse areas within the landscape industries.

Cal Poly graduates are employed nationally and internationally as business owners, growers, managers, researchers, educators, salespersons, designers, landscape contractors, extension agents, agricultural commissioners, consultants and advisers.

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

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

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

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

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

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

## CURRICULUM FOR B.S. ORNAMENTAL HORTICULTURE

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

### Freshman

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>OH 101</td>
<td>Principles of Landscape Drafting</td>
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<tr>
<td>OH 110</td>
<td>Orientation to Ornamental Horticulture</td>
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<td>OH 131, OH 132</td>
<td>Fundamentals of Ornamental Horticulture I, II</td>
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<td>OH 133</td>
<td>Plant Propagation, Fundamentals III</td>
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<tr>
<td>OH 134</td>
<td>Landscape Maintenance, Fundamentals IV</td>
<td>3</td>
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<tr>
<td>SS 121</td>
<td>Introductory Soil Science</td>
<td>4</td>
</tr>
<tr>
<td>BOT 121</td>
<td>General Botany (B.1.b.)</td>
<td>4</td>
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<tr>
<td>BOT 123</td>
<td>Introductory Plant Taxonomy (B.1.b.)</td>
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<tr>
<td>CHEM 121</td>
<td>General Chemistry (B.1.a.)</td>
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<td>CHEM 122</td>
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<td>ENGL 114</td>
<td>Writing: Exposition (A.1.)</td>
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<td>Critical Thinking (A.2.)</td>
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<td>Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.)</td>
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<td>MATH 118</td>
<td>Pre-Calculus Algebra (B.2.)</td>
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<tr>
<td>PSY 201/PSY 202</td>
<td>General Psychology (E.1.)</td>
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<td>SPC 201</td>
<td>Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
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<td>STAT 130</td>
<td>Introduction to Statistical Reasoning or STAT 211 Elementary Probability and Statistics (B.2.)</td>
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### Sophomore

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<th>Course Code</th>
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<tbody>
<tr>
<td>OH 126</td>
<td>Ornamental Horticulture Construction</td>
<td>2</td>
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<tr>
<td>OH 231, OH 232, OH 233</td>
<td>Plant Materials</td>
<td>4,4,4</td>
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<tr>
<td>OH 250</td>
<td>Principles of Landscape Design</td>
<td>3</td>
</tr>
<tr>
<td>ENT 220</td>
<td>Agricultural Entomology or CRSC 311 Applied Insect Pest Management</td>
<td>4</td>
</tr>
<tr>
<td>SS 221</td>
<td>Fertilizers</td>
<td>4</td>
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<tr>
<td>ECON 201</td>
<td>Survey of Economics or ECON 211 Principles of Economics (D.3.)</td>
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<tr>
<td>ENGL 215</td>
<td>Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.)</td>
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<td>MATH 118</td>
<td>Pre-Calculus Algebra (B.2.)</td>
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<td>PSY 201/PSY 202</td>
<td>General Psychology (E.1.)</td>
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<td>SPC 201</td>
<td>Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
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<td>STAT 130</td>
<td>Introduction to Statistical Reasoning or STAT 211 Elementary Probability and Statistics (B.2.)</td>
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### Junior

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<tr>
<td>ACTG 211</td>
<td>Financial Accounting for Nonbusiness Majors</td>
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<tr>
<td>BOT 322</td>
<td>Introductory Plant Physiology (B.1.b.)</td>
<td>4</td>
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<tr>
<td>BOT 324</td>
<td>Ornamental and Forest Pathology</td>
<td>4</td>
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<tr>
<td>BUS 201</td>
<td>Business Law Survey</td>
<td>3</td>
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<tr>
<td>CHEM 326</td>
<td>Survey of Organic Chemistry</td>
<td>4</td>
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<tr>
<td>POLS 210</td>
<td>American and California Government (D.1.)</td>
<td>3</td>
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<td>Critical reading electives (C.1.)</td>
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<td>CRSC/FRSC/VGSC elective (200-400 level)</td>
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<td>Electives and courses to complete major</td>
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Senior

OH 427  Diseases and Pests of Ornamental Plants ............................................. 5
OH 460  Senior Seminar .................................................................................. 1
OH 461  Senior Project .................................................................................. 2
OH 462  Senior Project .................................................................................. 2
ANT 201/GEOG 150/SOC 105  (D.4.a.) ....................................................... 3
HIST 204  History of American Ideals and Institutions  (D.1.) ...................... 3
HIST 315  Modern World History  (D.2.) ...................................................... 3
PHIL 230/PHIL 231  Philosophical Classics  (C.1.) ......................................... 3
1  ANT/BUS/ECON/GEOG/POLS/SOC elective  (D.4.b.) ................................. 3
1  Arts and humanities elective  (Area C) ...................................................... 3
1  BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100 elective  (E.2.) ............ 2
1  Fine and performing arts elective  (C.2.) .................................................. 3
1  Literature, philosophy, arts elective (300–400 level)  (C.3.) ....................... 3
2  Electives and courses to complete major ...................................................... 9

1 To be selected in accordance with the General Education-Breadth requirements. (Please see page 114 of this catalog.)
2 Of the total elective units 25 must be chosen in a concentration with approval of the adviser with a minimum
   of 17 units at 300–400 level.
3 MATH 116 and MATH 117 will substitute for MATH 118 and are taught at a slower pace for those who need
   more review. MATH 117 will satisfy GEB area B.2.

Floriculture and Nursery Production Concentration

(Add Courses Below to Basic Curriculum)

OH 424  Wholesale Nursery Management or OH 443  Greenhouse Management .......... 4
OH 340  Principles of Greenhouse Environment .................................................. 5
OH 342  Potted Plant Production ........................................................................ 4
Select from the following .................................................................................. 12
AE 131, OH 324, OH 325, OH 341, OH 381, OH 400, OH 424, OH 425, OH 426, OH 443,
OH 470/471

Horticultural Sales and Services Concentration

(Add Courses Below to Basic Curriculum)

OH 302  Ornamental Horticulture Sales and Service ........................................... 3
OH 324  Foliage Plant Culture ........................................................................... 4
OH 402  Advanced Ornamental Horticulture Sales and Service ......................... 4
AGB 201  Agribusiness Sales and Service ......................................................... 3
Select from the following .................................................................................. 11
AGB 310, AGB 323, AGB 404, OH 125, OH 145, OH 251, OH 252, OH 253, OH 321, OH

Landscape Industry Concentration

(Add Courses Below to Basic Curriculum)

OH 243  Turf Management .................................................................................. 4
OH 331  Landscape Contracting ......................................................................... 4
OH 434  Landscape Management ....................................................................... 3
AE 131  Agricultural Surveying or AE 237  Engineering Surveying I .................. 2
AE 337  Landscape irrigation ............................................................................ 3
Select from the following .................................................................................. 9
AE 141, OH 320, OH 321, OH 322, OH 324, OH 332, OH 333, OH 337, OH 381, OH 400,
OH 421, OH 435, OH 454, OH 470/471, SS 310

25
SOIL SCIENCE DEPARTMENT

Science Bldg. (52), Room A-10
(805) 756-2261

Faculty

Department Head, Terry L. Smith

Gaston Amedee  Royce L. Lambert  Thomas A. Ruehr
Delmar D. Dingus  Thomas J. Rice, Jr.  Ronald D. Taskey
Brent G. Hallock

Programs

B.S. Soil Science with Concentrations in:

Land Resources  Environmental Science and Technology
Environmental Management

Three-fourths of the world's food supply and nearly all of its fiber come from the fragile, thin skin of the land's surface—the soil. Moreover, soil absorbs and transmits rain and snow which replenish our groundwater; and it captures untold quantities of environmental wastes. Soil scientists are the most knowledgeable and best trained people responsible for the management of soil, one of our most precious natural resources.

The Bachelor of Science degree in Soil Science provides fundamental knowledge and skills needed for field, laboratory, management, and teaching positions, as well as for graduate studies. Concentrations are offered in Land Resources, Environmental Management, and Environmental Science and Technology. These high quality programs help ensure that our graduates are well prepared for the diverse opportunities awaiting them. Moreover, graduates can meet educational requirements for professional certification by the American Registry of Certified Professionals in Agronomy, Crops and Soils, and as Certified Professional Erosion and Sediment Control Specialists.

Students are encouraged to reinforce their education, develop professional contacts, and strengthen their career potential by participating in any of the following activities: the Soils Club and the Soil and Water Conservation Society, each of which is nationally affiliated; the Soil judging Team, which often qualifies for national competition; the Soil Testing Enterprise Program, which analyzes soil and water samples for local growers and gardeners; and internships and cooperative education programs with government and industry.

Facilities of the department include laboratories having up-to-date analyzers, a glasshouse and a computer room. The department has access to several thousand acres of agricultural, forest and range land managed by the School of Agriculture. All of the facilities, equipment and land, which allow practical application of classroom knowledge, are for student use.

Even though the Soil Science Department is small and highly personable, our undergraduate program ranks among the largest and strongest in the nation. Our graduates are employed from Alaska to Mexico, Maine to Hawaii, and on every continent. Their Cal Poly experience has provided them with the strong scientific foundation, practical skills and balanced general education needed to be flexible and competitive in today's diverse, and often unpredictable, job market.

Undergraduate and graduate students majoring in soil science earn a solid, useful education; likewise, students from other fields who select soil science courses as electives can augment their skills and knowledge, making them more adaptable to changing professional opportunities. Moreover, all students can discover soil's vital role in their lives, and the human dependence on the quality of soil for quality of life.
Cal Poly offers a Master of Science degree in Agriculture with a specialization in Soil Science. For information regarding this degree program, please refer to page 148 of this catalog.

**CURRICULAR CONCENTRATIONS**

**Land Resources**
This concentration prepares students for professional opportunities in soil and water conservation, farm advisement, fertilizer and agricultural chemicals industries, forest and range soils, urban land enhancement, laboratory analysis, soil surveying, environmental issues, and international agriculture. The flexibility of this concentration allows students to pursue one of several approved minors, and to prepare for graduate studies.

**Environmental Management**
This concentration offers a solid scientific background melded with environmental policy and administration, site analysis, and resource planning. The program helps prepare students for managerial positions dealing with today's complicated environmental problems and opportunities.

**Environmental Science and Technology**
This concentration provides the strongest foundation for evaluating and solving complex environmental problems, including land and water degradation and contamination by hazardous wastes. Additionally, the concentration includes courses needed for admission to rigorous graduate programs.

**CURRICULUM FOR B.S. SOIL SCIENCE**

*Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.*

### Freshman

<table>
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<th>Course Code</th>
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<tr>
<td>SS 110</td>
<td>Orientation in Soil Science</td>
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<tr>
<td>SS 121</td>
<td>Introductory Soil Science</td>
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<tr>
<td>SS 202</td>
<td>Soil and Water Conservation</td>
<td>3</td>
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<tr>
<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BOT 121</td>
<td>General Botany (B.1.b.)</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 127</td>
<td>General Chemistry (B.1.a.)</td>
<td>4</td>
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<tr>
<td>ENGL 114</td>
<td>Writing: Exposition (A1.)</td>
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<td>ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.)</td>
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<td>GEOL 201</td>
<td>Physical Geology (B.1.a.)</td>
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<tr>
<td>MATH 118</td>
<td>Pre-Calculus Algebra or MATH 131 Technical Calculus (B.2.)</td>
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<td>MATH 119</td>
<td>Pre-Calculus Trigonometry or MATH 132 Technical Calculus (B.2.)</td>
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### Sophomore

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<th>Units</th>
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<tr>
<td>SS 221</td>
<td>Fertilizers and Plant Nutrition</td>
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<tr>
<td>SS 223</td>
<td>Rocks and Minerals</td>
<td>4</td>
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<tr>
<td>CHEM 129</td>
<td>General Chemistry</td>
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<td>CHEM 328/PHYS 122/PHYS 132</td>
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<tr>
<td>ECON 201</td>
<td>Survey of Economics or ECON 211 Principles of Economics (D.3.)</td>
<td>3</td>
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<tr>
<td>ENGL 215</td>
<td>Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.)</td>
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<tr>
<td>HIST 204</td>
<td>History of American Ideals and Institutions (D.1.)</td>
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<tr>
<td>PHYS 121</td>
<td>College Physics (B.1.a.) or PHYS 131 General Physics (B.1.a.)</td>
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<td>POLS 210</td>
<td>American and California Government (D.1.)</td>
<td>3</td>
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<td>SPC 201</td>
<td>Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
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<td>Agricultural Climatology</td>
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<tr>
<td>SS 321</td>
<td>Soil Morphology</td>
<td>4</td>
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<tr>
<td>SS 322</td>
<td>Soil Fertility</td>
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<tr>
<td>SS 323</td>
<td>Soil Fertility Laboratory</td>
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<tr>
<td>AG 250</td>
<td>Computer Application to Agriculture or CSC 111</td>
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<tr>
<td>BACT 224</td>
<td>General Microbiology (B.1.b.)</td>
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<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
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<td>PHIL 230/231</td>
<td>Philosophical Classics (C.1.)</td>
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<td>PSY 201/202</td>
<td>General Psychology (E.1.)</td>
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<td>ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.)</td>
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<td>BACT/BIO/BOT elective (300-400 level)</td>
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Electives and courses to complete the concentration: 

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<tr>
<td>51</td>
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See COURSES OF INSTRUCTION section of this catalog for description of courses in Soil Science and other subjects.

1. Students in the Environmental Science and Technology concentration take MATH 131 and MATH 132.
2. To be selected in accordance with the General Education-Breadth requirements. (Please see page 114 of this catalog.)
3. Selected from approved list.
Land Resources Concentration
(Add Courses Below to Basic Curriculum)

CHEM 326  Survey of Organic Chemistry ................................................................. 4
CRSC 311  Applied Insect Pest Management ............................................................ 4
CRSC 411  Experimental Techniques and Analysis ..................................................... 4
STAT 211  Elementary Probability and Statistics (B.2.) ............................................. 3

Support courses selected from approved list, with at least 8 units having significant environmental component. These units may be selected to apply toward an approved minor. . 23

Environmental Management Concentration
(Add Courses Below to Basic Curriculum)

Required:
AG 339  Internship in Agriculture or SS 400  Special Problems for Advanced Graduates .. 3
CHEM 326  Survey of Organic Chemistry ................................................................. 4
CRP 212  Introduction to Urban Planning ............................................................... 3
ENVE 330  Environmental Quality Control ............................................................ 3
NRM 403  Environmental Impact Analysis .............................................................. 3
NRM 405  Applied Resource Analysis ................................................................. 4
NRM 407  Environmental Law ............................................................................. 3
NRM 408  Water Resource Law and Policy .......................................................... 3
POLS 314/POLS 404/POLS 405 ........................................................................... 3
SS 433  Land Use Planning ................................................................................ 3

Select 2 courses from: CRSC 411/STAT 211/STAT 212 ........................................ 6

Environmental Science and Technology Concentration
(Add Courses Below to Basic Concentration)

CHEM 316  Organic Chemistry ............................................................................. 4
CHEM 317  Organic Chemistry ............................................................................. 5
CHEM 318  Organic Chemistry ............................................................................. 5
CHEM 331  Quantitative Analysis ...................................................................... 5
ENVE 434  Water Quality Measurements ............................................................ 2
ENVE 436  Introduction to Hazardous Waste Management or ENVE 439 Solid Waste Management ......................................................................................... 3
MATH 133  Technical Calculus ........................................................................... 4
STAT 321  Statistical Analysis .............................................................................. 3
STAT 322  Statistical Analysis .............................................................................. 3
Select from the following: BOT 321, CHEM 341, CSC 251, STAT 324, ZOO 131 or other faculty approved courses. ................................................................. 4
ARCHITECTURE AND DESIGN SCHOOL OF ENVIRONMENTAL DESIGN AND ARCHITECTURE SCHOOL OF ENVIRONMENTAL DESIGN ARCHITECTURE SCHOOL OF ENVIRONMENTAL DESIGN ARCHITECTURE SCHOOL OF ENVIRONMENTAL DESIGN ARCHITECTURE SCHOOL OF ENVIRONMENTAL DESIGN ARCHITECTURE SCHOOL OF ENVIRONMENTAL DESIGN ARCHITECTURE SCHOOL OF ENVIRONMENTAL DESIGN ARCHITECTURE SCHOOL OF ENVIRONMENTAL DESIGN ARCHITECTURE SCHOOL OF ENVIRONMENTAL DESIGN ARCHITECTURE SCHOOL OF ENVIRONMENTAL DESIGN ARCHITECTURE SCHOOL OF ENVIRONMENTAL DESIGN ARCHITECTURE SCHOOL OF ENVIRONMENTAL DESIGN ARCHITECTURE SCHOOL OF ENVIRONMENTAL DESIGN ARCHITECTURE SCHOOL OF ENVIRONMENTAL DESIGN ARCHITECTURE SCHOOL OF ENVIRONMENTAL DESIGN ARCHITECTURE SCHOOL OF ENVIRONMENTAL DESIGN ARCHITECTURE SCHOOL OF ENVIRONMENTAL DESIGN ARCHITECTURE SCHOOL OF ENVIRONMENTAL DESIGN ARCHITECTURE SCHOOL OF ENVIRONMENTAL DESIGN ARCHITECTURE SCHOOL OF ENVIRONMENTAL DESIGN ARCHITECTURE SCHOOL OF ENVIRONMENTAL DESIGN ARCHITECTURE SCHOOL OF ENVIRONMENTAL DESIGN ARCHITECTURE SCHOOL OF ENVIRONMENTAL DESIGN
School of Architecture and Environmental Design

Degree Programs

B.S. Architectural Engineering .......................................................... 201
B.Arch. Architecture ................................................................. 204
B.S. City and Regional Planning ..................................................... 208
B.S. Construction Management ..................................................... 212
B.S. Landscape Architecture .......................................................... 215
M.S. Architecture ........................................................................ 206
M.C.R.P. City and Regional Planning ............................................. 210
SCHOOL OF ARCHITECTURE AND ENVIRONMENTAL DESIGN

Architecture and Environmental Design Bldg. (05), Room 212
(805) 756-1311

G. Day Ding, Dean
K. Richard Zweifel, Associate Dean

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

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

The excellent school facilities include design laboratories, grading galleries, soils laboratory, stress laboratory, construction shop, project yard, instructional resource center, computer laboratories, multi-media laboratory, and photo presentation laboratory. An outlying area of 12 acres known as the “Canyon” is available for extensive experimental construction. The location of the campus between the great population centers of San Francisco and Los Angeles is ideal for environmental studies ranging from rural to large metropolitan complexes. There is a continual stream of visiting lecturers. Field trips are arranged to various parts of the State as required work. Additionally, the school offers several opportunities through departmentally sponsored programs for directed foreign study as a part of curricular offerings, in addition to regular participation in The California State University’s International Programs in Denmark and Italy.

Departments are members of their respective professional associations, namely, the Association of Collegiate Schools of Architecture, the Council of Educators in Landscape Architecture, the Association of Collegiate Schools of Planning, and the Associated Schools of Construction. Likewise, students maintain active chapters of the professional organizations of the American Institute of Architects, the American Society of Landscape Architects, the Associated General Contractors, the Structural Engineering Association of California, the American Planning Association, and the National Society of Architectural Engineers.

Advanced professional and inter-professional studies by students and faculty undertaken as applied investigations and community service are organized under the school's Design Institute through its research and service units on Barrier-Free Design, Computer-Aided Design, Design Professionals’ Role in Development, Earthquake-Resistant Building Systems, Geographic Information System Technology, Small Town and Rural Planning Issues and Community Service.

Students interested in pursuing one of the five undergraduate program offerings within the school should familiarize themselves with the appropriate curriculum flow chart, available through the University Admissions Office and the Student Services Coordinator, Architecture and Environmental Design Bldg. (05), Room 212. Special attention is directed to the strict sequencing of courses and prerequisite requirements. Students who plan to transfer from a California community college should schedule classes to maximize transfer units. Reference should be made to the “Articulation Agreement” located in the community college counseling center.

All student work submitted for course credit becomes school property and will be returned only at the discretion of the instructor.
The four-year program in Architectural Engineering leads to the Bachelor of Science degree and has its major emphasis in the structural engineering of buildings. Students are encouraged to develop aptitudes in science and mathematics for creative engineering accomplishments. Graduates of this program will generally seek professional registration as civil and structural engineers. The Architectural Engineering curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (A.B.E.T.).

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

**CURRICULUM FOR B.S. ARCHITECTURAL ENGINEERING**

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. Cal Poly follows the quarter system.

**Freshman**

- ARCH 106 Materials of Construction ................................................................. 3
- ARCH 111 Introduction to Drawing and Perspective ........................................... 3
- ARCH 112 Basic Graphics ................................................................................. 3
- ARCH 113 Graphic Analysis and Communication Skills for Designers ........... 3
- EDES 101 Introduction to Architecture and Environmental Design .............. 2
- ENGL 114 Writing: Exposition (A.1.) ............................................................ 4
- ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) ................................. 3
- MATH 141 Calculus I (B.2.) ........................................................................... 4
- MATH 142 Calculus II (B.2.) ........................................................................... 4
- MATH 143 Calculus III (B.2.) .......................................................................... 4
- PHYS 131 General Physics (B.1.a.) ................................................................. 4
- PHYS 132 General Physics (B.1.a.) ................................................................. 4
- PSY 201/PSY 202 General Psychology (E.1.) .................................................. 3
- SPC 201 Public Speaking or SPC 202 Principles of Speech Communication (A.3.) 3
- Fine and performing arts elective (C.2.) ....................................................... 3
- Life science elective (B.1.b.) ......................................................................... 3

"Life science elective (B.1.b.)"
### Sophomore

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<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>ARCE 221</td>
<td>Elementary Structures</td>
<td>3</td>
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<tr>
<td>ARCE 222</td>
<td>Mechanics of Structural Members I</td>
<td>3</td>
</tr>
<tr>
<td>ARCE 223</td>
<td>Mechanics of Structural Members II</td>
<td>3</td>
</tr>
<tr>
<td>ARCE 227</td>
<td>Structural Analysis I</td>
<td>2</td>
</tr>
<tr>
<td>ARCH 208</td>
<td>Architectural Design Basics</td>
<td>2</td>
</tr>
<tr>
<td>ARCH 209</td>
<td>Architectural Design Basics</td>
<td>2</td>
</tr>
<tr>
<td>ARCH 231</td>
<td>Architectural Practice</td>
<td>3</td>
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<tr>
<td>ARCH 457/458/459</td>
<td>Calculus IV</td>
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<td>MATH 241</td>
<td>Calculus IV</td>
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<td>MATH 242</td>
<td>Differential Equations</td>
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<td>PHYS 133</td>
<td>General Physics</td>
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<td>CHEM 124</td>
<td>General Chemistry (B.1.a.)</td>
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<td>CSC 251</td>
<td>Digital Computer Applications (F.1.)</td>
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<td>ECON 201</td>
<td>Survey of Economics or ECON 211</td>
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<td>ENGL 215</td>
<td>Writing: Argumentation or ENGL 218</td>
<td>3</td>
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<tr>
<td>HIST 204</td>
<td>History of American Ideals and Institutions (D.1.)</td>
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<td>American and California Government (D.1.)</td>
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### Junior

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<tr>
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<tr>
<td>ARCE 302</td>
<td>Structural Analysis II</td>
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<td>Steel Design</td>
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<td>ARCE 304</td>
<td>Timber Design</td>
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<tr>
<td>ARCE 305</td>
<td>Masonry Design</td>
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<td>ARCE 306</td>
<td>Matrix Analysis of Structures</td>
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<td>ARCE 351</td>
<td>Structural Computing Applications I</td>
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<td>ARCE 352</td>
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<td>ARCE 353</td>
<td>Structural Computing Applications III</td>
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<td>ARCE 371</td>
<td>Structural Systems Laboratory</td>
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<td>ARCE 372</td>
<td>Steel Design Laboratory</td>
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<td>ARCE 421</td>
<td>Soil Mechanics</td>
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<tr>
<td>CM 322</td>
<td>Concrete Testing Laboratory or ARCE 481 Structural Models Laboratory</td>
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<tr>
<td>CM 342</td>
<td>Concrete, Formwork and Structural Steel Practices</td>
<td>3</td>
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<td>CSC 331</td>
<td>Numerical Linear Analysis</td>
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<tr>
<td>EE 311</td>
<td>Electrical Circuit Theory</td>
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<tr>
<td>ETME 301</td>
<td>Thermodynamics for Engineering Technology</td>
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<tr>
<td>GEOL 201</td>
<td>Physical Geology</td>
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<tr>
<td>ARCH 317/318/319</td>
<td>(C.3.)</td>
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<td>BIO 220/FSN 210/HE 210/FE 250/PSY 304/REC 100 elective (E.2.)</td>
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<td>† Critical reading elective (C.1.)</td>
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Total units for Sophomore: 51

Total units for Junior: 53
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<tr>
<td>ARCE 325</td>
<td>Dynamics</td>
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<td>ARCE 322</td>
<td>Foundation Design</td>
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<tr>
<td>ARCE 444</td>
<td>Reinforced Concrete Design I</td>
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<tr>
<td>ARCE 451</td>
<td>Timber and Masonry Design Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>ARCE 452</td>
<td>Reinforced Concrete Design Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>ARCE 453</td>
<td>Senior Integrated Design Project</td>
<td>3</td>
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<tr>
<td>ARCE 483</td>
<td>Seismic Design</td>
<td>4</td>
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<tr>
<td>CM 433</td>
<td>Economic Analysis for Engineers</td>
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<tr>
<td>ME 341</td>
<td>Fluid Mechanics</td>
<td>3</td>
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<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
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<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
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<tr>
<td>PHIL 230/PHIL 231</td>
<td>Philosophical Classics (C.1.)</td>
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<td>ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.)</td>
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<td>Critical reading elective (C.1.)</td>
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<td>Approved technical electives</td>
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</table>

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

1 To be selected in accordance with the General Education-Breadth requirements. (Please see page 114 of this catalog.)
2 ARCE 444 is a corequisite.
3 To be selected from an approved list or with departmental approval.
ARCHITECTURE DEPARTMENT

Architecture and Environmental Design Bldg. (05), Room 212  
(805) 756-1316

Faculty

Department Head, W. Mike Martin
Associate Department Head for Student Services, James R. Bagnall

Joseph C. Amanzio       Terry C. Hargrave       Sixto E. Moreira
Sharad D. Atre          John E. Harrigan, Jr.    Paul R. Neel
Ronald E. Batterson    George Hasslein          Raymond E. Nordquist
David A. Brodie        Patrick D. Hill        Daniel L. Panetta
William H. Brown       George K. Ikenoyama     Jens G. Pohl
Arthur J. Chapman      Brian B. Kesner         Charles W. Quinlan
Allan R. Cooper        Donald J. Koberg        Irwin J. Reps
M. Polly Cooper        Kenneth M. Kohlen        Marcel E. Sedletzky
M. Bilgi Denel         Sandra D. Lakeman       Don E. Swearingen
Serim Denel            John H. Lange           Howard Weisenthal
Donna P. Duerk          Larry H. Loh            Paul M. Wolff
Merrill C. Gaines      David Lord              Donald S. Woolard
Donald P. Grant        Sandra D. Miller      Christopher Yip

Programs

B.Arch. Architecture       M.S. Architecture

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

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

## 1st Year

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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ARCH 106</td>
<td>Materials of Construction</td>
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<tr>
<td>ARCH 111</td>
<td>Introduction to Drawing and Perspective</td>
<td>3</td>
</tr>
<tr>
<td>ARCH 112</td>
<td>Basic Graphics</td>
<td>3</td>
</tr>
<tr>
<td>ARCH 113</td>
<td>Graphics Analysis and Communication Skills</td>
<td>3</td>
</tr>
<tr>
<td>EDES 101</td>
<td>Introduction to Architecture and Environmental Design</td>
<td>2</td>
</tr>
<tr>
<td>ENGL 114</td>
<td>Writing: Exposition (A.1.)</td>
<td>4</td>
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<tr>
<td>ENGL 125/PHIL 125/SPC 125</td>
<td>Critical Thinking (A.2.)</td>
<td>3</td>
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<tr>
<td>ENGL 215</td>
<td>Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4)</td>
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<tr>
<td>MATH 141</td>
<td>Calculus I (B.2.)</td>
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<tr>
<td>MATH 142</td>
<td>Calculus II (B.2.)</td>
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<td>PHYS 131</td>
<td>General Physics (B.1.a.)</td>
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<td>PHYS 132</td>
<td>General Physics (B.1.a.)</td>
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<td>POLS 210</td>
<td>American and California Government (D.1.)</td>
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<td>STAT 211</td>
<td>Elementary Probability and Statistics (B.2.)</td>
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<td>Critical reading elective (C.1.)</td>
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## 2nd Year

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<tr>
<td>ARCH 207</td>
<td>Environmental Control Systems I</td>
<td>4</td>
</tr>
<tr>
<td>ARCH 219</td>
<td>History of Architecture</td>
<td>3</td>
</tr>
<tr>
<td>ARCH 231</td>
<td>Architectural Practice and Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>ARCH 250</td>
<td>Computer Applications (F.1.)</td>
<td>3</td>
</tr>
<tr>
<td>ARCH 251</td>
<td>Environmental Design Fundamentals</td>
<td>5</td>
</tr>
<tr>
<td>ARCH 252, ARCH 253</td>
<td>Architectural Design Fundamentals</td>
<td>5,5</td>
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<tr>
<td>ARCE 221</td>
<td>Elementary Structures</td>
<td>3</td>
</tr>
<tr>
<td>ARCE 222</td>
<td>Mechanics of Structural Members I</td>
<td>3</td>
</tr>
<tr>
<td>ARCE 226</td>
<td>Structural Systems for Architects</td>
<td>3</td>
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<tr>
<td>PHYS 137</td>
<td>General Physics: Applied Physics for Architects</td>
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<td>HIST 204</td>
<td>History of American Ideals and Institutions (D.1.)</td>
<td>3</td>
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<tr>
<td>SPC 201</td>
<td>Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
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## 3rd Year

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<tbody>
<tr>
<td>ARCH 307</td>
<td>Environmental Control Systems II</td>
<td>4</td>
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<tr>
<td>ARCH 317, ARCH 318, ARCH 319</td>
<td>History of Architecture</td>
<td>3,3,3</td>
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<tr>
<td>ARCH 341, ARCH 342</td>
<td>Architectural Practice</td>
<td>4,4</td>
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<tr>
<td>ARCH 351, ARCH 352, ARCH 353</td>
<td>Architectural Design</td>
<td>5,5,5</td>
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<tr>
<td>ARCE 321</td>
<td>Timber Design</td>
<td>3</td>
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<tr>
<td>ARCE 322</td>
<td>Steel Design</td>
<td>3</td>
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<td>ARCE 323</td>
<td>Concrete and Masonry Design</td>
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<tr>
<td>PHIL 230/PHIL 231</td>
<td>Philosophical Classics (C.1.)</td>
<td>3</td>
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<tr>
<td>BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100 elective (E.2.)</td>
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50

50

47
### 4th Year

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<tbody>
<tr>
<td>ARCH 407</td>
<td>Environmental Control Systems III</td>
<td>4</td>
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<tr>
<td>ARCH 441, ARCH 442</td>
<td>Professional Practice</td>
<td>3,3</td>
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<tr>
<td>ARCH 451, ARCH 452, ARCH 453</td>
<td>Architectural Design</td>
<td>5,5,5</td>
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<td>ANT 201/GEOG 150/SOC 105</td>
<td>(D.4.a.)</td>
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<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
<td>3</td>
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<td>PSY 201/PSY 202</td>
<td>General Psychology (E.1.)</td>
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<td>ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.)</td>
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<td>1</td>
<td>Arts and humanities elective (Area C)</td>
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<td>Life sciences elective (B.1.b.)</td>
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<td>2</td>
<td>Adviser approved professional electives (C.3.)</td>
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<td>To be selected in accordance with the General Education-Breadth requirements. (Please see Page 114 of this catalog.)</td>
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### 5th Year

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<tr>
<td>ARCH 481</td>
<td>Senior Architectural Design Thesis Project</td>
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<td>1</td>
<td>Literature, philosophy, arts electives (300-400 level) (C.3.)</td>
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<td>Adviser approved professional electives (C.3.)</td>
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<td>To be selected with department approval and must include 3 units from each of the departments of the SAED (ARCE 221, 222, 223, 321, 322 or 323 fulfill this requirement for ARCE). 18 of the 24 units required must be 300 level or above.</td>
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### MASTER OF SCIENCE IN ARCHITECTURE

#### Professional Practice Specialization

This specialization is for applicants holding an accredited architecture degree wishing to pursue advanced studies with a strong professional practice orientation.

The Master of Science in Architecture is a post-professional specialized degree in the broad field of architecture with an emphasis on professional practice. Common core studies aim to establish a central professional focus for advanced study and research, while sub-core studies and directed electives provide for the development of in-depth study chosen by candidates.

#### Environmental Design Specialization

This specialization is for applicants holding a degree in one of the several cognate environmental design disciplines, engineering, or computer science, wishing to pursue advanced studies with a strong inter-professional orientation. This is a post-professional specialized degree in the inter-professional field of environmental design, with special reference to its three primary contributory disciplines of Architecture, City and Regional Planning, and Landscape Architecture. The common core curriculum aims to establish a central focus for advanced study and research, while sub-core studies and directed electives provide for the development of in-depth study in one of the contributory disciplines of Architecture, City and Regional Planning, Architectural Engineering, Landscape Architecture and Construction Management.
### CURRICULUM FOR M.S. ARCHITECTURE

**Units**

**Core Curriculum**

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<tr>
<td>ARCH 519</td>
<td>Theory of Architecture (3)</td>
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<tr>
<td>ARCH 532</td>
<td>Quantitative Methods in Architecture (3) or</td>
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<td>ARCH 537</td>
<td>Principles of Development (3)</td>
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<td>ARCH 561</td>
<td>Advanced Design (9)</td>
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<tr>
<td>ARCH 598</td>
<td>Master’s Design Project (9) or</td>
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<tr>
<td>ARCH 599</td>
<td>Master’s Thesis (9) or</td>
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A comprehensive examination with 9 additional units of approved graduate level coursework

**Courses in Area of Specialization**

A minimum of 12 units selected from a list of approved courses.

**Directed Electives**

A maximum of 9 units of adviser approved elective courses may be included in a student’s formal program of study.

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For further information contact the Graduate Program Coordinator, Architecture Department, School of Architecture and Environmental Design, Cal Poly, San Luis Obispo, CA 93407.

See COURSES OF INSTRUCTION section of this catalog for description of courses in Architecture and other subjects.
City and Regional Planning emphasizes an understanding of urban and regional processes, supported by courses in computer applications, economics, management, natural environment, political science, and statistics. In addition, both the undergraduate and graduate programs offer an opportunity for students to apply their learning to practical situations in a series of laboratory courses, internships, and final student projects.

The BSCRP and MCRP degrees prepare students for professional careers in the design of human settlements in harmony with the natural environment and the needs of society. Practicing planners work in public agencies and private consulting firms, preparing comprehensive plans for projects, neighborhoods, cities, and entire regions. They deal with the use of land, housing, transportation, public facilities, and open space. In addition, they are responsible for finding the means to make their plans become a reality by budgeting for public projects and programs and by reviewing and regulating private development.

The curriculum leading to the Bachelor of Science in City and Regional Planning provides a broad, interdisciplinary education as well as competency in physical planning with a specialization in urban and regional design. The Master of City and Regional Planning degree builds on a general undergraduate preparation in the humanities, social sciences or natural sciences, and offers two areas of emphasis: urban land planning, and regional and environmental planning.
# CURRICULUM FOR B.S. CITY AND REGIONAL PLANNING

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. Cal Poly follows the quarter system.

## Freshman

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>CRP 101</td>
<td>Introduction to the Profession of City and Regional Planning</td>
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<tr>
<td>CRP 111</td>
<td>Introduction to Drawing and Perspective</td>
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<tr>
<td>CRP 112</td>
<td>Basic Graphics</td>
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<td>CRP 211</td>
<td>Introduction to Urbanization</td>
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<td>CRP 212</td>
<td>Introduction to Urban Planning</td>
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<td>Introduction to Architecture and Environmental Design</td>
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<td>CSC 110</td>
<td>Computers and Computer Applications (F.1.)</td>
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<td>Introduction to Architecture and Environmental Design</td>
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<td>ANT 201/GEOG 150/SOC 105</td>
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<td>Computers and Computer Applications (F.1.)</td>
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<td>ENGL 114</td>
<td>Writing: Exposition (A.1.)</td>
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<td>Environmental Design Fundamentals</td>
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<td>CRP 203</td>
<td>Applied Design and Planning Fundamentals</td>
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<tr>
<td>CRP 213</td>
<td>Information for Urban and Regional Planning</td>
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<tr>
<td>CRP 214</td>
<td>Urban and Regional Processes</td>
<td>3</td>
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<tr>
<td>CRP 216</td>
<td>Computer Applications for Planning</td>
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<tr>
<td>LA 213</td>
<td>Site and Terrain Analysis</td>
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<td>NRM 304</td>
<td>Ecology of Resource Areas</td>
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<tr>
<td>ECON 211</td>
<td>Principles of Economics (D.3.)</td>
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<td>ENGL 218</td>
<td>Writing: Argumentation and Reports (A.4.)</td>
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<td>Physical Geology (B.1.a.)</td>
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<td>American and California Government (D.1.)</td>
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<td>STAT 211</td>
<td>Elementary Probability and Statistics (B.2.)</td>
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<td>STAT 212</td>
<td>Statistical Methods (B.2.)</td>
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<td>CRP 215</td>
<td>Regional Planning and Economic Development</td>
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<td>CRP 314</td>
<td>Planning Theory</td>
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<td>CRP 347, CRP 348</td>
<td>Urban and Regional Design</td>
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<td>CRP 351, CRP 352, CRP 353</td>
<td>Planning Laboratory</td>
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<td>CRP 420</td>
<td>Planning Law</td>
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<td>POLS 403</td>
<td>Municipal Government</td>
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<tr>
<td>Critical reading electives</td>
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<td>Physical or life sciences elective (with laboratory)</td>
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Total Units: 50
### Senior

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<td>CRP 409</td>
<td>Planning Internship</td>
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<td>CRP 430</td>
<td>Planning Administration</td>
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<td>CRP 451, CRP 452</td>
<td>Planning Laboratory</td>
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<tr>
<td>CRP 461</td>
<td>Senior Project</td>
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<tr>
<td>CRP 462</td>
<td>Senior Project</td>
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<tr>
<td>CRP 463</td>
<td>Undergraduate Seminar</td>
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<tr>
<td>MGT 317</td>
<td>Organizational Behavior or POLS 441</td>
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<tr>
<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
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<td>1 ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.)</td>
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<td>1 Literature, philosophy, arts elective (300-400 level) (C.3.)</td>
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### Notes

1. To be selected in accordance with General Education-Breadth requirements. (Please see page 114 of this catalog.)
2. To be selected with adviser approval.

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### MASTER OF CITY AND REGIONAL PLANNING

#### General Characteristics

The Master of City and Regional Planning degree program (MCRP) is professionally oriented and is open to students with high standards of academic achievement who wish to pursue careers in city and regional planning. It is structured to prepare graduates with competence to function in a general context of planning, as well as in a particular area of emphasis. The MCRP core courses cover planning theory, methods, law, formulation and implementation of plans and policies.

Two principal areas of study are emphasized: urban land planning, focused on comprehensive physical planning and urban design; and regional and environmental planning, focused on natural systems and development impacts.

The master’s program is structured to meet the needs of those who have earned baccalaureate degrees in a variety of disciplines including, but not limited to, economics, geography, architecture, landscape architecture, civil engineering, political science, environmental or urban studies, natural resources management, and ecology. The program is six quarters (two years) in duration and consists of 70 approved units (not including courses necessary to compensate for deficiencies). Because of the sequencing of courses, students admitted to the program are expected to begin their studies in the fall quarter. Students with prerequisite coursework deficiencies and those with backgrounds allowing waivers of first-year core courses (maximum of 10 units) may be admitted in other quarters.

The MCRP Program offers students an opportunity to develop close working relationships with the planning faculty. Self-directed study, tailored to the student’s interests and needs, is also encouraged.
Prerequisites

Students entering the MCRP Program are expected to bring with them a background in certain basic subject areas or to make up deficiencies in these basic subject areas after admission. These include the following Cal Poly courses or their equivalents:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>STAT 211</td>
<td>Elementary Probability and Statistics</td>
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<tr>
<td>CSC 110</td>
<td>Computers and Computer Applications</td>
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</table>

Applicants for admission to the Master of City and Regional Planning program are expected to:

1. Have earned a bachelor's degree from an accredited university or college,
2. Have attained a grade point average of 3.0 in last 90 units of undergraduate work,
3. Provide the CRP Graduate Review Committee with the results of the Graduate Records Examination Aptitude Test,
4. Give indications of motivation, maturity, and high standards of academic involvement through work and references (three letters required) and submission of a project or paper demonstrating writing ability,
5. Provide a statement (maximum of 300 words) addressing your understanding of and areas of interest in city and regional planning, your career objectives, and your educational objectives.

Applicants lacking prerequisites or other background requirements for classified standing requirements may be admitted on a conditionally classified basis, depending on the results of an individual analysis of their applications.

CURRICULUM FOR MASTER OF CITY AND REGIONAL PLANNING

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tr>
<td>Core Courses</td>
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<tr>
<td>CRP 409 Planning Internship (2)</td>
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<td>CRP 420 Planning Law (4)</td>
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<td>CRP 501 Foundations of Urban and Regional Planning (4)</td>
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<td>CRP 502 Planning Principles and Practice (4)</td>
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<td>CRP 510 Planning Theory (4)</td>
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<td>CRP 513 Survey and Research Methods (4)</td>
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<td>CRP 515 Graphic Communication for Planners (3)</td>
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<td>CRP 516 Quantitative Methods in Planning (4)</td>
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<td>CRP 552 Urban Planning Laboratory (4)</td>
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<td>CRP 598 Research Design and Methods (2)</td>
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<td>CRP 599 Thesis/Project (6)</td>
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<td>Emphasis Area (select one)</td>
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<td>Urban Land Planning</td>
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<td>CRP 520 Feasibility Studies in Planning (4)</td>
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<td>CRP 548 Principles of Urban Design (3)</td>
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<td>CRP 553 Project Planning Laboratory (4)</td>
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<td>Regional and Environmental Planning</td>
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<td>CRP 407 Environmental Law (3)</td>
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<td>CRP 505 Principles of Regional Planning (4)</td>
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<tr>
<td>CRP 554 Regional Planning Laboratory (4)</td>
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<td>Environmental electives (8)</td>
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<tr>
<td>Adviser approved electives</td>
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<tr>
<td>See COURSES OF INSTRUCTION section of this catalog for description of courses in City and Regional Planning and other subjects.</td>
<td>70</td>
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</tbody>
</table>
CONSTRUCTION MANAGEMENT DEPARTMENT

Engineering West (21), Room 116-A
(805) 756-1323

Faculty

Department Head, James A. Rodger
Harold A. Johnston        David R. Pierce, Jr.        Matthias R. Wall
John C. Mouton

Programs

B.S. Construction Management

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

CURRICULUM FOR B.S. CONSTRUCTION MANAGEMENT

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

Freshman

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<th>Course Code</th>
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<tbody>
<tr>
<td>ARCH 106</td>
<td>Materials of Construction</td>
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<tr>
<td>ARCH 111</td>
<td>Introduction to Drawing and Perspective</td>
<td>3</td>
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<tr>
<td>ARCH 112</td>
<td>Basic Graphics</td>
<td>3</td>
</tr>
<tr>
<td>EDES 101</td>
<td>Introduction to Architecture and Environmental Design</td>
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<tr>
<td>ANT 201/GEOG 150/SOC 105</td>
<td>(D.4.a.)</td>
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<tr>
<td>BIO 220</td>
<td>Physiology and Biological Adaptation (B.1.b., E. 2.)</td>
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<tr>
<td>ENGL 114</td>
<td>Writing: Exposition (A.1.)</td>
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<tr>
<td>ENGL 125/PHIL 125/SPC 125</td>
<td>Critical Thinking (A.2.)</td>
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<tr>
<td>HIST 204</td>
<td>History of American Ideals and Institutions (D.1.)</td>
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<tr>
<td>MATH 141</td>
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<td>MATH 142</td>
<td>Calculus II (B.2.)</td>
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<td>General Physics (B.1.a.)</td>
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<td>PHYS 132</td>
<td>General Physics (B.1.a.)</td>
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<td>POLS 210</td>
<td>American and California Government (D.1.)</td>
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<td>PSY 201/PSY 202</td>
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50
**Sophomore**

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<tr>
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<td>Introduction to Construction Management</td>
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<tr>
<td>AE 237</td>
<td>Engineering Surveying</td>
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<tr>
<td>ARCE 221</td>
<td>Elementary Structures</td>
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<tr>
<td>ARCE 222</td>
<td>Mechanics of Structural Members I</td>
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<tr>
<td>ARCE 226</td>
<td>Structural Systems for Architects</td>
<td>3</td>
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<td>ARCH 208</td>
<td>Architectural Design Basics</td>
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<tr>
<td>ARCH 209</td>
<td>Architectural Design Basics</td>
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<tr>
<td>BUS 201</td>
<td>Business Law Survey</td>
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<tr>
<td>CRP 212</td>
<td>Introduction to Urban Planning</td>
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<tr>
<td>GEOL 201</td>
<td>Physical Geology</td>
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<td>LA 213</td>
<td>Site and Terrain Analysis</td>
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<td>PHYS 133</td>
<td>General Physics or PHYS 137 General Physics: Applied Physics for Architects</td>
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<td>Computer Applications or CSC 110 Computers and Computer Applications (F.1.)</td>
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<td>Philosophical Classics (C.1.)</td>
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<td>SPC 201</td>
<td>Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
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**Junior**

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<td>CM 322</td>
<td>Concrete Technology Laboratory</td>
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<td>CM 331</td>
<td>Construction Cost Control</td>
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<td>CM 332</td>
<td>Cost Alternatives Evaluation</td>
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<td>CM 333</td>
<td>Construction Contract Administration</td>
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<td>CM 341</td>
<td>Wood and Masonry Construction Practices</td>
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<td>CM 342</td>
<td>Concrete, Formwork and Structural Steel Construction Practices</td>
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<td>CM 343</td>
<td>Earthwork and Civil Works Construction Practices</td>
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<td>CM 351, CM 352, CM 353</td>
<td>Building Support System Construction Practices</td>
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<td>ARCE 309</td>
<td>Survey of Soil Mechanics and Foundation Engineering</td>
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<td>ARCE 321</td>
<td>Timber Design</td>
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<td>ARCE 322</td>
<td>Steel Design</td>
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<td>ARCE 323</td>
<td>Concrete and Masonry Design</td>
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<tr>
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**Total Credits:** 53
214 Construction Management

Senior
CM 441 Building Estimating I ................................................................. 3
CM 442 Building Estimating II ............................................................... 2
CM 443 Principles of Construction Management ................................... 3
CM 451 Principles of Heavy Construction .......................................... 4
CM 452 Project Controls ....................................................................... 4
CM 453 Project Development .............................................................. 4
CM 461 Senior Project ........................................................................... 2
   CM 462 Senior Project ....................................................................... 1
FIN 412 Law of Real Property ............................................................. 4
HIST 315 Modern World History (D.2.) ............................................... 3
1 ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) ...................... 3
1 Arts and humanities elective (Area C) ............................................. 3
1 Critical reading electives (C.1.) ....................................................... 6
1 Fine and performing arts elective (C.2.) ....................................... 3
1 Literature, philosophy, arts elective (300–400 level) (C.3.) .......... 3

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

1 To be selected in accordance with the General Education-Breadth requirements. (Please see page 114 of this catalog.)
LANDSCAPE ARCHITECTURE DEPARTMENT

Dexter Bldg.(34), Room 251  
(805) 756-1319

Faculty
Department Head, Gerald L. Smith

Brian A. Aviles  John F. Gilliam  Ronald R. Stoltz
Walter D. Bremer  Alice C. Loh  Dale A. Sutliff
Gary C. Dwyer  Roger J. Osbaldeston  Walter M. Tryon
Omar Faruque

Affiliate Faculty: Thomas J. Rice, Jr., Soils Scientist

Programs

B.S. Landscape Architecture

The profession of landscape architecture is primarily involved with the design, planning, and protection of the natural and manmade environments. The Bachelor of Science degree program in Landscape Architecture is accredited by the American Society of Landscape Architects and recognized by the California State Board of Landscape Architects.

An emphasis is placed on a process oriented approach to design and planning while developing an awareness and sensitivity to community and human values as they relate to environmental conditions. Students majoring in landscape architecture will acquire technical competencies and creative design skills through a range of projects which represent the breadth of the profession. Specialization may be elected through advisement in different areas. Please consult with departmental advisers for details.

Graduates of the program are prepared for positions in private practice, consulting, governmental agencies at the national, state or local levels, industry and construction firms. Graduate study is encouraged for those students interested in pursuing areas of specialization.

 Majors who are in their last two years of study and have at least a 3.2 grade point average may have the opportunity to join Theta Chapter of Sigma Lambda Alpha, the national scholastic honor society for landscape architecture.
CURRICULUM FOR B.S. LANDSCAPE ARCHITECTURE

Indented courses to be taken in sequence. For course prerequisites, refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

**Freshman**

<table>
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<th>Course Code</th>
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<td>Graphic Communication for Landscape Architects</td>
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<td>LA 111</td>
<td>Three Dimensional Graphics for Landscape Architects</td>
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<tr>
<td>LA 112</td>
<td>Graphic Communication Techniques for Landscape Architects</td>
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<tr>
<td>LA 152</td>
<td>Fundamentals of Design and Planning in Landscape Architecture</td>
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<tr>
<td>LA 153</td>
<td>Fundamentals of Design and Planning in Landscape Architecture</td>
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<tr>
<td>AE 237</td>
<td>Engineering Surveying</td>
<td>2</td>
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<tr>
<td>EDES 101</td>
<td>Introduction to Architecture and Environmental Design</td>
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<tr>
<td>SS 121</td>
<td>Introductory Soil Science (F.2.)</td>
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<tr>
<td>BOT 121</td>
<td>General Botany (B.1.b.)</td>
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<tr>
<td>ENGL 114</td>
<td>Writing: Exposition (A.1.)</td>
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<td>ENGL 125/PHIL 125/SPC 125</td>
<td>Critical Thinking (A.2.)</td>
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<tr>
<td>MATH 120</td>
<td>Pre-Calculus Algebra and Trigonometry (B.2.)</td>
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<td>POLS 210</td>
<td>American and California Government (D.1.)</td>
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<tr>
<td>PSY 201/PSY 202</td>
<td>General Psychology (E.1.)</td>
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<tr>
<td>SPC 201</td>
<td>Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
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<tr>
<td></td>
<td>1 Computer literacy elective (F.1.)</td>
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**Sophomore**

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<tr>
<th>Course Code</th>
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<tr>
<td>LA 202</td>
<td>Fundamentals of Design and Planning in Landscape Architecture</td>
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<tr>
<td>LA 203</td>
<td>Applied Design and Planning Fundamentals</td>
<td>3</td>
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<tr>
<td>LA 214</td>
<td>Landscape Analysis and Planning</td>
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<tr>
<td>LA 231</td>
<td>Landscape Architecture Construction I</td>
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<tr>
<td>LA 247</td>
<td>Landscape Plant Composition</td>
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<tr>
<td>LA 310</td>
<td>Introduction to Computing in Planning and Design</td>
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<tr>
<td>LA 311</td>
<td>History of Landscape Architecture</td>
<td>3</td>
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<tr>
<td>LA 341</td>
<td>Landscape Architecture Construction II</td>
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<td>AE 337</td>
<td>Landscape Irrigation</td>
<td>3</td>
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<tr>
<td>BOT 238</td>
<td>Native Plant Materials</td>
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<tr>
<td>OH 237</td>
<td>Landscape Plants I</td>
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<tr>
<td>ANT 201/GEOG 150/SOC 105</td>
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<td>Writing: Argumentation or ENGL 218</td>
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<td>ENGL 218</td>
<td>Writing: Argumentation and Reports (A.4.)</td>
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<td>History of American Ideas and Institutions (D.1.)</td>
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<td>PHIL 230/PHIL 231</td>
<td>Philosophical Classics (C.1.)</td>
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<td>BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100</td>
<td>elective (E.2.)</td>
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<td>1 Critical reading elective (C.1.)</td>
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</tr>
<tr>
<td></td>
<td>1 Physical or life science elective (with lab) (B.1.)</td>
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54
### Junior

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>LA 323</td>
<td>History of Twentieth Century Landscape Architecture</td>
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<tr>
<td>LA 342, LA 343</td>
<td>Landscape Architecture Construction III, IV</td>
<td>3,3</td>
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<tr>
<td>LA 348</td>
<td>Advanced Landscape Plant Composition</td>
<td>3</td>
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<tr>
<td>LA 351, LA 352, LA 353</td>
<td>Design for Landscape Architects</td>
<td>4,4,4</td>
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<tr>
<td>LA 410</td>
<td>Information Systems in Landscape Architecture</td>
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<tr>
<td>ARCE 311</td>
<td>Structures for Landscape Architects</td>
<td>3</td>
</tr>
<tr>
<td>CRP 212</td>
<td>Introduction to Urban Planning</td>
<td>3</td>
</tr>
<tr>
<td>OH 238</td>
<td>Landscape Plants II</td>
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<tr>
<td>ECON 201</td>
<td>Survey of Economics or ECON 211 Principles of Economics (D.3.)</td>
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<td>^1 AN11/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.)</td>
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<tr>
<td>^1 Critical reading elective (C.1.)</td>
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<tr>
<td>^1 Mathematics or statistics elective (B.2.)</td>
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### Senior

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<tr>
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<tr>
<td>LA 321</td>
<td>Concepts in Environmental Decision Making</td>
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<tr>
<td>LA 441, LA 442</td>
<td>Professional Practice I, II</td>
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<tr>
<td>LA 451</td>
<td>Regional Landscape Assessment and LA 452 Urban Design for Landscape Architects</td>
<td>5,5</td>
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<tr>
<td>LA 461</td>
<td>Senior Design Project</td>
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<tr>
<td>LA 463</td>
<td>Undergraduate Seminar</td>
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<td>CM 325</td>
<td>Construction Management Practice</td>
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<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
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<tr>
<td>^1 Arts and humanities elective (Area C)</td>
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<tr>
<td>^1 Fine and performing arts elective (C.2.)</td>
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<tr>
<td>^1 Literature, philosophy, arts elective (300-400 level) (C.3.)</td>
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<tr>
<td>^1 Physical sciences elective (B.1.)</td>
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</tr>
<tr>
<td>^2 SAED Professional elective.</td>
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</tbody>
</table>

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

^1 To be selected in accordance with the General Education-Breadth requirements. (Please see page 114 of this catalog.)

^2 To be selected with adviser approval.
SCHOOL OF BUSINESS
School of Business

Degree Programs

B.S. Business Administration
  Accounting Department ........................................... 225
  Accounting Concentration
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  Specialization in Engineering Management

MINORS

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Economics .......................................................... 234
SCHOOL OF BUSINESS

Business Administration and Education Bldg. (02), Room 127
(805) 756-2704

Kenneth D. Walters, Dean
Kenneth D. Riener, Associate Dean

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

In pursuing these objectives, the school is committed to maintaining and improving upon the following:

- tradition of teaching excellence in the school;
- professional stature of the school faculty by stimulating research, publication and other professional development activities;
- faculty involvement in providing service to the university and community which enhances their teaching and research abilities.

Both the baccalaureate and graduate programs in business administration are accredited by the American Assembly of Collegiate Schools of Business. The objective of accreditation is to foster high quality in education for business administration.

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

Programs leading to degrees of Bachelor of Science in Business Administration, Master of Business Administration, and Bachelor of Science in Economics are offered. The School also offers an Economics Minor and a Business Minor. A pre-law advisement service is available to all university students.

The school's educational philosophy follows the Cal Poly tradition—that of enlisting maximum student involvement in the learning process through career-oriented study, case analysis, special projects, internships, and computer applications. The school has its own computer lab facilities which are available to students to meet their coursework needs. Educational programs are designed to help the student achieve maximum personal development, to prepare the student for entry into the business world, and to foster citizenship, leadership, and constructive community living. The curriculum includes general education requirements and specialized studies in the student's major field. Optional areas of concentration within each major enable the student to select the program most closely suited to the chosen career field.
MASTER OF BUSINESS ADMINISTRATION

General Characteristics

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

- To provide an integrated understanding of the principles of the various business disciplines. Besides mastering the principles of the individual disciplines, the ability to integrate those principles is an essential characteristic of successful managers. Cal Poly's approach to MBA education is purposely aimed at fostering this integrated understanding.

- To develop an expertise in assembling and analyzing relevant facts as a basis for significant business decisions. The student will learn analytical, planning and forecasting skills to provide a basis for effective managerial decisions as firms adapt to their changing environment.

- To promote the ability to work with other people through an understanding of human values, motivations, and organizational structures. The student will understand the essential elements of interpersonal relations, individual and group behavior, and the design of effective organizations.

Prerequisites

There are no specific prerequisite courses for the MBA program.

Admission to the MBA program is based upon:

a) the student's undergraduate record, emphasizing most heavily the last 90 quarter units (or equivalent);

b) achievement on the Graduate Management Admission Test (GMAT); and

c) management potential as evidenced by previous work experience, community or college extracurricular activities, and evaluations by professors and/or supervisors.

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

Program of Study

The MBA program entails a two-year program of graduate work. The purpose of the first year is to build a broad understanding of the concepts and principles of the field of business administration. At the end of the first year the student should have a firm knowledge of current business practices. In addition, the first year courses stress the fundamental theoretical concepts of the various business fields. The second year curriculum enables the student to integrate understanding of principles of various business disciplines and also to specialize in an area of interest by taking a cluster of carefully selected elective courses. About half the second year consists of elective classes, which allows students to take classes in their areas of interest. Satisfactory completion of a comprehensive examination is a requirement of the MBA program.

Agribusiness Specialization

This specialization is offered in conjunction with the Agribusiness Department. It requires the completion of six graduate courses taught by the Agribusiness Department. These courses are taken in lieu of the electives in the MBA program. Satisfactory completion of a comprehensive examination is required. The MBA Agribusiness specialization is designed for those interested in agribusiness management careers. Graduates will be prepared for large farm and ranch management as well as for positions in supporting agribusiness industries such as commodity marketing or food processing.
## CURRICULUM FOR MASTER OF BUSINESS ADMINISTRATION

### FIRST YEAR

#### Fall
- GSB 511 Financial Accounting (4)
- GSB 512 Foundations for Quantitative Analysis (4)
- GSB 513 Organizations and Management (4)
- GSB 514 Legal Aspects of Management and the Market System (4)

#### Winter
- GSB 521 Accounting for Management Planning and Control (4)
- GSB 522 Managerial Statistics (4)
- GSB 523 Managerial Economics (4)
- GSB 524 Marketing Management (4)

#### Spring
- GSB 531 Managerial Finance (4)
- GSB 532 Quantitative Business Analysis I (4)
- GSB 533 Aggregate Economic Analysis and Policy (4)
- GSB 534 Operations Management (4)

### SECOND YEAR

#### Fall
- GSB 541 Organizational Behavior (4)
- GSB 542 Marketing Research and Planning (4)
- GSB 543 Information Systems for Decision Support (4)
- Electives (4)

#### Winter
- GSB 551 Management in an International Environment (4)
- GSB 552 Financial Analysis and Planning (4)
- Electives (8)

#### Spring
- GSB 561 Business, Government and Society (4)
- GSB 562 Business Strategy and Policy (4)
- Electives (8)

### AGRIBUSINESS SPECIALIZATION

Add courses below in place of electives in MBA Program:

- AGB 524 Agribusiness Managerial Leadership and Communication (4)
- AGB 544 Advanced Farm and Ranch Management (4)
- AGB 553 Agribusiness Policy and Program Analysis (4)
- AGB 554 Managing Price Risk in Agribusiness (4)
- AGB 563 Agricultural Trade and Market Development (4)
- AG 539 Graduate Internship in Agriculture (4) or AG 500 Individual Study (4)

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

---

1. Agribusiness Specialization students postpone taking GSB 514 until fall quarter of their second year in the program and instead take AGB 524 as an elective during fall quarter of their first year.
2. Not required from students who have taken an equivalent course in their undergraduate programs. They must take a replacement course.
3. Not required from Agribusiness Specialization students.
4. Not required from students with undergraduate business degrees; a replacement course must be taken.
JOINT M.B.A./M.S. ENGINEERING,
SPECIALIZATION IN ENGINEERING MANAGEMENT

The joint Engineering Management specialization is an interdisciplinary program linking the MBA and MS in Engineering degree programs. It is a cooperative effort between the School of Engineering (Industrial Engineering Department) and the School of Business. Students are required to have a prerequisite degree in engineering, computer science, or similar technical degree to be admitted to both the School of Engineering and the School of Business, and to be enrolled in both degree programs. Successful participants will be awarded both MBA and MS in Engineering degrees each with a specialization in Engineering Management.

The three major objectives are: 1) to integrate knowledge and skills from engineering and business disciplines for effective responses to rapidly changing technological and business environments; 2) to prepare engineers for effective participation in management of technology, management of technology-based organizations, and management of technological change; and 3) to take advantage of the unique background of program participants and the unique strengths of Cal Poly.

Units

FIRST YEAR

Fall
- GSB 511 Financial Accounting (4)
- GSB 513 Organizations and Management (4)
- GSB 514 Legal Aspects of Management and the Market System (4)
- Technical Elective in Specialization (3)  

Units: 15

Winter
- GSB 521 Accounting for Management Planning and Control (4)
- GSB 523 Managerial Economics (4)
- GSB 524 Marketing Management (4)
- IE 557 Technological Assessment and Planning (4)

Units: 16

Spring
- GSB 531 Managerial Finance (4)
- GSB 532 Quantitative Business Analysis I (4)
- GSB 533 Aggregate Economic Analysis and Policy (4)
- GSB 534 Operations Management (4)

Units: 16

Summer
- GSB 598 Graduate Internship in Business (4)

Units: 4

SECOND YEAR

Fall
- GSB 541 Organizational Behavior (4)
- GSB 542 Marketing Research and Planning (4)
- GSB 543 Information Systems for Decision Support (4)
- IE 545 Advanced Topics in Simulation (3)

Units: 15

Winter
- GSB 551 Management in an International Environment (4)
- GSB 552 Financial Analysis and Planning (4)
- IE 555 Computer Integrated Manufacturing (4)
- IE 558 Engineering Decision Making (4)

Units: 16

1 Technical electives to be selected with adviser's approval and may include: IE 470, IE 500, IE 541, IE 543, IE 544, IE 559, CSC 420, CSC 421, CSC 444.
2 Waived if satisfied prior to admission by successful completion of IE 304 or IE 305 or equivalent. If waived, four less total units are required and an elective normally taken in the final summer quarter could be substituted.
3 Waived if satisfied prior to admission by successful completion of IE 410 or IE 411 or equivalent. If waived, four less total units are required and an elective normally taken in the final summer quarter could be substituted.
4 Not required for students who have taken an equivalent course in their undergraduate program. Replacement course must be taken.
CURRICULUM FOR BUSINESS MINOR

The Business Minor provides non-business students with an introduction to the body of knowledge expected of persons pursuing careers in business. A business minor will give a student a competitive edge when applying for certain jobs, by providing concepts, tools and skills which will enhance one's progress in a career. In addition, students who plan on a career in the non-business sector will gain a greater appreciation of the challenges and opportunities facing business, now and in the future.

Enrollment in the Business Minor is limited, and selection will be made based upon the applicant's performance in the prerequisite courses listed below. After admission to the Minor, the student must complete the remaining required courses. At least 16 units must be completed after admission to the program.

Prerequisites

The following courses must be taken before admission to the minor. Since admission is competitive, selection will be based on performance in these courses.

- ACTG 211 Financial Accounting for Nonbusiness Majors (4) or ACTG 221 Financial Accounting I (4)
- BUS 207 Business Law (4)
- ECON 221 Microeconomics (4)
- ECON 222 Macroeconomics (D.3.) (4)
- MATH 221 Calculus for Business and Economics (B.2.) (4)
- STAT 251 Statistical Inference for Management I (B.2.) (4)
- STAT 252 Statistical Inference for Management II (B.2.) (4)

Required courses

The following courses comprise the Business Minor. At least 16 units must be completed after admission to the minor.

- ACTG 211 Financial Accounting for Nonbusiness Majors or ACTG 221 Financial Accounting I ................................................. 4
- ACTG 301 Managerial Accounting ................................................. 4
- BUS 207 Business Law ................................................................... 4
- FIN 342 Financial Management .................................................. 4
- MGT 312/MGT 314/MGT 317 .......................................................... 4
- MIS 321 Management Information Systems or
- MGT 301 Production and Operations Management .................. 4
- MKTG 301 Principles of Marketing ................................................. 4

1 These courses will have been taken prior to admission to the Business Minor, but will count as part of the Business Minor.
ACCOUNTING DEPARTMENT

Business Administration and Education Bldg. (02), Room 124
(805) 756-1384

Faculty

Department Head, James A. Anderson

Charles T. Andrews  Janice L. Carr  Harold R. Miller
Mary Beth Armstrong  Earl C. Keller  David E. Nutter
Lawrence E. Baur, Jr.  M. Zafar Iqbal  John C. Robison
William C. Boynton  Charles R. (Tad) Miller

Programs

B.S. Business Administration with Concentration in:

Accounting

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

CURRICULAR CONCENTRATION

Accounting

This concentration prepares students for accounting careers in public accounting, industry, and government. Students in the advanced stages of the program may gain practical experience participating in the university's Cooperative Education program or obtaining an internship position through the Placement Center.

The concentration builds on the principles of financial and managerial accounting coursework (ACTG 221, ACTG 222, and ACTG 301) included in the core program of the business major. The concentration requires 28 additional units of accounting study consisting of 20 required units and 8 units of accounting electives. The elective courses afford students an opportunity to pursue further study in auditing, cost accounting, micro-computer applications, and taxation.
CURRICULUM FOR B.S. BUSINESS ADMINISTRATION

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. Cal Poly follows the quarter system.

**Freshman**

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<td>The Business Enterprise</td>
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<td>ANT 201 /GEOG 150/SOC 105</td>
<td>(D.4.a.)</td>
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<tr>
<td>CSC 120</td>
<td>Principles of Business Data Processing (F.1.)</td>
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<td>ENGL 114</td>
<td>Writing: Exposition (A.1.)</td>
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<td>ENGL 125/PHIL 125/SPC 125</td>
<td>Critical Thinking (A.2.)</td>
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<td>MATH 124</td>
<td>Finite Mathematics (B.2.)</td>
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<td>PSY 201 /PSY 202</td>
<td>General Psychology</td>
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<td>BIG 220/FSN 210/HE 210/PE 250/PSY 304/REC 100 elective (E:2.)</td>
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<td>Critical Thinking (A.2.)</td>
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<tr>
<td>MATH 221</td>
<td>Calculus for Business and Economics (B.2.)</td>
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**Sophomore**

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<tr>
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<td>Financial Accounting I</td>
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<tr>
<td>ACTG 222</td>
<td>Financial Accounting II</td>
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<tr>
<td>BUS 207</td>
<td>Business Law</td>
<td>4</td>
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<tr>
<td>ECON 221</td>
<td>Microeconomics</td>
<td>4</td>
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<tr>
<td>ECON 222</td>
<td>Macroeconomics</td>
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<tr>
<td>ENGL 215</td>
<td>Writing: Argumentation or ENGL 218</td>
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<tr>
<td>HIST 204</td>
<td>History of American Ideals and Institutions</td>
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<td>Philosophical Classics (C.1.)</td>
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<td>American and California Government (D.1.)</td>
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<td>STAT 251</td>
<td>Statistical Inference for Management I</td>
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<td>STAT 252</td>
<td>Statistical Inference for Management II</td>
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<tr>
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<td>Writing: Argumentation or ENGL 218</td>
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<td>History of American Ideals and Institutions</td>
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<td>Philosophical Classics (C.1.)</td>
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<td>STAT 251</td>
<td>Statistical Inference for Management I</td>
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<td>ACTG 221</td>
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<td>ACTG 222</td>
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<tr>
<td>BUS 207</td>
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<td>ECON 221</td>
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<td>Writing: Argumentation or ENGL 218</td>
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<td>ENGL 215</td>
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**Junior**

<table>
<thead>
<tr>
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<tbody>
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<td>ACTG 301</td>
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<td>ECON 337</td>
<td>Money, Banking and Credit</td>
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<td>FIN 342</td>
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<tr>
<td>MGT 301</td>
<td>Production and Operations Management</td>
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<td>MGT 312</td>
<td>Organization and Management Theory</td>
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<tr>
<td>MGT 317</td>
<td>Organizational Behavior</td>
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<td>MIS 321</td>
<td>Management Information Systems</td>
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<tr>
<td>MKTG 301</td>
<td>Principles of Marketing</td>
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<td>ANT/ECON/GEOG/POLS/SOC elective (D.4.b.)</td>
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Senior

ACTG 461  Senior Project ................................................................. 2
ACTG 462  Senior Project ................................................................. 2
BUS 404  Governmental and Social Influences on Business .................. 4
MGT 406  Multinational Business Operations .................................... 4
MGT 414  Business Strategy and Policy Seminar .................................. 4
HIST 315  Modern World History (D.2.) ........................................... 3
1 Arts and humanities elective (Area C) ........................................... 3
Electives and courses to complete major ......................................... 27

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

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

1 To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 114 of this catalog.

Accounting Concentration
(Add Courses Below to Basic Curriculum)

Junior

ACTG 304  Tax Accounting ................................................................. 4
ACTG 321  Intermediate Accounting I ............................................... 4
ACTG 322  Intermediate Accounting II .............................................. 4
ACTG 323  Advanced Accounting I ................................................... 4

Senior

ACTG 446  Auditing ................................................................. 4
Adviser approved electives .............................................................. 8

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BUSINESS ADMINISTRATION DEPARTMENT

Business Administration and Education Bldg. (02), Room 113-A
(805) 756-2822

Faculty

Department Head, Jeffrey E. Danes
Dan Bertozzi, Jr. John R. Lindvall John C. Rogers
Lee B. Burgunder Lynn E. Metcalf Paul R. Warshaw
James M. Buxbaum Eugene L. O'Connor Alan M. Weatherford
D. Jan Duffy Walter W. Perlick Luc A. Soenen
R. Krishnan Kenneth D. Riener

Programs

B.S. Business Administration with Concentrations in:
Financial Management Marketing Management

The department offers an undergraduate program leading to the Bachelor of Science degree in Business Administration with concentrations available in Financial Management and Marketing Management.¹

The objective of the Business Administration Department is to prepare graduates for rewarding careers in the fields of marketing and/or finance. Within the concentrations there is sufficient flexibility to allow each student the opportunity to develop proficiency in subject matter uniquely suited for the student's occupational goals.

The department provides service courses to many departments of the university, notably in Business Law and Public Policy. The department also provides major staff support for the Master's degree program in Business Administration. See Master of Business Administration for details of this program, page 221.

CURRICULAR CONCENTRATIONS

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

¹ The Agricultural Business Major is distinguished from a major in Business Administration. Agricultural Business emphasizes training in management for careers in agriculture. The program focuses on preparation of students for careers in firms that supply inputs and services to agricultural production enterprises and by those engaged in the processing, marketing, financing, distribution, and sales of agricultural products. In addition, there is a concentration available in the management of farms and ranches as a business enterprise. Thirty units of coursework in production agriculture are required.
Marketing Management
This concentration emphasizes coursework in all of the many areas traditionally covered in the marketing function. These areas include marketing research, sales management, physical distribution, promotion, and buyer behavior. Students must take the majority of their elective courses from Marketing. Graduates of this concentration are in demand for positions in marketing intelligence, research, advertising, and sales management.

**CURRICULUM FOR B.S. BUSINESS ADMINISTRATION**

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

### Freshman

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<td>The Business Enterprise</td>
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<td>CSC 120</td>
<td>Principles of Business Data Processing (F.1.)</td>
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### Sophomore

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<td>Financial Accounting II</td>
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<td>Macroeconomics</td>
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<td>ENGL 215</td>
<td>Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.)</td>
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<td>Philosophical Classics (C.1.)</td>
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<td>American and California Government (D.1.)</td>
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<td>STAT 251</td>
<td>Statistical Inference for Management I (B.2.)</td>
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<td>STAT 252</td>
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### Junior

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<td>MGT 312</td>
<td>Organization and Management Theory</td>
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<td>MGT 317</td>
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<td>Management Information Systems</td>
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<td>HIST 315</td>
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<td>BUS 462</td>
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<td>MGT 406</td>
<td>Multinational Operation</td>
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<td>MGT 414</td>
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</table>

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

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

1 To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 114 of this catalog.

---

### Financial Management Concentration

(Add Courses Below to Basic Curriculum)

<table>
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<td>ACTG 321</td>
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<td>FIN 411</td>
<td>Securities Analysis and Portfolio Management</td>
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<td>FIN 388</td>
<td>Financial Management II</td>
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<td>Financial Management III</td>
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### Marketing Management Concentration

(Add Courses Below to Basic Curriculum)

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<td>MKTG 303</td>
<td>Buyer Behavior</td>
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<td>MKTG 402</td>
<td>Marketing Research II</td>
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<td>MKTG 406</td>
<td>Marketing Management</td>
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</table>
ECONOMICS DEPARTMENT

Business Administration and Education Bldg. (02), Room 136
(805) 756-2783

Faculty

Department Head, Panagiotis Papakyriazis

John P. Adams, Jr.  Michael L. Marlow  Fuad H. Tellew
George L. Beardsley, Jr.  Artemis Papakyriazis  Daniel J. Villegas
George M. Eastham  Walter E. Rice  Daniel P. Williamson
Timothy W. Kersten  Alden F. Shiers

Programs

B.S. Economics with Concentrations in:

Business and Industrial Economics  International Trade and Development
Quantitative Economics

Minor: Economics

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

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

CURRICULAR CONCENTRATIONS

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

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

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

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

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

Freshman

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<tr>
<td>ACTG 222</td>
<td>Financial Accounting II</td>
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</tr>
<tr>
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<td>CSC 120</td>
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<td>POLS 210</td>
<td>American and California Government (D.1.)</td>
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Sophomore

<table>
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<td>ECON 221</td>
<td>Microeconomics</td>
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<td>ENGL 215</td>
<td>Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.)</td>
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<td>History of American Ideals and Institutions (D.1.)</td>
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<td>General Psychology (E.1.)</td>
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<td>Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
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Junior

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<thead>
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<th>Course Title</th>
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<tr>
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<td>Intermediate Microeconomics and Macroeconomics</td>
<td>4,4,4</td>
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<td>ECON 324</td>
<td>American Economic History</td>
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<td>ECON 337</td>
<td>Money, Banking and Credit</td>
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<td>GEOG 315</td>
<td>Geography of Resource Utilization</td>
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49
Senior
ECON 314 Monetary and Fiscal Policy ........................................................................ 4
ECON 317 Development of Economic Analysis .................................................... 3
ECON 410 Public Finance and Cost-Benefit Analysis ............................................ 4
ECON 461 Senior Project ..................................................................................... 2
ECON 462 Senior Project ..................................................................................... 2
ECON 463 Undergraduate Seminar ...................................................................... 2
Electives and courses to complete major depending on concentration .................... 31

Business and Industrial Economics Concentration
(Add Courses Below to Basic Curriculum)
ACTG 301 Managerial Accounting ....................................................................... 4
ECON 301 Introduction to Managerial Economics ............................................... 4
ECON 306 Applied Forecasting ........................................................................... 4
ECON 403 Industrial Organization ...................................................................... 4
ECON 413 Labor Economics ................................................................................ 4
MGT 312 Organization and Management Theory or MIS 318 Modeling Systems .... 4

International Trade and Development Concentration
(Add Courses Below to Basic Curriculum)
ECON 323 European Economic History ............................................................... 3
ECON 325 Underdevelopment and Economic Growth ......................................... 3
ECON 401 International Trade ............................................................................ 4
ECON 404 International Monetary Economics .................................................... 4
Adviser approved electives: .............................................................................. 7

Quantitative Economics Concentration
(Add Courses Below to Basic Curriculum)
ECON 306 Applied Forecasting ........................................................................... 4
ECON 339,ECON 340 Econometrics .................................................................. 4,4
Select two of the following:
ECON 325/ECON 401/ECON 404 ..................................................................... 7
CURRICULUM FOR ECONOMICS MINOR

This minor is designed to give students from other majors a general competency in economics. Its principle intent is to help meet the growing demand for secondary school teachers of economics. Students completing the minor will satisfy the state requirements for a supplementary authorization to teach economics in California high schools. The minor consists of 25-27 units of coursework, 19 of which are of required courses. For more information, contact the Economics Department.

<table>
<thead>
<tr>
<th>Units</th>
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<tbody>
<tr>
<td>Required courses</td>
</tr>
<tr>
<td>ECON 105 Personal and Consumer Economics (3)</td>
</tr>
<tr>
<td>ECON 211 Principles of Economics (D.3.) (3)</td>
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<tr>
<td>ECON 212 Principles of Economics (3)</td>
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<tr>
<td>ECON 304 Comparative Economic Systems (D.4.b.) (3)</td>
</tr>
<tr>
<td>ECON 324 American Economic History (3)</td>
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<tr>
<td>ECON 337 Money, Banking and Credit (4)</td>
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<tr>
<td>Approved electives (choose any two courses)</td>
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<tr>
<td>ECON 323 European Economic History (3)</td>
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<td>ECON 325 Underdevelopment and Economic Growth (D.4.b.) (3)</td>
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<td>ECON 330 Economics of Energy and Resources (3)</td>
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<td>ECON 335 Environmental Economics (3)</td>
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<td>ECON 401 International Trade (4)</td>
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<tr>
<td>ECON 413 Labor Economics (4)</td>
</tr>
</tbody>
</table>

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

Business Administration and Education Bldg.(02), Room 121
(805) 756-1301

Faculty

Department Head, David A. Peach
Allan S. Baillie  Robert Grant  James Sena
Joseph Biggs  Ray M. Haynes  Abraham B. Shani
Joseph Blasi  Eldon Y. Li  Michael Stebbins
H. Kenneth Bobele  Vijaya Narapareddy  Emil Thies
Rebecca Ellis  Rolf E. Rogers

Programs

B.S. Business Administration with Concentrations in:

Human Resources Management  Management Information Systems
International Business Management  Production and Operations
Management

The objectives of the Management Department are to provide knowledge and skills of modern management theory and practice through the study of subjects critical to management performance (including general management, human resources management, international management, management information systems, and production and operations management); to develop in the student knowledge and skills of a second area or function to facilitate initial employment and subsequent career development; to help the student to acquire an appreciation of cultural, economic, political and technological trends which affect the role of managers in contemporary society; to help professionally oriented students use theories, concepts, research findings, problem-solving techniques, and analytical skills in management situations; and to provide a broad background and generalist viewpoint by encouraging study of individual courses in several knowledge and skill areas (including labor, economics, and social and political science).

The degree awarded is the Bachelor of Science in Business Administration with concentrations in Human Resources Management, International Business Management, Management, Management Information Systems, and Production and Operations Management.

CURRICULAR CONCENTRATIONS

Human Resources Management
The two areas of interest within this concentration relate to labor management relations and personnel management. Students learn how to perform the functions of recruitment, selection, development, compensation, contract negotiations, and administration.

International Business Management
This concentration is designed to provide the student the opportunity to develop proficiency in the subject matter basic to an occupational goal in the management of international/multinational operations. It provides cultural understanding, organizational knowledge and analytical skill central to international business management.
Management
This concentration stresses the managerial process and decision making fundamental to all levels and functional areas of the business and industrial enterprise. The management program offers both quantitative and general management emphases to satisfy the individual needs of the student relative to business or academic ambitions.

Management Information Systems
This concentration is designed to prepare students for careers involving the analysis, design, and operation of business information systems within industry and government. It provides training and practice in administrative data processing and in the analysis of managerial information requirements.

Production and Operations Management
This concentration prepares students for careers in production and operations management with business or service organizations. It provides training in purchasing; cost, quality, and inventory control; materials planning; and other production or operations management functions.

CURRICULUM FOR B.S. BUSINESS ADMINISTRATION

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

Freshman

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<tr>
<th>Course Code</th>
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<tr>
<td>CSC 120</td>
<td>Principles of Business Data Processing</td>
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<td>ENGL 114</td>
<td>Writing: Exposition</td>
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<td>Critical Thinking (A.2.)</td>
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<td>MATH 221</td>
<td>Calculus for Business and Economics</td>
<td>4</td>
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<tr>
<td>PSY 201/PSY 202</td>
<td>General Psychology</td>
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<td>Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
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Sophomore

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<tr>
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<tr>
<td>ACTG 221</td>
<td>Financial Accounting I</td>
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<tr>
<td>ACTG 222</td>
<td>Financial Accounting II</td>
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<td>BUS 207</td>
<td>Business Law</td>
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<td>ECON 221</td>
<td>Microeconomics</td>
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<td>ECON 222</td>
<td>Macroeconomics (D.3.)</td>
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<td>ENGL 215</td>
<td>Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.)</td>
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<td>HIST 204</td>
<td>History of American Ideals and Institutions (D.1.)</td>
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<td>PHIL 230/PHIL 231</td>
<td>Philosophical Classics (C.1.)</td>
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<td>American and California Government</td>
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<td>STAT 251</td>
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<td>STAT 252</td>
<td>Statistical Inference for Management II</td>
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<td>Fine and performing arts elective</td>
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<td>Electives and courses to complete major depending on concentration</td>
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47

236 Management
Management
This concentration stresses the managerial process and decision making fundamental to all levels and functional areas of the business and industrial enterprise. The management program offers both quantitative and general management emphases to satisfy the individual needs of the student relative to business or academic ambitions.

Management Information Systems
This concentration is designed to prepare students for careers involving the analysis, design, and operation of business information systems within industry and government. It provides training and practice in administrative data processing and in the analysis of managerial information requirements.

Production and Operations Management
This concentration prepares students for careers in production and operations management with business or service organizations. It provides training in purchasing; cost, quality, and inventory control; materials planning; and other production or operations management functions.

CURRICULUM FOR B.S. BUSINESS ADMINISTRATION

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

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<td>BUS 101</td>
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<td></td>
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Sophomore

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<tr>
<th>Course Code</th>
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<tr>
<td>ACTG 221</td>
<td>Financial Accounting I</td>
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<tr>
<td>ACTG 222</td>
<td>Financial Accounting II</td>
<td>4</td>
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<tr>
<td>BUS 207</td>
<td>Business Law</td>
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<tr>
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<tr>
<td>STAT 252</td>
<td>Statistical Inference for Management II</td>
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<td>Critical reading elective</td>
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<td>Fine and performing arts elective</td>
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47
Management 237

Junior

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<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>ACTG 301</td>
<td>Managerial Accounting</td>
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<tr>
<td>ECON 337</td>
<td>Money, Banking and Credit</td>
<td>4</td>
</tr>
<tr>
<td>FIN 342</td>
<td>Financial Management</td>
<td>4</td>
</tr>
<tr>
<td>MGT 301</td>
<td>Production and Operations Management</td>
<td>4</td>
</tr>
<tr>
<td>MGT 312</td>
<td>Organization and Management Theory</td>
<td>4</td>
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<tr>
<td>MGT 317</td>
<td>Organizational Behavior</td>
<td>4</td>
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<tr>
<td>MIS 321</td>
<td>Management Information Systems</td>
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<td>MKTG 301</td>
<td>Principles of Marketing</td>
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<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
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<td>ANTECON/GEOG/POLS/SOC elective (D.4.b.)</td>
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Senior

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<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>BUS 404</td>
<td>Government and Social Influences on Business</td>
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<td>MGT 406</td>
<td>Multinational Business Operations</td>
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<td>MGT 414</td>
<td>Business Strategy and Policy Seminar</td>
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<td>MGT 461,</td>
<td>Senior Project</td>
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<td>MGT 462</td>
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</table>

All of the above courses except the electives are common to the Business Administration Department, Management Department, and Accounting Department curricula required for the B.S. in Business Administration. See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Accounting, Business, Economics, Financial Management, Management, Marketing and other subjects.

1 To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 114 of this catalog.

Human Resources Management Concentration
(Add Courses Below to Basic Curriculum)

<table>
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<th>Title</th>
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<td>History of Management, Labor and Capitalism in the United States</td>
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<tr>
<td>MGT 314</td>
<td>Human Resources Management</td>
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<tr>
<td>MGT 410</td>
<td>Compensation</td>
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<td>MGT 415</td>
<td>Advanced Personnel Management</td>
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International Business Management Concentration
(Add Courses Below to Basic Curriculum)

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<tr>
<td>ECON 401</td>
<td>International Trade</td>
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<tr>
<td>ECON 404</td>
<td>International Monetary Economics or FIN 430 International Business Finance</td>
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<tr>
<td>MGT 332</td>
<td>International Cross Cultural Management</td>
<td>4</td>
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<tr>
<td>MGT 314</td>
<td>Human Resources Management</td>
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<tr>
<td>MGT 489</td>
<td>Advanced Seminar in International Management</td>
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<td>MKTG 401</td>
<td>International Marketing</td>
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Management 237
junior
ACTG 301 Managerial Accounting ............................................ 4
ECON 337 Money, Banking and Credit ....................................... 4
FIN 342 Financial Management ............................................. 4
MGT 301 Production and Operations Management ....................... 4
MGT 312 Organization and Management Theory .......................... 4
MGT 317 Organizational Behavior ......................................... 4
MIS 321 Management Information Systems ................................ 4
MKTG 301 Principles of Marketing ......................................... 4
HIST 315 Modern World History (D.2.) ................................... 3
ANT/ECOn/GEOG/POLS/SOC elective (D.4.b.) ................................ 3
Electives and courses to complete major depending on concentration .. 12

Senior

BUS 404 Government and Social Influences on Business ................ 4
MGT 406 Multinational Business Operations ................................ 4
MGT 414 Business Strategy and Policy Seminar .......................... 4
MGT 461, MGT 462 Senior Project ........................................ 2
MGT 461, MGT 462 Senior Project ........................................ 2
Arts and humanities elective (Area C) .................................... 3
Electives and courses to complete major depending on concentration .. 31

All of the above courses except the electives are common to the Business Administration Department, Management Department, and Accounting Department curricula required for the B.S. in Business Administration. See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Accounting, Business, Economics, Financial Management, Management, Marketing and other subjects.

1 To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 114 of this catalog.
### Management Concentration
*(Add Courses Below to Basic Curriculum)*

<table>
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<th>Title</th>
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<td>MGT 314</td>
<td>Human Resources Management</td>
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<td>MGT 331</td>
<td>Organization Design and Analysis</td>
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<td>MGT 332</td>
<td>International Cross Cultural Management</td>
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<td>MGT 488</td>
<td>Small Business Administration</td>
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### Management Information Systems Concentration
*(Add Courses Below to Basic Curriculum)*

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<td>CSC 218</td>
<td>Fundamentals of Computer Science II</td>
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<tr>
<td>CSC 203</td>
<td>COBOL Programming</td>
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<td>CSC 345</td>
<td>Data Structures</td>
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<td>MGT 314</td>
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<td>MIS 412</td>
<td>Information Management and Database Systems</td>
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<td>MIS 422</td>
<td>Information Systems Analysis</td>
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<td>MIS 432</td>
<td>Information Systems Design and Implementation</td>
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<td>CSC 204, CSC 346, CSC 347, MIS 318, MIS 418, MIS 419</td>
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### Production and Operations Management Concentration
*(Add Courses Below to Basic Curriculum)*

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<tbody>
<tr>
<td>ACTG 402</td>
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<td>MGT 314</td>
<td>Human Resources Management</td>
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<td>MGT 440</td>
<td>Service Operations Management</td>
<td>4</td>
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<tr>
<td>MGT 441</td>
<td>Operations Planning and Control</td>
<td>4</td>
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<td>MGT 442</td>
<td>Purchasing and Materials Management</td>
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<td>MGT 445</td>
<td>Advanced Operations Management</td>
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<tr>
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</table>
School of Engineering

DEGREE PROGRAMS

B.S. Aeronautical Engineering ................................................................. 249
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  Manufacturing Processes Technology Concentration
  Mechanical Technology Concentration
  Welding Technology Concentration
B.S. Environmental Engineering .......................................................... 256
B.S. Industrial Engineering .................................................................. 281
B.S. Mechanical Engineering ............................................................... 284
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  Petroleum Concentration
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<th>Aero</th>
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<th>CSC</th>
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<td>Units vary. See appropriate degree curriculum.</td>
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</table>
The School of Engineering offers programs leading to the Bachelor of Science degree in ten engineering disciplines, and in the disciplines of computer science and engineering technology. It also offers programs leading to the Master of Science degree in Aeronautical Engineering, Civil and Environmental Engineering, Computer Science, Electrical and Electronic Engineering, and the Master of Science degree in Engineering.

Engineering and computer science at Cal Poly are strongly oriented toward preparing students for immediate entry into professional practice upon graduation from one of the bachelor's degree programs. Each student selects a major at entrance and generally takes at least one course in that major each quarter. This early introduction increases motivation to master the mathematics, basic science, and engineering science or computer science which constitute a very important portion of each curriculum.

Cal Poly engineering and computer science graduates are in great demand and find a large variety of challenges awaiting them. They enter professional occupations such as engineering design, computer hardware and software engineering, test and evaluation, systems analysis, modeling and simulation, manufacturing, applied research, development, sales, and field engineering. Graduates pursue careers in a broad cross-section of industry, government agencies, public utilities, marketing groups, and educational institutions.

Engineering degree curricula offered in the School of Engineering leading to the Bachelor of Science degree are: Aeronautical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, Electronic Engineering, Engineering Science, Environmental Engineering, Industrial Engineering, Mechanical Engineering, and Metallurgical and Materials Engineering. These ten engineering disciplines provide the education for entry to the engineering profession and for continued academic work toward advanced degrees. Many of our graduates enter graduate school at Cal Poly or another institution.

The Accreditation Board for Engineering and Technology (ABET) defines engineering as "the profession in which a knowledge of the mathematical and natural sciences gained by study, experience, and practice is applied with judgment to develop ways to utilize economically the materials and forces of nature for the benefit of mankind."

The School of Engineering also offers a curriculum leading to the Bachelor of Science degree in Engineering Technology. The Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC/ABET) defines engineering technology as follows: "Engineering technology is part of a continuum extending from the craftsman to the engineer. Located nearest the engineer, it requires the application of scientific and engineering principles in support of engineering activities."

The School of Engineering also offers the Bachelor of Science degree in Computer Science which is designed in accordance with the model computer science curricula of the newly established Computing Sciences Accreditation Board (CSAB). Numerous laboratory and project experiences enhance the practical skills of the graduate. They are equally prepared for the practice of computer science and graduate study.
Attention is directed to the preceding chart on recommended community college preparation for engineering, computer science, and engineering technology major curricula. This chart should be studied and followed in order to prevent loss of time in completing the program after transferring to Cal Poly.

The master's degree programs in the School of Engineering are built upon the excellence of Cal Poly's undergraduate engineering and computer science programs. Industry most often considers the master's degree as an important requirement for the design, development, applied research and analysis occupations in engineering and computer science. The master's degree allows entry into these occupations at higher levels of technical skills and responsibilities.

The M.S. in Computer Science has special provisions for students whose undergraduate degree is in a field other than computer science. Students from a wide variety of fields have earned the M.S. in Computer Science by following a carefully designed remedial curriculum prior to enrolling in graduate courses. A similar program is available in the engineering master's degree program for students whose undergraduate degree is in a closely related field of science.

The School of Engineering (Industrial Engineering Department) and the School of Business offer a joint Engineering Management Specialization, an interdisciplinary program linking the M.B.A. and the M.S. in Engineering degree programs.
MASTER OF SCIENCE DEGREE IN ENGINEERING

General Characteristics

The Master of Science program in Engineering has the following objectives:

- Job-entry education for the more complex areas of engineering, such as research and development, innovative design, systems analysis and design, and engineering management;
- Updating and upgrading opportunities for practicing engineers;
- Graduate preparation for further study in engineering, leading to the Doctor of Engineering or Ph.D. degree;
- A base which allows graduates to maintain currency in their fields.

Prerequisites

For admission as a classified graduate student, an applicant must hold a bachelor's degree in engineering or a closely related physical science with a minimum grade point average of 3.0 in the last 90 quarter units (60 semester units) attempted. Applicants for graduate engineering programs are required to submit satisfactory scores for the General (Aptitude) Test of the Graduate Record Examination in engineering. An applicant who meets these standards but lacks prerequisite coursework may be admitted as a conditionally classified student and must make up any deficiencies before advancement to classified graduate standing.

Information pertaining to specific requirements for admission to graduate standing (classified or conditionally classified) may be obtained from the Graduate Coordinator, School of Engineering.

Program of Study

Graduate students must file a formal study plan with their adviser, department, school and university graduate studies office by no later than the end of the quarter in which the 12th unit of approved courses is completed.

The formal program of study must include a minimum of 45 units (at least 24 of which must be at the 500 level) with a specialization in one of the following areas:

- Biochemical Engineering
- Industrial Engineering
- Mechanical Engineering
- Metallurgical and Materials Engineering

The broad curriculum requirements for the Master of Science degree in Engineering are:

a) a minimum of 24 units in the field of specialization, with at least 18 units at the 500 level;

b) a minimum of 9 units from an approved list of mathematics, statistics, computer science, or analytic engineering courses, with at least 3 units at the 500 level;

c) the remaining units taken from a list of approved electives;

d) at least 24 units of the 45 unit program at the 500 level.

In some specializations, two program options are available for M.S. in Engineering students: a thesis program which requires coursework, a thesis and oral defense of thesis; or a nonthesis option which involves additional coursework and a comprehensive examination. The nonthesis option is normally allowed only for those students who have completed an undergraduate senior project or have had significant engineering project experience.

Other Graduate Programs

In addition to the M.S. degree in Engineering, the School of Engineering also offers several other graduate programs: M.S. Aeronautical Engineering, M.S. Civil and Environmental Engineering, M.S. Computer Science, and M.S. Electronic and Electrical Engineering. Information regarding these programs is listed with the respective department.
## CURRICULUM FOR M.S. ENGINEERING, SPECIALIZATION IN BIOCHEMICAL ENGINEERING

<table>
<thead>
<tr>
<th>Units</th>
<th>Core Courses</th>
</tr>
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</table>
| 9     | Analytical Methods for Engineering (6)  
|       | To be chosen from: CSC 431, EE 525, GSB 511, GSB 561, MATH 408, MATH 512, MATH 513, MATH 518, ME 517, STAT 512  
|       | Advanced Mathematics (3)  
|       | To be chosen from: MATH 512, MATH 518, STAT 512  
|       | Required Courses in Specialization  
|       | ME 541 Advanced Thermodynamics (4)  
|       | ME 552 Conductive Heat Transfer (3)  
|       | ME 553 Convective Heat Transfer (3)  
|       | CHEM 572 Advanced Biochemistry (3)  
|       | CHEM 573 Advanced Biochemistry (3)  
|       | CHEM 574 Advanced Biochemistry (3)  
|       | ENGR 599 Design Project (Thesis) (2) (2) (5)  
|       | 9 units of approved technical electives and written comprehensive examination  

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<th>Units</th>
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## CURRICULUM FOR M.S. ENGINEERING, SPECIALIZATION IN INDUSTRIAL ENGINEERING

<table>
<thead>
<tr>
<th>Units</th>
<th>Core Courses</th>
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</table>
| 12    | Analytical Methods for Engineering  
|       | To be chosen from: CSC 431, EE 525, GSB 511, GSB 531, GSB 552, MATH 408, MATH 512, MATH 513, MATH 518, ME 517, STAT 512  
|       | Required Courses in Specialization  
|       | IE 426 Engineering Test Design and Analysis (4)  
|       | IE 544 Advanced Topics in Engineering Economy (3)  
|       | IE 541 Advanced Operations Research (3)  
|       | IE 542 Reliability Engineering (3)  
|       | IE 543 Advanced Human Factors (4)  
|       | IE 545 Advanced Topics in Simulation (3)  
|       | IE 555 Computer Integrated Manufacturing (4)  
|       | IE 599 Design Project (Thesis) (2) (2) (5)  
|       | 9 units of approved technical electives and written comprehensive examination  

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<tr>
<th>Units</th>
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<tr>
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CURRICULUM FOR M.S. ENGINEERING,
SPECIALIZATION IN MECHANICAL ENGINEERING

Units

Core Courses ................................................................. 9
  Analytical Methods for Engineering/Advanced Mathematics
    To be chosen from: CSC 431, CSC 531, CSC 532, EE 525, GSB 511, GSB 561,
    MATH 408, MATH 512, MATH 513, MATH 518, ME 517, STAT 512

Required Courses in Specialization ........................................ 27
  ME 599 Design Project (Thesis) (2) (2) (5) or
  9 units of approved technical electives and written
  comprehensive examination
  18 units to be selected from the following:
    ME 502 Stress Analysis (4)
    ME 517 Advanced Vibrations (4)
    ME 541 Advanced Thermodynamics (4)
    ME 542 Dynamics and Thermodynamics of Compressible Fluid Flow (4)
    ME 551 Mechanical Systems Analysis (4)
    ME 552 Conductive Heat Transfer (3)
    ME 553 Convective Heat Transfer (3)
    ME 554 Computational Heat Transfer (3)

Approved electives .................................................................. 9

CURRICULUM FOR M.S. ENGINEERING,
SPECIALIZATION IN METALLURGICAL AND MATERIALS
ENGINEERING

Units

Core Courses ................................................................. 9
  Analytical Methods for Engineering (6)
    To be chosen from: CSC 431, EE 525, GSB 511, GSB 561, MATH 408,
    MATH 512, MATH 513, MATH 518, ME 517, STAT 512
  Advanced Mathematics (3)
    To be chosen from: MATH 512, MATH 518, STAT 512

Required Courses in Specialization ........................................ 24
  To be selected from the following:
    MET 421 Materials Thermodynamics I (4)
    MET 424 Ceramic Materials (3)
    MET 562 Mechanical Behavior of Materials (3)
    MET 564 Fracture Mechanics (3)
    MET 599 Design Project (Thesis) (2) (2) (5) or
    9 units of approved technical electives and written
    comprehensive examination
    PHYS 412 Solid State Physics for Engineers (3)

Approved Electives .................................................................. 12

Joint M.B.A./M.S. ENGINEERING,
SPECIALIZATION IN ENGINEERING MANAGEMENT

The joint Engineering Management specialization is an interdisciplinary program linking the MBA and
MS in Engineering degree programs. It is a cooperative effort between the School of Engineering
(Industrial Engineering Department) and the School of Business. Students are required to have a
prerequisite degree in engineering, computer science, or similar technical degree to be admitted to
both the School of Engineering and the School of Business, and to be enrolled in both degree
programs. Successful participants will be awarded both MBA and MS in Engineering degrees each
with a specialization in Engineering Management.
The three major objectives are: 1) to integrate knowledge and skills from engineering and business disciplines for effective responses to rapidly changing technological and business environments; 2) to prepare engineers for effective participation in management of technology, management of technology-based organizations, and management of technological change; and 3) to take advantage of the unique background of program participants and the unique strengths of Cal Poly.

**FIRST YEAR**

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<th>Semester</th>
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<tr>
<td><strong>Fall</strong></td>
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<td>GSB 513 Organizations and Management (4)</td>
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<td>GSB 514 Legal Aspects of Management and the Market System (4)</td>
</tr>
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<td>Technical Elective in Specialization (3)</td>
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<tr>
<td><strong>Winter</strong></td>
<td>GSB 521 Accounting for Management Planning and Control (4)</td>
</tr>
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<td></td>
<td>GSB 523 Managerial Economics (4)</td>
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<td>GSB 524 Marketing Management (4)</td>
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<td>IE 557 Technological Assessment and Planning (4)</td>
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<td><strong>Spring</strong></td>
<td>GSB 531 Managerial Finance (4)</td>
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<tr>
<td></td>
<td>GSB 532 Quantitative Business Analysis I (4)</td>
</tr>
<tr>
<td></td>
<td>GSB 533 Aggregate Economic Analysis and Policy (4)</td>
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<td></td>
<td>GSB 534 Operations Management (4)</td>
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<tr>
<td><strong>Summer</strong></td>
<td>GSB 598 Graduate Internship in Business (4)</td>
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**SECOND YEAR**

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<th>Semester</th>
<th>Courses</th>
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<tr>
<td><strong>Fall</strong></td>
<td>GSB 541 Organizational Behavior (4)</td>
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<td>GSB 542 Marketing Research and Planning (4)</td>
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<td>GSB 543 Information Systems for Decision Support (4)</td>
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<td>IE 545 Advanced Topics in Simulation (3)</td>
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<tr>
<td><strong>Winter</strong></td>
<td>GSB 551 Management in an International Environment (4)</td>
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<td>GSB 552 Financial Analysis and Planning (4)</td>
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<td>IE 555 Computer Integrated Manufacturing (4)</td>
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<td>IE 558 Engineering Decision Making (4)</td>
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<td><strong>Spring</strong></td>
<td>GSB 561 Business, Government and Society (4)</td>
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<td>GSB 562 Business Strategy and Policy (4)</td>
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<td>IE 556 Technological Project Management (4)</td>
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<td>Technical Elective in Specialization (3)</td>
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<tr>
<td><strong>Summer</strong></td>
<td>Business Elective (4) (4)</td>
</tr>
</tbody>
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1. Technical electives to be selected with adviser's approval and may include: IE 470, IE 500, IE 541, IE 543, IE 544, IE 559, CSC 420, CSC 421, CSC 444.
2. Waived if satisfied prior to admission by successful completion of IE 304 or IE 305 or equivalent. If waived, four less total units are required and an elective normally taken in the final summer quarter could be substituted.
3. Waived if satisfied prior to admission by successful completion of IE 410 or IE 411 or equivalent. If waived, four less total units are required and an elective normally taken in the final summer quarter could be substituted.
4. Not required for students who have taken an equivalent course in their undergraduate program. Replacement course must be taken.
5. May be taken earlier if other courses waived. Business elective courses include GSB 579, GSB 582, and GSB 590.
6. Total number required units may be reduced if previous coursework completed justifies waiver of some required courses (e.g., see footnotes 2 and 3 above).
AERONAUTICAL ENGINEERING DEPARTMENT

Engineering Bldg. (13), Room 260
(805) 756-2562

Faculty

Department Head, Doral R. Sandlin
Alfred E. Andreoli       Jon A. Hoffmann       Faysal A. Kolkailah
Russell M. Cummings

Programs

B.S. Aeronautical Engineering       M.S. Aeronautical Engineering

The Bachelor of Science degree in Aeronautical Engineering prepares students for engineering work related to aerodynamics, flight testing, structures, propulsion, control systems, dynamics, stability and control, and flight simulation for both fixed and rotary wing aircraft, missiles, and spacecraft. The problems faced by the aerospace industry offer an unusual engineering challenge. Much of the analysis and testing must be accomplished at the very frontiers of knowledge. Nevertheless, products must be designed and manufactured; thus, an exceptionally wide range of engineering abilities is required within the industry and government.

The B.S. curriculum in Aeronautical Engineering is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology. It places emphasis on both analysis and design. Supplementary to both is the basic work in graphics and laboratory. Throughout the entire curriculum there is constant interplay between theory and application. Opportunities are available for advanced elective work in the student’s field of special interest.

Graduates in aeronautical engineering obtain employment in all phases of the aerospace industry such as general design, aerodynamics, stress analysis, flight testing, flight simulation, dynamics, and stability and control.

There are laboratory facilities for fabrication, propulsion, structural test, aerodynamics, dynamics, flight simulation and flight test, and two design rooms. There is also a hangar and aircraft with an adjoining airstrip.

There are four student chapters of the national societies—the American Institute of Aeronautics and Astronautics, the American Helicopter Society, the Society of Flight Test Engineers, and the Society for the Advancement of Material and Process Engineering. There is also a student chapter of the national aerospace engineering honor society, Sigma Gamma Tau.
CURRICULUM FOR B.S. AERONAUTICAL ENGINEERING

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. Cal Poly follows the quarter system.

Freshman

AERO 121 Aerospace Fundamentals .......................................................... 1
ETME 141 Applied Descriptive Geometry .................................................. 2
ETMP 121 Manufacturing Survey .............................................................. 1
BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.) .................... 4
CHEM 124 General Chemistry (B.1.a.) .................................................. 4
CSC 251 Digital Computer Applications (F.1.) ....................................... 2
ENGL 114 Writing: Exposition (A.1.) ................................................... 4
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) ......................... 3
ENGL 218 Writing: Argumentation and Reports (A.4.) ......................... 4
MATH 141 Calculus I (B.2.) ................................................................. 4
MATH 142 Calculus II ........................................................................... 4
MATH 143 Calculus III ............................................................... 4
PHYS 131 General Physics (B.1.a.) ..................................................... 4
PHYS 132 General Physics .................................................................... 4
PSY 201/PSY 202 General Psychology (E.1.) ...................................... 3
1 Fine and performing arts elective (C.2.) ......................................... 3

Sophomore

AERO 202 Aeronautical Engineering Analysis ........................................ 2
CE 204 Strength of Materials................................................................. 3
CE 205, CE 206 Strength of Materials and Laboratory .......................... 2,1
EE 311, EE 351 Electric Circuit Theory and Laboratory ....................... 3,1
ME 211 Engineering Statics ................................................................. 3
ME 212 Engineering Dynamics ............................................................. 3
PHYS 133 General Physics .................................................................... 4
PHYS 210 Introduction to Modern Physics ........................................... 4
ANT 201/GEOG 150/SOC 105 (D.4.a.) ................................................. 3
ECON 201 Survey of Economics or ECON 211 Principles of Economics (D.3.) ................................................................. 3
MATH 241 Calculus IV ........................................................... 4
MATH 242 Differential Equations .......................................................... 4
MATH 318 Advanced Engineering Mathematics (B.2.) ...................... 4
SPC 201 Public Speaking or SPC 202 Principles of Speech Communication (A.3.) ................................................................. 3
1 Critical reading elective (C.1.) ....................................................... 3
2 Manufacturing processes elective ..................................................... 1
### Junior

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<tr>
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<tr>
<td>AERO 301</td>
<td>Aerothermodynamics</td>
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<td>AERO 304</td>
<td>Experimental Aerothermodynamics</td>
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<tr>
<td>AERO 306</td>
<td>Aerodynamics I</td>
<td>5</td>
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<tr>
<td>AERO 307</td>
<td>Wind Tunnel and Flight Test Laboratory</td>
<td>3</td>
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<td>AERO 324</td>
<td>Stress Analysis</td>
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<tr>
<td>CSC 332</td>
<td>Numerical Analysis I</td>
<td>3</td>
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<tr>
<td>EL 321, EL 361</td>
<td>Electronics and Laboratory</td>
<td>3,1</td>
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<tr>
<td>MET 306</td>
<td>Materials Engineering</td>
<td>3</td>
</tr>
<tr>
<td>PHIL 230/PHIL 231</td>
<td>Philosophical Classics (C.1)</td>
<td>3</td>
</tr>
<tr>
<td>HIST 204</td>
<td>History of American Ideals and Institutions (D.1.)</td>
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<tr>
<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
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<td>POLS 210</td>
<td>American and California Government (D.1.)</td>
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<tr>
<td>ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.)</td>
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<tr>
<td>Literature, philosophy, arts elective (300–400 level) (C.3)</td>
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### Senior

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<tr>
<th>Course Code</th>
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<tr>
<td>AERO 401</td>
<td>Propulsion Systems</td>
<td>4</td>
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<tr>
<td>AERO 404</td>
<td>Gas Dynamics</td>
<td>4</td>
</tr>
<tr>
<td>AERO 408</td>
<td>Aerospace Structural Analysis</td>
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<td>AERO 410</td>
<td>Experimental Stress Analysis</td>
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<tr>
<td>AERO 420</td>
<td>Stability and Control of Aircraft</td>
<td>5</td>
</tr>
<tr>
<td>AERO 443</td>
<td>Flight Vehicle Design</td>
<td>2</td>
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<tr>
<td>AERO 444</td>
<td>Flight Vehicle Design</td>
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<td>AERO 445</td>
<td>Flight Vehicle Design</td>
<td>4</td>
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<tr>
<td>AERO 461</td>
<td>Senior Project</td>
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<tr>
<td>AERO 462</td>
<td>Senior Project</td>
<td>3</td>
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<tr>
<td></td>
<td>Arts and humanities elective (Area C)</td>
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<td>Critical reading elective (C.1.)</td>
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<td></td>
<td>Aeronautical Engineering electives</td>
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</table>

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

1. To be selected in accordance with the General Education-Breadth and A.B.E.T. requirements. See adviser and page 114 of this catalog.
2. To be selected from ETMP 144, ETWT 144, IE 141, or IT 141.
3. To be chosen with adviser approval.
MASTER OF SCIENCE DEGREE IN AERONAUTICAL ENGINEERING

General Characteristics
The Master of Science program in Aeronautical Engineering prepares the student for entry into a well-established field of aeronautical engineering. In addition, the subject matter relative to flight simulation and controls, structures, and aerothermal sciences has been integrated into the program. The M.S. program in Aeronautical Engineering emphasizes engineering science and research activity. The degree increases a student's capability for more complex research, development, and innovative design, and prepares the student for future graduate study in engineering, leading to the Doctor of Engineering or Ph.D. degree.

Prerequisites
For admission as a classified graduate student, an applicant must hold a bachelor's degree in engineering (preferably aeronautical engineering) or a closely related physical science with a minimum grade point average of 3.0 in the last 90 quarter units (60 semester units) attempted.

Applicants are required to submit satisfactory scores for the General (Aptitude) Test and Subject (Advanced) Test of the Graduate Record Examination in engineering.

An applicant who meets these standards but lacks prerequisite coursework may be admitted as a conditionally classified student and must make up any deficiencies before advancement to classified graduate standing.

Information pertaining to specific requirements for admission to graduate standing (classified or conditionally classified) may be obtained from the Graduate Coordinator, Department of Aeronautical Engineering.

Program of Study
Graduate students must file a formal study plan with their adviser, department, school and university graduate studies office by no later than the end of the quarter in which the 12th unit of approved courses is completed.

The formal program of study must include a minimum of 45 units (at least 24 of which must be at the 500 level).

A thesis or project is required as a culminating experience.

CURRICULUM FOR M.S. AERONAUTICAL ENGINEERING

<table>
<thead>
<tr>
<th>Required Courses</th>
<th>Units</th>
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<tbody>
<tr>
<td>AERO 515 Continuum Mechanics (3)</td>
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<tr>
<td>AERO 520 Theoretical Aerodynamics (3)</td>
<td>9</td>
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<tr>
<td>AERO 522 Boundary Layer Theory (3)</td>
<td>9</td>
</tr>
<tr>
<td>AERO 590 Graduate Seminar (1)</td>
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</tr>
<tr>
<td>AERO 599 Design Project (Thesis) (2) (2) (5)</td>
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</tr>
<tr>
<td>Adviser approved electives</td>
<td>18</td>
</tr>
<tr>
<td>Advanced Mathematics/Analytical Methods for Engineers</td>
<td>8</td>
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<tr>
<td>MATH 501, MATH 502 Methods of Applied Mathematics I and II (4) (4)</td>
<td>8</td>
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</table>

Total: 45 Units
CIVIL AND ENVIRONMENTAL ENGINEERING
DEPARTMENT

Engineering Bldg. (13), Room 263
(805) 756-2947

Faculty
Chair, Stephen L. M. Hockaday
Harold M. Cota                      H. Mallareddy       S. Somayaji
Jay S. DeNatale                  Dragoslav M. Misic    Edward C. Sullivan
Carl C. F. Hsieh                  Edward A. Nowatzki   Samuel A. Vigil
Stuart E. Larsen

Programs
B.S. Civil Engineering          B.S. Environmental Engineering
M.S. Civil and Environmental Engineering

CIVIL ENGINEERING
Civil engineers are concerned with the structures in which we live and work, the transportation systems by which we travel, and the environment around us. The Bachelor of Science degree in Civil Engineering emphasizes the study of engineering principles and the application of scientific knowledge and technology for the betterment of humankind. The program stresses the team design concept and systems approach to problem solving and is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

Graduates of the program are trained for the expanding needs of society in transportation, geotechnical engineering, water resources, structures and the environment under the broad Civil Engineering degree. The emphasis is on preparation for immediate entry into the profession. Students completing the program find a wide variety of positions available in local, state, and federal government service or with private engineering firms. These positions involve the planning, design, and construction of civil engineering projects.

The curriculum includes surveying, structural engineering, hydraulics, geotechnical engineering, sanitary engineering, and transportation planning—all based upon broad coverage of the engineering sciences and basic sciences, mathematics, social sciences, and humanities. The program is oriented toward the practical problems of the industrial world, and adequate scientific depth is maintained so that graduates are readily accepted into graduate programs in civil engineering.
CURRICULUM FOR B.S. CIVIL ENGINEERING

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

**Freshman**

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<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tr>
<td>CE 111, CE 112</td>
<td>Civil Engineering Fundamentals I and II</td>
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<tr>
<td>ETME 141</td>
<td>Applied Descriptive Geometry</td>
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<tr>
<td>CHEM 124</td>
<td>General Chemistry (B.1.a.)</td>
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<td>CHEM 125</td>
<td>General Chemistry</td>
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<td>ENGL 114</td>
<td>Writing: Exposition (A.1.)</td>
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<td>ENGL 125/PHIL 125/SPC 125</td>
<td>Critical Thinking (A.2.)</td>
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<tr>
<td>ENGL 218</td>
<td>Writing: Argumentation and Reports (A.4.)</td>
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<tr>
<td>MATH 141</td>
<td>Calculus I (B.2.)</td>
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<tr>
<td>MATH 142</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 143</td>
<td>Calculus III</td>
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<tr>
<td>PHIL 230/PHIL 231</td>
<td>Philosophical Classics (C.1.)</td>
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<td>PHYS 131</td>
<td>General Physics (B.1.a.)</td>
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<td>1 Critical reading electives (C.1.)</td>
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**Sophomore**

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<tbody>
<tr>
<td>CE 204</td>
<td>Strength of Materials</td>
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<tr>
<td>CE 205, CE 206</td>
<td>Strength of Materials and Laboratory</td>
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<tr>
<td>CE 221</td>
<td>Fundamentals of Transportation</td>
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<tr>
<td>CE 259</td>
<td>Civil Engineering Materials</td>
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<tr>
<td>AE 237</td>
<td>Engineering Surveying</td>
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<tr>
<td>AE 238</td>
<td>Engineering Surveying</td>
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<tr>
<td>GEOL 201</td>
<td>Physical Geology</td>
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<tr>
<td>MATH 241</td>
<td>Calculus IV</td>
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<td>MATH 242</td>
<td>Differential Equations</td>
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<td>ME 211</td>
<td>Engineering Statics</td>
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<tr>
<td>ME 212</td>
<td>Engineering Dynamics</td>
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<tr>
<td>ME 341</td>
<td>Fluid Mechanics</td>
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<td>CSC 251</td>
<td>Digital Computer Applications (F.1.)</td>
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<td>ECON 211</td>
<td>Principles of Economics (D.3.)</td>
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<td>PHYS 132</td>
<td>General Physics (B.1.a.)</td>
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<td>PHYS 133</td>
<td>General Physics</td>
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<td>POLS 210</td>
<td>American and California Government (D.1.)</td>
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<td>SPC 201</td>
<td>Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
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<tbody>
<tr>
<td>CE 336</td>
<td>Water Resources Engineering</td>
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<tr>
<td>CE 337</td>
<td>Hydraulics Laboratory</td>
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<tr>
<td>CE 352, CE 353</td>
<td>Structural Analysis I and II</td>
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<td>CE 355</td>
<td>Reinforced Concrete Design</td>
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<tr>
<td>CE 381</td>
<td>Geotechnical Engineering</td>
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<tr>
<td>EE 311</td>
<td>Electric Circuits Theory</td>
<td>3</td>
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<tr>
<td>ENVE 331</td>
<td>Introduction to Environmental Engineering</td>
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<tr>
<td>ME 302</td>
<td>Thermodynamics I</td>
<td>3</td>
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<td>MET 306, MET 341</td>
<td>Materials of Engineering and Laboratory</td>
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<td>ANT 201/GEOG 150/SOC 105</td>
<td>(D.4.a.)</td>
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<td>BIO 220</td>
<td>Physiology and Biological Adaptation (B.1.b., E.2.)</td>
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<td>History of American Ideals and Institutions (D.1.)</td>
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<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
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<td>1 ANTV/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.)</td>
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<td>1 Fine and performing arts elective (C.2.)</td>
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<tr>
<td>Approved Computer Science or IE elective</td>
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<td>Structural Dynamics</td>
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<tr>
<td>CE 421</td>
<td>Traffic Engineering</td>
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<tr>
<td>CE 440</td>
<td>Hydraulic Systems Engineering</td>
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</tr>
<tr>
<td>CE 453</td>
<td>Structural Steel Design</td>
<td>3</td>
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<tr>
<td>CE 454</td>
<td>Structural Design</td>
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<tr>
<td>CE 461</td>
<td>Senior Project</td>
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<tr>
<td>CE 462</td>
<td>Senior Project</td>
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<tr>
<td>CE 464</td>
<td>Professional Practice</td>
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<tr>
<td>CE 481</td>
<td>Analysis and Design of Shallow Foundations</td>
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<td>ENVE 438</td>
<td>Water and Wastewater Treatment</td>
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<td>General Psychology (E.1.)</td>
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<td>STAT 321</td>
<td>Statistical Analysis (B.2.)</td>
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<td>1 Arts and humanities elective (Area C)</td>
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<td>1 Literature, philosophy, arts elective (300-400 level) (C.3.)</td>
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</table>

1 To be selected in accordance with the General Education-Breadth and A.B.E.T. requirements. (Please see page 114 of this catalog.)

2 To be selected with adviser approval from departmental list.
ENVIRONMENTAL ENGINEERING

The Bachelor of Science degree in Environmental Engineering is concerned with the interrelation of people, materials, and processes in a complex and changing environment. The broad field of environmental engineering includes control of air and water pollution, industrial hygiene, noise and vibration control, and solid waste and hazardous waste management. Cal Poly has one of the few undergraduate programs in this field.

The program offers a sound background in the fundamentals of thermodynamics, heat transfer, fluid mechanics, mass transfer, and the physiological interactions in response to the environment. The problem-oriented approach to instruction, in modern well-equipped laboratories, provides an excellent opportunity to gain understanding and experience. The curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

The Society of Environmental Engineers offers technical programs and other activities, including field trips each year to the Los Angeles and San Francisco areas to study typical installations of systems. Student memberships also are available in the Air and Waste Management Association, the California Water Pollution Control Association, and the Water Pollution Control Federation.

An engineering approach to the subject enables graduates to pursue careers in industry, consulting firms, and public agencies concerned with air and water pollution control, groundwater, potable water treatment, solid waste management, and hazardous waste management.

CURRICULUM FOR B.S. ENVIRONMENTAL ENGINEERING

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

**Freshman**

<table>
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<th>Course Code</th>
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<td>Civil Engineering Fundamentals II</td>
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<td>ETME 141</td>
<td>Applied Descriptive Geometry</td>
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<td>BIO 220</td>
<td>Physiology and Biological Adaptation (B.1.b., E.2.)</td>
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<td>CHEM 124</td>
<td>General Chemistry (B.1.a.)</td>
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<td>General Chemistry</td>
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<td>Writing: Exposition</td>
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<td>Critical Thinking (A.2.)</td>
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<td>Calculus I (B.2.)</td>
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<td>MATH 142</td>
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<td>Calculus III</td>
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<td>PHYS 131</td>
<td>General Physics (B.1.a.)</td>
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<td>PHYS 132</td>
<td>General Physics</td>
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<tr>
<td>ENGL 218</td>
<td>Writing: Argumentation and Reports (A.4.)</td>
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**Sophomore**

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<tr>
<td>CE 205</td>
<td>Strength of Materials</td>
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<tr>
<td>CE 221</td>
<td>Fundamentals of Transportation</td>
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<tr>
<td>ME 211</td>
<td>Engineering Statics</td>
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<td>ME 212</td>
<td>Engineering Dynamics</td>
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<td>ME 302</td>
<td>Thermodynamics I</td>
<td>3</td>
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<tr>
<td>ME 341</td>
<td>Fluid Mechanics</td>
<td>3</td>
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<tr>
<td>CHEM 326</td>
<td>Survey of Organic Chemistry</td>
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<td>MATH 241</td>
<td>Calculus IV</td>
<td>4</td>
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<td>MATH 242</td>
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<td>ECON 211</td>
<td>Principles of Economics (D.3.)</td>
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<tr>
<td>ENGL 218</td>
<td>Writing: Argumentation and Reports (A.4.)</td>
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<td>POLS 210</td>
<td>American and California Government (D.1.)</td>
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<td>STAT 321</td>
<td>Statistical Analysis (B.2.)</td>
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<tr>
<td>ENGL 341</td>
<td>Writing: Exposition</td>
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1 Critical reading elective. (C.1.)
Junior

CE 336 Water Resources Engineering ................................................................. 4
CE 337 Hydraulics Laboratory ............................................................................... 1
CE 381 Geotechnical Engineering ....................................................................... 4
ENVE 304 Thermodynamics of Processes ............................................................. 3
ENVE 309 Noise and Vibration Control ................................................................. 3
ENVE 316 Automatic Process Control .................................................................. 2
ENVE 325 Environmental Air Quality .................................................................... 3
ENVE 326 Air Pollution Measurements .................................................................. 3
EE 311 Electric Circuit Theory ............................................................................... 3
EE 351 Electric Circuit Laboratory ........................................................................ 1
ME 313 Heat Transfer ........................................................................................... 3
ANT 201/GEOG 150/SOC 105 (D.4.a.) ............................................................... 3
HIST 204 History of American Ideals and Institutions (D.1.) .............................. 3
HIST 315 Modern World History (D.2.) ................................................................ 3
SPC 201 Public Speaking or SPC 202 Principles of Speech Communication (A.3.) 3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) ............................................... 3
PSY 201/PSY 202 General Psychology (E.1.) ..................................................... 3
Computer literacy elective (F.1.) ........................................................................ 3

<1 Fine and performing arts elective (C.2.) .......................................................... 3

Senior

CE 434 Groundwater Hydraulics and Hydrology .................................................... 3
CE 440 Hydraulic Systems Engineering ................................................................ 3
ENVE 411 Air Pollution Control ........................................................................... 3
ENVE 421 Mass Transfer Operations .................................................................... 3
ENVE 434 Water Quality Measurements .............................................................. 2
ENVE 435 Principles of Water and Wastewater Engineering ............................... 3
ENVE 436 Introduction to Hazardous Waste Management ................................... 3
ENVE 438 Water and Wastewater Treatment Design .......................................... 3
ENVE 439 Solid Waste Management .................................................................... 3
ENVE 441, ENVE 442 Advanced System Design .................................................. 3, 3
ENVE 461, ENVE 462 Senior Project ..................................................................... 2, 2
<1 ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) ....................................... 3
<1 Arts and humanities elective (Area C) ............................................................... 3
<1 Literature, philosophy, arts elective (300-400 level) (C.3.) ............................... 3
Approved technical electives .............................................................................. 8

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

<1 To be selected in accordance with the General Education-Breadth requirements. (Please see page 114 of this catalog.)
MASTER OF SCIENCE DEGREE IN CIVIL AND ENVIRONMENTAL ENGINEERING

General Characteristics
The Master of Science program in Civil and Environmental Engineering has the following objectives:

- Job-entry education for the more complex areas of engineering, such as research and development, innovative design, systems analysis and design, and managerial engineering;
- Updating and upgrading opportunities for practicing engineers;
- Graduate preparation for further study in engineering, leading to the Doctor of Engineering or Ph.D. degree;
- A base which allows graduates to maintain currency in their fields.

Prerequisites
For admission as a classified graduate student, an applicant must hold a bachelor's degree in engineering or a closely related physical science with a minimum grade point average of 3.0 in the last 90 quarter units (60 semester units) attempted. Applicants for graduate engineering programs are required to submit satisfactory scores for the General (Aptitude) Test of the Graduate Record Examination. An applicant who meets these standards but lacks prerequisite coursework may be admitted as a conditionally classified student and must make up any deficiencies before advancement to classified graduate standing.

Information pertaining to specific requirements for admission to graduate standing (classified or conditionally classified) may be obtained from the Graduate Coordinator, Civil and Environmental Engineering Department.

Program of Study
Graduate students must file a formal study plan with their adviser, department, school and university graduate studies office by no later than the end of the quarter in which the 12th unit of approved courses is completed.

The formal program of study must include a minimum of 45 units (at least 24 of which must be at the 500 level). With the graduate adviser's approval, students will be expected to select their elective units in one of the following areas of study: geotechnical engineering, transportation and planning, or water resources and environmental engineering.

The broad curriculum requirements for the M.S. in Civil and Environmental Engineering are:

a) a core of 17 units as required;
b) a minimum of 9 units of adviser approved electives;
c) a minimum of 9 units chosen from mathematics, statistics, computer science, or from an approved list of analysis courses, with at least 3 units at the 500 level;
d) the remaining units taken from a list of approved electives;
e) at least 24 units of the 45 unit program at the 500 level.

Two program options are available for M.S. in Civil and Environmental Engineering students: a thesis program which requires coursework, a thesis and oral defense of thesis; or a nonthesis option which involves additional coursework and a comprehensive examination. The nonthesis option is normally allowed only for those students who have completed an undergraduate senior project or have had significant engineering project experience.
CURRICULUM FOR M.S. CIVIL AND ENVIRONMENTAL ENGINEERING

Units

Core Courses

- CE 571 Selected Advanced Laboratory (3)
- CE 574 Computer Applications in Civil Engineering (3)
- CE 591 Graduate Seminar (2)
- CE 599/ENVE 599 Design Project (Thesis) (2) (2) (5) or 9 units of approved technical electives and comprehensive exam

Adviser approved electives

To be selected from the following with adviser’s approval:

- CE 405 Advanced Strength of Materials (3)
- CE 407 Structural Dynamics (4)
- CE 422 Geometric Design of Highways (4)
- CE 424 Public Transportation (4)
- CE 431 Coastal Hydraulics (3)
- CE 434 Ground Water Hydraulics and Hydrology (3)
- CE 487 Rock Mechanics (3)
- CE 521 Airfield and Highway Pavement Design (4)
- CE 522 Advanced Transportation Design (4)
- CE 523 Transportation Systems Planning (4)
- CE 525 Airport Planning and Design (4)
- CE 527 Traffic Engineering - Operations and Controls (4)
- CE 533 Advanced Water Resources Engineering (3)
- CE 554 Matrix Analysis of Structures (3)
- CE 558 Introduction to Finite Element Analysis (3)
- CE 559 Advanced Structural Design (3)
- CE 573 Public Works Administration (3)
- CE 581 Advanced Soil Mechanics (3)
- CE 582 Advanced Geotechnical Testing (3)
- CE 583 Soil Dynamics (3)
- CE 584 Lateral Support Systems (3)
- CE 585 Slope Stability Analysis (3)
- CE 586 Advanced Foundation Design (3)
- CE 587 Analysis and Design of Deep Foundations (3)
- ENVE 411 Air Pollution Control (3)
- ENVE 421 Mass Transfer Operations (3)
- ENVE 434 Water Quality Measurements (2)
- ENVE 436 Introduction to Hazardous Waste Management (3)
- ENVE 439 Solid Waste Management (3)
- ENVE 441 Advanced System Design (3)
- ENVE 465 Environmental Management and Urban Systems (2)
- ENVE 534 Advanced Design of Pollution Control Systems (3)
- ENVE 535 Advanced Wastewater Treatment (3)
- ENVE 536 Biological Wastewater Treatment Processes Engineering (3)
- ENVE 541 Resource and Energy Recovery from Waste (3)

Required Quantitative Techniques Courses

A minimum of 9 units chosen from CSC, MATH, STAT or from an approved list of analysis courses with at least 3 units at the 500 level.

Approved technical electives

Total Units: 45
COMPUTER ENGINEERING

CPE Advising Center, Engineering East Bldg. (20), Room 122 (805) 756-1461

Faculty

Co-Chairs:
Roger C. Camp, Department Chair, Computer Science
Martin E. Kaliski, Department Chair, Electronic and Electrical Engineering

James L. Beug     Elmo A. Keller     Carl A. MacCarley
James G. Harris   Wayne E. McMorran   Zane C. Motteler

Programs

B.S. Computer Engineering

The goal of the B.S. program in Computer Engineering is the education of those students with an interest in designing computer based systems. The study of both hardware and software builds upon the resources of a balanced computer engineering course of study.

The graduate of the program will have a firm foundation in both electronic engineering and computer science. This balanced background will enable the graduate to make intelligent decisions in the area of the definition and design of systems, hardware, software and the trade-offs among these components of design.

The graduates will be well-rounded in hardware, software, and the mathematics of real-time computing, allowing them to work effectively in such areas as digital systems simulation and digital control systems. Knowledge and skills in the technical areas of computer architecture and structures will provide the basic understanding necessary to work with computer networks and communications. A thorough knowledge of modern microprocessors will enable the graduate to apply these machines to such diverse fields as robotics and data acquisition.

In addition to a sound theoretical background in the field of computer engineering, the student will encounter many practical design courses and problems. Laboratory courses supplement the program to bring “hands on” skills in all areas of study. Technical electives allow specialization in those areas of special interest of the students and expertise of the faculty.

GRADUATE PROGRAMS

For information regarding graduate degree programs in engineering, please refer to the following pages of this catalog:

M.S. Aeronautical Engineering, page 252
M.S. Civil and Environmental Engineering, page 258
M.S. Computer Science, page 267
M.S. Electronic and Electrical Engineering, page 272
  Computer Engineering Specialization
  Electrical Engineering Specialization
  Electronic Engineering Specialization
M.S. Engineering, page 245
  Biochemical Engineering Specialization
  Industrial Engineering Specialization
  Mechanical Engineering Specialization
  Metallurgical and Materials Engineering Specialization
Joint M.B.A./M.S. Engineering with Specialization
  in Engineering Management, page 247
**CURRICULUM FOR B.S. COMPUTER ENGINEERING**

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. Cal Poly follows the quarter system.

### Freshman

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<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>CSC 118</td>
<td>Fundamentals of Computer Science I (F.1.)</td>
<td>4</td>
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<tr>
<td>CSC 218</td>
<td>Fundamentals of Computer Science II</td>
<td>3</td>
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<tr>
<td>CSC 215</td>
<td>Computer Architecture I</td>
<td>4</td>
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<tr>
<td>EE 112</td>
<td>Electric Circuit Analysis I</td>
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<tr>
<td>ANT 201/GEOG 150/SOC 105</td>
<td>D.4.a.)</td>
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<tr>
<td>CHEM 124</td>
<td>General Chemistry (B.1.a.)</td>
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<tr>
<td>ENGL 114</td>
<td>Writing: Exposition (A.1.)</td>
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### Sophomore

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<td>CSC 345</td>
<td>Data Structures</td>
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<td>EE 211, EE 241</td>
<td>Electric Circuit Analysis II and Laboratory</td>
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<td>Electric Circuit Analysis III and Laboratory</td>
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<td>EL 208, EL 248</td>
<td>Electronic Devices and Laboratory</td>
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<td>MATH 317</td>
<td>Topics in Engineering Mathematics</td>
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<td>ME 211</td>
<td>Engineering Statics</td>
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<td>POLS 210</td>
<td>American and California Government (D.1.)</td>
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<td>Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
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<td>STAT 321</td>
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<td>CSC 315</td>
<td>Computer Architecture II</td>
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<td>CSC 346</td>
<td>File Structures</td>
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<td>CSC 351</td>
<td>Programming Languages I: Design</td>
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<td>EE 301, EE 341</td>
<td>Linear Systems Analysis and Laboratory</td>
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<td>EE 302, EE 342</td>
<td>Linear Control Systems and Laboratory</td>
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<td>EL 307, EL 347</td>
<td>Digital Integrated Electronics and Laboratory</td>
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<td>EL 308, EL 348</td>
<td>Electronic Circuits and Laboratory</td>
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<td>EL 309, EL 349</td>
<td>Integrated Electronic Circuits and Laboratory</td>
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<td>EL 319, EL 359</td>
<td>Digital System Design and Laboratory</td>
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<td>BIO 220</td>
<td>Physiology and Biological Adaptations (B.1.b. and E.2.)</td>
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<td>HIST 204</td>
<td>History of American Ideals and Institutions (D.1.)</td>
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* Critical reading electives (C.1.) 6
### Senior

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<td>CPE 463</td>
<td>Undergraduate Seminar</td>
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<td>CSC 316</td>
<td>Computer Architecture III</td>
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<td>CSC 353</td>
<td>Computer Systems Programming</td>
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<td>CSC 404</td>
<td>Computer Networks</td>
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<td>CSC 440</td>
<td>Software Engineering I</td>
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<td>CSC 453</td>
<td>Introduction to Operating Systems</td>
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<td>EL 446</td>
<td>Microprocessor Interfacing Laboratory</td>
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<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
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<td>Philosophical Classics (C.1.)</td>
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<td>Fine and performing arts elective (C.2.)</td>
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<td>Literature, philosophy, arts elective (300-400 level) (C.3.)</td>
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<tr>
<td>2</td>
<td>Technical electives</td>
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</tbody>
</table>

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

1. To be selected in accordance with the General Education-Breadth requirements. (Please see page 114 of this catalog.)

2. Special interest electives to be chosen with the approval of the adviser.
The department offers a program leading to the Bachelor of Science degree in Computer Science, a graduate program leading to a Master of Science degree in Computer Science, and a minor in Computer Science.

The undergraduate program provides an in-depth study of computer science fundamentals and practice. This material includes programming, operating systems, computer architecture, languages and translators, database systems, telecommunications, and software engineering. The undergraduate curriculum is accredited by the Computing Sciences Accreditation Board.

Adequate numbers of elective units are provided so that students can specialize in various aspects of computation and its applications. Typical areas of emphasis are artificial intelligence, computer graphics, computer systems, scientific computation, business computation, computer hardware and computer simulation.

Practice is emphasized in addition to the study of theory and concepts. The curriculum is project-oriented and is designed to develop an ability to solve problems through efficient utilization of modern computer concepts. Students can expect to complete many assigned projects on a variety of computer systems and in a variety of programming languages. Students completing the course of study are well prepared to become practicing computer scientists. They are also well prepared for graduate study. During their last year of study, undergraduate students must complete a significant project experience through enrollment in the senior project, a two-quarter course. The project may be done either as an individual or as a member of a team.

Graduates of the computer science program are sought by the computer industry for positions as systems engineers, applications programmers, program analysts and sales representatives.
A wide variety of computing equipment is available on campus. Lower division courses are usually conducted using the equipment of the university's Academic Computing Services. These central campus resources consist of several mainframe and minicomputers in a time-sharing environment. Upper division courses are usually conducted using the facilities of the department's Computer Systems Laboratory. This laboratory, administered by the Computer Science Department, has a variety of mini- and micro-computers. It also houses a graphics laboratory and several research systems which provide an environment suitable for advanced studies.

The department has active student chapters of the Association for Computing Machinery, and Upsilon Pi Epsilon (computer science honor society).

**COMPUTER ENGINEERING**

For information regarding the B.S. degree program in Computer Engineering, please see page 260. This program is jointly administered by the Computer Science Department and the Electronic and Electrical Engineering Department.

**CURRICULUM FOR B.S. COMPUTER SCIENCE**

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. Cal Poly follows the quarter system.

**Freshman**

<table>
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<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tr>
<td>CSC 118</td>
<td>Fundamentals of Computer Science I (F.1.)</td>
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<tr>
<td>CSC 218</td>
<td>Fundamentals of Computer Science II</td>
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<td>CSC 215</td>
<td>Computer Architecture I</td>
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<tr>
<td>CHEM 124</td>
<td>General Chemistry</td>
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<tr>
<td>El 219</td>
<td>Logic and Switching Circuits</td>
<td>3</td>
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<tr>
<td>ANT 201/GEOG 150/SOC 105</td>
<td>(D.4.a.)</td>
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<tr>
<td>ENGL 114</td>
<td>Writing: Exposition (A.1.)</td>
<td>4</td>
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<tr>
<td>ENGL 125/PHIL 125/SPC 125</td>
<td>Critical Thinking (A.2.)</td>
<td>3</td>
</tr>
<tr>
<td>MATH 141</td>
<td>Calculus I</td>
<td>4</td>
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<tr>
<td>MATH 142</td>
<td>Calculus II</td>
<td>4</td>
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<tr>
<td>MATH 143</td>
<td>Calculus III</td>
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<tr>
<td>SPC 201</td>
<td>Public Speaking or SPC 202</td>
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<tr>
<td>Electives</td>
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**Sophomore**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSC 240</td>
<td>Programming Environments I</td>
<td>3</td>
</tr>
<tr>
<td>CSC 245</td>
<td>Discrete Structures</td>
<td>3</td>
</tr>
<tr>
<td>CSC 315</td>
<td>Computer Architecture II</td>
<td>4</td>
</tr>
<tr>
<td>CSC 332</td>
<td>Numerical Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>CSC 345</td>
<td>Data Structures</td>
<td>3</td>
</tr>
<tr>
<td>CSC 346</td>
<td>File Structures</td>
<td>3</td>
</tr>
<tr>
<td>MATH 206</td>
<td>Linear Algebra I</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 215</td>
<td>Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.)</td>
<td>4</td>
</tr>
<tr>
<td>HIST 204</td>
<td>History of American Ideals and Institutions (D.1.)</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 131</td>
<td>General Physics (B.1.a.)</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 132</td>
<td>General Physics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 133</td>
<td>General Physics (B.1.a.)</td>
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<tr>
<td>POLS 210</td>
<td>American and California Government (D.1.)</td>
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<td>Electives</td>
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| Total       |                                                 | 52    |
## Junior

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>CSC 347</td>
<td>Introduction to Database Systems</td>
<td>4</td>
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<tr>
<td>CSC 351</td>
<td>Programming Languages I: Design</td>
<td>3</td>
</tr>
<tr>
<td>CSC 353</td>
<td>Computer Systems Programming</td>
<td>3</td>
</tr>
<tr>
<td>CSC 440</td>
<td>Software Engineering I</td>
<td>3</td>
</tr>
<tr>
<td>CSC 441</td>
<td>Software Engineering II</td>
<td>3</td>
</tr>
<tr>
<td>CSC 445</td>
<td>Theory of Computing I</td>
<td>3</td>
</tr>
<tr>
<td>CSC 453</td>
<td>Introduction to Operating Systems</td>
<td>4</td>
</tr>
<tr>
<td>BIO 220</td>
<td>Physiology and Biological Adaptation (E.2.)</td>
<td>4</td>
</tr>
<tr>
<td>ECON 201/211/222</td>
<td>Modern World History (D.2.)</td>
<td>3</td>
</tr>
<tr>
<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
<td>3</td>
</tr>
<tr>
<td>PHIL 230/231</td>
<td>Philosophical Classics (C.1.)</td>
<td>3</td>
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<tr>
<td>STAT 321, 322</td>
<td>Statistical Analysis (B.2.)</td>
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</table>

1. Critical reading electives (C.1.)

## Senior

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>CSC 404</td>
<td>Computer Networks</td>
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<tr>
<td>CSC 450</td>
<td>Programming Languages II: Description and Analysis</td>
<td>3</td>
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<tr>
<td>CSC 451</td>
<td>Programming Languages III: Compiler Implementation</td>
<td>3</td>
</tr>
<tr>
<td>CSC 461</td>
<td>Senior Project</td>
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<tr>
<td>CSC 462</td>
<td>Senior Project</td>
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<tr>
<td>CSC 463</td>
<td>Undergraduate Seminar</td>
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<tr>
<td>PSY 201/202</td>
<td>General Psychology (E.1.)</td>
<td>3</td>
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<tr>
<td>ANT/BUS/ECON/GEOG/POLS/SOC elective</td>
<td>(D.4.b.)</td>
<td>3</td>
</tr>
</tbody>
</table>

1. Critical reading electives (C.1.)

2. As an alternative to MATH 206, students may select MATH 241 and MATH 242 thereby decreasing free electives by 4 units.

3. Must be selected with the approval of the student's adviser in one field in which computer science is applied.
Nearly all disciplines need to integrate and utilize the capabilities of computers. The computer science minor consists of a core of 13 to 14 units and the choice of a track for specialized study. The core is to provide the common knowledge and skills that all need who wish to advance further in computer science. The track consists of several required courses and one or two restricted electives.

### Required courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>CSC 118 Fundamentals of Computer Science I</td>
<td>4</td>
</tr>
<tr>
<td>CSC 218 Fundamentals of Computer Science II</td>
<td>3</td>
</tr>
<tr>
<td>CSC 345 Data Structures</td>
<td>3</td>
</tr>
<tr>
<td>CSC 215 Computer Architecture I</td>
<td>4</td>
</tr>
<tr>
<td>or</td>
<td></td>
</tr>
<tr>
<td>CSC 240 Programming Environments I</td>
<td>3</td>
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</table>

### Tracks (select one)

<table>
<thead>
<tr>
<th>Track</th>
</tr>
</thead>
<tbody>
<tr>
<td>Database and Application Development</td>
</tr>
<tr>
<td>CSC 347 Database Systems</td>
</tr>
<tr>
<td>CSC 440 Software Engineering</td>
</tr>
<tr>
<td>Upper-division restricted electives</td>
</tr>
<tr>
<td>Computer Architecture</td>
</tr>
<tr>
<td>EL 219 Logic and Switching Circuits</td>
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<tr>
<td>CSC 315 Computer Architecture II</td>
</tr>
<tr>
<td>CSC 316 Computer Architecture III</td>
</tr>
<tr>
<td>Upper-division restricted electives</td>
</tr>
<tr>
<td>Numerical Applications</td>
</tr>
<tr>
<td>CSC 332 Numerical Analysis I</td>
</tr>
<tr>
<td>CSC 333 Numerical Analysis II</td>
</tr>
<tr>
<td>Upper-division restricted electives</td>
</tr>
<tr>
<td>Analysis and Simulation of Systems</td>
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<tr>
<td>CSC 350 Discrete Dynamic Systems</td>
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<tr>
<td>CSC 360 Continuous Dynamic Systems</td>
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<tr>
<td>Upper-division restricted electives</td>
</tr>
<tr>
<td>Artificial Intelligence</td>
</tr>
<tr>
<td>CSC 420 Artificial Intelligence</td>
</tr>
<tr>
<td>CSC 421 Knowledge Based Systems</td>
</tr>
<tr>
<td>Upper-division restricted electives</td>
</tr>
<tr>
<td>Computer Based Training</td>
</tr>
<tr>
<td>CSC 413 Authoring Languages</td>
</tr>
<tr>
<td>CSC 414 Authoring Languages/Systems</td>
</tr>
<tr>
<td>Upper-division restricted electives</td>
</tr>
<tr>
<td>Graphics</td>
</tr>
<tr>
<td>CSC 455 Computer Graphics I</td>
</tr>
<tr>
<td>CSC 456 Computer Graphics II</td>
</tr>
<tr>
<td>Upper-division restricted electives</td>
</tr>
</tbody>
</table>

24-28
MASTER OF SCIENCE IN COMPUTER SCIENCE

The department offers a program leading to a Master of Science in Computer Science with particular emphasis in the following areas: computer systems and software, computer graphics, numerical analysis, computer modeling and simulation, expert systems, information processing and computer architecture. The program is designed for maximum flexibility to allow the student to concentrate in one particular area of study or to blend coursework in several areas. Graduate lectureships for quarter-time teaching assignments are generally available, but are usually awarded to students already in residence. Special features of the program include its emphasis on applications of computers to current industrial problems.

A close association with industry is typified by the practicum, which involves students and their advisers in a problem of interest to a specific industrial organization, and the School of Engineering Student/Faculty Internship Program, which provides for individual contracting of students with a specific company.

All students are required to complete a thesis or a practicum. These are scholarly investigations or projects which culminate students' classroom and laboratory learning. The theses and practica allow students to demonstrate in practice their mastery of the field of computer science.

In addition to the several systems provided by the university's Academic Computing Services, the department has its own Computer Systems Laboratory. The laboratory is supported by industry and has a variety of different computer systems. The largest is the Pyramid 98X which runs UNIX. In addition, the CSL has Sun workstations, Hewlett Packard 6400's, and a Sequent with 10 processors for parallel programming. In addition there are several graphics workstations, terminals, and printers.

Outstanding students who did not major in computer science at the undergraduate level are encouraged to apply for admission and finish the prerequisites for graduate work before beginning the program requirements. The Department strongly encourages women and underrepresented minorities to apply.

Foreign applicants must take the TOEFL exam and the TWE (Test of Written English). For admission as a classified graduate student, an applicant must hold a bachelor's degree in computer science or a closely related technical field with a minimum grade point average of 3.0 in the last 90 quarter units (60 semester units) attempted and must have satisfactory scores on the TOEFL and the TWE. Applicants meeting these standards, but with a bachelor's degree in a field not closely related to computer science, may be admitted as conditionally classified students and must complete all prerequisite coursework before advancement to classified graduate standing. Advancement to Candidacy requires approval of an advisory committee and completion of 12 units of coursework specified in the student's formal program of study with a minimum grade point average of 3.0.

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

CURRICULUM FOR M.S. COMPUTER SCIENCE

Core sequence of required courses: ................................................................. 15
CSC 501 Language and Translators (4)  
CSC 502 Database Systems (4)  
CSC 503 Operating Systems (4)  
CSC 590 Graduate Seminar (3)

Two courses from the following: ........................................................................ 7-8
CSC 504, CSC 505, CSC 506, CSC 507, CSC 517, CSC 570

Thesis, project, or practicum .................................................................................. 6
CSC 599 Thesis/Project (2-3) (2-3) or  
CSC 559, 560 Practicum in Computer Science I, II (1) (5)

Electives to be selected with adviser's approval ....................................................... 17-16

For further information or advisement students should communicate with the Graduate Coordinator of the Computer Science Department.

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Computer Science and other subjects.
The Electronic and Electrical Engineering Department offers two degree programs which are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology: the Bachelor of Science degree in Electronic Engineering and the Bachelor of Science degree in Electrical Engineering. When applying for admission, one of the two majors must be selected. These two majors have identical curricula through the sophomore year with minor differences in the junior year. Consequently, the student may elect a major change from one to the other as late as the junior year.

The main objective of the department is to prepare the student for engineering; i.e., pursuing solutions to urgent problems in reshaping the environment to meet human needs while being responsibly aware of all implications. The curriculum provides a sound theoretical background along with current, practical engineering knowledge. The student begins the major in the first quarter with orientation and generally has one or more major courses each quarter until graduation. The many laboratory courses provide practical experience and lead logically into design which begins in the third year.

Senior students select specialized technical courses which make them more attractive to industry as early contributors. The student wishing to pursue graduate work may select appropriate senior courses in keeping with this goal. In the required senior design project, students demonstrate their understanding of engineering knowledge and their ability to apply that knowledge creatively to practical problems. Learning in the humanities and the social sciences extends over all years, and is assisted by the assignment of a faculty adviser from the School of Liberal Arts.
Students are encouraged to participate in appropriate professional clubs such as: Eta Kappa Nu, Amateur Radio Club, Audio Engineering Society, the Electronic and Electrical Engineering Council, the Student Branch of the Institute of Electrical and Electronics Engineers (IEEE), International Society of Hybrid Microelectronics (ISHM), Society of Photo-Optical Instrumentation Engineers (SPIE), Poly Phase Club, and Power Engineering Society.

**COMPUTER ENGINEERING**

For information regarding the B.S. degree program in Computer Engineering, please see page 260. This program is jointly administered by the Electronic and Electrical Engineering Department and the Computer Science Department.

**BASIC CURRICULUM FOR B.S. ELECTRICAL ENGINEERING AND B.S. ELECTRONIC ENGINEERING**

The first two years of the Electronic Engineering and Electrical Engineering curricula introduce the student to material basic to both of these disciplines.

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

**Freshman**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>EE 110</td>
<td>Orientation</td>
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<tr>
<td>EE 112</td>
<td>Electric Circuit Analysis I</td>
<td>2</td>
</tr>
<tr>
<td>ETMP 157</td>
<td>Electronic Manufacturing</td>
<td>3</td>
</tr>
<tr>
<td>ANT 201/GEOG 150/SOC 105</td>
<td>(D.4.a.)</td>
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</tr>
<tr>
<td>CHEM 124</td>
<td>General Chemistry (B.1.a.)</td>
<td>4</td>
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<tr>
<td>CHEM 125</td>
<td>General Chemistry (B.1.1)</td>
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<tr>
<td>CSC 204</td>
<td>C and UNIX (F.1.)</td>
<td>3</td>
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<tr>
<td>ENGL 114</td>
<td>Writing: Exposition (A.1.)</td>
<td>4</td>
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<tr>
<td>ENGL 125/PHIL 125/SPC 125</td>
<td>Critical Thinking (A.2.)</td>
<td>3</td>
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<tr>
<td>ENGL 215</td>
<td>Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 141</td>
<td>Calculus I (B.2.)</td>
<td>4</td>
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<td>MATH 142</td>
<td>Calculus II (B.2.)</td>
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<tr>
<td>MATH 143</td>
<td>Calculus III (B.2.)</td>
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<tr>
<td>PHYS 131</td>
<td>General Physics (B.1.a.)</td>
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<td>PHYS 133</td>
<td>General Physics (B.1.a.)</td>
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<tr>
<td>SPC 201</td>
<td>Public Speaking or SPC 202 Principles of Speech Communication (A.3)</td>
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**Sophomore**

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>EE 211, EE 241</td>
<td>Electric Circuit Analysis and Laboratory II</td>
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<tr>
<td>EE 212, EE 242</td>
<td>Electric Circuit Analysis and Laboratory III</td>
<td>3,1</td>
</tr>
<tr>
<td>EL 208, EL 248</td>
<td>Electronic Devices and Laboratory</td>
<td>3,1</td>
</tr>
<tr>
<td>EL 219</td>
<td>Logic and Switching Circuits</td>
<td>3</td>
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<tr>
<td>MATH 241</td>
<td>Calculus IV</td>
<td>4</td>
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<tr>
<td>MATH 242</td>
<td>Differential Equations</td>
<td>4</td>
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<tr>
<td>MATH 317</td>
<td>Topics in Engineering Mathematics</td>
<td>4</td>
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<tr>
<td>ME 211</td>
<td>Engineering Statics</td>
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</tr>
<tr>
<td>ME 212</td>
<td>Engineering Dynamics</td>
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<tr>
<td>PHYS 132</td>
<td>General Physics</td>
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<td>PHYS 211</td>
<td>Modern Physics</td>
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<tr>
<td>ECON 201/ECON 211/ECON 222</td>
<td>(D.3.)</td>
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<td>PHIL 230/PHIL 231</td>
<td>Philosophical Classics (C.1.)</td>
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<tr>
<td>PSY 201/PSY 202</td>
<td>General Psychology (E.1.)</td>
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</tbody>
</table>

Electronic and Electrical Engineering  269
CURRICULUM FOR B.S. ELECTRICAL ENGINEERING

Electrical engineering is that branch of engineering which deals with industrial process control systems and with generation, distribution, control and utilization of electric power. The curriculum includes basic circuit, field and device theory accompanied by control systems and power system analysis. The curriculum is responsive to current technical advancements in engineering and science.

Senior elective courses provide specialized preparation in a selected area such as advanced control systems, energy conversion, power system analysis, protection and stability and solid state motor control.

The Electric Power Institute, sponsored by the university and underwritten by major utility companies and electrical equipment manufacturers, offers advanced seminars and lectures in the electrical power field and provides limited student and faculty exchange opportunities.

There are appropriate laboratories equipped to support the program. They provide not only hands-on instrumentation experience, but also design experience.

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

<table>
<thead>
<tr>
<th>Junior</th>
<th></th>
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<tbody>
<tr>
<td>EE 301, EE 341 Linear Systems Analysis and Laboratory</td>
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<tr>
<td>EE 302, EE 342 Linear Control Systems and Laboratory</td>
<td>3,1</td>
<td></td>
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<tr>
<td>EE 303 Power Transmission</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EE 325, EE 365 Energy Conversion Electromagnetics and Laboratory</td>
<td>3,1</td>
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</tr>
<tr>
<td>EL 307, EL 347 Digital Integrated Electronics and Laboratory</td>
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<tr>
<td>EL 308, EL 348 Electronic Circuits and Laboratory</td>
<td>3,1</td>
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<td>EL 309, EL 349 Integrated Electronic Circuits and Laboratory</td>
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<tr>
<td>EL 319 Digital System Design</td>
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<tr>
<td>EL 328 Discrete Time Systems</td>
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<td>EL 334 Electromagnetic Fields I</td>
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<td>EL 359 Digital System Design Laboratory</td>
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<td>MET 306 Materials Engineering</td>
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<tr>
<td>BIO 220 Physiology and Biological Adaptation</td>
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<tr>
<td>HIST 204 History of American Ideals and Institutions</td>
<td>3</td>
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<td>POLS 210 American and California Government</td>
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</table>

1 Fine and performing arts elective (C.2.)               | 3          |

53

<table>
<thead>
<tr>
<th>Senior</th>
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</thead>
<tbody>
<tr>
<td>EE 406 Power System Analysis I</td>
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<tr>
<td>EE 461 Senior Project</td>
<td>3</td>
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<tr>
<td>EE 462 Senior Project</td>
<td>2</td>
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<td>EL 463 Undergraduate Seminar</td>
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<tr>
<td>ME 302 Thermodynamics I</td>
<td>3</td>
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<td>ME 313 Heat Transfer</td>
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</tr>
<tr>
<td>ME 341 Fluid Mechanics</td>
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</tr>
<tr>
<td>HIST 315 Modern World History (D.2.)</td>
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</tr>
<tr>
<td>1 ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.)</td>
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<td></td>
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<tr>
<td>1 Arts and humanities elective (Area C)</td>
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<td></td>
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<tr>
<td>1 Critical reading electives (C.1.)</td>
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<td></td>
</tr>
<tr>
<td>1 Literature, philosophy, arts elective (300–400 level) (C.3.)</td>
<td>3</td>
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</tr>
<tr>
<td>2 Approved technical electives</td>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>

1 To be selected in accordance with the General Education-Breadth requirements, and to be approved by GEB adviser. (Please see page 114 of this catalog.)

2 A minimum of two senior design laboratories with EL or EE prefixes and two design lecture courses in the major is required. To be approved by major adviser.
CURRICULUM FOR B.S. ELECTRONIC ENGINEERING

Electronic engineering is that branch of engineering which deals with the development, design and application of circuits, devices and systems for communication, computers, controls, information processing and display, and system instrumentation. The curriculum includes circuit, field and device theory accompanied by logic and switching circuit design. The program is responsive to current technical advancements in engineering and science.

Senior elective courses provide specialized preparation in a selected area such as active and passive network synthesis, advanced communications systems, computer system design, microelectronic circuit engineering, microprocessor systems applications, microwave engineering, electro-optics, and solid state devices.

There are appropriate laboratories equipped to support the program. They provide not only hands-on instrumentation experience, but also design experience.

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

Junior

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL 307, EL 347 Digital Integrated Electronics and Laboratory</td>
<td>3,1</td>
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<tr>
<td>EL 308, EL 348 Electronic Circuits and Laboratory</td>
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<tr>
<td>EL 309, EL 349 Integrated Electronic Circuits and Laboratory</td>
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<tr>
<td>EL 319 Digital System Design</td>
<td>3</td>
</tr>
<tr>
<td>EL 328 Discrete Time Systems</td>
<td>3</td>
</tr>
<tr>
<td>EL 334 Electromagnetic Fields I</td>
<td>3</td>
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<tr>
<td>EL 339 Digital System Design Laboratory</td>
<td>1</td>
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<tr>
<td>EE 301, EE 341 Linear Systems Analysis and Laboratory</td>
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<tr>
<td>EE 302, EE 342 Linear Control Systems and Laboratory</td>
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<tr>
<td>EE 303, EE 343 Signal Transmission and Laboratory</td>
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<tr>
<td>EE 325, EE 365 Energy Conversion Electromagnetics and Laboratory</td>
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</tr>
<tr>
<td>MET 306 Materials Engineering</td>
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<tr>
<td>BIO 220 Physiology and Biological Adaptation (B1.b., E.2.)</td>
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<td>HIST 204 History of American Ideals and Institutions (D.1.)</td>
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<td>POLS 210 American and California Government (D.1.)</td>
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Senior

<table>
<thead>
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<tr>
<td>EL 401 Electromagnetic Fields II</td>
<td>3</td>
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<tr>
<td>EL 414 Introduction to Communication Systems</td>
<td>3</td>
</tr>
<tr>
<td>EL 461 Senior Project</td>
<td>3</td>
</tr>
<tr>
<td>EL 462 Senior Project</td>
<td>2</td>
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<tr>
<td>EL 463 Undergraduate Seminar</td>
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<tr>
<td>ME 302 Thermodynamics I</td>
<td>3</td>
</tr>
<tr>
<td>ME 313 Heat Transfer</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 412 Solid State Physics for Engineers</td>
<td>3</td>
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<tr>
<td>PHYS 452 Solid State Physics Laboratory for Engineers</td>
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<tr>
<td>HIST 315 Modern World History (D.2.)</td>
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<tr>
<td>ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.)</td>
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<td>Critical reading electives (C.1.)</td>
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<tr>
<td>Literature, philosophy, arts elective (300-400 level) (C.3.)</td>
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<tr>
<td>Approved technical electives</td>
<td>11</td>
</tr>
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</table>

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

1 To be selected in accordance with the General Education-Breadth requirements, and approved by G.E. & B. adviser. (Please see page 114 of this catalog.)

2 A minimum of 2 senior design laboratories with EL or EE prefixes and two design lecture courses in the major is required. To be approved by major adviser.
MASTER OF SCIENCE DEGREE IN ELECTRONIC AND ELECTRICAL ENGINEERING

General Characteristics
The Master of Science program in Electronic and Electrical Engineering has the following objectives:

- Job-entry education for the more complex areas of engineering, such as research and development, innovative design, systems analysis and design, and managerial engineering;
- Updating and upgrading opportunities for practicing engineers;
- Graduate preparation for further study in engineering, leading to the Doctor of Engineering or Ph.D. degree;
- A base which allows graduates to maintain currency in their fields.

Prerequisites
For admission as a classified graduate student, an applicant must hold a bachelor’s degree in engineering or a closely related physical science with a minimum grade point average of 3.0 in the last 90 quarter units (60 semester units) attempted. Applicants for graduate engineering programs are required to submit satisfactory scores for the General (Aptitude) Test of the Graduate Record Examination in engineering. An applicant who meets these standards but lacks prerequisite coursework may be admitted as a conditionally classified student and must make up any deficiencies before advancement to classified graduate standing.

Information pertaining to specific requirements for admission to graduate standing (classified or conditionally classified) may be obtained from the Graduate Coordinator, Electronic and Electrical Engineering Department.

Program of Study
Graduate students must file a formal study plan with their adviser, department, school and university graduate studies office by no later than the end of the quarter in which the 12th unit of approved courses is completed.

The formal program of study must include a minimum of 45 units (at least 24 of which must be at the 500 level) with a specialization in one of the following areas:

- Computer Engineering
- Electrical Engineering
- Electronic Engineering

The broad curriculum requirements for the M.S. in Electronic and Electrical Engineering are:

a) a core of 18 units as required;
b) a minimum of 15 or 16 units in the field of specialization;
c) the remaining units taken from a list of approved electives;
d) at least 24 units of the 45 unit program at the 500 level.

Two program options are available for M.S. in Electronic and Electrical Engineering students: a thesis program which requires coursework, a thesis and oral defense of thesis; or a nonthesis option which involves additional coursework and a comprehensive examination. The nonthesis option is normally allowed only for those students who have completed an undergraduate senior project or have had significant engineering project experience.
CURRICULUM FOR M.S. ELECTRONIC AND ELECTRICAL ENGINEERING, SPECIALIZATION IN COMPUTER ENGINEERING

Units

Core Courses ........................................................................................................................................ 19
EE 525 Stochastic Processes for Engineers (4)
EE 599 Design Project (Thesis) (2) (2) (5) or
9 units of approved technical electives and a comprehensive written examination
Approved courses chosen from MATH, STAT, or CSC (6)

Recommended courses in specialization.......................................................................................... 14
EL 515 Discrete Time Filters (4)
EL 520 Digital Systems Design (3)
EL 521 Computer Systems (4)
EL 522 Microprocessor-Based Digital System Design (4)
EL 526 Digital Communications (4)

Approved technical electives (400-500 level) ............................................................................ 12
45

CURRICULUM FOR M.S. ELECTRONIC AND ELECTRICAL ENGINEERING, SPECIALIZATION IN ELECTRICAL ENGINEERING

Units

Core Courses ........................................................................................................................................ 19
EE 525 Stochastic Processes for Engineers (4)
EE 599 Design Project (Thesis) (2) (2) (5) or
9 units of approved technical electives and comprehensive written examination
Approved courses chosen from MATH, STAT, or CSC (6)

Recommended courses in specialization.......................................................................................... 14
EE 511 Electric Machines Theory (3)
EE 513 Control Systems Theory (4)
EE 518 Advanced Power System Analysis (3)
EE 519 Power System Design (4)
EE 520 Solar-PV System Design (3)

Approved technical electives........................................................................................................... 12
45

CURRICULUM FOR M.S. ELECTRONIC AND ELECTRICAL ENGINEERING, SPECIALIZATION IN ELECTRONIC ENGINEERING

Units

Core Courses ........................................................................................................................................ 19
EE 525 Stochastic Processes for Engineers (4)
EE 599 Design Project (Thesis) (2) (2) (5) or
9 units of approved technical electives and comprehensive written examination
Approved courses chosen from MATH, STAT, or CSC (6)

Recommended courses in specialization.......................................................................................... 14
EL 515 Discrete Time Filters (4)
EL 520 Digital Systems Design (3)
EL 524 Solid State Electronics (3)
EL 526 Digital Communications (4)
EL 528 Digital Image Processing (4)

Approved technical electives (400-500 level) ............................................................................ 12
45
ENGINEERING SCIENCE

An Interdisciplinary Curriculum in Engineering Science and Emerging Technologies

Engineering Bldg. (13), Room 266
(805) 756-2131

Faculty
Coordinator, Daniel W. Walsh

Programs
B.S. Engineering Science

The Bachelor of Science degree in Engineering Science is designed to allow students the latitude in course selection required to educate themselves either in the classical study of engineering science or in new and evolving interdisciplinary technologies. The curriculum builds a sound foundation in the fundamental principles of engineering and engineering systems during the early years of study. During their final quarters of study, students customize their study plan with the help of a faculty adviser and are given the opportunity to focus their education while still at the undergraduate level. A B.S. degree in Engineering Science is, therefore, a direct path to employment in a classic engineering field or in an area of emerging technology. It is also a natural step toward a professional or a graduate degree.

All practitioners of engineering must have an understanding of the physical sciences and mathematics. Further, they must have a firm grasp of engineering sciences. The basic engineering sciences are (1) mechanics of solids and fluids, (2) electrical science, encompassing electric and magnetic fields, and circuits, (3) thermodynamics and statistical mechanics, (4) materials science, (5) information transmission, (6) logic and computing devices, (7) systems analysis, and (8) transfer and rate processes. The engineering science curriculum provides the framework for this matrix of understanding, upon which the practitioner may begin to develop a unique area of expertise.

The curriculum in engineering science emphasizes practical applications as well as principles. The laboratories in many of the courses are constantly evolving, so students benefit from frequent exposure to a variety of state-of-the-art equipment.

Engineering Science is a curriculum for directed, highly motivated students. The technical elective courses should be consistent with a sharply defined career goal. Each student will be required to submit a study plan to the coordinator prior to the end of the first quarter of their junior year. Study plans selected in the past have emphasized engineering physics, biomedical engineering, geological engineering, ocean engineering, and atmospheric science. Plans that are currently popular include biochemical engineering, modeling and simulation, computer integrated manufacturing and engineering for extraterrestrial environments.
GRADUATE PROGRAMS
For information regarding graduate degree programs in engineering, please refer to the following
pages of this catalog:

M.S. Aeronautical Engineering, page 252
M.S. Civil and Environmental Engineering, page 258
M.S. Computer Science, page 267
M.S. Electronic and Electrical Engineering, page 272
  Computer Engineering Specialization
  Electrical Engineering Specialization
  Electronic Engineering Specialization
M.S. Engineering, page 245
  Biochemical Engineering Specialization
  Industrial Engineering Specialization
  Mechanical Engineering Specialization
  Metallurgical and Materials Engineering Specialization
Joint M.B.A./M.S. Engineering with Specialization
  in Engineering Management, page 247

CURRICULUM FOR B.S. ENGINEERING SCIENCE

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

Freshman

EE 112 Electric Circuit Analysis .......................... 2
ETME 141 Applied Descriptive Geometry .............. 2
ETME 240 CAD Project Laboratory .................. 1
BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.) .................. 4
CHEM 124 General Chemistry (B.1.a.) ................. 4
CHEM 125 General Chemistry (B.1.a.) ................. 4
CSC 204 C and UNIX or CSC 251 Digital Computer Applications (F.1.) 2-3
ENGL 114 Writing: Exposition (A.1.) ................. 4
  ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .................. 3
MATH 141 Calculus I (B.2.) .......................... 4
MATH 142 Calculus II (B.2.) .......................... 4
MATH 143 Calculus III (B.2.) .......................... 4
PHYS 131 General Physics (B.1.a.) .................. 4
PHYS 132 General Physics (B.1.a.) .................. 4
SPC 201 Public Speaking or SPC 202 Principles of Speech Communication (A.3.) 3

1 Required and elective courses to complete major 3-2

52

Sophomore

CE 204 Strength of Materials ................................... 3
  CE 205, CE 206 Strength of Materials and Laboratory .... 2,1
EE 211, EE 241 Electric Circuit Analysis and Laboratory II ..... 3,1
MATH 241 Calculus IV ..................................... 4
MATH 242 Differential Equations ....................... 4
  MATH 317 Topics in Engineering Mathematics ............. 4
ME 211 Engineering Statics .................................. 3
ME 212 Engineering Dynamics .............................. 3
PHYS 133 General Physics .................................. 4
  PHYS 210 Introduction to Modern Physics or PHYS 211 Modern Physics 4
ANT 201/GEOG 150/SOC 105 (D.4.a.) ...................... 3
CSC 112 Pascal Programming (F.1.) ..................... 3
ECON 201 Survey of Economics or ECON 211 Principles of Economics (D.3.) 3
ENGL 218 Writing: Argumentation and Reports (A.4.) ........../
HIST 204 History of American Ideals and Institutions (D.1.) ....../
# Engineering Science

## Junior

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
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<tbody>
<tr>
<td>CSC 332</td>
<td>Numerical Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>EL 208, EL 248</td>
<td>Electronic Devices and Laboratory</td>
<td>3,1</td>
</tr>
<tr>
<td>IE 314</td>
<td>Engineering Economics</td>
<td>3</td>
</tr>
<tr>
<td>ME 302</td>
<td>Thermodynamics I</td>
<td>3</td>
</tr>
<tr>
<td>ME 313</td>
<td>Heat Transfer</td>
<td>3</td>
</tr>
<tr>
<td>ME 318</td>
<td>Mechanical Vibrations</td>
<td>4</td>
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<tr>
<td>MET 306, MET 341</td>
<td>Materials Engineering and Laboratory</td>
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<tr>
<td>POLS 210</td>
<td>American and California Government (D.1.)</td>
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<tr>
<td>PSY 201/PSY 202</td>
<td>General Psychology (E.1.)</td>
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<td>Arts and humanities elective (Area C)</td>
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1 Required and elective courses to complete major .......................................................... 14

## Senior

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<th>Course Code</th>
<th>Course Name</th>
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<tbody>
<tr>
<td>MET 301</td>
<td>Physical Properties of Materials</td>
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<td>ME 341</td>
<td>Fluid Mechanics</td>
<td>3</td>
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<tr>
<td></td>
<td>Senior Project</td>
<td>2,2</td>
</tr>
<tr>
<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
<td>3</td>
</tr>
<tr>
<td>PHIL 230/PHIL 231</td>
<td>Philosophical Classics (C.1.)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Fine and performing arts elective (C.2.)</td>
<td>3</td>
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<tr>
<td></td>
<td>Literature, philosophy, arts elective (300-400 level) (C.3.)</td>
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<tr>
<td></td>
<td>Required and elective courses to complete major</td>
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</tbody>
</table>

Electives ........................................................................................................................................ 8

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

1 To be selected in accordance with the General Education-Breadth requirements. (Please see page 114 of this catalog.)

2 Emphasis area elective units must be chosen with the approval of the adviser.

3 To be selected in an appropriate engineering discipline.
ENGINEERING TECHNOLOGY DEPARTMENT

Computer Science Bldg. (14), Room 240
(805) 756-1138

Faculty

Department Head, Paul E. Rainey
Franklin P. Abshire
Kenneth L. Brown
Nan A. Byars
Archie D. Cheda
Neill V. Clark
Mark A. Cooper
Kim Davis
James R. Ehrenberg
Fred S. Friedman
Gary A. Granneman
Michael Hawes
William R. Hodges
Thomas D. Kay
Karl D. Lilje
Charles G. Lomas
Robert L. Rogers
Richard A. Strahl
Omar Zia

Programs

B.S. Engineering Technology with Concentrations in:

Electronic Technology
Manufacturing Processes
Technology
Mechanical Technology
Welding Technology

Engineering technology is that part of the technological field which requires the application of scientific and engineering knowledge and methods combined with technical skills in support of engineering activities; it lies in the occupational spectrum between the engineer and the technician at the end of the spectrum closest to the engineer.

The engineering technologist is somewhat more specialized than the engineer, focusing on a technical field within a traditional discipline. Compared to engineering, there is less breadth and rigor in underlying engineering sciences, mathematics, and basic sciences. There is more study in knowledge and skills related to production, routine design, equipment selection and modification, service, and maintenance. Emphasis is given to application of state-of-the-art technology.

The curriculum begins with a core of courses including mathematics, science, drafting, manufacturing processes, and mechanical, electrical, and materials fundamentals. Each student selects a concentration (listed below) for specialization. Finally, technical electives are selected from four groups, with the adviser’s approval, to permit individual career orientation. All four concentrations are accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology.

The programs are structured to optimize transfer credit from associate engineering technology programs offered by the California community colleges. Many of the students in the Bachelor of Science in Engineering Technology program have transferred from these institutions.

The bachelor of science degree leads to careers in manufacturing, quality assurance, design support, field service, product testing and evaluation, maintenance, technical aspects of marketing, and other areas of technical support of engineering activity.

In several concentrations, some of the courses are offered every other year, and occasionally a course may be cancelled due to low enrollment. Students are encouraged to contact their adviser for course scheduling or possible course substitution.
Deviation Request forms submitted for consideration of substituting courses from other colleges for possible equivalent Cal Poly Engineering Technology courses must be submitted within the first two quarters of being a major in the Engineering Technology Department.

CURRICULAR CONCENTRATIONS

Electronic Technology
Emphasizes application of state-of-the-art technology, both analog and digital, used in computers, controls, communications systems, industrial electronics, and instrumentation. Technical electives provide specialization in such areas as computer technology, communications, audio and video technology, and electro-optics.

Manufacturing Processes Technology
Emphasizes the technologies of manufacturing systems, including computer-aided methods, numerical control, production tooling and material handling, as well as the study of the processes and ancillary support systems of modern manufacturing.

Mechanical Technology
Emphasizes computer-aided methods in support of design of mechanical equipment and systems, fluid power, engines, process control, and product evaluation and modification.

Welding Technology
Emphasizes welding techniques, nondestructive testing, power sources, production equipment and problems, and welding process control in both construction and industrial environments.

CURRICULUM FOR B.S. ENGINEERING TECHNOLOGY

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

Freshman

| ETEL 124 | Introduction to Electronic Circuits | 4 |
| ETEL 125 | Introduction to Electronic Devices | 4 |
| ETME 142 | Engineering Drawing I | 1 |
| ETME 143 | Engineering Drawing II | 1 |
| CHEM 121 | General Chemistry (B.1.a.) | 4 |
| ENGL 114 | Writing: Exposition (A.1.) | 4 |
| ENGL 125/PHIL 125/SPC 125 | Critical Thinking (A.2.) | 3 |
| MATH 120 | Pre-Calculus Algebra and Trigonometry | 5 |
| MATH 131 | Technical Calculus (B.2.) | 4 |
| MATH 132 | Technical Calculus (B.2.) | 4 |
| PHYS 121 | College Physics (B.1.a.) | 4 |
| PHYS 122 | College Physics (B.1.a.) | 4 |
| CSC 110 | Computers and Computer Applications (F.1.) | 3 |
| 1 Engineering drawing electives | | |
| 1 Manufacturing Processes electives | | |

Sophomore

| ETEL 226 | Electrical Practices | 4 |
| ETME 205 | Statics for Engineering Technology | 3 |
| ETME 206 | Dynamics for Engineering Technology | 4 |
| IE 222 | Engineering Analysis | 3 |
| MATH 133 | Technical Calculus | 4 |
| PHYS 123 | College Physics | 4 |
| BIO 220 | Physiology and Biological Adaptation (B.1.b., E.2.) | 4 |
| ENGL 218 | Writing: Argumentation and Reports (A.4.) | 4 |
| PHIL 230/PHIL 231 | Philosophical Classics (C.1.) | 3 |
| SPC 201 | Public Speaking or SPC 202 Principles of Speech Communication (A.3.) | 3 |
| 3 Critical reading elective (C.1.) | | 3 |
| 1 Digital computer programming | | 2 |
| 1 Courses to complete concentration | | 7 |
| 4 ACTG/BUS/MGT/MKTG/IE elective (200-400 level) | | 3 |
### Junior

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Units</th>
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<tbody>
<tr>
<td>ETME 301</td>
<td>Thermodynamics for Engineering Technology</td>
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<tr>
<td>ANT 201/GEOG 150/SOC 105</td>
<td>Principles of Economics (D.4.a.)</td>
<td>3</td>
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<tr>
<td>ECON 201</td>
<td>Survey of Economics or ECON 211</td>
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<tr>
<td>HIST 204</td>
<td>History of American Ideals and Institutions (D.1.)</td>
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<tr>
<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
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<tr>
<td>POLS 210</td>
<td>American and California Government (D.1.)</td>
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<tr>
<td>PSY 201/PSY 202</td>
<td>General Psychology (E.1.)</td>
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<tr>
<td>Approved technical electives</td>
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<tr>
<td>Courses to complete concentration</td>
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### Senior

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<tr>
<td>ET 461</td>
<td>Senior Project</td>
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<td>ET 462</td>
<td>Senior Project</td>
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<tr>
<td>ET 463</td>
<td>Undergraduate Seminar</td>
<td>2</td>
</tr>
<tr>
<td>IE 403</td>
<td>Principles of Engineering Economics</td>
<td>3</td>
</tr>
<tr>
<td>BUS 404</td>
<td>Governmental and Social Influences on Business (D.4.b.)</td>
<td>4</td>
</tr>
<tr>
<td>HUM 402/PHIL 337</td>
<td>Professional Ethics (C.3.)</td>
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<tr>
<td>Fine and performing arts elective (C.2.)</td>
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</tr>
<tr>
<td>Approved technical electives</td>
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<td></td>
</tr>
<tr>
<td>Courses to complete concentration</td>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>

1. To be selected with approval of adviser.
2. 200-level or higher statistics course taught by the Math or Stat Department may be acceptable. Consult with your adviser.
3. To be selected in accordance with the General Education-Breadth and TAC/ABET requirements. Skills courses are not acceptable. (Please see page 114 of this catalog.)
4. Elective is to be selected with the approval of student's adviser. IE courses must be of a management nature.

### Electronic Technology Concentration

(Add courses below to basic curriculum)

#### Sophomore

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Units</th>
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<tbody>
<tr>
<td>ETEL 218</td>
<td>Digital Circuits I</td>
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<tr>
<td>ETEL 231</td>
<td>Passive Network Analysis</td>
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#### Junior

<table>
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<th>Course Code</th>
<th>Course Name</th>
<th>Units</th>
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<tbody>
<tr>
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<td>Electronic Circuits and Devices I, II</td>
<td>4, 4</td>
</tr>
<tr>
<td>ETEL 311</td>
<td>Transmission Lines and Antennas</td>
<td>4</td>
</tr>
<tr>
<td>ETEL 312</td>
<td>Active Linear Circuits</td>
<td>4</td>
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#### Senior

<table>
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<th>Course Code</th>
<th>Course Name</th>
<th>Units</th>
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<tbody>
<tr>
<td>ETEL 334</td>
<td>Digital Circuits II</td>
<td>4</td>
</tr>
<tr>
<td>ETEL 335</td>
<td>Communications I</td>
<td>4</td>
</tr>
<tr>
<td>ETEL 338</td>
<td>Fundamentals of Computer Technology</td>
<td>4</td>
</tr>
<tr>
<td>ETEL 435</td>
<td>Communications II</td>
<td>4</td>
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</tbody>
</table>

39
### Manufacturing Processes Technology Concentration

*(Add courses below to basic curriculum)*

**Sophomore**
- ETMP 244, ETMP 245 Machining Technology I, II ............................................... 3,3

**Junior**
- ETME 320 Mechanisms ......................................................................................... 3
- ETME 344 Design Systems and Practices .............................................................. 2
- ETMP 246 Machining Technology III ................................................................. 2
- ETMP 321, ETMP 322 Tool Design I, II ............................................................. 3,3
- IE 214 Production Control .................................................................................... 2
- IE 233 Computer Aided Manufacturing ............................................................... 2

**Senior**
- ETMP 336 Numerical Control Programming ...................................................... 3
- ETMP 337 Computer Aided Manufacturing Technology ....................................... 3
- ETMP 434, ETMP 435 Advanced Manufacturing Technology I, II ...................... 3,3
- Approved upper-division manufacturing elective ................................................. 4

### Mechanical Technology Concentration

*(Add courses below to basic curriculum)*

**Sophomore**
- ETAC 322 Mechanical Equipment of Buildings .................................................. 3
- ETME 335 Selection of Engineering Materials .................................................... 2
- IT 302 Plastic Design ............................................................................................. 2

**Junior**
- ETME 320 Mechanisms ......................................................................................... 3
- ETME 333 Industrial Hydraulics and Pneumatics .................................................. 4
- ETME 337 Instrumentation of Mechanical Systems ............................................. 3
- ETME 338 Industrial Engines ................................................................................ 4
- ETME 344 Design Systems and Practices ............................................................. 2

**Senior**
- ETME 421, ETME 422 Applied Machine Design I, II ........................................... 4,4
- ETME 437 Applied Fluid Power Systems ............................................................. 4
- ETME 443 Mechanical Systems ............................................................................ 4

### Welding Technology Concentration

*(Add courses below to basic curriculum)*

**Sophomore**
- ETWT 359 Gas Shielded Arc Welding ................................................................ 2
- CHEM 122 General Chemistry ............................................................................. 4

**Junior**
- ETWT 324 High Energy—Non Conventional Welding Processes ....................... 4
- ETWT 325 Metallurgy and Mechanical Testing of Carbon Steel Welds .............. 4
- ETWT 326 Weldability of Low Alloy Steels-Structural Welding Code .................. 4
- ETWT 335 Nondestructive Evaluation .................................................................. 3
- ETWT 337 Nondestructive Testing of Weldments ................................................ 2

**Senior**
- ETWT 336 Welding Power Sources ...................................................................... 3
- ETWT 434 Weldability of Stainless Steels and Nickel Alloys .................................. 4
- ETWT 435 Weldability of Nonferrous Alloys .......................................................... 4
- ETWT 436 Performance of Welded and Brazed Joints ........................................... 4
- Approved upper-division welding elective ............................................................ 1

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**Total Credits:**
- Manufacturing Processes Technology Concentration: 39
- Mechanical Technology Concentration: 39
- Welding Technology Concentration: 39
INDUSTRIAL ENGINEERING DEPARTMENT

Graphic Arts Bldg. (26), Room 100
(805) 756-2341

Faculty
Department Chair, Unny Menon
K. N. Balasubramanian
J. Kent Butler
Janice C. Chang
Anthony K. Mason
Henry L. Pfister
A. Reza Pouraghabagher
Ahmad K. Seifoddini
Donald E. White
Tao H. Yang

Programs

B.S. Industrial Engineering

Minor: Integrative Technology

Industrial Engineering is the profession concerned with solving engineering and management problems by applying scientific logic and by utilizing information, energy, materials, facilities, and personnel most effectively. Its objective is to improve quality and efficient production of goods and services and to act as the interface between technology and the human factor. Engineering methods and practical knowledge are used in formulating decision models for optimum application of engineering and management principles.

Industrial engineering graduates can choose from a most challenging range of career activities: operations research and analysis, production planning and scheduling, plant design, management, human factors engineering design, data processing and analysis, measurement, quality control and reliability assurance, technical economic planning, resource conservation, productivity measurement, increasing productivity using computer integrated manufacturing techniques, robotics, and, in general, systems analysis and design. The physical, engineering, and social sciences form the broad base for these endeavors.

The curriculum leading to the Bachelor of Science in Industrial Engineering degree, accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, is oriented to provide graduates with the capability of producing results with a minimum of additional training. Graduates also are well prepared for successful postgraduate study. Health care industries, banks, retail chains, farms, airlines, mines, computer firms, as well as government and traditional manufacturing industries, employ graduates of this discipline. There are active student chapters of the Institute of Industrial Engineers; Alpha Pi Mu, the national honorary society for industrial engineers; Omega Rho, the national honor society for operations research; and APICS, the American Production and Inventory Control Society.

Department and university laboratories and equipment, including computers and programmable processors, are integrated into coursework from matriculation until graduation to investigate, test, and apply theoretical principles learned in the classroom.

Integrative Technology Minor

The Integrative Technology minor is an interdisciplinary program jointly sponsored by Industrial Engineering, Industrial Technology and Psychology and Human Development departments. The minor is for non-engineering students who wish to pursue their professional career in a corporate
setting and want to learn more about the impact of technology. The minor will acquaint students with how factories operate and how technology is integrated into corporate operations. For more information, see page 336.

GRADUATE PROGRAMS
For information regarding graduate degree programs in engineering, please refer to the following pages of this catalog:

- M.S. Aeronautical Engineering, page 252
- M.S. Civil and Environmental Engineering, page 258
- M.S. Computer Science, page 267
- M.S. Electronic and Electrical Engineering, page 272
- Computer Engineering Specialization
- Electrical Engineering Specialization
- Electronic Engineering Specialization
- M.S. Engineering, page 245
- Biochemical Engineering Specialization
- Industrial Engineering Specialization
- Mechanical Engineering Specialization
- Metallurgical and Materials Engineering Specialization
- Joint M.B.A./M.S. Engineering with Specialization in Engineering Management, page 247

CURRICULUM FOR B.S. INDUSTRIAL ENGINEERING
Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

Freshman

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>IE 101</td>
<td>Introduction to Industrial Engineering</td>
<td>2</td>
</tr>
<tr>
<td>IE 121</td>
<td>Industrial Systems Analysis</td>
<td>2</td>
</tr>
<tr>
<td>IE 131</td>
<td>Work Design and Measurement</td>
<td>3</td>
</tr>
<tr>
<td>IE 141</td>
<td>Manufacturing Processes</td>
<td>1</td>
</tr>
<tr>
<td>ETME 142</td>
<td>Engineering Drawing I</td>
<td>1</td>
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<tr>
<td>ETME 143</td>
<td>Engineering Drawing II</td>
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<tr>
<td>ETMP 144</td>
<td>Manufacturing Processes</td>
<td>2</td>
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<tr>
<td>ANT 201/GEOG 150/SOC 105</td>
<td>(D.4.a.)</td>
<td>3</td>
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<tr>
<td>BIO 220</td>
<td>Physiology and Biological Adaptation</td>
<td>4</td>
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<tr>
<td>CHEM 124</td>
<td>General Chemistry</td>
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<td>ENGL 114</td>
<td>Writing: Exposition</td>
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<td>ENGL 125/PHIL 125/SPC 125</td>
<td>Critical Thinking</td>
<td>3</td>
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<tr>
<td>ENGL 218</td>
<td>Writing: Argumentation and Reports</td>
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<td>MATH 141</td>
<td>Calculus I</td>
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<tr>
<td>MATH 142</td>
<td>Calculus II</td>
<td>4</td>
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<td>MATH 143</td>
<td>Calculus III</td>
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<tr>
<td>PSY 201/PSY 202</td>
<td>General Psychology</td>
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Sophomore

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<tbody>
<tr>
<td>IE 233</td>
<td>Computer-Aided Manufacturing</td>
<td>2</td>
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<tr>
<td>IE 234</td>
<td>Robotic Assembly</td>
<td>2</td>
</tr>
<tr>
<td>IE 239</td>
<td>Industrial Costs and Controls</td>
<td>3</td>
</tr>
<tr>
<td>IE 251</td>
<td>Manufacturing Engineering</td>
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</tr>
<tr>
<td>IE 314</td>
<td>Engineering Economics</td>
<td>3</td>
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<tr>
<td>ETMP 145</td>
<td>Manufacturing Processes: Machining II* or IT 141</td>
<td>1</td>
</tr>
<tr>
<td>MATH 241</td>
<td>Calculus IV</td>
<td>4</td>
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<tr>
<td>MATH 242</td>
<td>Differential Equations</td>
<td>4</td>
</tr>
<tr>
<td>ME 211</td>
<td>Engineering Statics</td>
<td>3</td>
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</table>
CSC 251 Digital Computer Applications (F.1.) .................................................. 2
ECON 201/ECON 211/ECON 222 (D.3.) ............................................................ 3
HIST 204 History of American Ideas and Institutions (D.1.) .......................... 3
PHYS 131 General Physics (B.1.a.) ................................................................. 4
PHYS 132 General Physics (B.1.a.) ................................................................. 4
PHYS 133 General Physics (B.1.a.) ................................................................. 4
POLS 210 American and California Government (D.1.) .................................. 3
SPC 201 Public Speaking or SPC 202 Principles of Speech Communication (A.3.) 3

Junior

IE 304 Operations Research I ........................................................................ 3
IE 305 Operations Research II ....................................................................... 4
IE 312 Data Management and System Design .............................................. 3
IE 316 Manufacturing Automation ............................................................... 3
IE 319 Human Factors Engineering .............................................................. 3
IE 334 CAD/CAM ..................................................................................... 3
IE 407 Algorithmic Systems Analysis ......................................................... 4
IE 420 Simulation Design and Analysis ....................................................... 4
IE 426 Engineering Test Design and Analysis .............................................. 4
CE 204 Strength of Materials or ME 341 Fluid Mechanics ......................... 3
EE 311, EE 351 Electric Circuits Theory and Laboratory ...................... 3, 1
ME 212 Engineering Dynamics ................................................................... 3
ME 302 Thermodynamics or MET 306 Materials Engineering ................. 3
STAT 321 Statistical Analysis (B.2.) ............................................................. 3

1 Critical reading elective (C.1.) ................................................................. 6

Senior

IE 410 Inventory Control Systems ............................................................... 4
IE 411 Production Systems Analysis ............................................................ 3
IE 430 Quality Assurance ........................................................................... 4
IE 441, IE 442 Fundamentals of Supervision ............................................ 2, 1
IE 443 Facilities Planning and Design ........................................................... 4
IE 461 Senior Project .................................................................................. 2
IE 462 Senior Project .................................................................................. 3
IE 463 Undergraduate Seminar ................................................................... 2
EL 321 Electronics ...................................................................................... 3
HIST 315 Modern World History (D.2.) ...................................................... 3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) ........................................ 3
1 ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) ............................ 3
1 Arts and humanities elective (Area C) ...................................................... 3
1 Fine and performing arts elective (C.2.) .................................................. 3
1 Literature, philosophy, arts elective (300–400 level) (C.3.) ....................... 3
2 Technical elective .................................................................................... 6

1 To be selected in accordance with the General Education-Breadth and A.B.E.T. requirements. (Please see page 114 of this catalog.)
2 Choose from the following: IE 303, IE 409, IE 416, IE 421, IE 433, IE 435, IE 437, PSY 494 or current listing.

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

Engineering Bldg. (13), Room 252
(805) 756-1334

Faculty

Department Head, Ronald L. Mussulman

James G. Andresen
Edward H. Baker
Ernest W. Blattner
Thomas W. Carpenter
Donald R. Chivens
William E. Clark
Otto C. Davidson
Edward R. Garner
Harold E. Gascoigne
Raymond G. Gordon
Michael A. Iannce
Mark S. Johnson
James G. LoCascio
Fredrick B. Malmborg
James M. Meagher
Amrollah Mehdizadeh
Safwat M. A. Moustafa
Ronald S. Mullisen
Lawrence H. Nelson
Saeed Niku
Philip W. B. Niles
William B. Patterson
Ramesh T. Shah
Jack D. Wilson
Yuen Cjen Yong

Programs

B.S. Mechanical Engineering with Concentrations in:

General Mechanical Engineering
Petroleum

Heating, Ventilating, Air Conditioning, and Solar

The Bachelor of Science degree in Mechanical Engineering concerns itself primarily with the design, construction, and use of a wide variety of equipment ranging from manufacturing machinery and power generation equipment to consumer goods. Of primary concern to the mechanical engineer is the proper application of solid mechanics, fluid mechanics, and thermodynamics in the design, manufacturing, and use of this equipment.

Graduates obtain employment primarily with manufacturers, contractors, public utilities, and governmental agencies. Types of work performed by graduates include design, engineering sales, engineering testing, engineering management, supervision of manufacturing and construction.

The curriculum gives the student a thorough grounding in mechanical engineering and a choice of a curricular concentration in heating, ventilating, air conditioning and solar engineering (HVAC/solar) or petroleum engineering or in general mechanical engineering. Engineering courses are found in all years. In the junior and senior years, the professional specialities include such courses as turbomachinery, robotics, mechanical design, heat and mass transfer, mechanical control systems, and solar systems. The curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

Laboratories are an important part of the student's education. The student is enrolled in engineering laboratories from the beginning of the freshman year until graduation. These laboratories include work in power generation, fluid flow, heat transfer, vibration, strength of materials, electronics, and others.

There are five organized student clubs associated with Mechanical Engineering: student branches of the American Society of Mechanical Engineers, the Society of Petroleum Engineers, the Society of Automotive Engineers, and the American Society of Heating, Refrigerating and Air Conditioning Engineers, and the Alternative Energy Club. These clubs offer students an active program of professional and social activity.
CURRICULAR CONCENTRATIONS

General Mechanical Engineering
This is a broad program of study which allows the student some opportunity to pursue his or her particular interest. Four courses in this concentration are specified, and three courses may be chosen (with adviser approval) from approximately thirty advanced courses. These courses cover the wide range of faculty interests and expertise.

Heating, Ventilating, Air Conditioning, and Solar
This concentration prepares students to enter those phases of engineering dealing with thermal and solar systems and their control. These applications include: heating, ventilating and air conditioning of buildings; energy conservation and management; active and passive solar heating; and cooling and industrial refrigeration.

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

GRADUATE PROGRAMS
For information regarding graduate degree programs in engineering, please refer to the following pages of this catalog:

- M.S. Aeronautical Engineering, page 252
- M.S. Civil and Environmental Engineering, page 258
- M.S. Computer Science, page 267
- M.S. Electronic and Electrical Engineering, page 272
  - Computer Engineering Specialization
  - Electrical Engineering Specialization
  - Electronic Engineering Specialization
- M.S. Engineering, page 245
  - Biochemical Engineering Specialization
  - Industrial Engineering Specialization
  - Mechanical Engineering Specialization
  - Metallurgical and Materials Engineering Specialization
- Joint M.B.A./M.S. Engineering with Specialization in Engineering Management, page 247

CURRICULUM FOR B.S. MECHANICAL ENGINEERING

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

Freshman
- ME 134 Mechanical Systems ................................................................................................................................................................. 3
- ETME 141 Applied Descriptive Geometry ........................................................................................................................................... 2
- ETME 142 Engineering Drawing I ............................................................................................................................................................. 1
- ETME 143 Engineering Drawing II .......................................................................................................................................................... 1
- ETMP 144 Manufacturing Processes: Machining I .............................................................................................................................. 2
- ETWT 144 Manufacturing Processes: Welding .................................................................................................................................... 2
- ANT 201/GEOG 150/SOC 105 (D.4.a.) ....................................................................................................................................................... 3
- CHEM 124 General Chemistry (B.1.a.) ........................................................................................................................................... 4
- CHEM 125 General Chemistry .............................................................................................................................................................. 4
- ENGL 114 Writing: Exposition (A.1.) ..................................................................................................................................................... 4
- ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) ......................................................................................................................... 3
- HIST 204 History of American Ideas and Institutions (D.1.) ........................................................................................................... 3
- MATH 141 Calculus I (B.2.) .............................................................................................................................................................. 4
- MATH 142 Calculus II .............................................................................................................................................................. 4
- MATH 143 Calculus III .............................................................................................................................................................. 4
- PHYS 131 General Physics (B.1.a.) .................................................................................................................................................... 4
- PHYS 132 General Physics .............................................................................................................................................................. 4
- Manufacturing Processes elective ....................................................................................................................................................... 1

Total: 53 credits
## Sophomore

<table>
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<th>Course Code</th>
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<tr>
<td>ME 211</td>
<td>Engineering Statics</td>
<td>3</td>
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<tr>
<td>ME 212</td>
<td>Engineering Dynamics</td>
<td>3</td>
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<tr>
<td>ME 236</td>
<td>Thermal Systems</td>
<td>3</td>
</tr>
<tr>
<td>CE 204</td>
<td>Strength of Materials</td>
<td>3</td>
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<tr>
<td>CE 205, CE 206</td>
<td>Strength of Materials and Laboratory</td>
<td>2,1</td>
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<tr>
<td>MET 306, MET 341</td>
<td>Materials Engineering and Laboratory</td>
<td>3,1</td>
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<tr>
<td>PHYS 133</td>
<td>General Physics</td>
<td>4</td>
</tr>
<tr>
<td>CSC 251</td>
<td>Digital Computer Applications (F.I.)</td>
<td>2</td>
</tr>
<tr>
<td>ECON 201</td>
<td>Survey of Economics (D.3.)</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 218</td>
<td>Writing: Argumentation and Reports (A.4.)</td>
<td>4</td>
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<tr>
<td>MATH 241</td>
<td>Calculus IV</td>
<td>4</td>
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<tr>
<td>MATH 242</td>
<td>Differential Equations</td>
<td>4</td>
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<tr>
<td>MATH 318</td>
<td>Advanced Engineering Mathematics (B.2.)</td>
<td>4</td>
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<tr>
<td>POLS 210</td>
<td>American and California Government (D.1.)</td>
<td>3</td>
</tr>
<tr>
<td>PSY 201/PSY 202</td>
<td>General Psychology (El.)</td>
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<tr>
<td>SPC 201</td>
<td>Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
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## Junior

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<tr>
<td>ME 302</td>
<td>Thermodynamics I</td>
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<td>ME 303</td>
<td>Thermodynamics II</td>
<td>3</td>
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<tr>
<td>ME 313</td>
<td>Heat Transfer</td>
<td>3</td>
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<tr>
<td>ME 318</td>
<td>Mechanical Vibrations</td>
<td>4</td>
</tr>
<tr>
<td>ME 326</td>
<td>Intermediate Dynamics</td>
<td>4</td>
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<tr>
<td>ME 328</td>
<td>Introduction to Design</td>
<td>4</td>
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<tr>
<td>ME 341</td>
<td>Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>ME 342</td>
<td>Fluid Mechanics</td>
<td>4</td>
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<tr>
<td>ME 343</td>
<td>Thermal Science Laboratory</td>
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<tr>
<td>ME 345</td>
<td>Fluid Mechanics Laboratory</td>
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<tr>
<td>EE 311, EE 351</td>
<td>Electric Circuit Theory and Laboratory</td>
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<tr>
<td>EL 321, EL 361</td>
<td>Electronics and Laboratory</td>
<td>3,1</td>
</tr>
<tr>
<td>BIO 220</td>
<td>Physiology and Biological Adaptation (B.1.b., E.2.)</td>
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<tr>
<td>HIST 315</td>
<td>Modern World History</td>
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1. Critical reading elective (C.1.) 3

Required and elective courses to complete concentration 4

## Senior

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>ME 422</td>
<td>Mechanical Control Systems</td>
<td>4</td>
</tr>
<tr>
<td>ME 461</td>
<td>Senior Project</td>
<td>2</td>
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<tr>
<td>ME 462</td>
<td>Senior Project</td>
<td>3</td>
</tr>
<tr>
<td>ME 463</td>
<td>Undergraduate Seminar</td>
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<tr>
<td>PHIL 230/PHIL 231</td>
<td>Philosophical Classics (C.1.)</td>
<td>3</td>
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<td>2. ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.)</td>
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<td>2. Fine and performing arts elective (C.2.)</td>
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<td>2. Literature, philosophy, arts elective (300-400 level) (C.3.)</td>
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Required and elective courses to complete concentration 24

## Notes

1. Choose one unit from IT 141, IE 141 or IT 327.
2. To be selected in accordance with General Education-Breadth and A.B.E.T. requirements. (Please see page 114 of this catalog.)

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

(Add Courses Below to Basic Curriculum)

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<tr>
<td>ME 329 Intermediate Design</td>
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<tr>
<td>ME 428 Design</td>
<td>4</td>
</tr>
<tr>
<td>ME 440 Thermal System Design</td>
<td>4</td>
</tr>
<tr>
<td>EE 325 Energy Conversion Electromagnetics</td>
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<td>EE 365 Energy Conversion Laboratory</td>
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<tr>
<td>Adviser approved electives</td>
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## Heating, Ventilating, Air Conditioning, and Solar Concentration

(Add Courses Below to Basic Curriculum)

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ME 350 Thermal Environmental Engineering</td>
<td>4</td>
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<tr>
<td>ME 351 Active Solar System Analysis and Design</td>
<td>4</td>
</tr>
<tr>
<td>ME 451 Passive Solar System Analysis and Design</td>
<td>3</td>
</tr>
<tr>
<td>ME 452 Solar Engineering Design</td>
<td>2</td>
</tr>
<tr>
<td>ME 455 Thermal Environmental Experimentation</td>
<td>2</td>
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<tr>
<td>ME 456, ME 457, ME 458 HVAC System Design</td>
<td>3,3,3</td>
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<tr>
<td>ME 459 Advanced Thermal Environmental Engineering Design</td>
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## Petroleum Concentration

(Add Courses Below to Basic Curriculum)

<table>
<thead>
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<th>Course</th>
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<tbody>
<tr>
<td>ME 329 Intermediate Design</td>
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<tr>
<td>ME 424 Design of Piping Systems</td>
<td>4</td>
</tr>
<tr>
<td>ME 432 Petroleum Reservoir Engineering</td>
<td>4</td>
</tr>
<tr>
<td>ME 434 Enhanced Oil Recovery</td>
<td>4</td>
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<tr>
<td>ME 435 Drilling Engineering</td>
<td>4</td>
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<td>ME 436 Petroleum Production Surface Operations</td>
<td>4</td>
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<tr>
<td>ME 440 Thermal Systems Design</td>
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</tbody>
</table>

28
MATERIALS ENGINEERING DEPARTMENT

Air Conditioning Engineering Bldg. (12), Room 107-C
(805) 756-2568

Faculty

Department Head, Robert H. Heidersbach, Jr.

William D. Forgeng  George T. Murray  Daniel W. Walsh

Robert B. Leonesio

Programs

B.S. Metallurgical and Materials Engineering

Materials engineers deal with materials spanning the spectrum from steels for large bridges, buildings, pipelines and similar structures to the ultralight, high-strength materials used in modern aerospace applications. Increasing numbers of materials engineers find employment in research related to ultrapure electronic materials and components. Materials engineers are heavily involved in the advances being made with high-temperature, superconducting ceramics.

Because virtually all engineering designs are limited by the availability and cost of materials, materials engineers work closely with all other engineering disciplines. They use knowledge of science, engineering, and state-of-the-art analytical instruments to make recommendations on virtually all major engineering designs. The ability to communicate with a wide variety of people with differing backgrounds is very important to the successful practice of materials engineering.

Metallurgical and materials engineers find employment in many industries offering a number of challenging career opportunities. Many graduates are employed in the aerospace, electronic, chemical and petroleum industries. Some work as consultants for large or small organizations. Others become executives in industries ranging from defense contracting to biomedical-device manufacturing. A significant number of materials engineers are involved in research; many technological advances are limited by materials, and new materials are needed for virtually all evolving technologies.

The curriculum in metallurgical and materials engineering emphasizes practical applications as well as principles. The laboratories are constantly evolving, and our students benefit from frequent exposure to a wide variety of materials testing and analysis equipment. The curriculum is accredited by the Accreditation Board for Engineering and Technology. Our students have a reputation for being immediately productive in industry, and they are also actively sought by graduate programs throughout the country.

Metallurgical and materials engineering students participate in a variety of professional societies on campus. They are especially active in the Student Chapters of Society for the Advancement of Material and Process Engineering and ASM International (formerly American Society for Metals).

GRADUATE PROGRAMS

For information regarding graduate degree programs in engineering, please refer to the following pages of this catalog:

M.S. Aeronautical Engineering, page 252
M.S. Civil and Environmental Engineering, page 258
CURRICULUM FOR B.S. METALLURGICAL AND MATERIALS ENGINEERING

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

**Freshman**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MET 121 Introduction to Materials Engineering</td>
<td>1</td>
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<tr>
<td>MET 122 Introduction to Materials Engineering Analysis</td>
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<tr>
<td>ETME 142 Engineering Drawing I</td>
<td>1</td>
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<tr>
<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
<td>3</td>
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<tr>
<td>CHEM 124 General Chemistry (B.1.a.)</td>
<td>4</td>
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<tr>
<td>CHEM 125 General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>MATH 141 Calculus I (B.2.)</td>
<td>4</td>
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<tr>
<td>MATH 142 Calculus II (B.2.)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 143 Calculus III</td>
<td>4</td>
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<tr>
<td>ENGL 114 Writing: Exposition (A.1.)</td>
<td>4</td>
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<tr>
<td>ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.)</td>
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<tr>
<td>HIST 204 History of American Ideals and Institutions (D.1.)</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 131 General Physics (B.1.a.)</td>
<td>4</td>
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<tr>
<td>POLS 210 American and California Government (D.1.)</td>
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<td>PSY 201/PSY 202 General Psychology (E.1.)</td>
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<tr>
<td>Fine and performing arts elective (C.2.)</td>
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**Sophomore**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>MET 222 Ferrous Metals</td>
<td>4</td>
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<tr>
<td>MET 223 Nonferrous Metals</td>
<td>3</td>
</tr>
<tr>
<td>MET 224 Metallography</td>
<td>2</td>
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<tr>
<td>MET 225 Metallography</td>
<td>2</td>
</tr>
<tr>
<td>MET 306, MET 341 Materials Engineering and Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>CE 204 Strength of Materials</td>
<td>3</td>
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<tr>
<td>MATH 241 Calculus IV</td>
<td>4</td>
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<tr>
<td>MATH 242 Differential Equations</td>
<td>4</td>
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<tr>
<td>ME 211 Engineering Statics</td>
<td>3</td>
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<td>ME 212 Engineering Dynamics</td>
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<tr>
<td>PHYS 132 General Physics</td>
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<tr>
<td>PHYS 133 General Physics</td>
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<tr>
<td>BIOL 220 Physiology and Biological Adaptation (B.1.b., E.2.)</td>
<td>4</td>
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<tr>
<td>CSC 251 Digital Computer Applications (F.1.)</td>
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<tr>
<td>ENGL 215 Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.)</td>
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<tr>
<td>SPC 201 Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
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<td>Courses</td>
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<tr>
<td>----------------</td>
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<tr>
<td><strong>Junior</strong></td>
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<tr>
<td></td>
<td>MET 301 Physical Properties of Materials</td>
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<tr>
<td></td>
<td>MET 302 Mechanical Metallurgy</td>
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<td>MET 303 Mechanical Metallurgy</td>
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<td>MET 324 Materials Inspection</td>
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<td>MET 326 Failure Analysis</td>
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<td></td>
<td>MET 302 Mechanical Metallurgy</td>
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<tr>
<td></td>
<td>MET 303 Mechanical Metallurgy</td>
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<tr>
<td></td>
<td>MET 324 Materials Inspection</td>
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<td></td>
<td>MET 326 Failure Analysis</td>
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<td></td>
<td>CE 205, CE 206 Strength of Materials and Laboratory</td>
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<td>EE 311, EE 351 Electric Circuits Theory and Laboratory</td>
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<td>IE 314 Engineering Economics</td>
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<td>ME 313 Heat Transfer</td>
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<td>CHEM 305 Physical Chemistry (B.1.a.)</td>
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<td></td>
<td>CHEM 306 Physical Chemistry (B.1.a.)</td>
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<td></td>
<td>HIST 315 Modern World History (D.2.)</td>
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<td></td>
<td>Critical reading electives (C.1.)</td>
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<td></td>
<td>Literature, philosophy, arts elective (300-400 level) (C.3.)</td>
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<td>Mathematics elective</td>
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<tr>
<td><strong>Senior</strong></td>
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<tr>
<td></td>
<td>MET 421 Materials Thermodynamics I</td>
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<td></td>
<td>MET 422 Materials Thermodynamics II</td>
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<td></td>
<td>MET 423 Rate Processes</td>
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<td>MET 424 Ceramic Materials</td>
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<td>MET 425 Corrosion Engineering</td>
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<td></td>
<td>MET 426 Fracture of Materials</td>
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<td></td>
<td>MET 427 Polymers and Composites</td>
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<td></td>
<td>MET 441 Advanced Materials Laboratory I</td>
</tr>
<tr>
<td></td>
<td>MET 442 Advanced Materials Laboratory II</td>
</tr>
<tr>
<td></td>
<td>MET 443 Advanced Materials Laboratory III</td>
</tr>
<tr>
<td></td>
<td>MET 434 Welding Engineering I</td>
</tr>
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<td></td>
<td>MET 461 Senior Project</td>
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<td></td>
<td>MET 462 Senior Project</td>
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<tr>
<td></td>
<td>MET 463 Undergraduate Seminar</td>
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<td>ECON 201/ECON 211/ECON 222 (D.3.)</td>
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<td>PHIL 230/PHIL 231 Philosophical Classics (C.1.)</td>
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<td></td>
<td>ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.)</td>
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<td>Arts and humanities elective (Area C)</td>
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<td>Electives</td>
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</table>

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

1. ETME 141 or ETME 143 or other drafting course may be substituted.
2. To be selected in accordance with the General Education-Breadth and EAC-ABET requirements. (Please see page 114 of this catalog.)
3. Select a total of 4 units from the following: ETWT 144, ETMP 144, IT 302, IT 141, IE 141.
4. To be taken concurrently.
5. May substitute CSC 112, CSC 118, CSC 204.
6. IE 426 may be substituted.
7. Any 300-level or higher MATH, STAT, or CSC course in linear algebra, advanced calculus, or statistics.
# School of Liberal Arts

## DEGREE PROGRAMS

<table>
<thead>
<tr>
<th>Degree</th>
<th>Concentration(s)</th>
<th>Page</th>
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<tbody>
<tr>
<td>B.S.</td>
<td>Applied Art and Design</td>
<td>296</td>
</tr>
<tr>
<td></td>
<td>Graphic Design Concentration</td>
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<tr>
<td></td>
<td>Photography Concentration</td>
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<tr>
<td>B.A.</td>
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<tr>
<td>B.A.</td>
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<td>B.S.</td>
<td>Journalism</td>
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<td>Agricultural Journalism Concentration</td>
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<td>Broadcast Journalism Concentration</td>
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<td>News-Editoral Concentration</td>
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<td>Public Relations Concentration</td>
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<td>B.A.</td>
<td>Political Science</td>
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<td>International Affairs Concentration</td>
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<td>Pre-Law Concentration</td>
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<td>Public Administration Concentration</td>
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<td></td>
<td>Teaching Concentration</td>
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<tr>
<td></td>
<td>Urban Studies Concentration</td>
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<tr>
<td>B.S.</td>
<td>Social Sciences</td>
<td>322</td>
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<tr>
<td></td>
<td>Criminal Justice Concentration</td>
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<td></td>
<td>Cross-Cultural Studies Concentration</td>
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<td></td>
<td>Organizations Concentration</td>
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<td></td>
<td>Social Sciences (Teaching) Concentration</td>
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<td></td>
<td>Social Services Concentration</td>
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<td>B.A.</td>
<td>Speech Communication</td>
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<td>M.A.</td>
<td>English</td>
<td>305</td>
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## MINORS

<table>
<thead>
<tr>
<th>Minor</th>
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<tbody>
<tr>
<td>Anthropology-Geography</td>
<td>326</td>
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<tr>
<td>Art</td>
<td>300</td>
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<tr>
<td>Dance</td>
<td>331</td>
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<td>English</td>
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<td>French</td>
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<td>German</td>
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<td>History</td>
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<tr>
<td>International Relations</td>
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<td>Linguistics</td>
<td>303</td>
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<tr>
<td>Music</td>
<td>315</td>
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<tr>
<td>Philosophy</td>
<td>316</td>
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<tr>
<td>Public Administration</td>
<td>320</td>
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<tr>
<td>Spanish</td>
<td>307</td>
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<tr>
<td>Speech Communication</td>
<td>329</td>
</tr>
<tr>
<td>Theatre</td>
<td>331</td>
</tr>
<tr>
<td>Women's Studies</td>
<td>295</td>
</tr>
</tbody>
</table>
The School of Liberal Arts provides a record of imaginative, and reflective human experience. The school seeks to relate itself to the technological disciplines in a way that will help contribute to the solution of human problems. Accordingly, a wide range of courses is offered to serve every thoughtful individual without regard to specialized professional interests.

The school includes disciplines which represent four broad areas of knowledge: the fine and performing arts, communications, humanities, and social sciences. While the school has great breadth and diversity, unity is found in a study of the most engaging subject of all . . . human endeavor. Whether the focus is on imagination, politics, creativity, or rationality, there is a settled purpose: to help each student know herself or himself, to understand human values and human potential, and to understand our society and its institutions.

The eleven departments in the school are Art and Design, English, Foreign Languages and Literatures, History, Journalism, Music, Philosophy, Political Science, Social Sciences, Speech Communication, and Theatre and Dance. Bachelor's degree programs are offered in each department except Foreign Languages and Literatures, Music, Philosophy and Theatre and Dance. Academic minors are offered in these latter four departments as well as in Anthropology–Geography, Art, English, Linguistics, Public Administration, Speech Communication and Women's Studies. The English Department offers a Master of Arts degree.

Departmental offerings are supplemented by courses designated as Humanities. These courses, offered under the direction of a Humanities Coordinator, aim to heighten the student's sense of the interdisciplinary nature of humanistic studies and to increase awareness of humanistic values. The school also participates in the training of teachers by providing waiver programs. For further information regarding teacher credential programs, please see page 348.

The School of Liberal Arts administers Study Abroad programs in London and Paris. For further information, see page 68.

In addition to extensive involvement in the instructional program, the school has a major responsibility for activities which enhance the cultural and intellectual environment of the campus. Through Cal Poly Arts, the school sponsors a full range of cultural programs, including exhibits, concerts, literary presentations, and dramatic productions; and encourages and fosters artistic development and accomplishment across the campus. Students with other talents are attracted to the school's cocurricular programs such as KCPR Radio, Mustang Daily, Model United Nations, Foreign Languages Club, creative writing contests, or intercollegiate forensics and debate. In addition, the school regularly sponsors an Arts and Humanities Lecture Series, a similar series with a focus on political science and supports both the Center for Practical Politics and the Center for the Arts.
CURRICULUM FOR WOMEN'S STUDIES MINOR

The Women's Studies minor is designed to provide students with an understanding of women's contributions to various areas of human life and to women's place in history and society. The minor is multidisciplinary and offers a comprehensive perspective of women as a principal category of scholarly investigation. The minor centers on an ability to analyze the interactions of women in political, economic, and social arenas. Students are provided with a focused academic foundation appropriate to advanced study and career opportunities related to social science and services, health science and services, and disciplines requiring an understanding of women from a scholarly perspective.

Units

Core courses .................................................................................................................................... 15

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>WS 301</td>
<td>Introduction to Women's Studies (3)</td>
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<tr>
<td>WS 401</td>
<td>Seminar in Women's Studies (3)</td>
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<tr>
<td>WS 411</td>
<td>Women, Race and Class (3)</td>
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<td>HIST 435</td>
<td>Women in History (3)</td>
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<tr>
<td>PSY 314</td>
<td>Psychology of Women (3)</td>
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</table>

Electives ........................................................................................................................................ 12

The remaining courses in the minor may be chosen from the following list. Other courses considered applicable will be chosen by the student with approval of a Women's Studies adviser.

<table>
<thead>
<tr>
<th>Course Code</th>
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<tr>
<td>ANT 360</td>
<td>Human Cultural Adaptation (D.4.b.) (3)</td>
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<td>ANT 444</td>
<td>Sex, Death, and Human Nature (3)</td>
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<td>ENGL 345</td>
<td>Women Writers (4)</td>
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<td>HD 103</td>
<td>Pairing and Marriage (3)</td>
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<td>SOC 311</td>
<td>Sociology of Sex Roles (3)</td>
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<td>PSY 315</td>
<td>Psychology of Men (3)</td>
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<td>Special Problems for Advanced Undergraduates (1-2) from appropriate disciplines</td>
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<td></td>
<td>Internship (2-4) from appropriate disciplines</td>
<td></td>
</tr>
</tbody>
</table>
ART AND DESIGN DEPARTMENT

Dexter Bldg. (34), Room 170
(805) 756-1148

Faculty
Department Chair, Charles W. Jennings
Robert S. Densham  Eric B. Johnson  Daniel D. Piel
Keith W. Dills  Mary LaPorte  Robert Reynolds
Clarissa Hewitt  Norman Lerner  Joanne Beaule Ruggles
Robert Howell  John P. Mendenhall  Henry Wessels
George D. Jercich

Programs
B.S. Applied Art and Design with Concentrations in:
Graphic Design  Photography
Minor: Art

The Art and Design Department offers a curriculum leading to the Bachelor of Science degree in Applied Art and Design which prepares students for professional participation in the fields of graphic design or photography. The department also offers an Art Minor.

Both the graphic design and photographic concentrations support creative and aesthetic growth and require the development of technical skills as a foundation for personal direction and enrichment. In support of the department’s professional concentration and its continued commitment to the enhancement of non-art majors, a selection of courses is offered in the areas of art history and appreciation, studio art, and 3-dimensional design.

Because art and design are increasingly relevant to many professional fields, art courses are frequently required within various university majors and the department provides this service through a strong and diversified program.

In addition to the major and support programs, general education courses are available for all students to enrich their understanding, appreciation, and practical skills.

Curricular Concentrations
Graphic Design

The curriculum in graphic design offers a foundation study of basic design, typography and design history, with specialized courses in corporate identity, packaging graphics, advertising, layout and

1 The Graphic Design concentration of the Art and Design Department is distinguished from the Design Reproduction Technology concentration of the Graphic Communication Department. By focusing on creative problem solving, and development of design and layout skills, the Graphic Design concentration leads to positions such as graphic designer, art director and creative director for advertising agencies, design studios and corporate design departments.

The Graphic Communication Department’s Design Reproduction Technology concentration focuses on the technical and electronic aspects of transforming design into suitable fashion for reproduction in print media. The concentration leads to positions such as account executive, sales representative, estimator, production coordinator, and other positions requiring a technical understanding of design preparation and reproduction.
Art and Design

Illustration. Emphasis is placed on the development of visual problem-solving methodology and acquisition of specific skills needed in the design profession. Graphic design students have the unique opportunity to work with students in the applied photography programs as well, gaining practical experience in the art director and photographer relationship. Coursework in computer-assisted design allows for an exploration of new technology, while classes in graphic communication provide technical knowledge of print production. The graphic design program culminates in the study of professional practices and the preparation of a portfolio, enabling students to pursue a career in the area of their particular interest.

Photography

The photography concentration is a diversified program in commercially oriented photography stressing careers in advertising, product illustration, portraiture, corporate and editorial communications and fashion. Creative problem solving is emphasized within a context of a wide range of visual communication and expressive projects. Studio and location lighting are emphasized as well as the development of professional-quality printing skills. Courses progress from black and white to both negative and positive color printing, large-format photography, multimedia, corporate editorial, fashion and illustration. Development of the individual student’s creative, expressive abilities is a key ingredient throughout the program. The program also includes a study of the history of photography as well as current professional practices and computerized electronic imaging technology.

CURRICULUM FOR B.S. APPLIED ART AND DESIGN

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

Freshman

ART 101 Fundamentals of Drawing ................................................................. 4
ART 131 2-Dimensional Design Fundamentals .............................................. 3
ART 132 Beginning Color Theory ................................................................. 3
ART 133 Color and Design ............................................................................. 3
ART 201 Intermediate Drawing or elective .................................................. 3
ART 211 Art History: Prehistoric through the European Middle Ages .......... 4
ART 221 Basic B/W Photography ................................................................. 3
ENGL 114 Writing: Exposition (A.1.) ......................................................... 4
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) ............................ 3
PSY 201/PSY 202 General Psychology (E.1.) ............................................. 3
1 Life sciences elective (B.1.b.) ................................................................. 3
2 Mathematics elective (B.2.) ..................................................................... 3
2 Physical sciences elective (B.1.a.) .......................................................... 3
2 Physical or life sciences elective (with laboratory) (B.1.) ......................... 3
2 Mathematics, physical or life science elective (B.1. or B.2.) ..................... 3

Sophomore

ART 134 3-Dimensional Design I ................................................................. 3
ART 135 3-Dimensional Design II ............................................................... 3
ART 212 Art History: European Renaissance–Baroque Eras or ART 213 Art History: European 18th and 19th Century Art ........................................ 4
ART 222 35mm Intermediate B/W Photography ......................................... 3
ART 224 35mm Advanced B/W Photography ............................................. 3
ART 311 Art History–Modern Art ............................................................... 4
1 GRC 122 Typography (4) or ART 228 35mm Color Slide Photography (2) and ART 320 Fashion Photography (3) ................................................. 4–5
MKTG 204/BUS 101/BUS 207 .................................................................... 4
ENGL 215 Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.) ................................................................. 4
HIST 204 History of American Ideas and Institutions (D.1.) ..................... 3
SPC 201 Public Speaking or SPC 202 Principles of Speech Communication (A.3.) ................................................................................................. 3
Computer literacy elective (F.1.) ............................................................... 3
Electives ....................................................................................................... 2–1
Courses to complete major depending on concentration .......................... 8
Junior

ART 312 Art History—Contemporary Art .......................................................... 4
ART 314 History of Photography (4) or ART 316 Design History (3) .................. 4-3
ANT 201/GEOG 150/SOC 105 (D.4.a.) ................................................................. 3
ECON 201/ECON 211/ECON 222 (D.3.) ............................................................... 3
HIST 315 Modern World History (D.2.) .............................................................. 3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) ............................................... 3
POLS 210 American and California Government (D.1.) ..................................... 3
2 Critical reading electives (C.1.) ................................................................. 6
2 Statistics elective (B.2.) ........................................................................ 3
Electives ........................................................................................................ 4-5
Courses to complete major depending on concentration .................................. 15

Senior

ART 460 Professional Practices ........................................................................... 2
ART 461 Senior Project ...................................................................................... 3
ART 462 Senior Portfolio Project ....................................................................... 1
ART 463 Undergraduate Seminar ...................................................................... 2
2 ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .................................... 3
2 Arts and humanities elective (Area C) ............................................................ 3
BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100 elective (E.2.) .......... 2
DANC 221/MU 101/MU 204/TH 210 (C.2.) .................................................... 3
2 Literature, philosophy, arts (except ART courses) electives (300-400 level) (C.3.) ........ 3
2 Technology elective (F.2.) ........................................................................... 3
Electives ......................................................................................................... 8
Courses to complete major depending on concentration ................................... 15

1 Students in the Graphic Design Concentration take ART 201, CRC 122, ART 316 and students in the Photography Concentration take ART 228, ART 314, ART 320.
2 To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 114 of this catalog.
## Graphic Design Concentration
(Add Courses Below to Basic Curriculum)

### Sophomore
- ART 204 Watercolor ............................................... 3
- ART 230 Beginning Graphic Design ................................ 3
- GRC 322 Advanced Typography ................................ 2

### Junior
- ART 301 Advanced Drawing ........................................ 3
- ART 331 Typographic Design ......................................... 3
- ART 332 Symbology ..................................................... 3
- ART 333 Corporate Identity ........................................... 3
- GRC 223 Copy Preparation .......................................... 3

### Senior
- ART 302 Life Drawing I ............................................... 3
- ART 408 Illustration .................................................... 3
- ART 431 Package Design .............................................. 3
- ART 432 Advertising Design .......................................... 3
- ART 433 Editorial Design ............................................. 3

## Photography Concentration
(Add Courses Below to Basic Curriculum)

### Sophomore
- ART 322 Color Photography I, Negative .................... 3
- ART 323 Color Photography II, Positive .................... 3
- ART 321 Photographic Expression: B/W .................... 4

### Junior
- ART 325 4x5 Camera Techniques, B/W ...................... 3
- ART 326 4x5 Camera/Commercial ............................... 3
- ART 327 Portraiture B/W ........................................... 3
- ART 424 Multimedia Photography ............................ 4

### Senior
- ART 329 Editorial and Corporate Photography ............ 3
- ART 426 Illustration Photography I, B/W .................... 3
- ART 427 Illustration Photography II, Color ................ 3
- ART 428 Commercial Photography ............................. 4
- ART 465 Contemporary Photography Seminar ............. 2

38
CURRICULUM FOR ART MINOR

The Art Minor offers two areas of concentration: 2-dimensional or 3-dimensional art. Students who wish to pursue the minor should meet with one of the following advisers from the Art and Design Department: Bob Reynolds, Crissa Hewitt, George Jerchich, Henry Wessels or Keith Dills.

<table>
<thead>
<tr>
<th>Units</th>
</tr>
</thead>
</table>

Core courses ........................................................................................................................................ 15

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ART 101</td>
<td>Fundamentals of Drawing (C.2.) (4)</td>
<td></td>
</tr>
<tr>
<td>ART 108</td>
<td>Fundamentals of Sculpture (C.2.) (4)</td>
<td></td>
</tr>
<tr>
<td>ART 112</td>
<td>Survey of Western Art (C.2.) (3)</td>
<td></td>
</tr>
<tr>
<td>ART 312</td>
<td>Art History—Contemporary Art (C.3.) (4)</td>
<td></td>
</tr>
</tbody>
</table>

After consultation with an Art and Design Department adviser, complete a minimum of 3 units from one of the two options below ......................................................... 3

2-D Option

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ART 201</td>
<td>Intermediate Drawing (3)</td>
<td></td>
</tr>
<tr>
<td>ART 202</td>
<td>Beginning Watercolor (3)</td>
<td></td>
</tr>
<tr>
<td>ART 206</td>
<td>Printmaking—Intaglio (3) or ART 207 Printmaking—Serigraphy (3)</td>
<td></td>
</tr>
</tbody>
</table>

3-D Option

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ART 242</td>
<td>Glassblowing (3) or ART 243 Glassforming (3)</td>
<td></td>
</tr>
<tr>
<td>ART 255</td>
<td>Jewelry Design (3)</td>
<td></td>
</tr>
</tbody>
</table>

After consultation with an Art and Design Department adviser, complete 12 units from one of the two options below ........................................................................... 12

2-D Option

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ART 301</td>
<td>Advanced Drawing (3)</td>
<td></td>
</tr>
<tr>
<td>ART 302</td>
<td>Life Drawing I (3)</td>
<td></td>
</tr>
<tr>
<td>ART 303</td>
<td>Life Drawing II (3)</td>
<td></td>
</tr>
<tr>
<td>ART 304</td>
<td>Advanced Watercolor (3)</td>
<td></td>
</tr>
<tr>
<td>ART 305</td>
<td>Painting Techniques (3)</td>
<td></td>
</tr>
<tr>
<td>ART 311</td>
<td>Art History—Modern Art (4)</td>
<td></td>
</tr>
<tr>
<td>ART 316</td>
<td>Design History (3)</td>
<td></td>
</tr>
</tbody>
</table>

3-D Option

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ART 308</td>
<td>Sculpture (3)</td>
<td></td>
</tr>
<tr>
<td>ART 342</td>
<td>Cold Forming Techniques for Glass (3)</td>
<td></td>
</tr>
<tr>
<td>ART 343</td>
<td>Glass Casting (3)</td>
<td></td>
</tr>
<tr>
<td>ART 345</td>
<td>Ceramic Form Design (3)</td>
<td></td>
</tr>
<tr>
<td>ART 346</td>
<td>Ceramic Surface Design (3)</td>
<td></td>
</tr>
<tr>
<td>ART 355</td>
<td>Metalsmithing (3)</td>
<td></td>
</tr>
<tr>
<td>ART 356</td>
<td>Jewelry Casting (3)</td>
<td></td>
</tr>
<tr>
<td>ART 311</td>
<td>Art History—Modern Art (4)</td>
<td></td>
</tr>
<tr>
<td>ART 316</td>
<td>Design History (3)</td>
<td></td>
</tr>
</tbody>
</table>

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Recommended support courses in Interior Design.
ENGLISH DEPARTMENT

Faculty Office Bldg. (47), Room 32-E
(805) 756-2596

Faculty
Department Chair, Brent Keetch

Kathleen A. Balgley  Robert L. Inchausti  Mona G. Rosenman
John Battenburg  David J. Kann  Habib Sheik
Patricia A. Brenner  Douglas Keeseey  James E. Simmons
Carl R. V. Brown  Alfred Landwehr  Richard K. Simon
Edward A. Cairns  Kathleen M. Lant  Douglas B. Smith
Kevin Clark  Donald P. Lazere  Charles W. Strong
Susan Currier  Nancy Lucas  Gerald J. Sullivan
Monica Espinosa  Carol MacCurdy  Evelyn M. Torres
Angela M. Estes  Steven R. Marx  Luis A. Torres
Katharine S. Gittes  Robert McDonnell  Karla K. Walters
Linda H. Halisky  Matthew S. Novak  Michael J. Wenzl
John F. Harrington  Michael P. Orth

Programs

B.A. English  Minor: English
M.A. English  Minor: Linguistics
Certificate: Technical Communication

The English Department serves students through courses in writing, in technical communication, in literature, and in linguistics. The aim of the department is to provide students with greater expressive power, and with understanding and appreciation of literature. The department also endeavors to develop in students abilities valuable in the professional and business world and in private life: the abilities of reading critically, of organizing a large body of information, and of expressing the results in clear, forceful prose.

The department offers general education courses, courses for elective credit, minors in English and Linguistics, and the Bachelor of Arts and the Master of Arts programs. An English major or minor is valuable as preparation for law, for business, for teaching, and for other careers in which handling and expressing ideas are essential. The department also offers an upper-division technical communication certificate program. Students interested in an English or Linguistics minor should write or visit the department office for details.

In cooperation with the Education Department, the English Department prepares undergraduates and graduates for careers in secondary school teaching. Students interested in English teaching careers should contact the Coordinator of English Education, (English Department), to learn more about the California single subject credential. English majors who have an interest in teaching at the elementary level are advised to complete concurrently the waiver requirements for Liberal Studies (School of Professional Studies and Education). For more information regarding teaching credential programs, see page 348.
**CURRICULUM FOR B.A. ENGLISH**

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. Cal Poly follows the quarter system.

### Freshman

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 114</td>
<td>Writing: Exposition (A.1.)</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 125/PHIL 125/SPC 125</td>
<td>Critical Thinking (A.2.)</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 215</td>
<td>Writing: Argumentation or ENGL 218</td>
<td>4</td>
</tr>
<tr>
<td>PHIL 230/PHIL 231</td>
<td>Philosophical Classics (C.1.)</td>
<td>3</td>
</tr>
<tr>
<td>SPC 201</td>
<td>Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
<td>3</td>
</tr>
<tr>
<td>BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100 elective (E.2.)</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

1. Critical reading electives (C.1.)
2. Mathematics elective (B.2.)
3. Physical and life sciences electives (one with lab) (B.1.)
4. Electives

---

### Sophomore

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 251/ENGL 252/ENGL 253</td>
<td>Great Books of World Literature</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 290</td>
<td>Introduction to Linguistics</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 345</td>
<td>Women Writers or ENGL 346 Ethnic American Literature</td>
<td>4</td>
</tr>
<tr>
<td>Foreign language (200 level or above)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>ANT 201/GEOG 150/SOC 105</td>
<td>(D.4.a)</td>
<td>3</td>
</tr>
<tr>
<td>ECON 201/ECON 211/ECON 222</td>
<td>(D.3.)</td>
<td>3</td>
</tr>
<tr>
<td>HIST 204</td>
<td>History of American Ideals and Institutions (D.1.)</td>
<td>3</td>
</tr>
<tr>
<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
<td>3</td>
</tr>
<tr>
<td>POLS 210</td>
<td>American and California Government (D.1.)</td>
<td>3</td>
</tr>
<tr>
<td>PSY 201/PSY 202</td>
<td>General Psychology (E.1.)</td>
<td>3</td>
</tr>
</tbody>
</table>

1. Computer literacy elective (F.1.)
2. Fine and Performing Arts elective (C.2.)
3. Literature, philosophy, art elective (300-400 level) (C.3.)
4. Mathematics or statistics elective (B.2.)
5. Science, mathematics or statistics elective (Area B)
6. Electives

---

### Junior

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 302</td>
<td>Writing: Advanced Composition or ENGL 326 Literary Criticism</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 325</td>
<td>Creative Writing</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 330/ENGL 331/ENGL 332</td>
<td>British Literature</td>
<td>4,4</td>
</tr>
<tr>
<td>ENGL 333/ENGL 334</td>
<td>British Literature</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 340, ENGL 341</td>
<td>American Literature</td>
<td>4,4</td>
</tr>
<tr>
<td>ENGL 390/ENGL 395/ENGL 495/ENGL 496</td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

1. ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.)
2. Arts and humanities elective (Area C)
3. Electives

---

### Senior

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 339</td>
<td>Introduction to Shakespeare</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 350/ENGL 351/ENGL 352</td>
<td>Modern Novel, Poetry, or Drama</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 461</td>
<td>Senior Project</td>
<td>3</td>
</tr>
<tr>
<td>English elective (300-400 level)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>English electives (400 level)</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

1. Technology elective (300-400 level) (F.2.)
2. Electives

---

1. To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 114 of this catalog.
### CURRICULUM FOR ENGLISH MINOR

<table>
<thead>
<tr>
<th>Units</th>
<th>Required Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ENGL 253 Great Books (3)</td>
</tr>
<tr>
<td></td>
<td>ENGL 302 Advanced Composition or ENGL 326 Literary Criticism (4)</td>
</tr>
<tr>
<td></td>
<td>ENGL 339 Introduction to Shakespeare (3)</td>
</tr>
<tr>
<td></td>
<td>ENGL 390 Modern English Grammar or ENGL 395 History of the English Language (4)</td>
</tr>
<tr>
<td></td>
<td>Select one of the following British literature courses</td>
</tr>
<tr>
<td></td>
<td>ENGL 330 British Literature: Medieval Period (C.3.)</td>
</tr>
<tr>
<td></td>
<td>ENGL 331 British Literature: The Renaissance (C.3.)</td>
</tr>
<tr>
<td></td>
<td>ENGL 332 British Literature: The Enlightenment (C.3.)</td>
</tr>
<tr>
<td></td>
<td>ENGL 333 British Literature: The Romantic Movement (C.3.)</td>
</tr>
<tr>
<td></td>
<td>ENGL 334 British Literature: The Victorians (C.3.)</td>
</tr>
<tr>
<td></td>
<td>Select one of the following American literature courses</td>
</tr>
<tr>
<td></td>
<td>ENGL 340 American Literature to 1860 (C.3.)</td>
</tr>
<tr>
<td></td>
<td>ENGL 341 American Literature 1860-1914 (C.3.)</td>
</tr>
<tr>
<td></td>
<td>ENGL 342 American Literature 1914 to the Present (C.3.)</td>
</tr>
<tr>
<td></td>
<td>Select one of the following courses</td>
</tr>
<tr>
<td></td>
<td>ENGL 350 Modern Novel (C.3.)</td>
</tr>
<tr>
<td></td>
<td>ENGL 351 Modern Poetry (C.3.)</td>
</tr>
<tr>
<td></td>
<td>ENGL 352 Modern Drama (C.3.)</td>
</tr>
</tbody>
</table>

### CURRICULUM FOR LINGUISTICS MINOR

<table>
<thead>
<tr>
<th>Units</th>
<th>Required courses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ENGL 290 Introduction to Linguistics (4)</td>
</tr>
<tr>
<td></td>
<td>ANT 333 Language and Culture (3)</td>
</tr>
<tr>
<td></td>
<td>Language structuring courses</td>
</tr>
<tr>
<td></td>
<td>ENGL 390 Modern English Grammar (4)</td>
</tr>
<tr>
<td></td>
<td>ENGL 395 History of the English Language (4)</td>
</tr>
<tr>
<td></td>
<td>SPC 300 Voice and Phonetics (4)</td>
</tr>
<tr>
<td></td>
<td>Choose one of the following areas of emphasis</td>
</tr>
<tr>
<td></td>
<td>SPC 303 Development of Speech and Language (3)</td>
</tr>
<tr>
<td></td>
<td>SPC 302 Introduction to Communicative Disorders (4)</td>
</tr>
</tbody>
</table>

**Language Development:**

**Orientation to Non-native Use of Language:**

- ENGL 496 Introduction to Teaching English as a Second Language (4)
- SPC 316 Cross-cultural Communication (3)
TECHNICAL COMMUNICATION CERTIFICATE PROGRAM

This program requires between 26 and 30 units—about the same number as a minor. A current course list is available in the English Department office.

The certificate program is designed for men and women who have or want careers in technical writing, information development, or business communication, or who simply want to supplement their technical training with communication training. Students in the certificate program may already be enrolled in Cal Poly undergraduate or graduate degree programs, or, through Concurrent Enrollment, may be enrolled only in the certificate program.

Businesses and government agencies employ professional communicators in many roles: writers, editors, public relations officers, spokespeople, and so on. These professionals' skills center on using the written word effectively, but often include auxiliary skills, such as public speaking or publications design and production. They write regulations, brochures, forms, technical manuals, computer documentation, on-line training programs and corporate executives' speeches, for example. They edit company newsletters and magazines, and put technical information into understandable prose.

MASTER OF ARTS DEGREE IN ENGLISH

General Characteristics

This program includes the study of literary criticism, language, theory of composition, and literature. It is designed to provide students with the kind of knowledge and command of English that will prepare them specifically for 1) teaching English at the elementary, secondary, or community college levels; 2) employment in business, industry, and government service where specific communication skills are demanded; 3) self-directed development in writing; 4) graduate work at other institutions.

Prerequisites

Admission with classified status requires that the student have a baccalaureate in English from an accredited institution (or the equivalent, as determined by the English Graduate Committee), have maintained a grade point average of 3.0 for the last 90 quarter units (60 semester units), and have a satisfactory score on the Graduate Record Examination Advanced Test in English Literature. Non-native speakers should also submit TOEFL scores (Test of English as a Foreign Language). Advancement candidacy requires approval of a formal program of study by the Graduate Committee and completion of 12 units with a grade point average of 3.0.

Program of Study

The formal program of study must include the following: 1) 48 units of graduate work approved by the Director of Graduate Studies and the Graduate Committee; 2) a grade point average of 3.0 or better in all courses taken subsequent to admission; 3) two years of a foreign language (e.g., French, Spanish, German) or certification of the equivalent; 4) a comprehensive examination at the end of 48 units of study. The foreign language requirement must be satisfied before the comprehensive examination is taken. Students will elect an emphasis within the Master of Arts program: literature, linguistics, or writing.

Applications

Applications for admission and requests for further information should be directed to the Director of Graduate Studies, English Department.

All applications should include a sample of expository writing.
CURRICULUM FOR M.A. ENGLISH  

Units

Required courses ........................................................................ 36

- ENGL 501 Techniques of Literary Research (4)
- ENGL 502 Seminar in Critical Analysis (4)
- ENGL 503 Seminar in English Linguistics (4)
- ENGL 505 Seminar in Composition Theory (4)
- ENGL 510 Seminar in Authors (4) or ENGL 513 Special Topics (4)
- ENGL 511 Seminar in American Literary Periods (4) (4)
- ENGL 512 Seminar in British Literary Periods (4) (4)

English electives ................................................................................ 8

Additional units in the English 400 and 500 series, selected with English Graduate Committee approval (at least half of the units at the 500 level)

Electives .............................................................................................. 4

Elective units which may be taken at the 400 or 500 level in other departments, provided the English Graduate Committee approves

48

Emphases

Within the 12 elective units listed above, students will choose, under advisement, a series of courses to complete one of these emphases:

- Literature–3 courses
- Linguistics–3 courses (which must include ENGL 504)
- Writing–3 courses

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in English and other subjects.
FOREIGN LANGUAGES AND LITERATURES
DEPARTMENT

English Bldg. (22), Room 201
(805) 756-1205

Faculty
Department Head, William Little
Odile Clause
Alberto Urista (Alurista)
Gloria Velásquez
Bianca Rosenthal

Programs
Minor: French
Minor: Spanish
Minor: German

The department offers coursework in French, German and Spanish. Elementary Italian and Japanese are also offered. Instruction at all levels emphasizes active language skills to prepare the student for technical, vocational, literary, and cultural needs in California, throughout the United States and abroad. Central to the instruction is active use of a state-of-the-art language laboratory.

The department offers minors in French, German, and Spanish. Each minor consists of 28 quarter units of coursework specified by the department. A minimum of eighteen upper division units, including at least one 305 course, must be completed in residence and a minimum grade point average of 2.75 must be maintained. The minor is conferred concurrently with the baccalaureate degree. For general university requirements regarding minors, please see page 112 of this catalog. Information and application forms for the declaration of a French, German, or Spanish minor are available in the Department office.

The department is active in training students who wish to obtain a bilingual teaching credential and it administers the Bilingual Proficiency Exam. For more information regarding teacher credential programs, please see page 348. The department also supports such student clubs as the French Club, the German Club, the Latin American Student Association, and MECHA (Movimiento Estudiantil Chicano de Aztlan.)
### CURRICULUM FOR FRENCH MINOR

**Units**

**Required courses**
- FR 201, FR 202 Intermediate French (4) (4)
- FR 233 Critical Reading in French Literature (C.1.) (4)
- FR 301 Advanced French Composition and Grammar (4)
- FR 305 Significant Writers in French (C.3.) (4)

**Electives to be chosen from the following:**
- FR 302 Advanced French Conversation and Grammar (4)
- FR 405 French Literature in English Translation (C.3.) (4)
- FR 470 Selected Advanced Topics (1-4) (repeatable to 8)
- FORL 303 Culture (French) (3) or HUM 310 Humanities in World Cultures (French) (C.3.) (3)
- FORL 401 Translation (French) (4)

**Total Units**: 28

### CURRICULUM FOR GERMAN MINOR

**Units**

**Required courses**
- GER 201, GER 202 Intermediate German (4) (4)
- GER 233 Critical Reading in German Literature (C.1.) (4)
- GER 301 Advanced German Composition and Grammar (4)
- GER 305 Significant Writers in German (C.3.) (4)

**Electives to be chosen from the following:**
- GER 302 Advanced German Conversation and Grammar (4)
- GER 405 German Literature in English Translation (C.3.) (4)
- GER 470 Selected Advanced Topics (1-4) (repeatable to 8)
- FORL 303 Culture (German) (3) or HUM 310 Humanities in World Cultures (German) (C.3.) (3)
- FORL 401 Translation (German) (4)

**Total Units**: 28

### CURRICULUM FOR SPANISH MINOR

**Units**

**Required courses**
- SPAN 201, SPAN 202 Intermediate Spanish (4) (4)
- SPAN 233 Critical Reading in Hispanic Literature (C.1.) (4)
- SPAN 301 Advanced Spanish Composition and Grammar (4)
- SPAN 305 Significant Writers in Spanish (C.3.) (4)

**Electives to be chosen from the following:**
- SPAN 302 Advanced Spanish Conversation and Grammar (4)
- SPAN 323 Spanish Phonetics (3)
- SPAN 330 Spanish for Bilingual Speakers (4)
- SPAN 405 Hispanic Literature in English Translation (C.3.) (4)
- SPAN 470 Selected Advanced Topics (1-4) (repeatable to 8)
- FORL 303 Culture (Hispanic) (3) or HUM 310 Humanities in World Cultures (Hispanic or Latin American) (C.3.) (3)
- FORL 401 Translation (Spanish) (4)

**Total Units**: 28
HISTORY DEPARTMENT

Faculty Office Bldg. (47), Room 27C
(805) 756-2543

Faculty
Department Chair, Max E. Riedisperger
Timothy M. Barnes  George B. Cotkin  Daniel E. Krieger
Lloyd N. Beecher  Manzar Foroohar  Edward L. Mayo
Robert E. Burton  Donald A. Grinde, Jr.  John Snetsinger
Nancy L. Clark  Barbara M. Hallman  Quintard Taylor, Jr.

Programs
B.A. History
Minor: History

Historians study humans over time which gives them perspective on the present and the aptitude to plan intelligently for the future. Such an ability is crucial to all who wish to make thoughtful and wise decisions in a world undergoing constant change.

History broadens our understanding and tolerance of other peoples and cultures and deepens our knowledge of ourselves.

By majoring in history one can prepare for a teaching career and for advanced work in the discipline.

The skills of the historian are elementary to many other fields of endeavor. The way historians gather, synthesize, analyze and interpret evidence and then present their findings to a general audience in a concise, logical, coherent written and oral manner is a methodology common to lawyers, business executives, politicians, and administrators.

The study of history and the historical method facilitates and enhances decision-making, makes us more complete human beings, and prepares students for a wide range of careers. It provides a broad-based education in the liberal arts and humanities.

CURRICULUM FOR B.A. HISTORY

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. Cal Poly follows the quarter system.

Freshman
HIST 101, HIST 102, HIST 103  History of Western Civilization .............................................. 3,3,3
POLS 204  Basic Political Thought ................................................................. 3
ENGL 114  Writing: Exposition (A.1.) .............................................................. 4
ENGL 125/PHIL 125/SPC 125  Critical Thinking (A.2.) .................................... 3
ENGL 215  Writing: Argumentation or ENGL 218  Writing: Argumentation and Reports (A.4.) .......................................................... 4
PHIL 230/PHIL 231  Philosophical Classics (C.1.) ............................................. 3
POLS 210  American and California Government (D.1.) .................................... 3
1 Computer literacy elective (F.1.) .................................................................... 3
1 Critical reading elective (C.1.) ....................................................................... 3
1 Fine and Performing Arts elective (C.2.) ....................................................... 3
1 Mathematics elective (B.2.) .......................................................................... 3
1 Physical or life sciences electives (one of each, one with lab) (B.1.) .......... 6
### Sophomore

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIST 201, HIST 202, HIST 203 United States History</td>
<td>3,3,3</td>
</tr>
<tr>
<td>HIST 221 Historical Craft</td>
<td>3</td>
</tr>
<tr>
<td>HIST 222 Writing and Research Seminar in History</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 150 Human Geography</td>
<td>3</td>
</tr>
<tr>
<td>POLS 105 Introduction to International Relations</td>
<td>3</td>
</tr>
<tr>
<td>SOC 105 Introduction to Sociology</td>
<td>3</td>
</tr>
<tr>
<td>ANT 201 Cultural Anthropology (D.4.a.)</td>
<td>3</td>
</tr>
<tr>
<td>ECON 201/ECN 211/ECN 222 (D.3.)</td>
<td>3</td>
</tr>
<tr>
<td>PSY 201/PSY 202 General Psychology (E.1.)</td>
<td>3</td>
</tr>
<tr>
<td>SPC 201 Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
<td>3</td>
</tr>
<tr>
<td>BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100 elective (E.2.)</td>
<td>2</td>
</tr>
<tr>
<td>Critical reading elective (C.1.)</td>
<td>3</td>
</tr>
<tr>
<td>Mathematics or statistics elective (B.2.)</td>
<td>3</td>
</tr>
<tr>
<td>Physical or life sciences elective (B.1.)</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>47</td>
</tr>
</tbody>
</table>

### Junior

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIST 301 Historiography</td>
<td>3</td>
</tr>
<tr>
<td>HIST 315 Modern World History</td>
<td>3</td>
</tr>
<tr>
<td>ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.)</td>
<td>3</td>
</tr>
<tr>
<td>Arts and humanities elective (Area C)</td>
<td>3</td>
</tr>
<tr>
<td>Literature, philosophy, arts elective (300-400 level) (C.3.)</td>
<td>3</td>
</tr>
<tr>
<td>Mathematics, statistics or science elective (B.1. or B.2.)</td>
<td>3</td>
</tr>
<tr>
<td>Technology elective (F.2.)</td>
<td>3</td>
</tr>
<tr>
<td>U.S. History electives (300-400 level)</td>
<td>9</td>
</tr>
<tr>
<td>Electives</td>
<td>17</td>
</tr>
<tr>
<td>Total</td>
<td>47</td>
</tr>
</tbody>
</table>

### Senior

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIST 460 Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>HIST 461 Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>POLS 370 Contemporary Global Political Issues</td>
<td>3</td>
</tr>
<tr>
<td>ANT/ECON/GEOG/POLS/SOCS/(300-400) electives</td>
<td>6</td>
</tr>
<tr>
<td>European history electives (300-400 level)</td>
<td>6</td>
</tr>
<tr>
<td>History electives (300-400 level)</td>
<td>6</td>
</tr>
<tr>
<td>Electives</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>45</td>
</tr>
</tbody>
</table>

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

1. To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 114 of this catalog.
2. See curriculum sheet in History Department for list of approved courses.
3. At least 14 units must be at the 300-400 level.
**CURRICULUM FOR HISTORY MINOR**

Students choosing to add a strong historical dimension to their major field may enroll in the minor program in history. This 30-unit curriculum stresses reading and writing skills as well as the ability to weight evidence and think critically. Details and application forms are available from the History Department.

<table>
<thead>
<tr>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Required courses</strong></td>
</tr>
<tr>
<td>HIST 101, HIST 102, HIST 103  History of Western Civilization (3)</td>
</tr>
<tr>
<td>(3)</td>
</tr>
<tr>
<td>HIST 201  United States History (3)</td>
</tr>
<tr>
<td>HIST 221  Historical Craft (3)</td>
</tr>
<tr>
<td>Select 3 units of upper-division United States history from</td>
</tr>
<tr>
<td>HIST 385, HIST 401, HIST 402, HIST 403, HIST 404, HIST 405, HIST 406, HIST 407</td>
</tr>
<tr>
<td>Select 6 units from outside the areas of U.S. and European history</td>
</tr>
<tr>
<td>HIST 307, HIST 314, HIST 328, HIST 329, HIST 339, HIST 340, HIST 341, HIST 381, HIST 382, HIST 415, HIST 416 and HIST 417</td>
</tr>
<tr>
<td>Select 6 units in any 300-400 upper-division history courses</td>
</tr>
<tr>
<td>(excluding HIST 315)</td>
</tr>
<tr>
<td>30</td>
</tr>
</tbody>
</table>

*It is recommended that HIST 203 be taken in place of HIST 204 as fulfillment of GEB D.1. requirement.*
The Journalism Department offers a professional program leading to the Bachelor of Science degree in Journalism. All journalism majors must complete the basic journalism curriculum, which includes courses in the journalism core and supplementary courses in the humanities, natural sciences, and social sciences. Each major must also complete a specified number of required and elective courses in one of the following concentrations: Agricultural Journalism, Broadcast Journalism, News-Editorial, or Public Relations.

The Journalism Department requires that all majors successfully complete 12 quarter units of a foreign language.

The Journalism Department conforms to the rules of the Accrediting Council on Education in Journalism and Mass Communications (ACEJMC) which stipulate that of the 198 units required for a bachelor’s degree, 131 quarter units must be taken in courses outside the major area of journalism, with no fewer than 94 quarter hours in liberal arts and sciences. Certain courses in art and graphics may be considered as professionally related to journalism and cannot be counted toward the 131 units outside the major. Students must consult advisers.

Transfer students may apply a maximum of 12 journalism and professionally related lower division units (including photography and graphics courses) to the major requirement. Students transferring into the program are advised to limit these units to equivalents for JOUR 218, JOUR 201, JOUR 203, or ART 221.

All journalism majors are expected to serve as staff members of departmental communications media, including Mustang Daily, the student newspaper, or KCPR, the FM-stereo radio station. They are also expected to participate in professional and scholarly organizations in their interests. The department sponsors campus chapters of the Society of Professional Journalists, the Public Relations Student Society of America, and the Agricultural Communicators of Tomorrow.

The Brock Center for Agricultural Communication, a joint project of the School of Agriculture and the School of Liberal Arts, is directed by a faculty member from the Journalism Department.

CURRICULAR CONCENTRATIONS

Agricultural Journalism
Prepares students for careers as writers and editors for agricultural magazines and newspapers; for
public relations positions in agribusiness; or as communicators with government agencies, trade associations, or private agricultural operations.

**Broadcast Journalism**
Prepares students for careers as reporters and newscasters for radio and television. Emphasizes the acquisition of knowledge and skills necessary for initial employment upon graduation as well as those necessary for future growth to positions of responsibility in the news and public affairs aspects of the electronic media.

**News-Editorial**
Prepares students for reporting and editing jobs on the staffs of newspapers and wire services. Emphasizes acquisition of knowledge and skills necessary for initial employment upon graduation as well as those necessary for future growth to positions of responsibility in print media.

**Public Relations**
Prepares students for business, governmental, and institutional positions in public relations. Emphasizes the acquisition of knowledge and skills needed for future growth into management positions with the communications media and other institutions.

**CURRICULUM FOR B.S. JOURNALISM**

*Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.*

**Freshman**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>JOUR 203 Reporting I</td>
<td>4</td>
</tr>
<tr>
<td>JOUR 218 Mass Media in Society</td>
<td>4</td>
</tr>
<tr>
<td>BUS 101 Business Enterprise</td>
<td>4</td>
</tr>
<tr>
<td>MGT 118 Introduction to Human Relations in Business</td>
<td>3</td>
</tr>
<tr>
<td>ANT 201/IGEOG 150/SOC 105 (D.4.a.)</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 114 Writing: Exposition (A.1.)</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.)</td>
<td>3</td>
</tr>
<tr>
<td>PHIL 230/231 Philosophical Classics (C.1.)</td>
<td>3</td>
</tr>
<tr>
<td>2 Computer literacy elective (F.1.)</td>
<td>3</td>
</tr>
<tr>
<td>2 Critical reading elective (C.1.)</td>
<td>3</td>
</tr>
<tr>
<td>2 Mathematics elective (B.2.)</td>
<td>3</td>
</tr>
<tr>
<td>2 Physical and life sciences electives (one each, one with lab) (B.1.)</td>
<td>3,3,3</td>
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</tbody>
</table>

**Sophomore**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>JOUR 233 Copy Editing</td>
<td>4</td>
</tr>
<tr>
<td>JOUR 304 Reporting II</td>
<td>4</td>
</tr>
<tr>
<td>ART 221 Basic B/W Photography</td>
<td>3</td>
</tr>
<tr>
<td>POLS 206 Judicial Process</td>
<td>3</td>
</tr>
<tr>
<td>ECON 201/ECON 211/ECON 222 (D.3.)</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 215 Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.)</td>
<td>4</td>
</tr>
<tr>
<td>HIST 204 History of American Ideals and Institutions (D.1.)</td>
<td>3</td>
</tr>
<tr>
<td>POLS 210 American and California Government (D.1.)</td>
<td>3</td>
</tr>
<tr>
<td>PSY 201/PSY 202 General Psychology (E.1.)</td>
<td>3</td>
</tr>
<tr>
<td>SPC 201 Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
<td>3</td>
</tr>
<tr>
<td>BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100 elective (E.2.)</td>
<td>2-4</td>
</tr>
<tr>
<td>2 Critical reading elective (C.1.)</td>
<td>3</td>
</tr>
<tr>
<td>2 Fine and Performing Arts elective (C.2.)</td>
<td>3</td>
</tr>
<tr>
<td>2 Mathematics or statistics elective (B.2.)</td>
<td>3</td>
</tr>
<tr>
<td>2 Physical and life science elective (B.1.)</td>
<td>3</td>
</tr>
<tr>
<td>3 Electives and courses to complete major</td>
<td>5-3</td>
</tr>
</tbody>
</table>
### Journalism

#### Junior

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>JOUR 201</td>
<td>Mass Media Law</td>
<td>4</td>
</tr>
<tr>
<td>JOUR 302</td>
<td>International Communication</td>
<td>4</td>
</tr>
<tr>
<td>JOUR 401</td>
<td>Foreign language requirement</td>
<td></td>
</tr>
<tr>
<td>GEOG 305</td>
<td>Political Geography or GEOG 308</td>
<td>3</td>
</tr>
<tr>
<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
<td>3</td>
</tr>
<tr>
<td>ANT/BUS/ECON/POLS/SOC elective (D.4.b.)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Technology elective (300-400 level) (F.2.)</td>
<td>3</td>
<td></td>
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</tbody>
</table>

Electives and courses to complete major: 18-16

#### Senior

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>JOUR 402</td>
<td>Social Responsibility of Mass Media</td>
<td>4</td>
</tr>
<tr>
<td>JOUR 444</td>
<td>Media Internship</td>
<td>4</td>
</tr>
<tr>
<td>JOUR 460</td>
<td>Senior Project</td>
<td>3</td>
</tr>
<tr>
<td>POLS 401</td>
<td>State and Local Government or POLS 403 Municipal Government</td>
<td>4</td>
</tr>
<tr>
<td>Arts and humanities elective (Area C)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Technology elective (300-400 level) (C.3.)</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Electives and courses to complete major: 24

#### Agricultural Journalism Concentration

(Add Courses Below to Basic Curriculum)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>JOUR 205</td>
<td>Agricultural Communications</td>
<td>3</td>
</tr>
<tr>
<td>JOUR 352</td>
<td>Reporting Practice</td>
<td>3,3</td>
</tr>
<tr>
<td>ASCI 230</td>
<td>General Animal Science</td>
<td>4</td>
</tr>
<tr>
<td>CRSC 230</td>
<td>General Field Crops</td>
<td>4</td>
</tr>
<tr>
<td>FSN 230</td>
<td>Elements of Food Processing</td>
<td>4</td>
</tr>
<tr>
<td>SS 121</td>
<td>Introductory Soil Science</td>
<td>4</td>
</tr>
</tbody>
</table>

#### Broadcast Journalism Concentration

(Add Courses Below to Basic Curriculum)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>JOUR 323</td>
<td>Photojournalism</td>
<td>3</td>
</tr>
<tr>
<td>JOUR 346</td>
<td>Broadcast Announcing</td>
<td>4</td>
</tr>
<tr>
<td>JOUR 333</td>
<td>Broadcast News I</td>
<td>4</td>
</tr>
<tr>
<td>JOUR 351</td>
<td>Broadcast Practice</td>
<td>3,3</td>
</tr>
<tr>
<td>JOUR 432</td>
<td>Broadcast News II</td>
<td>4</td>
</tr>
<tr>
<td>SPC 300</td>
<td>Voice and Phonetics</td>
<td>4</td>
</tr>
</tbody>
</table>

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

1. Unless already acceptable typists, majors will be required to attain typing proficiency during their freshman year.
2. To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 114 of this catalog.
3. 18 to 27 of the elective units must be taken in a field of concentration.
### News-Editorial Concentration

*(Add Courses Below to Basic Curriculum)*

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>JOUR 323</td>
<td>Photojournalism</td>
<td>3</td>
</tr>
<tr>
<td>JOUR 352</td>
<td>Reporting Practice</td>
<td>3,3</td>
</tr>
<tr>
<td>JOUR 405</td>
<td>Reporting III</td>
<td>4</td>
</tr>
<tr>
<td>JOUR 407</td>
<td>Feature Writing</td>
<td>3</td>
</tr>
<tr>
<td>JOUR 434</td>
<td>Advanced Editing</td>
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</table>

### Public Relations Concentration

*(Add Courses Below to Basic Curriculum)*

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>JOUR 312</td>
<td>Introduction to Public Relations</td>
<td>4</td>
</tr>
<tr>
<td>JOUR 342</td>
<td>Public Relations Media</td>
<td>4</td>
</tr>
<tr>
<td>JOUR 352</td>
<td>Reporting Practice</td>
<td>3,3</td>
</tr>
<tr>
<td>JOUR 413</td>
<td>Advanced Public Relations</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 310</td>
<td>Corporate Communication</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>or SPC 301 Business and Professional Communication</td>
<td>4</td>
</tr>
<tr>
<td>MGT 201</td>
<td>Principles of Management</td>
<td>3–4</td>
</tr>
<tr>
<td></td>
<td>or MKTG 204 Elements of Marketing</td>
<td>3–4</td>
</tr>
<tr>
<td>SPC 213</td>
<td>Organizational Communication</td>
<td>4</td>
</tr>
</tbody>
</table>

29–30
MUSIC DEPARTMENT

Davidson Music Center (45), Room 129
(805) 756-2406

Faculty
Department Head, Clifton Swanson
Antonio G. Barata        William V. Johnson      John G. Russell
Thomas H. Davies         Craig H. Russell       Graydon J. Williams

Programs
Minor: Music

Through its courses and activities, the Music Department provides opportunities for personal enrichment to students from all other departments of the university. It offers students with an interest in music a broader insight into the general field of music through courses in appreciation, theory, harmony, and music history; it gives musically inclined students the opportunity to participate in university musical organizations and to further their proficiency both in singing and in playing instruments; and it provides the prospective teacher with basic skills and instructional techniques in music required for the elementary credential. The music program works cooperatively with various areas on campus to enable students to gain experience in fields such as recording technology, electronic music, acoustics, and music criticism.

The Music Department also serves as a cultural center for both Cal Poly and community through a program of public performances by student and faculty groups and through department-sponsored concerts, clinics, workshops, and lectures by outstanding individuals from outside the university.

CURRICULUM FOR MUSIC MINOR

A 27-unit minor is available to students who desire documented competency in music. An individualized curriculum based on the following guidelines will be developed in consultation with a member of the music faculty. Information and application forms for the declaration of a Music minor are available in the Music Department Office.

<table>
<thead>
<tr>
<th>Required Courses</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MU 103 Music Theory I (3)</td>
<td></td>
</tr>
<tr>
<td>MU 104 Musicianship I (1)</td>
<td></td>
</tr>
<tr>
<td>MU 105 Theory II (3)</td>
<td></td>
</tr>
<tr>
<td>MU 106 Musicianship II (1)</td>
<td></td>
</tr>
<tr>
<td>MU 120 Introduction to Music (C.2.) (4)</td>
<td></td>
</tr>
<tr>
<td>One year of upper division vocal or instrumental study (3)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Upper Division Electives</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chosen from 300-400 level Music courses (or, in some cases, specific courses offered by other departments).</td>
<td>12</td>
</tr>
</tbody>
</table>

27

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

Faculty Office Bldg. (47), Room 37-B
(805) 756-2041

Faculty
Department Chair, Laurence D. Houlgate

Stephen W. Ball Russell A. Lascola Judy D. Saltzman
A. C. W. Bethel Diane P. Michelfelder Talmage E. Scriven
Stanislaus J. Dundon Paul Miklowitz Kendrick W. Walker
Charles T. Hagen Frederick J. O'Toole

Programs
Minor: Philosophy

The courses offered by the Philosophy Department are intended to provide an opportunity for students to examine fundamental questions about the human condition, and the importance of those questions to historical, scientific, religious, and social issues. These courses will acquaint the student with the problems of logic (the nature of argument), metaphysics (the nature of reality), epistemology (the nature and limits of human knowledge), and axiology (the nature of what is right or worthwhile), and with the historical development of these problems and proposed solutions to them. The Philosophy Department also offers courses examining patterns of belief and worship in the world’s major religions. All these courses provide the student with an opportunity to participate in philosophical discussion and to develop proficiency in critically examining philosophical positions, with a view to enabling the student to develop a personal philosophy and a more comprehensive view of the world.

CURRICULUM FOR PHILOSOPHY MINOR

Students may earn a minor in Philosophy by a coordinated course of study consisting of 24 units (12 specified, 12 chosen from an approved list) designed by the individual student and the Philosophy Department. Interested students are invited to contact the Philosophy Department.

<table>
<thead>
<tr>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
</tr>
</tbody>
</table>

Required courses

ENGL/PHIL/SPC 125 Critical Thinking (A.2.) (3)
PHIL 230 Philosophical Classics (C.1.) (3)
PHIL 231 Philosophical Classics (C.1.) (3)
PHIL 311 History of Greek Philosophy (C.3.) (3)

Electives to be chosen from the following groups: 

<table>
<thead>
<tr>
<th>One of the following:</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHIL 312 History of Medieval Philosophy (C.3.) (3)</td>
</tr>
<tr>
<td>PHIL 313 Continental Philosophy: Montaigne to Leibnitz (C.3.) (3)</td>
</tr>
<tr>
<td>PHIL 314 British Philosophy: Bacon to Mill (C.3.) (3)</td>
</tr>
<tr>
<td>PHIL 315 German Philosophy: Kant to Nietzsche (C.3.) (3)</td>
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<table>
<thead>
<tr>
<th>One of the following:</th>
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<tbody>
<tr>
<td>PHIL 316 Contemporary European Philosophy (C.3.) (3)</td>
</tr>
<tr>
<td>PHIL 317 Contemporary British and American Philosophy (C.3.) (3)</td>
</tr>
</tbody>
</table>

Two additional upper division philosophy courses.

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

Faculty Office Bldg. (47), Room 14-C
(805) 756-2984

Faculty
Department Chair, Dianne N. Long

Gaye G. Benson       David L. George       Carl E. Lutrin
Randal L. Cruikshanks Reginald H. Gooden, Jr. Carroll R. McKibbin
John H. Culver        Earl D. Huff          Allen K. Settle
Philip L. Fetzer      Richard B. Kranzdorf Joseph N. Weatherby

Programs

B.A. Political Science with Concentrations in:
Individualized Course of Study       Public Administration
International Affairs       Teaching
Pre-Law       Urban Studies

Minor: International Relations
Minor: Public Administration

The Political Science Department offers undergraduate instruction leading to the Bachelor of Arts degree in Political Science. With a concern for theoretical principles as well as practical application, the degree requirements include both a common body of material and the completion of a curricular concentration in Political Science as listed below. Such curricular alternatives focus the training within the degree program toward career opportunities in government and other public agencies, private enterprise, and in the legal profession.

In addition to the major in Political Science, the department offers minors in International Relations and Public Administration. Beyond that, the Political Science Department provides students in all curricula within the university with an understanding of the operations of local, state, and national government and the processes by which the individual and community interact in the several levels of government. The department supports internship opportunities in local, state, and federal agencies in addition to applied public policy research opportunities through the Center for Practical Politics.

Through the required and elective courses, the department seeks to expand each student’s comprehension of the political process, to develop those skills and attitudes which are essential for effective citizenship, and to prepare each Cal Poly graduate for intelligent and responsible political behavior.

CURRICULAR CONCENTRATIONS

International Affairs
This concentration is designed to prepare students for careers in government, business and related agencies which deal in the many problems in international affairs and to prepare students to enter graduate studies in the field of international relations.

Pre-Law
This concentration is designed to prepare students for careers in the several fields of law. Some students who complete this concentration may seek admission to law school to continue their preparation for the legal profession. Others may seek careers in law-related professions such as law enforcement, judicial administration and legal assistance.

Public Administration
This concentration is designed to prepare students for careers in administrative work in government and related agencies and to prepare students to enter graduate studies in the field of administration.
### Teaching

This concentration is designed to prepare students for careers as social studies teachers in junior and senior high schools. With additional coursework as prescribed by the Education Department, political science graduates who have completed this concentration may obtain a California single subject teaching credential in Government or in Social Sciences. For more information regarding teacher credential programs, please see page 348.

### Urban Studies

This concentration is designed to prepare students for careers in broad fields of planning within government and related agencies and to prepare students to enter advanced studies in the field of city and regional planning.

### Individualized Course of Study

This program is designed to provide career identity for students who do not select any of the above concentrations and to permit students with varying backgrounds and interests to pursue a course of study which meets their individual needs and interests. It consists of 27 units of coursework at the 300–400 level selected by the student and recommended by the student's academic adviser.

### OTHER CONCENTRATIONS AVAILABLE

Concentrations in Criminal Justice, Cross-Cultural Studies, and Social Services are currently offered by the Social Sciences Department and may be taken by Political Science majors. In addition, the following concentrations from the School of Business may be taken: Accounting, Human Resources Management, International Business Management, Management, and Management Information Systems. Students who intend to follow a concentration offered in the School of Business will need to obtain the approval of the appropriate department.

### CURRICULUM FOR B.A. POLITICAL SCIENCE

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. Cal Poly follows the quarter system.

#### Freshman

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>POLS 100</td>
<td>Political Inquiry</td>
<td>3</td>
</tr>
<tr>
<td>POLS 105</td>
<td>Introduction to International Relations</td>
<td>3</td>
</tr>
<tr>
<td>POLS 210</td>
<td>American and California Government (D.1.)</td>
<td>3</td>
</tr>
<tr>
<td>HIST 102, HIST 103</td>
<td>History of Western Civilization</td>
<td>3,3</td>
</tr>
<tr>
<td>ENGL 114</td>
<td>Writing: Exposition (A.1.)</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 125/PHIL 125/SPC 125</td>
<td>Critical Thinking (A.2.)</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 215</td>
<td>Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.)</td>
<td>4</td>
</tr>
<tr>
<td>SPC 201</td>
<td>Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
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</tr>
<tr>
<td>Statistics elective (B.2.)</td>
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<tr>
<td>BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100 elective (E.2.)</td>
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#### Sophomore

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<tr>
<td>POLS 206</td>
<td>Judicial Process</td>
<td>3</td>
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<tr>
<td>POLS 212</td>
<td>Comparative Politics</td>
<td>3</td>
</tr>
<tr>
<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ECON 201/ECON 211/ECON 222 (D.3.)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>HIST 204</td>
<td>History of American Ideals and Institutions (D.1.)</td>
<td>3</td>
</tr>
<tr>
<td>PSY 201/PSY 202</td>
<td>General Psychology (E.1.)</td>
<td>3</td>
</tr>
<tr>
<td>1 Computer literacy elective (F.1.)</td>
<td>3</td>
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<tr>
<td>1 Critical reading electives (C.1.)</td>
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<td>1 Mathematics elective (B.2.)</td>
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<tr>
<td>1 Physical and life sciences electives (one each, one with lab) (B.1.)</td>
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## Political Science

**Junior**

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<tbody>
<tr>
<td>POLS 204</td>
<td>Basic Concepts of Political Thought</td>
<td>3</td>
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<tr>
<td>POLS 305</td>
<td>Political Analysis</td>
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<tr>
<td>POLS 314</td>
<td>Public Administration</td>
<td>3</td>
</tr>
<tr>
<td>Geography elective</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
<td>3</td>
</tr>
<tr>
<td>PHIL 230/PHIL 231</td>
<td>Philosophical Classics (C.1.)</td>
<td>3</td>
</tr>
<tr>
<td>1 ANT/ BUS/ ECON/ GEOG/ SOC elective (D.4.b.)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>1 Arts and humanities elective (Area C)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>1 Literature, philosophy, arts elective (300-400 level) (C.3.)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>1 Technology elective (F.2.)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Political science electives (300-400 level)</td>
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<td>6</td>
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<tr>
<td>2 Electives and courses to complete concentration</td>
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</table>

**Senior**

<table>
<thead>
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<tbody>
<tr>
<td>POLS 461</td>
<td>Senior Project</td>
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<tr>
<td>POLS 462</td>
<td>Senior Project</td>
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</tr>
<tr>
<td>Political science electives (300-400 level)</td>
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<tr>
<td>2 Electives and courses to complete concentration</td>
<td></td>
<td>20</td>
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</tbody>
</table>

---

1. To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 114 of this catalog.
2. Seven units must be prefix other than POLS. 27 elective units at the 300-400 level must be chosen with the approval of the adviser in the field of concentration.
3. Students in the Teaching Concentration should take HIST 201, HIST 202, HIST 203 instead of HIST 204 shown in the basic curriculum.
4. To be selected from GEOG 150, GEOG 215, GEOG 250, GEOG 305, GEOG 308, GEOG 315, GEOG 320, GEOG 325.

### International Affairs Concentration

**Add Courses Below to Basic Curriculum**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>POLS 304</td>
<td>Politics of Global Survival</td>
<td>4</td>
</tr>
<tr>
<td>POLS 311</td>
<td>Inter-American Relations</td>
<td>3</td>
</tr>
<tr>
<td>POLS 312</td>
<td>International Politics</td>
<td>3</td>
</tr>
<tr>
<td>POLS 313</td>
<td>National Security Policy</td>
<td>3</td>
</tr>
<tr>
<td>POLS 411</td>
<td>Contemporary U.S. Foreign Policy</td>
<td>3</td>
</tr>
<tr>
<td>POLS 417</td>
<td>Asian Politics</td>
<td>3</td>
</tr>
<tr>
<td>POLS 418</td>
<td>Soviet Politics</td>
<td>3</td>
</tr>
<tr>
<td>POLS 465</td>
<td>Middle Eastern Politics</td>
<td>4</td>
</tr>
<tr>
<td>POLS 468</td>
<td>African Politics</td>
<td>4</td>
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</tbody>
</table>

May substitute POLS 384 (3) and JOUR 401 (3) for any of the above.

### Pre-Law Concentration

**Add Courses Below to Basic Curriculum**

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>ENGL 302</td>
<td>Writing: Advanced Composition</td>
<td>4</td>
</tr>
<tr>
<td>POLS 321</td>
<td>American Constitutional Law</td>
<td>3</td>
</tr>
<tr>
<td>POLS 322</td>
<td>Civil Liberties</td>
<td>3</td>
</tr>
<tr>
<td>POLS 334</td>
<td>Jurisprudence</td>
<td>3</td>
</tr>
<tr>
<td>Pre-Law electives (300-400 level)</td>
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<td>14</td>
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</tbody>
</table>

---
Public Administration Concentration
(Add Courses Below to Basic Curriculum)

POLS 340 Government Internship ............................................ 4
POLS 401 State and Local Government ........................................ 4
POLS 405 Politics of Finance and Planning ..................................... 3
POLS 441 Administrative Theory and Behavior ............................. 4
POLS 442 Public Personnel Administration .................................. 4
Adviser approved electives ....................................................... 11

Teaching Concentration
(Add Courses Below to Basic Curriculum)

POLS 301 California State and Local Politics ................................ 3
ED 300 Introduction to the Teaching Profession .............................. 3
HIST 101 History of Western Civilization .................................... 3
1 HIST 201, HIST 202, HIST 203 U.S. History .......................... 3,3,3
Adviser approved electives ....................................................... 12

1 Students in the Teaching Concentration should take HIST 201, HIST 202, HIST 203 instead of HIST 204 shown in the basic curriculum.

Urban Studies Concentration
(Add Courses Below to Basic Curriculum)

POLS 401 State and Local Government ........................................ 4
POLS 403 Municipal Government .............................................. 3
POLS 405 Politics of Finance and Planning .................................... 3
POLS 425 Public Policy Analysis ............................................... 4
GEOG 310 Urban Geography ................................................... 3
SOC 313 Urban Sociology ....................................................... 3
Adviser approved electives ....................................................... 9

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CURRICULUM FOR PUBLIC ADMINISTRATION MINOR

Students interested in public sector careers may enroll in the minor program in Public Administration. The minor consists of 28 units of coursework and involves a supervised internship experience in a governmental agency. Details are available from the Political Science Department.

Units

Required courses .............................................................. 22

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>POLS 314 Public Administration</td>
<td>(3)</td>
</tr>
<tr>
<td>POLS 340 Government Internship</td>
<td>(4)</td>
</tr>
<tr>
<td>POLS 405 Politics of Finance and Planning</td>
<td>(3)</td>
</tr>
<tr>
<td>POLS 425 Public Policy Analysis</td>
<td>(4)</td>
</tr>
<tr>
<td>POLS 441 Administration Theory and Behavior</td>
<td>(4)</td>
</tr>
<tr>
<td>POLS 442 Public Personnel Administration</td>
<td>(4)</td>
</tr>
</tbody>
</table>

Electives ............................................................. 6
6 units of adviser approved electives.
Students interested in adding a strong international dimension to their major field of study may enroll in the minor program in International Relations. The minor consists of 28-30 units of coursework divided into three categories: 12 units of required coursework, 9-12 units in area of emphasis (Latin America, Middle East, Africa, Europe) and 7-12 units of general coursework. Details are available from the Political Science Department.

<table>
<thead>
<tr>
<th>Units</th>
<th>Required courses</th>
<th>Area of emphasis</th>
<th>Adviser approved electives</th>
</tr>
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<tbody>
<tr>
<td>12</td>
<td>POLS 105  Introduction to International Relations (3)</td>
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<tr>
<td></td>
<td>POLS 411  Contemporary U.S. Foreign Policy (3)</td>
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<tr>
<td></td>
<td>ECON 325  Underdevelopment and Economic Growth (D.4.b.) (3)</td>
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<tr>
<td></td>
<td>GEOG 308  Global Geography (D.4.b.) (3)</td>
<td></td>
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</tr>
<tr>
<td>9–12</td>
<td>Adviser approved coursework in area of emphasis (Latin America, Middle East, Africa, Europe)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7–4</td>
<td>Adviser approved electives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
SOCIAL SCIENCES DEPARTMENT

Faculty Office Bldg. (47), Room 13-D
(805) 756-2260

Faculty
Department Chair, Warren W. DeLey

<table>
<thead>
<tr>
<th>James W. Coleman</th>
<th>Patrick C. McKim</th>
<th>William L. Preston</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barbara E. Cook</td>
<td>John A. McKinstry</td>
<td>Richard A. Shaffer</td>
</tr>
<tr>
<td>Donald R. Floyd</td>
<td>Barbara L. Mori</td>
<td>George J. Suchand</td>
</tr>
<tr>
<td>Robert L. Hoover</td>
<td>Leo W. Pinard II</td>
<td>Calvin H. Wilvert</td>
</tr>
<tr>
<td>Harold R. Kerbo</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Programs

B.S. Social Sciences with Concentrations in:

- Criminal Justice Organizations
- Cross-Cultural Studies Social Sciences (Teaching)
- Individualized Course of Study Social Services
- Minor: Anthropology-Geography

The Social Sciences Department provides a broadly based orientation to the study of society and its environment drawing on courses in anthropology, geography, and sociology. Students prepare for a wide range of careers in federal, state and local government; teaching; social services agencies; and criminal justice including probation, parole, law and law enforcement; as well as in business and industry. The flexible curriculum offers the student the opportunity for familiarization and analysis concerning the most sensitive and critical issues of the student’s life.

The Social Sciences Department serves all of the schools of the campus in providing general education for citizenship. The department seeks to provide the student with a better understanding of the society in which we live, to develop in the student those skills and attitudes which are prerequisites for effective citizenship, and to prepare and encourage the individual toward intelligent and responsible social action.

The occupational objectives of the department are to prepare 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 educate those who expect to teach social studies in elementary or secondary schools.

Students with majors in fields other than the social sciences may select courses which will aid in qualifying them for a variety of civil service positions. The department offers an Anthropology-Geography Minor.

The department offers the degree of Bachelor of Science in Social Sciences. This degree allows the student to choose among five concentrations leading to different careers.

CURRICULAR CONCENTRATIONS

Criminal Justice
This concentration is designed to prepare students for careers in law, law enforcement, corrections, detention, probation, parole and other criminal justice agencies.
Cross-Cultural Studies
This concentration will prepare students for careers in a wide range of cross-cultural contexts: international development agencies, the public health field, intercultural education, plus numerous careers overseas in private industries.

Individualized Course of Study
This program is designed to provide students with varying backgrounds and interests to pursue a course of study which meets their individual needs and interests. It consists of 27 units taken at the 300-400 level. The student will select the courses in consultation with advising faculty and provide a written justification for those chosen and the way they constitute a cohesive, integrated study. The list of courses then becomes a contract between the student and the Department.

Organizations
Students in this concentration learn to apply the general principles of human behavior developed in the social sciences to the understanding of modern organizations. It prepares them for careers in either business or government organizations.

Social Services
This concentration provides a course of study that applies the general principles of human social behavior developed in the social sciences and specialized professional courses to prepare students for careers in the helping professions such as social work and counseling.

Teaching
With additional coursework as prescribed by the Education Department, students taking this concentration may pursue coursework leading to the Multiple Subject Credential for elementary school teachers or the Single Subject Credential for secondary school social science teachers of history, geography, political science and economics. Certain courses apply toward "waiver" programs which eliminate the National Teacher Examination requirement. For more information regarding teacher credential programs, please see page 348.

OTHER CONCENTRATIONS AVAILABLE
The following concentrations outside the Social Sciences Department are also offered with prior consultation and approval of the Social Sciences Department and the department offering the concentration: Public Administration, Pre-Law, International Affairs or Urban Studies (Political Science Department), Human Resources Management, Management, or International Business Management (School of Business).

CURRICULUM FOR B.S. SOCIAL SCIENCES
Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. Cal Poly follows the quarter system.

Freshman
ANT 201 Cultural Anthropology ................................................................. 3
ANT 203 Physical Anthropology ................................................................. 3
GEOG 150 Human Geography ................................................................. 3
GEOG 250 Physical Geography ................................................................. 3
SOC 105 Introduction to Sociology (D.4.a.) ............................................. 3
SOC 106 Social Problems .......................................................................... 3
ENGL 114 Writing: Exposition (A.1.) ..................................................... 4
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) ............................ 3
HIST 204 History of American Ideals and Institutions (D.1.) .................... 3
LIB 101 Library Instruction ........................................................................ 1
SPC 201 Public Speaking or SPC 202 Principles of Speech Communication (A.3.) 3
1 Physical and life sciences electives (one with lab) (B.1.) ......................... 12
2 Electives and courses to complete major .................................................. 5

49
## Sophomore

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tr>
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<td>World Prehistory</td>
<td>3</td>
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<tr>
<td>GEOG 215</td>
<td>Human Impact on the Earth</td>
<td>3</td>
</tr>
<tr>
<td>POLS 105</td>
<td>International Relations</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 215</td>
<td>Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.)</td>
<td>4</td>
</tr>
<tr>
<td>PHIL 230/PHIL 231</td>
<td>Philosophical Classics (C.1.)</td>
<td>3</td>
</tr>
<tr>
<td>POLS 210</td>
<td>American and California Government (D.1.)</td>
<td>3</td>
</tr>
<tr>
<td>PSY 201/PSY 202</td>
<td>General Psychology (E.1.)</td>
<td>3</td>
</tr>
<tr>
<td>STAT 211</td>
<td>Elementary Probability and Statistics (B.2.)</td>
<td>3</td>
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<tr>
<td>BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100</td>
<td>elective (E.2.)</td>
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<tr>
<td>Computer literacy elective (F.1.)</td>
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</tr>
<tr>
<td>Critical reading electives (C.1.)</td>
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</tr>
<tr>
<td>Economics elective (D.3.)</td>
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<td>3</td>
</tr>
<tr>
<td>Fine and Performing Arts elective (C.2.)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Mathematics elective (B.2.)</td>
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## Junior

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<tr>
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<tbody>
<tr>
<td>SOC 323</td>
<td>Social Stratification</td>
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</tr>
<tr>
<td>SOC 333</td>
<td>Social Research Methods I</td>
<td>3</td>
</tr>
<tr>
<td>SOC 334</td>
<td>Social Research Methods II</td>
<td>3</td>
</tr>
<tr>
<td>SOCS 366</td>
<td>Research and Writing Seminar in Social Sciences</td>
<td>3</td>
</tr>
<tr>
<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
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</tr>
<tr>
<td>Arts and humanities elective (Area C)</td>
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<tr>
<td>Literature, philosophy, arts elective (300-400 level) (C.3.)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Technology elective (F.2.)</td>
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<td>3</td>
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<tr>
<td>Anthropology elective (300-400 level)</td>
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<tr>
<td>Geography (300-400 level)</td>
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<tr>
<td>History elective (300-400 level)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Sociology elective (300-400 level)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Electives and courses to complete major</td>
<td></td>
<td>13</td>
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</table>

## Senior

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOC 421</td>
<td>Social Theory</td>
<td>3</td>
</tr>
<tr>
<td>SOCS 461</td>
<td>Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>SOCS 462</td>
<td>Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>BUS/ECON/POLS elective (D.4.b.)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Anthropology electives (300-400 level)</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Geography electives (300-400 level)</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>History elective (300-400 level)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Political science elective (300-400 level)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Sociology electives (300-400 level)</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Electives and courses to complete major</td>
<td></td>
<td>17</td>
</tr>
</tbody>
</table>

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

1. To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 114 of this catalog.

2. 27 of the elective units must be chosen with the approval of the adviser in a field of concentration.
Criminal Justice Concentration
(Add Courses Below to Basic Curriculum)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOC 316</td>
<td>American Minorities</td>
<td>3</td>
</tr>
<tr>
<td>SOC 402</td>
<td>Crime and Delinquency</td>
<td>3</td>
</tr>
<tr>
<td>SOC 412</td>
<td>Treatment of Criminals and Delinquents</td>
<td>3</td>
</tr>
<tr>
<td>SOC 413</td>
<td>Methods of Social Work</td>
<td>3</td>
</tr>
<tr>
<td>SOCS 440</td>
<td>Supervised Fieldwork</td>
<td>3</td>
</tr>
<tr>
<td>Adviser approved electives</td>
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<td></td>
</tr>
</tbody>
</table>

Cross-Cultural Studies Concentration
(Add Courses Below to Basic Curriculum)

**Required courses (12 units)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANT 341</td>
<td>Comparative Societies</td>
<td>3</td>
</tr>
<tr>
<td>ANT 360</td>
<td>Human Cultural Adaptation</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 308</td>
<td>Global Geography</td>
<td>3</td>
</tr>
<tr>
<td>SOC 309</td>
<td>World System</td>
<td>3</td>
</tr>
</tbody>
</table>

**Development courses to be selected from**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANT 325, 420, GEOG 315, 320</td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>

**Problems and Issues courses to be selected from**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANT 401, GEOG 305, 325, SOC 315</td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>

**Regions and Applications courses to be selected from approved list. See adviser.**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANT 325, 420, GEOG 315, 320</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

Organizations Concentration
(Add Courses Below to Basic Curriculum)

20–21 units to be selected from the following

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOC 310</td>
<td>Socialization: Self, Organizations and Society</td>
<td>3</td>
</tr>
<tr>
<td>SOC 350</td>
<td>Social Organization in Modern Japan</td>
<td>3</td>
</tr>
<tr>
<td>SOC 395</td>
<td>Sociology of Complex Organizations</td>
<td>3</td>
</tr>
<tr>
<td>SOCS 440</td>
<td>Supervised Fieldwork</td>
<td>3</td>
</tr>
<tr>
<td>MGT 312</td>
<td>Organization and Management Theory</td>
<td>4</td>
</tr>
<tr>
<td>MGT 314</td>
<td>Human Resource Management</td>
<td>4</td>
</tr>
<tr>
<td>MGT 317</td>
<td>Organizational Behavior</td>
<td>3</td>
</tr>
<tr>
<td>or PSY 302</td>
<td>Behavior in Organizations</td>
<td>4</td>
</tr>
<tr>
<td>Adviser approved electives</td>
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</tbody>
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Social Services Concentration
(Add Courses Below to Basic Curriculum)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOC 301</td>
<td>Social Work in the U.S.A.</td>
<td>3</td>
</tr>
<tr>
<td>SOC 302</td>
<td>Social Welfare Institutions</td>
<td>3</td>
</tr>
<tr>
<td>SOC 344</td>
<td>Sociology of Poverty</td>
<td>3</td>
</tr>
<tr>
<td>SOC 413</td>
<td>Methods of Social Work</td>
<td>3</td>
</tr>
<tr>
<td>SOCS 440</td>
<td>Supervised Fieldwork</td>
<td>6</td>
</tr>
<tr>
<td>Adviser approved electives</td>
<td>9</td>
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Social Services Concentration
(Add Courses Below to Basic Curriculum)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOC 301</td>
<td>Social Work in the U.S.A.</td>
<td>3</td>
</tr>
<tr>
<td>SOC 302</td>
<td>Social Welfare Institutions</td>
<td>3</td>
</tr>
<tr>
<td>SOC 344</td>
<td>Sociology of Poverty</td>
<td>3</td>
</tr>
<tr>
<td>SOC 413</td>
<td>Methods of Social Work</td>
<td>3</td>
</tr>
<tr>
<td>SOCS 440</td>
<td>Supervised Fieldwork</td>
<td>6</td>
</tr>
<tr>
<td>Adviser approved electives</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>
Teaching Concentration
(Add Courses Below to Basic Curriculum)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 340</td>
<td>Geography of California</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 350</td>
<td>Geography of the United States</td>
<td>3</td>
</tr>
<tr>
<td>SOC 316</td>
<td>American Minorities</td>
<td>3</td>
</tr>
<tr>
<td>SOCS 424</td>
<td>Organizing and Teaching Social Sciences</td>
<td>3</td>
</tr>
<tr>
<td>SOCS 440</td>
<td>Supervised Fieldwork or ED 300</td>
<td>3</td>
</tr>
<tr>
<td>HIST 101, HIST 102, HIST 103</td>
<td>History of Western Civilization</td>
<td>3,3,3</td>
</tr>
<tr>
<td>HIST 385</td>
<td>Topics in California History</td>
<td>3</td>
</tr>
</tbody>
</table>

CURRICULUM FOR ANTHROPOLOGY-GEOGRAPHY MINOR

The Anthropology-Geography Minor provides the broadest possible spatial and cultural knowledge of our world. The 30-unit program consists of 12 units of required core courses, in addition to others that allow the student maximum flexibility in tailoring training to a wide variety of specific occupational needs. Many majors may find this minor of special interest, especially those planning teaching careers in History, Political Science, and Liberal Studies, or those interested in international aspects of agriculture, economics, or business.

At least 15 units must be selected from upper division courses, and at least two foundation courses must be completed before proceeding to upper division courses.

<table>
<thead>
<tr>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
</tr>
</tbody>
</table>
Understanding the process of communication is no less important in today's Information Age than it was during the Golden Age of Athens, when skill in oral communication determined one's success in life. The study of speech as a means of influence, entertainment, and information was at the foundation of Western Civilization in Classical Greece and Rome. Isocrates and Cicero were among those who credited speech with the development of civilization and culture. A course of study in speech communication, always one that required a knowledge of many cognate fields like psychology and logic, is still interdisciplinary in nature. Faculty in speech communication teach aesthetic, historical, and empirical methods for understanding communication.

The aims of the discipline are both conceptual and practical. The study of communication embodies the concerns of rhetoric, one of the three original liberal arts. In broad terms, students who enroll in a liberal arts curriculum do so to develop the ability to analyze and reason critically, write and speak effectively, and appreciate the influences of culture upon their lives. The first role of the department is to advance these objectives.

Courses in the modern discipline of speech communication focus on the history and theory of communication. The field embraces communication in all contexts: political, organizational, debate, small group, intercultural, instructional, mass media, and performance of literature. The emphasis on developing theoretical insights unites these disparate fields.

The department offers fully articulated major and minor programs. Through the use of adviser approved electives, the major can be shaped to assist students in preparing for their educational and career objectives. Students use a speech communication major to prepare for careers in business, advertising and public relations, theatre, law, education, the mass media, and the clergy. In addition to providing students with an option to select from a broad range of internships and the opportunity to participate in the Teaching Credential Program (see page 348), the department houses an extensive program in competitive debate and speaking. It also offers individual and sequenced courses to develop practical skills in oral composition, critical thinking, and effective human communication, as well as general education courses in the history and theory of speech communication.
### CURRICULUM FOR B.A. SPEECH COMMUNICATION

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. Cal Poly follows the quarter system.

#### Freshman

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPC 101</td>
<td>Introduction to Speech Communication</td>
</tr>
<tr>
<td>SPC 201</td>
<td>Public Speaking (A.3.)</td>
</tr>
<tr>
<td>SPC 212</td>
<td>Interpersonal Communication</td>
</tr>
<tr>
<td>SPC 250</td>
<td>Forensic Activity</td>
</tr>
<tr>
<td>HIST 101, HIST 102, HIST 103</td>
<td>History of Western Civilization</td>
</tr>
<tr>
<td>ENGL 114</td>
<td>Writing: Exposition (A.1.)</td>
</tr>
<tr>
<td>ENGL 125/PHIL 125/SPC 125</td>
<td>Critical Thinking (A.2.)</td>
</tr>
<tr>
<td>POLS 210</td>
<td>American and California Government (D.1.)</td>
</tr>
<tr>
<td>1</td>
<td>Computer literacy elective (F.1.)</td>
</tr>
<tr>
<td>1</td>
<td>Mathematics elective (B.2.)</td>
</tr>
<tr>
<td>1</td>
<td>Mathematics, physical or life sciences elective (B.1. or B.2.)</td>
</tr>
<tr>
<td>1</td>
<td>Physical or life sciences elective with lab (B.1.)</td>
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<tr>
<td>1</td>
<td>Statistics elective (B.2.)</td>
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<tr>
<td>Electives</td>
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#### Sophomore

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>SPC 213</td>
<td>Organizational Communication</td>
</tr>
<tr>
<td>SPC 217</td>
<td>Small Group Communication</td>
</tr>
<tr>
<td>SPC 350</td>
<td>Advanced Forensic Activity</td>
</tr>
<tr>
<td>ANT 201/GEOG 150/SOC 105</td>
<td>(D.4.a.)</td>
</tr>
<tr>
<td>ENGL 215</td>
<td>Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.)</td>
</tr>
<tr>
<td>HIST 204</td>
<td>History of American Ideals and Institutions (D.1.)</td>
</tr>
<tr>
<td>PHIL 230/PHIL 231</td>
<td>Philosophical Classics (C.1.)</td>
</tr>
<tr>
<td>PSY 201/PSY 202</td>
<td>General Psychology (E.1.)</td>
</tr>
<tr>
<td>BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100</td>
<td>elective (E.2.)</td>
</tr>
<tr>
<td>1</td>
<td>Critical reading electives (C.1.)</td>
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<tr>
<td>1</td>
<td>Fine and Performing Arts elective (C.2.)</td>
</tr>
<tr>
<td>1</td>
<td>Life sciences elective (B.1.b.)</td>
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<tr>
<td>1</td>
<td>Physical sciences elective (B.1.a.)</td>
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<tr>
<td>Electives</td>
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</table>

#### Junior

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPC 300</td>
<td>Voice and Phonetics</td>
</tr>
<tr>
<td>SPC 305</td>
<td>Performance of Literature</td>
</tr>
<tr>
<td>SPC 312</td>
<td>Communication Theory</td>
</tr>
<tr>
<td>SPC 322</td>
<td>Persuasion</td>
</tr>
<tr>
<td>SPC 330</td>
<td>Classical Rhetorical Theory</td>
</tr>
<tr>
<td>SPC 460</td>
<td>Undergraduate Seminar</td>
</tr>
<tr>
<td>2</td>
<td>ENGL 302 Writing: Advanced Composition</td>
</tr>
<tr>
<td>ECON 201/ECON 211/ECON 222</td>
<td>(D.3.)</td>
</tr>
<tr>
<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
</tr>
<tr>
<td>1</td>
<td>Arts and humanities elective (Area C)</td>
</tr>
<tr>
<td>1</td>
<td>Literature, philosophy, arts elective (300-400 level) (C.3.)</td>
</tr>
<tr>
<td>3</td>
<td>Support courses</td>
</tr>
<tr>
<td>Electives</td>
<td></td>
</tr>
<tr>
<td>Course</td>
<td>Units</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>SPC 411 Communication Research</td>
<td>4</td>
</tr>
<tr>
<td>SPC 430 Rhetorical Criticism</td>
<td>4</td>
</tr>
<tr>
<td>SPC 461 Senior Project</td>
<td>3</td>
</tr>
<tr>
<td>1 ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.)</td>
<td>3</td>
</tr>
<tr>
<td>1 Technology elective (F.2.)</td>
<td>3</td>
</tr>
<tr>
<td>3 Support courses</td>
<td>7</td>
</tr>
<tr>
<td>4 Theatre or Speech Communication electives (300–400 level)</td>
<td>12</td>
</tr>
<tr>
<td>Electives</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>47</td>
</tr>
</tbody>
</table>

1 To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300–400 level). Please see page 114 of this catalog.
2 Or score of 10 on Junior Writing Test.
3 14 units from courses chosen with approval of student's adviser; minimum of 7 units at 300–400 level.
4 To be selected with approval of student's adviser.

**CURRICULUM FOR SPEECH COMMUNICATION MINOR**

A 25-unit minor is available for students who desire documented competency in Speech Communication. After completing the core courses listed below, students may select the remainder of their courses from an approved list. Copies of the list and further information and application forms are available in the Speech Communication Department office.

**Units**

**Required courses**

- SPC 201 Public Speaking (3) or SPC 202 Principles of Speech Communication (A.3.) (3)
- SPC 212 Interpersonal Communication (4)
- SPC 312 Communication Theory (4)
- SPC 330 Classical Rhetorical Theory or SPC 331 Contemporary Rhetorical Theory (C.3.) (4)

**Electives**

- 10 units of Speech Communication of which at least 8 units must be 300-400 level.

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See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Speech Communication and other subjects.
The courses offered by the Theatre and Dance Department provide students with a well-balanced program of studies, useful as a solid base on which to build further graduate or professional studies, as an attractive supplement to their other studies, or as a way of stretching themselves creatively. Courses are offered in both the theory and practice of theatre and dance. A full range of studio dance courses is available, plus courses designed especially for future teachers of dance and for elementary or secondary teachers. In theatre, the major aspects of the discipline are covered—technical theatre, design, acting and directing. General Education and Breadth courses are available for the inquiring student in Introduction to Theatre and for the more advanced student in Theatre History and Literature. Courses in Children’s Theatre are particularly designed for elementary or secondary teachers.

The department also acts as a campus and community cultural focus with its production of three mainstage dramatic productions and its annual Orchesis dance concert. All Cal Poly students have the opportunity to participate in these productions through auditioning, volunteering, or coursework. Recent stage productions have included Anything Goes, Macbeth, Three Sisters, Morning’s at Seven and at least one main stage world premiere production per year. In addition, the department frequently sponsors special guest lecturers and student-directed productions. Minors are offered in both Dance and Theatre.
CURRICULUM FOR DANCE MINOR

The Dance Minor consists of 30 units designed to provide the student with a well-balanced program in the art and education of dance.

Admission to the minor is contingent upon a departmental interview and review. All students must have more than a 2.0 GPA.

Units

Core courses ................................................................. 22
- DANC 221 Dance Appreciation (C.2.) (3)
- DANC 231 Intermediate Ballet (2)
- DANC 232 Intermediate Modern Dance (2)
- DANC 311 Orientation to Dance (3)
- DANC 320 Dance Notation (3)
- DANC 321 History of Dance (C.3.) (3)
- DANC 340 Dance Improvisation and Composition (3)
- DANC 381 Methods of Teaching Dance (3)

Elective courses to be selected from ........................................ 8
- DANC 134 Beginning Social Dance (2)
- DANC 135 International Folk Dance (1)
- DANC 233 Intermediate Jazz (2)
- DANC 234 Intermediate Social Dance (2)
- DANC 345 Choreography (3–9)
- DANC 346 Dance Production (3–12)

CURRICULUM FOR THEATRE MINOR

The Theatre Minor requires 28 units designed to provide the student with a sound foundation in the major aspects of theatre.

Admission to the minor is contingent upon a departmental interview and review. In addition, all students must have more than a 2.0 GPA.

This program assures each student of a balanced program in the major areas of theatre and it also allows for a degree of specialization in an area of the student’s choice. Students should discuss their interests with department faculty.

Units

Core courses ................................................................. 18–21
- TH 210 Introduction to the Theatre (C.2.) (3)
- TH 327 Theatre History and Literature (C.3.) (3)
- TH 328 Theatre History and Literature (C.3.) (3)
- TH 330 Stagecraft (3–9)
- TH 340 Acting (3)
- TH 430 Introduction to Stage Design: Scenery (3)

Elective courses to be selected from the following ......................... 10–7
- TH 342 Directing (3)
- TH 345 Rehearsal and Performance (3–9)
- TH 380 Children’s Drama (3)
- TH 432 Introduction to Stage Design: Costume (3)
- TH 434 Introduction to Stage Design: Lighting and Sound (3)
- TH 450 Theatre Management (3)
- TH 470 Selected Advanced Topics (1–3)

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School of Professional Studies
and Education

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  Printing Technology Concentration
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M.A. Education ................................................................. 339
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  Educational Administration Specialization
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  Special Education Specialization
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The School of Professional Studies and Education offers several major curricula leading to Bachelor of Science, Bachelor of Arts, Master of Arts, and Master of Science degrees. In addition, each department provides courses which are designed to serve all other departments of the university in offering experiences to students that enhance their general education.

The School of Professional Studies and Education is a unique school in that it is comprised of diverse disciplines with a common goal. This common goal is the preparation of students in career fields which are not oriented around a single discipline.

The seven departments in the school are: Education, Graphic Communication, Home Economics, Industrial Technology, Military Science, Physical Education and Recreation Administration, and Psychology and Human Development. Each offers its specialized studies taught by faculty with academic expertise and professional experience. Academic minors are offered in Gerontology, Packaging and Psychology. The Integrative Technology minor is jointly administered by the departments of Human Development and Psychology, Industrial Engineering and Industrial Technology.

The unifying element within each department is the interdisciplinary studies that are taken by all students. Knowledge is gathered from many areas and consolidated into a specialized emphasis. Students who are interested in specialized careers pursue their goals under the guidance of faculty and staff who are themselves uniquely qualified and experts in the various areas of study.

The Bachelor of Arts in Liberal Studies is offered in connection with the teacher education program. The school, through the Education Department, assists in the coordination of a campus-wide teacher education program and in the preparation of individuals seeking teaching, counseling or administrative services, reading and special education specialist credentials.

The school has taken the leadership in the sponsorship or direction of numerous community oriented projects which are timed to meet social needs in cooperation with local, state and federal agencies. The university supports a strong cocurricular program, and to this end the School of Professional Studies and Education provides valuable experiences to its students through specialized cocurricular activities which include: American Home Economics Association, American Institute of Plant Engineers, American Society for Quality Control, American Society of Interior Designers, Association of Computer-Based Education, Association of Fitness in Business, California Association of Health, Physical Education, Recreation and Dance, Cal Poly Teachers Society, Council for Exceptional Children, Epsilon Pi Tau (Industrial Technology), Friends of Shakespeare Press, Home Economics Advisory Board, Industrial Technology Society, Mat Pica Pi (Graphic Communication), Military Science and Advisory Board, Phi Upsilon Omicron (Home Economics), Poly Association for Consumer Economics, Psychology and Human Development Club, Recondo Unit, Recreation Administration Majors Club, Rifle Team, Scabbard and Blade, Society for Packaging and Handling Engineers, Society of Future Physical Therapists, Society of Plastic Engineers, Style (Textiles/Clothing Merchandising), Technical Association of the Graphic Arts.
GERONTOLOGY MINOR AND CERTIFICATE PROGRAM

An Interdisciplinary Program

This is an interdisciplinary program to upgrade the skills and increase the knowledge of persons already in the field of gerontology and to train students in various majors whose careers will be directly or indirectly related to gerontology. In addition, the program trains interested persons in providing continuing education programs for senior adults and assure the availability and accessibility of these programs to the elderly population through continuing education and peer educators.

The students acquire knowledge in the areas of the biological, psychological, and social aspects of aging; familiarity with changing roles and alternative roles; special housing and clothing needs of the frail elderly; stress related problems; retirement and leisure activities; and an understanding of the impact of an aging population on social, economic, and political institutions, and the impact of institutions on aging individuals. The focus of the curriculum will be on the majority of the elderly population (the independent, functioning older adult), while at the same time the program will recognize that a percentage of the elderly population have special needs due to mental and/or physical ailments.

Among the requirements for admission to the program is a minimum GPA of 3.00. All applicants will be reviewed by a faculty committee.

CURRICULUM FOR GERONTOLOGY MINOR AND CERTIFICATE PROGRAM

<table>
<thead>
<tr>
<th>Units</th>
<th>Required Core</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BIO 330 Biology of Aging (3)</td>
</tr>
<tr>
<td></td>
<td>PE 408 Exercise and Health Promotion for Senior Adults (3)</td>
</tr>
<tr>
<td></td>
<td>PSY 318 Psychology of Aging (3)</td>
</tr>
<tr>
<td></td>
<td>SOC 326 Sociology of Aging (3)</td>
</tr>
<tr>
<td></td>
<td>6 units to be selected with adviser's approval, from the following</td>
</tr>
<tr>
<td></td>
<td>FSN 315 Nutrition in Aging (3)</td>
</tr>
<tr>
<td></td>
<td>PSY 310 Death, Dying and Bereavement (3)</td>
</tr>
<tr>
<td></td>
<td>PSY 407 Behavior Disorders of the Aged (3)</td>
</tr>
<tr>
<td></td>
<td>REC 328 Aging and Leisure (3)</td>
</tr>
<tr>
<td></td>
<td>Electives (to be selected with adviser's approval)</td>
</tr>
<tr>
<td></td>
<td>HD 308 Adulthood (3)</td>
</tr>
<tr>
<td></td>
<td>HE 237 Fashion Analysis (3)</td>
</tr>
<tr>
<td></td>
<td>HE 305 Family Housing and Consumer Resources (5)</td>
</tr>
<tr>
<td></td>
<td>HE 423 Clothing for Disabled People (3)</td>
</tr>
<tr>
<td></td>
<td>PSY 317 Psychology of Stress (3)</td>
</tr>
<tr>
<td></td>
<td>PSY 459 Life Span Development (3)</td>
</tr>
<tr>
<td>3</td>
<td>Fieldwork</td>
</tr>
<tr>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>

1 Fieldwork may be fulfilled through the field placement/cooperative education/internship as an elective in the student's major (if related to gerontology), or it may be challenged due to previous work experience the student has had in gerontology.
CURRICULUM FOR INTEGRATIVE TECHNOLOGY MINOR

This minor is an interdisciplinary program which is sponsored by three departments: Industrial Engineering, Industrial Technology, and Psychology and Human Development. The goal of the minor is to educate students about the technical, social and business issues related to the use of new technology by companies. However, the emphasis of this minor is to present to business, social sciences, and humanities students the technological issues which companies face when dealing with technological change. After completing the minor, students should be literate in the technological aspects of manufacturing so that they will be able to participate with engineers and technological managers in the management of technological change.

For more information during the period 1990-92, please consult with Dr. Dan Levi, Psychology and Human Development Department.

<table>
<thead>
<tr>
<th>Units</th>
</tr>
</thead>
</table>

Required courses .......................................................................................................................... 16

ETMP 157 Electronic Manufacturing (3)
ETMP 158 Introduction to Robotics (2) or
   IE 234 Robotics Assembly (2)
IE 214 Production Control (2)
IE 319 Human Factors Engineering (3)
IT 350 Quality Systems Applications (3)
PSY 494 Psychology of Technological Change (3)

Select one from a set of Management electives ........................................................................... 3–4

MGT 311 Industrial Management (4)
MGT 313 Industrial Relations (3)
MGT 314 Human Resources Management (4)

Select one from a set of Humanities electives ............................................................................... 3

HIST 306 History of American Technology (3)
HIST 384 Labor and Work in American History (3)
HUM 402 Values and Technology (3)

Select one from a set of Social and Behavioral Sciences electives .................................................. 3–4

BUS 404 Government and Social Influence on Business (4)
PSY 302 Behavior in Organizations (3)
SPC 213 Organizational Communication (3)

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Engineering Technology-Manufacturing Processes, Industrial Engineering, Industrial Technology, Psychology and other subjects.
PACKAGING MINOR

An Interdisciplinary Program

The purpose of this interdisciplinary minor is to complement the student's degree major with a planned curriculum in packaging. The program is designed to capitalize on theories and skills learned in other disciplines thereby uniquely preparing students for success as packaging professionals in positions ranging from highly technical research and development through purchasing, production, sales and management.

Students gain the skills needed for the design of package forms and graphics, the specifications of materials and machinery to be used, the evaluation of package systems, as well as the planning and coordinating of packaging requirements. These specialized skills result from an integration of knowledge gained through the packaging curriculum with that of the major discipline. A significant understanding of packaging issues and their impact on the industry is also gained.

CURRICULUM FOR PACKAGING MINOR

<table>
<thead>
<tr>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required Core</td>
</tr>
<tr>
<td>CHEM 121 General Chemistry (B.1.a.) (4)</td>
</tr>
<tr>
<td>FSN 336 Food Packaging (3)</td>
</tr>
<tr>
<td>IT 327 Plastics Technology (3)</td>
</tr>
<tr>
<td>IT 330 Fundamentals of Packaging (3)</td>
</tr>
<tr>
<td>PHYS 104 Introductory Physics (B.1.a.) (4) or PHYS 121 College Physics (B.1.a.) (4)</td>
</tr>
<tr>
<td>Restricted Electives</td>
</tr>
<tr>
<td>Select three courses from the following list. Two courses must be 300 level or above to be selected with adviser's approval.</td>
</tr>
<tr>
<td>FSN 217 Fundamentals of Food Processing Operations (4)</td>
</tr>
<tr>
<td>FSN 230 Elements of Food Processing (4)</td>
</tr>
<tr>
<td>FSN 332 Statistical Quality Control (3)</td>
</tr>
<tr>
<td>GRC 437 Consumer Packaging (3)</td>
</tr>
<tr>
<td>IT 334 Materials Handling and Packaging (3)</td>
</tr>
<tr>
<td>IT 408 Protective Packaging (3)</td>
</tr>
<tr>
<td>IT 409 Machinery for Packaging (3)</td>
</tr>
<tr>
<td>IT 435 Package Development Management (3)</td>
</tr>
</tbody>
</table>
EDUCATION DEPARTMENT

Dexter Bldg. (34), Room 213
(805) 756-2583

Faculty

Department Head, Richard L. Warren

Mary Lud Baldwin
Donald Cheek
Leonard Davidman
Erland G. Dettloff
Howard Drucker
Margaret J. Glaser

Jack B. Jones
Robert L. Levison
Donald K. Maas
Susan L. McBride
Don M. Morris
Patricia A. Mulligan

Dennis M. Nulman
Kenneth F. Palmer
Louis D. Pippin
Marlynn F. Rice
David J. Sanchez
Bernard A. Troy

Programs

M.S. Counseling

M.A. Education with Specializations in:

- Computer Based Education
- Counseling and Guidance
- Curriculum and Instruction
- Educational Administration
- Reading
- Special Education

The Education Department offers a wide variety of courses and programs leading to careers in education. Common to all programs is a commitment to excellence, cooperation, and collaboration, to preparation for future educational challenges. A pronounced teaching shortage is upon us. As the state's population grows, enrollments in grades K-12 increase and with them the demand for teachers. New roles and responsibilities for highly competent teachers are developing, and teaching can lead to specialist positions in administration, curriculum planning, counseling, special education, reading, computer-based education. To meet the need for excellent teachers the Education Department seeks talented, creative students who are committed to a long term career in education and to the improvement of educational processes and institutions.

The Education Department offers a broad range of Master's degree specializations and teaching credential programs for qualified candidates. A Master of Arts degree in Education, and a Master of Science degree in Counseling are available. The Master of Arts degree in Education has areas of specialization in Computer Based Education, Counseling and Guidance, Curriculum and Instruction, Educational Administration, Reading, and Special Education. Credential programs include preliminary and advanced teaching credentials in single and multiple subjects. Service and specialist credentials in Administrative Services, Pupil Personnel Services, Reading Specialist and Special Education Specialist (Learning Handicapped and Severely Handicapped) are also offered. To accommodate the working professional, courses are offered during the late afternoon and evening.

Stressing the "learn by doing" philosophy of Cal Poly, the Education Department provides opportunities for extensive student on-site observation and fieldwork. Cal Poly maintains cooperative relations with the surrounding school districts, and within our service area students can enjoy cross-cultural, urban and rural fieldwork. Additionally, the department operates two clinics as a service to the community and for training purposes. The Reading Clinic provides diagnostic and remedial services for clients of school age. The Counseling and Guidance Clinic provides services in family, marital, individual, and child counseling.
MASTER OF ARTS DEGREE—EDUCATION

General Characteristics

The Master of Arts degree in Education is designed to provide both a broad-based perspective of education and increased competence in positions of special responsibility. Education master's degree programs described in this section are closely related to the occupational and professional requirements of a variety of vocational pursuits in the fields of education, counseling, college student affairs, and agencies involved with community affairs.

Program of Study

All programs require a minimum of 45 quarter units of acceptable graduate work, with at least 24 of the units with an Education prefix at the 500 series level. Courses taken in these programs may also be applied toward related credentials.

The candidate must maintain a grade point average of 3.0 (B) or better in all coursework attempted subsequent to admission to postbaccalaureate standing. Calculation of the grade point average will include all grades, although only the courses with A, B, or C grades will be counted to satisfy requirements for the degree. Required courses with a D or F grade must be repeated in all M.A. programs. All candidates must meet the current Graduation Writing Requirement (see page 138).

Credits earned in student teaching will not be accepted toward completion of any specialization within the Master of Arts in Education. At least 36 program-required quarter units shall be completed in residence. Transfer and/or extension credits will only be accepted when the credits are acceptable for master's degree credit by the offering institution in its own programs.

Depending on the specialization, final assessment of a candidate’s progress shall include a comprehensive written examination and ED 590 Research Applications in Education, or the completion of a thesis/project. Although only six units of credit may be applied to the degree requirements, students must enroll in ED 599 Thesis/Project for every quarter in which they are receiving advising.

Conditionally Classified Standing

The student may enroll in a graduate degree curriculum, if in the opinion of the appropriate campus authority, the student can remedy any deficiencies by additional preparation.

Classified Standing

For admission as a classified graduate student, a student shall have a minimum grade point average of 3.0 in the last 90 quarter units attempted. A student shall have earned an acceptable baccalaureate degree from a regionally accredited institution. Or, the student shall have completed equivalent academic preparation and have satisfactorily met the professional, personal, scholastic, and other standards for graduate study, including qualifying examinations, as the appropriate university authorities may prescribe. Only those applicants who show promise of success and fitness will be admitted to the graduate degree program, and only those who continue to demonstrate a satisfactory level of scholastic competence and who possess appropriate personal qualities will be eligible to continue in such a program.

Advancement to Candidacy

Advancement to master’s degree candidacy requires completion of a minimum of 24 quarter units of program-required courses in residence, specified in a formal program of study, with a minimum grade point average of 3.0 and the formal recommendation of the specialization faculty. Students must maintain a minimum grade point average of 3.0 in all coursework included on the formal program of study, and in all coursework completed subsequent to admission to postbaccalaureate standing.
The Computer Based Education specialization is designed to prepare teachers and other school personnel to develop and use computer programs for classroom instruction. Graduates of this program are expected to be capable of producing their own courseware and software; of integrating available software and technology into the curriculum; and of providing leadership in the modification of curriculum to take advantage of technological benefits. Either ED 590 and a written comprehensive examination or ED 599 are required for completion of the degree program.

**Prerequisites**

Students entering the Computer Based Education Program are expected to bring with them a background in certain basic subject areas or to make up deficiencies in these basic subject areas after admission. Prerequisite subject areas are BASIC Programming, PASCAL Programming, and classroom management.

---

### Units

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED 585</td>
<td>Research Methods in Education</td>
<td>4</td>
</tr>
<tr>
<td>ED 587</td>
<td>Educational Foundations and Current Issues</td>
<td>4</td>
</tr>
<tr>
<td>ED 588</td>
<td>Education, Culture and Learning</td>
<td>4</td>
</tr>
<tr>
<td>ED 590</td>
<td>Research Applications in Education</td>
<td>4</td>
</tr>
<tr>
<td>ED 599</td>
<td>Thesis/Project</td>
<td>3</td>
</tr>
</tbody>
</table>

**ED 585** and **ED 599** are required for completion of the degree program.

---

### Required Courses in Computer Science

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSC 413</td>
<td>Authoring Languages</td>
<td>4</td>
</tr>
<tr>
<td>CSC 414</td>
<td>Authoring Languages and Systems</td>
<td>4</td>
</tr>
<tr>
<td>CSC 416</td>
<td>Computer Applications in School Administration</td>
<td>3</td>
</tr>
<tr>
<td>CSC 427</td>
<td>Computer Based Educational Systems I</td>
<td>4</td>
</tr>
<tr>
<td>ED 501</td>
<td>Problems and Practices in Curriculum Development</td>
<td>3</td>
</tr>
<tr>
<td>ED 506</td>
<td>Models of Instruction</td>
<td>4</td>
</tr>
<tr>
<td>ED 507</td>
<td>Instructional Materials and Technology</td>
<td>3</td>
</tr>
<tr>
<td>ED 515</td>
<td>Educational Program Management and Evaluation</td>
<td>3</td>
</tr>
<tr>
<td>GRC 427</td>
<td>Desktop Publishing</td>
<td>2</td>
</tr>
<tr>
<td>PSY 494</td>
<td>Psychology of Technological Change in Organizations</td>
<td>3</td>
</tr>
</tbody>
</table>

### Restricted Electives

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ART 464</td>
<td>Graphics and Animation Techniques for Microcomputers</td>
<td>3</td>
</tr>
<tr>
<td>CSC 411</td>
<td>Advanced Computers for Educators</td>
<td>3</td>
</tr>
<tr>
<td>CSC 527</td>
<td>Advanced Computer Based Educational Systems II</td>
<td>3</td>
</tr>
<tr>
<td>ED 480</td>
<td>Computer Based Curriculum</td>
<td>3</td>
</tr>
<tr>
<td>ED 505</td>
<td>Computer Based Curriculum</td>
<td>3</td>
</tr>
<tr>
<td>GRC 427</td>
<td>Desktop Publishing</td>
<td>2</td>
</tr>
</tbody>
</table>

1 If ED 599 Thesis/Project is selected, student must register for credit each quarter of advisement.
CURRICULUM FOR M.A. EDUCATION, SPECIALIZATION IN COUNSELING AND GUIDANCE

The Master of Arts degree in Education with a Counseling and Guidance Specialization is designed to prepare students for careers in public or private school counseling or student affairs work in higher education. Admission to the program requires qualifying examinations, references, an autobiographical statement, and an interview. Coursework in personality theory is a prerequisite for this M.A. program. Candidates who have not completed such a class will not be denied admission to the university, but will be required to remove the deficiency as soon as possible. Pupil Personnel Services (PPS) Credential candidates must meet credential requirements of the State of California. Only six quarter units of fieldwork experience will apply toward the M.A., although additional fieldwork will be required to meet PPS credential and student affairs requirements. Student affairs candidates must include ED 562 in their formal program of study. ED 590 and a comprehensive examination or ED 599 are required. Courses taken in this program may be applied toward a fifth-year study for a clear teaching credential. Candidates whose goals are for clinical counseling careers in agency settings or in private practice should refer to the Master of Science in Counseling.

Unidades

Education Core ............................................................................................................................ 12
ED 585 Research Methods in Education (4)
ED 587 Educational Foundations and Current Issues (4)
ED 588 Education, Culture and Learning (4)

Required in the Area of Specialization .................................................................................... 29
ED 555 Counseling and Communication (4)
ED 556 Ethnic Counseling (4)
ED 557 Career Development (4)
ED 560 Counseling Theories and Assessment (4)
ED 561 Group Counseling (3)
ED 573 Field Experience—Counseling (6)
1 ED 590 Research Applications in Education (4)

Electives (to be selected with adviser’s approval) ................................................................... 7

If ED 599 Thesis/Project is selected in lieu of ED 590, student must register for credit each quarter of advisement.

48

1
The Curriculum and Instruction Specialization aims at expanding the candidate’s instructional skills and knowledge of curriculum at the elementary and/or secondary level. Candidates may want to improve their skills as classroom teachers; they may choose to enter positions as resource teachers, curriculum specialists, or instructional team leaders; or they may seek employment in the private sector in curriculum and training related positions. Courses taken in this program may be applied toward a fifth year of study for a clear teaching credential. In addition to the general prerequisites, applicants must have successfully completed student teaching prior to entering the program.

Either a comprehensive written examination and ED 590 or ED 599 are required for the completion of a master's degree with a specialization in curriculum and instruction.

<table>
<thead>
<tr>
<th>Units</th>
<th>Education Core</th>
<th>ED 585 Research Methods in Education (4)</th>
<th>ED 587 Educational Foundations and Current Issues (4)</th>
<th>ED 588 Education, Culture and Learning (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Required in Area of Specialization</td>
<td>ED 501 Problems and Practices in Curriculum Development (3)</td>
<td>ED 504 Seminar in Science and Mathematics Curriculum and Methods (4)</td>
<td>ED 505 Seminar in Social Studies Curriculum and Methods (3)</td>
</tr>
<tr>
<td></td>
<td>ED 506 Models of Instruction (4)</td>
<td>ED 507 Instructional Materials and Technology (3)</td>
<td>ED 532 Advanced Field Experiences in Education (3)</td>
<td>ED 532 Advanced Field Experiences in Education (3)</td>
</tr>
<tr>
<td></td>
<td>ED 590 Research Applications in Education (4) or</td>
<td>ED 599 Thesis/Project (3) (3)</td>
<td>ED 599 Thesis/Project (3) (3)</td>
<td>ED 599 Thesis/Project (3) (3)</td>
</tr>
<tr>
<td></td>
<td>Electives (selected with adviser's approval)</td>
<td>ED 440, ED 450, ED 480, ED 511, ED 512, ED 513, ED 515, ED 526, ED 529, ED 555, PE 422)</td>
<td>ED 440, ED 450, ED 480, ED 511, ED 512, ED 513, ED 515, ED 526, ED 529, ED 555, PE 422)</td>
<td>ED 440, ED 450, ED 480, ED 511, ED 512, ED 513, ED 515, ED 526, ED 529, ED 555, PE 422)</td>
</tr>
</tbody>
</table>

*If ED 599 Thesis/Project is selected, student must register for credit each quarter of advisement.
CURRICULUM FOR M.A. EDUCATION, SPECIALIZATION IN EDUCATIONAL ADMINISTRATION

This program is designed for career candidates in educational administration. It emphasizes a comprehensive knowledge of educational administration including applied theory of administration and leadership, schools in contemporary society, and effective management related to educational outcomes. While designed for career school administrators, the program can be helpful for administrators in other fields. ED 590 and a comprehensive written examination or ED 599 are required for completion of a masters degree with a specialization in Educational Administration.

Work in this program may be applicable to an Administrative Services Credential (See credential programs).

<table>
<thead>
<tr>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education Core ..................................................</td>
</tr>
<tr>
<td>ED 585 Research Methods in Education (4)</td>
</tr>
<tr>
<td>ED 587 Educational Foundations and Current Issues (4)</td>
</tr>
<tr>
<td>ED 588 Education, Culture and Learning (4)</td>
</tr>
<tr>
<td>Required in the Area of Specialization ..................................................</td>
</tr>
<tr>
<td>ED 512 Educational Organization and Management (4)</td>
</tr>
<tr>
<td>ED 513 Educational Leadership and Decision Making (4)</td>
</tr>
<tr>
<td>1 ED 590 Research Applications in Education (4) or ED 599 Thesis/Project (3) (3)</td>
</tr>
<tr>
<td>Electives (to be selected with adviser’s approval) ..................................................</td>
</tr>
<tr>
<td>Suggested electives: ED 416, ED 501, ED 510, ED 511, ED 514, ED 515, ED 516, ED 518, ED 542.</td>
</tr>
</tbody>
</table>

1 If ED 599 Thesis/Project is selected, student must register for credit each quarter of advisement.
CURRICULUM FOR M.A. EDUCATION, SPECIALIZATION IN READING

The Master of Arts degree in Education with a specialization in Reading is designed to present the candidate an opportunity for advanced preparation in reading. Graduate students not meeting minimum standards may appeal for special consideration to the Reading Assessment Committee.

Either a written comprehensive examination and ED 590, or ED 599 are required for the completion of a master's degree with a specialization in reading.

<table>
<thead>
<tr>
<th>Units</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Education Core</td>
<td>ED 585 Research Methods in Education (4)</td>
</tr>
<tr>
<td></td>
<td>ED 587 Educational Foundations and Current Issues (4)</td>
</tr>
<tr>
<td></td>
<td>ED 588 Education, Culture and Learning (4)</td>
</tr>
<tr>
<td></td>
<td>Required in Area of Specialization</td>
</tr>
<tr>
<td></td>
<td>ED 501 Problems and Practices in Curriculum Development (3)</td>
</tr>
<tr>
<td></td>
<td>ED 506 Models of Instruction (4)</td>
</tr>
<tr>
<td></td>
<td>ED 507 Instructional Materials and Technology (3)</td>
</tr>
<tr>
<td></td>
<td>ED 525 Reading Processes, Programs, and Technology (4)</td>
</tr>
<tr>
<td></td>
<td>ED 526 Diagnosing and Remediating Reading Problems (4)</td>
</tr>
<tr>
<td></td>
<td>ED 530 Secondary, College, and Adult Reading Practices (4)</td>
</tr>
<tr>
<td></td>
<td>ED 532 Advanced Field Experiences in Education (3)</td>
</tr>
<tr>
<td></td>
<td>ED 590 Research Applications in Education (4) or</td>
</tr>
<tr>
<td></td>
<td>ED 599 Thesis/Project (3)</td>
</tr>
<tr>
<td>Electives (to be selected with adviser's approval)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Suggested Electives: ED 529, ED 531)</td>
</tr>
</tbody>
</table>

*If ED 599 Thesis/Project is selected, student must register for credit each quarter of advisement.
CURRICULUM FOR M.A. EDUCATION, SPECIALIZATION IN SPECIAL EDUCATION

The Master of Arts degree with a specialization in Special Education is an academic program that offers the student an opportunity for advanced learning in Special Education. Applicants must meet personal and professional standards, including necessary qualifying examinations, presentation of personal recommendations, and a personal interview.

Units for the master’s degree program can be applied towards the requirements for a clear single or multiple subjects teaching credential. It is also possible for the qualified student to complete the requirements for the Specialist Credential while pursuing the requirements for the Master of Arts degree in Education.

ED 599 Thesis/Project is required for the completion of the Master’s degree with a specialization in Special Education.

| Units | Education Core | ED 585 Research Methods in Education (4) | ED 587 Educational Foundations in Current Issues (4) | ED 588 Education, Culture and Learning (4) | Required in Area of Specialization | ED 501 Problems and Practices in Curriculum Development (3) | ED 506 Models of Instruction (4) | ED 507 Instructional Materials and Technology (3) | ED 532 Advanced Field Experiences in Education (3) | ED 547 Atypical Learning Patterns (4) | ED 553 Current Issues in Special Education (3) | ED 590 Research Applications in Education (4) or ED 599 Thesis/Project (3) (3) | Electives (to be selected with adviser’s approval) |
|-------|----------------|----------------------------------------|-----------------------------------------------|-------------------------------------------|---------------------------------|-----------------------------------------------|--------------------------------|--------------------------------|-----------------------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| 12    |                | ED 501 Problems and Practices in Curriculum Development (3) | ED 506 Models of Instruction (4) | ED 507 Instructional Materials and Technology (3) | ED 532 Advanced Field Experiences in Education (3) | ED 547 Atypical Learning Patterns (4) | ED 553 Current Issues in Special Education (3) | ED 590 Research Applications in Education (4) or ED 599 Thesis/Project (3) (3) | Electives (to be selected with adviser’s approval) |

1 If ED 599 Thesis/Project is selected in lieu of ED 590, the student must register for credit each quarter of advisement.
MASTER OF SCIENCE DEGREE IN COUNSELING

General Characteristics

The Master of Science in Counseling, within the Education Department, provides graduate training in clinical counseling for candidates preparing for careers in agencies and/or seeking educational verification for the Marriage, Family and Child Counseling (MFCC) License. Admission to the program requires qualifying examinations, references, autobiographical information, an interview, and a minimum grade point average of 3.0 in the last 90 quarter units attempted.

Program of Study

The Master of Science in Counseling is required for students selecting the emphasis in Marriage, Family and Child Counseling (MFCC) and/or clinical training in agency counseling. Special coursework is required in child abuse, psychopharmacology, developmental psychology, ethics and law, psychopathology, diagnosis and treatment planning, sexual dysfunction, advanced MFC therapy, child therapy, and additional practicum and field experience, and other specific coursework as prescribed by the program and/or California legislation.

The candidate must maintain a grade point average of 3.0 (B) or better in all courses taken subsequent to admission to baccalaureate standing. Calculation of the grade point average will include all grades, though only the units in courses with grades of A, B, or C will be counted to satisfy requirements for the degree. Required courses with a grade of D or F must be repeated. All candidates must meet the current Graduation Writing Requirement (see page 138).

Forty-five quarter units must be completed in residence. Transfer credits will be allowed if acceptable for master's degree credit at the offering institution and approved by the Counseling Coordination Committee.

Completion of a thesis or project is required for the Master of Science degree in Counseling. Each candidate must file a formal program of study by the end of the first quarter as a classified graduate student. The student must complete one quarter in residence before applying for formal admission into the MS in Counseling, MFCC educational verification emphasis. The professional and personal growth of each graduate student is of major importance; consequently, candidates will be encouraged to seek the experience of personal therapy. Students must be very aware of course prerequisites and check the catalog carefully to assure enrollment in required courses.

Prerequisites

Prerequisites are coursework in abnormal psychology, behavioral effects of drugs and alcohol, developmental psychology, physiological psychology, and psychological testing. Candidates who have not completed such courses will not be denied admission to the university, but will be required to remove deficiencies as soon as possible.

Classified Standing

For admission as a classified graduate student, a student shall have a minimum grade point average of 3.0 in the last 90 quarter units attempted, and shall have earned an acceptable baccalaureate degree from an institution accredited by a regional association. Additionally, the graduate student must have satisfactorily met the professional, personal, scholastic, and other standards for graduate study, including qualifying examinations, as the appropriate university authorities may prescribe. Only those applicants who show promise of success and fitness will be admitted, and only those who continue to demonstrate a satisfactory level of scholastic competence and who possess appropriate personal qualities will be eligible to continue in such a curriculum.

Conditionally Classified Standing

The student may enroll in a graduate degree curriculum if in the opinion of the appropriate campus authority the student can remedy any deficiencies by additional preparation.

Advancement to Candidacy

Advancement to master's degree candidacy requires completion of a minimum of 30 quarter units of required courses in residence, specified in a formal program of study, with a minimum grade point average of 3.0 and the formal recommendation of the specialization faculty. Students must maintain a minimum GPA of 3.0 in all coursework completed subsequent to admission to the program.
CURRICULUM FOR M.S. COUNSELING

Human Development ........................................................................................................... 3

HD 450  Family Therapy (3)

Computer Science ........................................................................................................... 3

CSC 416  Computer Applications in School Administration (3) or any other CSC course
approved by adviser which meets the student's career needs.

Education ......................................................................................................................... 54

ED 555  Counseling and Communication (4)
ED 556  Ethnic Counseling (4)
ED 557  Career Development (4)
ED 560  Counseling Theories and Assessment (4)
ED 561  Group Counseling (3)
ED 566  Group Therapy (3)
ED 567  Counseling the Elderly and Their Families (3)
ED 568  Cognitive Behavioral Counseling (3)
1 ED 569  Counseling Clinic Practicum: MFCC (3)
1 ED 573  Field Experience: Counseling (12) or
ED 574  Field Experience: Marital and Family Counseling (12)
ED 585  Research Methods in Education (4)
ED 590  Research Applications in Education (4)
2 ED 599  Thesis/Project (3)

Psychology ....................................................................................................................... 9

PSY 452  Personality (3)
PSY 504  Psychoneurology/Pharmacology (3)
PSY 574  Applied Psychological Testing (3)

Statistics ............................................................................................................................ 3

STAT 512  Statistical Methods (3) or any STAT course approved by adviser which
meets the student's career needs.

3 Adviser approved electives ......................................................................................... 18

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

1 Additional fieldwork will be required to meet on-site requirements of MFCC educational verification. Only 12
units will apply toward the M.S. degree.
2 Must register for thesis/project credit each quarter of advisement.
3 Students seeking the MFCC emphasis within the M.S. in Counseling must meet the content area requirements
prescribed by California legislation (see adviser) which presently include, in addition to the M.S. in counseling
curriculum, developmental psychology, ethics and law, psychopathology, diagnosis and treatment planning,
sexual dysfunction therapy, advanced MFC therapy, child therapy, and additional practicum and field
experience.
TEACHING CREDENTIAL PROGRAMS

The Teaching Credential Programs consist of the coursework and field experiences, including student teaching, required to obtain the Preliminary and Professional Clear Teaching Credentials. Guidelines for credentials are established by the State of California's Commission on Teacher Credentialing (CTC).

Cal Poly is authorized by the Commission on Teacher Credentialing to prepare candidates and recommend for the following credentials:

- Multiple Subject Instruction (as commonly practiced in California elementary and middle schools)
- Single Subject Instruction (as commonly practiced in California high schools and most junior high schools)
- Administrative Services
- Agriculture Specialist
- Pupil Personnel Services
- Reading Specialist
- Special Education (Learning Handicapped Specialist, Severely Handicapped Specialist, and Resource Specialist Certificate)
- Multiple Subject Credential Bilingual Emphasis (Spanish)

The teaching credential programs typically take four quarters to complete. Applications are accepted only during specific periods (for these dates contact the SPSE Services Center, (805) 756-2126, Dexter Building, Room 216). Detailed information about other requirements can be found in the credential booklets "Becoming an Elementary Teacher at Cal Poly" and "Single Subject Teaching Credential Handbook," which are available upon request at the SPSE Services Center.

Candidates for the secondary teaching credential in agricultural science or the Agricultural Specialist Credential may complete their preparation program through the Agricultural Education Department at Cal Poly. For further information or advisement students should communicate with the head of the Agricultural Education Department.

Further information, requirements, and procedures for entering a particular credential program may be obtained from the appropriate credential program adviser and in other sections of this catalog dealing with specific degree programs. The Master of Arts in Education section of this catalog contains additional information regarding graduate degree programs which may coincide with fifth year programs and credential programs.

ADMISSION TO THE TEACHING CREDENTIAL PROGRAM

Students applying for admission must have a cumulative grade point average which places them in the upper one-half of undergraduate students in their discipline division. Additional requirements include passage of the California Basic Educational Skills Test (CBEST); passage of the National Teacher's Examination (NTE) General Knowledge Component (core battery) or an approved Liberal Studie; waiver agreement for Multiple Subject credential program; NTE Special Area or subject waiver for Single Subject credential program; completion of an appropriate early field experience, a professional aptitude interview; evidence of subject matter competence; a certificate of clearance; letters of recommendation; and proof of competency in oral reading, speech, and writing. Candidates in a credential program must maintain the admission requirements (minimum 2.5 for postbaccalaureate candidates in Agricultural Education). A minimum GPA requirement of 3.0 in all professional education courses attempted after entering the program is required for recommendation for a credential (Title 5, California Administrative Code, Sections 41100-41103). All postbaccalaureate candidates must maintain a 3.0 GPA in all courses taken while enrolled.

Candidates must file an application for admission to the Teacher Education Credential Program (STEP I). To enter the Credential Program and to meet other specific requirements to begin student teaching, filing should be done at least two quarters before planning to student teach (not including summer quarter). For most credential candidates this is done upon completion of the baccalaureate degree or application for entry into postbaccalaureate studies.

Candidates completing professional clear teaching credentials are referred to as being enrolled in a fifth year of study. All coursework for the professional clear teaching credential must be taken after the baccalaureate degree has been awarded except for Agricultural Education. Candidates should
contact their credential adviser for specific information about their program. The fifth year program may closely coincide with the Master of Arts in Education; however, these are separate programs and require separate applications. Students enrolled in service, specialist, or master’s programs will have other requirements to meet (explained in the Graduate Programs in Education section).

Admission to the university does not guarantee admission to the teacher education program.

MULTIPLE SUBJECT AND SINGLE SUBJECT TEACHING CREDENTIAL PROGRAMS

Multiple Subject Teaching Credential

The Multiple Subject Teaching Credential permits the credential holder to teach in self-contained classrooms in California, kindergarten through twelfth grade. Credential holders typically work in elementary and middle schools.

Majors from any undergraduate discipline can apply to enter the credential program. However, all candidates applying to enter the credential program will have to demonstrate subject matter competence in areas commonly taught in elementary schools prior to admission to the programs. Check the credential handbook “Becoming an Elementary Teacher at Cal Poly” for more information on this topic. For information, contact the Education Department’s Multiple Subject Coordinator.

Under current law, the Multiple Subject Credential has two levels, the Preliminary and the Professional Clear. The Preliminary Multiple Subject Credential is earned by completing the required courses and field experience which includes two quarters of student teaching. Forty-five units of additional coursework is typically required for the Professional Clear Credential.

Single Subject Teaching Credential

The Single Subject Teaching Credential is for those students who wish to teach in a single subject area in grades kindergarten through twelve in the State of California. Single subject credential holders typically teach in junior high or high school. For specific information, contact the major department’s single subject adviser or the Education Department’s Single Subject Coordinator.

Cal Poly offers Single Subject Teaching Credential Programs in the following areas:
- Agriculture (12 majors)
- English (and Speech Communication)
- History
- Home Economics
- Industrial and Technology Education
- Life Science (Biology)
- Mathematics
- Physical Education
- Physical Science (Chemistry and Physics)
- Political Science (Government)
- Social Science

Majors from any undergraduate discipline may apply to enter any single subject program. However, all candidates in a single subject program must demonstrate competence in the appropriate subject matter prior to being approved for student teaching. Check the credential handbook “Single Subject Teaching Credential Handbook” for more information on this topic.

Under current law, the Single Subject Credential has two levels, the Preliminary and the Professional Clear. The Preliminary Single Subject Credential is earned by completing a bachelor’s degree, an early field experience, subject matter competency requirements, and specified professional education courses including student teaching. The Professional Clear Single Subject Credential requires completion of 45 quarter units of postbaccalaureate coursework and specific coursework in health education, special education, and computer science, which may be part of the 45 quarter unit requirement.

At Cal Poly, the Teaching Credential Program consists of three “STEPS.” Each of these STEPS must be completed sequentially.

Prior to admission to the credential program (Step 1), it is required that the California Basic Education Skills Test (CBEST) be passed (see current CBEST booklet for the passing score); and the candidate
complete a supervised early field work experience. All candidates must apply for a Certificate of Clearance at least three (3) months prior to application to Step II.

**STEP I: Admission to the Teacher Education Credential Program**

Application should be made at least two quarters before you plan to student teach (not counting summer quarter) and submitted within the first three weeks of the quarter. Specific coursework and clearances must be completed in order to apply. Check the credential handbook to be sure all requirements are completed.

**STEP II: Admission to Student Teaching (6 & 12 Unit Assignments)**

Application must be made during the first three weeks of the quarter before you plan to student teach. Six and 12-unit student teaching assignments are to be completed in consecutive quarters. Six-unit student teaching consists of a part-time (usually half-day) experience in the classroom, observing and teaching under the supervision of a cooperating teacher and a university supervisor. Twelve unit student teaching consists of a full-time (full-day) experience with the student teacher gradually assuming responsibility for the class under the supervision of a cooperating teacher and a university supervisor.

**STEP III: Application for Preliminary or Professional Clear Credential**

Application is made during the eighth week of your twelve-unit student teaching assignment if all credential and degree requirements will be completed. Contact the SPSE Services Center (Dexter 216). The SPSE Services Center processes credential applications and forwards them to the Commission on Teacher Credentialing. See the credential handbook for more information.

Passing the California Basic Education Skills Test (CBEST) is required for all credentials.

**ADVANCED CREDENTIALS**

**Administrative Services**

The Educational Administration program offers two credential programs, one leading to recommendation for the Preliminary Administrative Services Credential, the second leading to recommendation for the Professional Administrative Services Credential.

The preliminary program is designed to prepare candidates for the Preliminary Administrative Services Credential which authorizes service in any administrative position, any grade level. It requires 44 quarter units, most of which are applicable to the Master of Arts degree with a Specialization in Educational Administration.

In consonance with the Master of Arts program, the credential program emphasizes a comprehensive knowledge of public school administration including applied theory of administration and leadership, schools in contemporary society, and effective management related to educational outcomes.

The credential emphasizes applied theory with actual experience in fieldwork assignments and an evaluation of administrative competence as a basis for credential recommendation.

The professional credential program prepares candidates for the Professional Administrative Services Credential. This program requires 36 quarter units of work, a minimum of 12 units of which must be advanced fieldwork, and 18 units must be appropriate coursework. Candidates must hold a Preliminary Administrative Services Credential or M.A. degree to be admitted.

The program emphasizes advanced skill development in building-level or central office administration with emphasis on the job application of management skills.

For credential recommendation the candidate must, in addition to completing the program of study, have had two years of successful administrative experience and meet program competency review criteria.

For more information regarding this program, contact the Coordinator, Administrative Services, Education Department.

**Bilingual Emphasis**

The Multiple Subject Credential Bilingual Emphasis (Spanish) is designed to prepare teachers for bilingual classrooms. Basic mastery of oral and written Spanish and knowledge of Hispanic culture
are required for admission to the program. Courses in bilingual classroom teaching methods, cultural heritage, and Spanish language supplement the regular credential program requirements.

For more information regarding this program, contact the Coordinator, Reading and Bilingual Education, Education Department.

**Pupil Personnel Services**

The Pupil Personnel Services Credential (PPS) is designed to prepare students for counseling and guidance positions in public and private schools in grades K-12. This program stresses applied theory and practical, direct experiences to prepare pupil personnel candidates. A low student-adviser ratio allows for personalized attention. The PPS Credential program has excellent fieldwork placements in K-12 public schools including career centers, continuation schools, and special classes. Required courses are generally offered in late afternoons and evenings.

For more information regarding this program, contact the Coordinator, Counseling and Guidance, Education Department.

**Reading Specialist**

The Reading Specialist Credential program is designed to supplement the basic multiple subject or single subject credential. The Reading Specialist Credential permits the holder to function as a Reading Supervisor, Reading Specialist or Reading Teacher in grades K-12. In order to qualify for admission to the Reading Specialist Credential program the candidate must hold a valid Multiple Subject or Single Subject Preliminary or Life Credential; have completed a reading methods course or the equivalent; and have a grade point average of 2.8 in the last 90 units attempted. The Reading Specialist Credential program requires two years of full-time teaching experience and successful completion of a final assessment examination before the credential can be awarded.

For more information, contact the Coordinator, Reading, Education Department.

**Special Education Specialist**

The Special Education Specialist program is designed to prepare teachers for two advanced credentials: the Learning Handicapped Credential, and the Severely Handicapped Credential.

**Learning Handicapped Credential**

This program is designed to give students the competencies needed to teach mildly handicapped students ages 3-21 in a special day class setting. This program stresses practical skills across a wide variety of areas.

**Severely Handicapped Credential**

This program is designed for those who wish to teach students ages 3–21 with severe handicaps including the trainable mentally retarded, severely emotionally disturbed, autistic, and multiply handicapped. The training emphasis is upon functional curriculum planning, integration into least restrictive environments, vocational preparation, and community living skills.

The Special Education Specialist program is a graduate program which attempts to accommodate the working professional. Courses are offered during the late afternoon and evening. The unit requirement for the credential allows the full-time student to complete the requirements in one year. The Special Education program emphasizes a practical orientation to teaching.

In order to be admitted to the program, a candidate must have a baccalaureate degree from an accredited institution, and should have at least a preliminary teaching credential that is valid in California. Included in the selection criteria is a minimum GPA of 2.8 for the last 90 quarter units (60 semester) attempted and passage of CBEST. Applicants must also meet certain personal and professional standards evaluated by required qualifying examinations and personal interviews. Generic courses are open to undergraduate students as per university guidelines.

Units for the Specialist Credential may be applied towards the requirements for a Clear Single or Multiple Subjects teaching credential. It is also possible for qualified students to complete the requirements for the Master of Arts degree in Education while pursuing the Specialist Credential.

For more information regarding this program, contact the Coordinator, Special Education, Education Department.
The Graphic Communication Department offers a curriculum leading to the Bachelor of Science degree. The curriculum is designed to prepare graduates for positions of responsibility in the printing, publishing, and packaging industries, and allied professions.

The program provides courses in general education together with a core of printing technology and management courses. Courses which are specific to the curricular concentrations are also provided. The student is introduced to all stages of the printing processes, and chooses a specialized concentration in the graphic communication field at the appropriate time. Students are educated for leadership as managers and other skilled professionals who are well grounded in printing technology.

The Graphic Communication Department occupies 33,000 square feet of floor space in the Graphic Arts Building. Theory and practice are taught in modern classrooms incorporating the latest in teaching aids. Fourteen well-equipped laboratories of printing equipment provide the student with diverse experience in the practical aspects of the industry.

### CURRICULAR CONCENTRATIONS

**Computer Graphic Communication**

This concentration is designed for the Graphic Communication major who wishes a career in which computer applications are given prominence. The concentration prepares the student for careers in computer typography, estimating, scheduling, production management, quality control, and graphic terminal displays.

**Design Reproduction Technology**

The Design Reproduction Technology concentration prepares technically oriented students for careers in design technology positions in graphic communication. Graduates prepare for a wide variety of positions such as account executive, sales representative, estimator, production coordinator, and related positions requiring a technical understanding of design preparation and reproduction.

The Art and Design Department's Graphic Design concentration focuses on creative problem solving and development of design and layout skills. The concentration leads to positions such as graphic designer, art director, and creative director for advertising agencies, design studios, and corporate design departments.
variety of positions in publication production, design reproduction, typography, mechanical and electronic preparation of art and copy for reproduction. The program combines a broad technological background in the graphic arts with the principles of design.

**Printing Management**
The Printing Management concentration is designed as a flexible program for the student interested in pursuing employment as a printing plant manager, planner, quality control specialist, production control specialist, estimator, or sales representative. The program also prepares the student for employment as a technical representative for manufacturers of graphic arts machinery and supplies.

**Printing Technology**
The Printing Technology concentration is designed for the student who is interested in the applications of science, engineering, and mathematics to the graphic communication field. The thrust of this concentration is to assist the technically-oriented student in understanding the scientific forces that impact the graphic communication profession and how to work with the emerging technologies. This program prepares students for careers in quality control, technical and production management, technical sales, product development and other technically-oriented positions.

**CURRICULUM FOR B.S. GRAPHIC COMMUNICATION**

*Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.*

### Freshman

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Units</th>
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<tbody>
<tr>
<td>GRC 101</td>
<td>Introduction to Graphic Communication</td>
<td>3</td>
</tr>
<tr>
<td>GRC 122</td>
<td>Typography</td>
<td>4</td>
</tr>
<tr>
<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>ENGL 114</td>
<td>Writing: Exposition (A.1.)</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ENGL 215</td>
<td>Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 118</td>
<td>Pre-Calculus Algebra or MATH 120 Pre-Calculus Algebra and Trigonometry (B.2.)</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 121, PHYS 122, PHYS 123 General Physics or CHEM 121, CHEM 122 General Chemistry and CHEM 326 Survey of Organic Chemistry (B.1)</td>
<td>4,4,4</td>
<td></td>
</tr>
<tr>
<td>POLS 210</td>
<td>American and California Government (D.1.)</td>
<td>3</td>
</tr>
<tr>
<td>PSY 201/PSY 202 General Psychology (E.1.)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100 (E.2.)</td>
<td>2</td>
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</table>

1 Computer literacy elective (F.1.) | 3 |

### Sophomore

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
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<tbody>
<tr>
<td>GRC 204</td>
<td>Introduction to Printing Management</td>
<td>3</td>
</tr>
<tr>
<td>GRC 223</td>
<td>Copy Preparation for Reproduction</td>
<td>3</td>
</tr>
<tr>
<td>GRC 227</td>
<td>Graphic Arts Photography</td>
<td>4</td>
</tr>
<tr>
<td>ECON 201/ECON 211/ECON 222 (D.3.)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>HIST 204</td>
<td>History of American Ideals and Institutions (D.1.)</td>
<td>3</td>
</tr>
<tr>
<td>SPC 201 Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>STAT 211</td>
<td>Elementary Probability and Statistics (B.2)</td>
<td>3</td>
</tr>
<tr>
<td>ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Critical reading electives (C.1)</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Fine and Performing Arts elective (C.2.)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Life sciences elective (B.1.b.)</td>
<td>3</td>
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</tbody>
</table>

2 Courses to complete major (depending on concentration) 9-10

<table>
<thead>
<tr>
<th>Electives</th>
<th>Units</th>
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<tbody>
<tr>
<td></td>
<td>5-4</td>
</tr>
</tbody>
</table>

51
Computer Graphic Communication Concentration
(Add courses below to basic curriculum)

### Sophomore
- CSC 101 FORTRAN Programming ...................................................... 2
- CSC 118 Fundamentals of Computer Science I ........................................ 4
- CSC 207 BASIC Programming ................................................................. 3

### Junior
- EL 219 Logic and Switching Circuits ...................................................... 3
- GRC 302 New Technologies in Graphic Communication .......................... 3
- CSC 221 Computer Principles and Programming ....................................... 4
- CSC 255 Computer Graphics Applications .............................................. 4

### Senior
- CSC 204 C and UNIX ........................................................................... 3
- GRC 331 Color Reproduction Control ..................................................... 3
- GRC 411 Estimating, Pricing and Costing ............................................... 4
- GRC 429 Computer Imaging .................................................................... 3

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1 MATH 116 and MATH 117 will substitute for MATH 118 and are taught at a slower pace for those who need more review. MATH 117 satisfies GEB Area B.2.
2 To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 114 of this catalog.
## Design Reproduction Technology Concentration

*(Add courses below to basic curriculum)*

### Sophomore

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>ART 131</td>
<td>2-D Design Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>ART 132</td>
<td>Beginning Color Theory</td>
<td>3</td>
</tr>
<tr>
<td>ART 133</td>
<td>Color and Design</td>
<td>3</td>
</tr>
</tbody>
</table>

### Junior

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>GRC 323</td>
<td>Pre-Separated Art for Camera</td>
<td>3</td>
</tr>
<tr>
<td>GRC 335</td>
<td>Line and Halftone Media</td>
<td>4</td>
</tr>
<tr>
<td>ART 331</td>
<td>Typographic Design</td>
<td>3</td>
</tr>
<tr>
<td>ART 332</td>
<td>Symbology</td>
<td>3</td>
</tr>
<tr>
<td>ART 333</td>
<td>Corporate Identity</td>
<td>3</td>
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### Senior

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<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>GRC 336</td>
<td>Modern Copy Technology</td>
<td>4</td>
</tr>
<tr>
<td>GRC 439</td>
<td>Advanced Line and Halftone Media</td>
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</tr>
<tr>
<td>GRC 440</td>
<td>Advanced Copy Technology</td>
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## Printing Management Concentration

*(Add courses below to basic curriculum)*

### Junior

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>GRC 302</td>
<td>New Technologies in Graphic Communication</td>
<td>3</td>
</tr>
<tr>
<td>GRC 331</td>
<td>Color Reproduction Control</td>
<td>4</td>
</tr>
<tr>
<td>GRC 333</td>
<td>Plant Layout Analysis</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 211</td>
<td>Financial Accounting for Nonbusiness Majors</td>
<td>4</td>
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<tr>
<td>CSC elective (100-200 level)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>MKTG 204</td>
<td>Elements of Marketing</td>
<td>4</td>
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### Senior

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRC 326</td>
<td>Printing Equipment Management</td>
<td>3</td>
</tr>
<tr>
<td>GRC 423</td>
<td>Printing Management</td>
<td>4</td>
</tr>
<tr>
<td>BUS 201</td>
<td>Business Law Survey</td>
<td>3</td>
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<tr>
<td>Select two courses from the following</td>
<td></td>
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<tr>
<td>GRC 323, GRC 408, GRC 429, GRC 432, GRC 474</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Select one course from the following</td>
<td></td>
<td></td>
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<tr>
<td>ENGL 301, SPC 301, BUS/MKTG upper division course selected with adviser approval</td>
<td>3</td>
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</tbody>
</table>
# Printing Technology Concentration

(Add courses below to basic curriculum)

## Junior

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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</tr>
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<tbody>
<tr>
<td>PHYS 121</td>
<td>College Physics or CHEM 121 General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 122</td>
<td>College Physics or CHEM 122 General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 123</td>
<td>College Physics or CHEM 326 Survey of Organic Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>MATH 131</td>
<td>Technical Calculus</td>
<td>4</td>
</tr>
<tr>
<td>CSC 101</td>
<td>FORTRAN Programming</td>
<td>2</td>
</tr>
<tr>
<td>GRC 302</td>
<td>New Technologies in Graphic Communication</td>
<td>3</td>
</tr>
</tbody>
</table>

## Senior

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>GRC 326</td>
<td>Printing Equipment Management</td>
<td>3</td>
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<tr>
<td>GRC 331</td>
<td>Color Reproduction Control</td>
<td>3</td>
</tr>
<tr>
<td>GRC 333</td>
<td>Plant Analysis and Design</td>
<td>3</td>
</tr>
<tr>
<td>GRC 429</td>
<td>Computer Imaging</td>
<td>3</td>
</tr>
<tr>
<td>GRC 432</td>
<td>Analytical Methods for Printing</td>
<td>4</td>
</tr>
</tbody>
</table>

If students take the physics sequence in general education, then they take chemistry in the concentration, and vice versa. Students in the Printing Technology concentration must take one year of physics and one year of chemistry.

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356 Graphic Communication
HOME ECONOMICS DEPARTMENT

Mathematics and Home Economics Bldg. (38), Room 136
(805) 756-2225

Faculty

Department Head, Barbara P. Weber
Nikki Barnhart  Lezlie A. Labhard  Nancy A. Morris
Connie Breazeale  Sarah S. Lord  Cynthia L. Regan
Sylvan Eldringhoff

Programs

B.S. Home Economics with Concentrations in:
  Interior Design  Textiles and Clothing Merchandising
M.S. Home Economics

Long noted for its successful preparation of professionals in home economics, the Cal Poly Home Economics Department continues to provide outstanding professional training for its majors. Students from throughout the state are attracted to this program because of excellent faculty, a firm home economics core, outstanding emphasis area courses, and the department’s strong commitment to the university’s “learn by doing” educational philosophy.

Students have the opportunity to explore the integrative, holistic nature of home economics which includes the study of individuals and families in their near environment; human growth and development; the interrelationships of individuals of all ages and socio-economic levels; the interdependence of food and nutrition as they influence human behavior and health; the relationship of design, technology, and environment to human behavior; and management theory, application, and family decision-making behavior.

Students selecting the emphasis area in general home economics obtain a professional education of maximum breadth and depth for employment in business, industries, and institutions whose various products and services require broad home economics expertise. A wide range of additional professional courses in foods and consumer economics to meet individual career goals may also be selected.

Students selecting the emphasis area in home economics education are offered the opportunity to obtain a professional education focusing on specific breadth and depth in major home economics subject areas and on the education competencies required for obtaining a secondary credential in home economics.

Facilities include well-equipped laboratories for foods and residential equipment, interior design, clothing, and textiles.

The interior design program has been granted full accreditation by the Foundation for Interior Design Education Research (FIDER).
CURRICULAR CONCENTRATIONS

Interior Design
A concentration in Interior Design offers students a professional education focusing on the specific knowledge and technical skills required in the practice of residential and contract interior design for employment in design studios, design firms, architectural firms, and in related wholesale and retail businesses. Students select coursework in consultation with an adviser. Subjects studied include fundamentals of drawing, materials of construction, design fundamentals, introduction to drawing and perspective, basic graphics, human factors for environmental designers, history of interior design, individual residential design, interior design materials and techniques, barrier free environments, and advanced interior design.

Textiles and Clothing Merchandising
A concentration in Textiles and Clothing Merchandising offers students a professional education focusing on specific knowledge in textiles and clothing subjects, for employment in textile and clothing industries and in fashion and textiles merchandising at both wholesale and retail levels. Students select coursework in consultation with an adviser. Subjects studied include clothing construction, principles of management, fashion analysis, flat pattern, advertising, principles of purchasing, elements of marketing, financial accounting for nonbusiness majors, and tailoring. Students select from a list of restricted electives in the major which include: textiles and clothing industries, fashion merchandising, fashion promotion, clothing for disabled people, and advanced textiles.

CURRICULUM FOR B.S. HOME ECONOMICS

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. Cal Poly follows the quarter system.

Freshman

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>HE 101</td>
<td>Home Economics as a Profession</td>
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<tr>
<td>HE 121</td>
<td>Fundamentals of Foods</td>
<td>4</td>
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<tr>
<td>HE 122</td>
<td>Design Analysis</td>
<td>3</td>
</tr>
<tr>
<td>HD 108</td>
<td>Introduction to Human Development</td>
<td>3</td>
</tr>
<tr>
<td>ANT 201/GEOL 150/SOC 105</td>
<td>(D.4.a.)</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 121</td>
<td>General Chemistry (B.1.a.)</td>
<td>4</td>
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<tr>
<td>ENGL 114</td>
<td>Writing: Exposition (A.1.)</td>
<td>4</td>
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<tr>
<td>ENGL 125/PHIL 125/SPC 125</td>
<td>Critical Thinking (A.2.)</td>
<td>3</td>
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<tr>
<td>Fine and Performing Arts elective (C.2.)</td>
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<td></td>
</tr>
<tr>
<td>Mathematics elective (B.2.)</td>
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<td>Physical science elective (B.1.a.)</td>
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Sophomore

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<tr>
<td>HE 210</td>
<td>Nutrition (E.2.)</td>
<td>3</td>
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<tr>
<td>HE 220</td>
<td>Textile End-Products</td>
<td>3</td>
</tr>
<tr>
<td>HE 242</td>
<td>Interior Design</td>
<td>3</td>
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<tr>
<td>HD 203</td>
<td>Family Development</td>
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<tr>
<td>ENGL 215</td>
<td>Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.)</td>
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<tr>
<td>PHIL 230/PHIL 231</td>
<td>Philosophical Classics (C.1.)</td>
<td>3</td>
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<tr>
<td>PSY 201/PSY 202</td>
<td>General Psychology (E.1.)</td>
<td>3</td>
</tr>
<tr>
<td>SPC 201</td>
<td>Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
<td>3</td>
</tr>
<tr>
<td>Computer literacy elective (F.1.)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Critical reading elective (C.1.)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Economics elective (D.1.)</td>
<td>3</td>
<td></td>
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<tr>
<td>MATH/STAT elective (B.2.)</td>
<td>3</td>
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<tr>
<td>Electives and courses to complete major (depending on concentration)</td>
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Total: 50

Total: 47
### Junior

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<th>Course Title</th>
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<tbody>
<tr>
<td>HE 305</td>
<td>Family Housing and Consumer Resources</td>
<td>5</td>
</tr>
<tr>
<td>HE 322</td>
<td>Textiles</td>
<td>3</td>
</tr>
<tr>
<td>HE 324</td>
<td>Management of Family Resources</td>
<td>3</td>
</tr>
<tr>
<td>HE 326</td>
<td>Presentation Methods</td>
<td>3</td>
</tr>
<tr>
<td>HE 331</td>
<td>Residential Equipment</td>
<td>3</td>
</tr>
<tr>
<td>HE 341</td>
<td>Clothing and Human Behavior</td>
<td>3</td>
</tr>
<tr>
<td>HE 343</td>
<td>Interior Design Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>HIST 204</td>
<td>History of American Ideals and Institutions (D.1.)</td>
<td>3</td>
</tr>
<tr>
<td>POLS 210</td>
<td>American and California Government (D.1.)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Critical reading elective (C.1.)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Life sciences elective (B.1.b.)</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Restricted electives and courses to complete major/concentration</td>
<td>18</td>
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</tbody>
</table>

### Senior

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>HE 463</td>
<td>Undergraduate Seminar</td>
<td>2</td>
</tr>
<tr>
<td>HE 461</td>
<td>Senior Project</td>
<td>3</td>
</tr>
<tr>
<td>HE 462</td>
<td>Senior Project</td>
<td>3</td>
</tr>
<tr>
<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Arts and humanities elective (Area C)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Literature, philosophy, arts elective (300-400 level) (C.3.)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Restricted electives and courses to complete major/concentration</td>
<td>29</td>
</tr>
</tbody>
</table>

1. To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 114 of this catalog.

2. 24 restricted elective units to be chosen from HE 300 and HE 400 series must be selected from coursework related to concentration or emphasis area. 12 units must be chosen from the HE 400 series.

### Interior Design Concentration

(Add courses below to basic curriculum)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>HE 344</td>
<td>Interior Design Materials and Techniques</td>
<td>4</td>
</tr>
<tr>
<td>HE 323</td>
<td>Individual Residential Design</td>
<td>4</td>
</tr>
<tr>
<td>ARCH 111</td>
<td>Introduction to Drawing and Perspective</td>
<td>3</td>
</tr>
<tr>
<td>ARCH 106</td>
<td>Materials of Construction</td>
<td>3</td>
</tr>
<tr>
<td>ARCH 401</td>
<td>Toward a Barrier-Free Environment</td>
<td>3</td>
</tr>
<tr>
<td>ART 101</td>
<td>Fundamentals of Drawing</td>
<td>4</td>
</tr>
<tr>
<td>ART 131</td>
<td>2-Dimensional Design Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>ART 132</td>
<td>Beginning Color Theory</td>
<td>3</td>
</tr>
<tr>
<td>ART 134</td>
<td>3-Dimensional Design I</td>
<td>3</td>
</tr>
<tr>
<td>ART 230</td>
<td>Beginning Graphic Design or ARCH 112 Basic Graphics</td>
<td>3</td>
</tr>
<tr>
<td>EDES 303</td>
<td>Human Factors for Environmental Design</td>
<td>3</td>
</tr>
</tbody>
</table>

### Textiles and Clothing Merchandising Concentration

(Add courses below to basic curriculum)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>HE 131</td>
<td>Apparel Construction</td>
<td>3</td>
</tr>
<tr>
<td>HE 224</td>
<td>Creative Textiles</td>
<td>3</td>
</tr>
<tr>
<td>HE 237</td>
<td>Fashion Analysis</td>
<td>3</td>
</tr>
<tr>
<td>HE 241</td>
<td>Flat Pattern</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 211</td>
<td>Financial Accounting for Non-Business Majors</td>
<td>4</td>
</tr>
<tr>
<td>JOUR 331</td>
<td>Advertising</td>
<td>3</td>
</tr>
<tr>
<td>MGT 201</td>
<td>Principles of Management</td>
<td>3</td>
</tr>
<tr>
<td>MGT 206</td>
<td>Principles of Purchasing</td>
<td>3</td>
</tr>
<tr>
<td>MKTG 204</td>
<td>Elements of Marketing</td>
<td>4</td>
</tr>
</tbody>
</table>
MASTER OF SCIENCE IN HOME ECONOMICS

The Master of Science degree in Home Economics is designed to provide appropriate graduate level courses for: (1) job-entry level of competence for instructors of home economics in community colleges, (2) upgrading teachers now in the field, (3) qualifying students for continued graduate work at other institutions, (4) developing ability for self-directed study and growth, (5) international students, (6) professional competence for employment in business, extension, community, and civil service.

The degree study plan must include 45 units of adviser-approved graduate work, at least 24 of which must be at the 500 level. Student teaching will not be accepted as credit toward the degree program. A minimum overall grade point average of 3.0 is required in all units attempted subsequent to admission to the program. Any course grade less than a C will not be accepted as meeting unit requirements for the degree. All candidates must meet the current Graduation Writing Requirement (see page 138).

Although only 9 units of credit may be applied to the degree requirements, students must enroll in HE 599 Thesis for every quarter in which they are receiving advisement.

For further information or advisement students should communicate with the head of the Home Economics Department or the Graduate Program Coordinator.

CURRICULUM FOR M.S. HOME ECONOMICS

Required courses ................................................................. 15–16

HE 511 Research Design (3) or
ED 585 Research Methods in Education (4)
HE 580 Seminar (3)

1 HE 599 Thesis (3) (3) (3)

or additional approved coursework and comprehensive examination (9)

Courses in the general field of Home Economics and in major area(s) of interest selected from 400 and 500 series level ................................................................. 24

Electives selected from 400 and 500 series level ................................................................. 6

45–46

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

1 Must register for thesis credit each quarter of advisement.
INDUSTRIAL TECHNOLOGY DEPARTMENT

Engineering West Bldg. (21), Room 100
(805) 756-2676

Faculty

Department Head, Gerald E. Cunico
Fred Abitia
William C. Chambers
Larry W. Gay
Roger L. Keep
Lynn S. Mosher
James L. Murphy
Anthony J. Randazzo
Nelson L. Smith III
Raymond A. Wysock

Programs

B.S. Industrial Technology with Concentrations in:
  Industrial and Technology
  Industrial Management
  Education

M.A. Industrial and Technical Studies

Minors:
  Integrative Technology
  Packaging Minor

The Industrial Technology Department offers two degree programs: 1) Bachelor of Science in Industrial Technology, and 2) Master of Arts in Industrial and Technical Studies. This department also administers the Bachelor of Vocational Education program and the Packaging Minor.

The Bachelor of Science program in Industrial Technology has two concentrations which prepare graduates for employment in a broad range of professional positions in industry, Industrial Management and Industrial and Technology Education. (Also see Teaching Credential programs, page 348.)

Integrative Technology Minor
The Integrative Technology minor is an interdisciplinary program jointly sponsored by Industrial Engineering, Industrial Technology and Psychology and Human Development departments. The minor is for non-engineering students who wish to pursue their professional career in a corporate setting and want to learn more about the impact of technology. The minor will acquaint students with how factories operate and how technology is integrated into corporate operations. For more information, see page 336.

Packaging Minor
The Packaging Minor is administered by the Industrial Technology Department. For more information, please see page 337.

CURRICULAR CONCENTRATIONS

Industrial and Technology Education
This concentration provides undergraduate professional preparation of industrial and technology education teachers for secondary schools, community colleges, and industrial training programs. The curriculum provides for instruction and laboratory experiences in construction, electronics, energy and power, manufacturing (plastics, metals, woods), visual communications and related technologies. Graduates of this concentration have an extensive understanding of industrial manufacturing procedures plus the ability to work well with students, helping them to become familiar with the processes of industry. The Single Subjects Credential (for secondary teaching) is available as part of this program. The Bachelor of Vocational Education degree is administered under this area.
### Industrial Technology

#### Industrial Management

This concentration emphasizes preparation for technical leadership responsibilities with a broad variety of industries including manufacturing, communication, transportation and utility services. Graduates in the field of industrial management function in the mid-ground between the applied aspects of engineering and administration. Students who enjoy working primarily with people in solving technical problems are particularly well suited for careers in industrial technology. Preparation for professional emphasis in industrial sales, production, quality management, plant facilities management, industrial training, or facilities/construction is provided through the selection of appropriate electives.

### CURRICULUM FOR B.S. INDUSTRIAL TECHNOLOGY

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

#### Freshman

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>IT 101</td>
<td>Technical Problem Solving</td>
<td>3</td>
</tr>
<tr>
<td>IT 235</td>
<td>Industrial Drawing</td>
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<tr>
<td>IT 245</td>
<td>Technical Sketching</td>
<td>2</td>
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<tr>
<td>ANT 201 / GEOG 150 / SOC 105 (D.4.a.)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>ENGL 114</td>
<td>Writing: Exposition (A.1.)</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 125 / PHIL 125 / SPC 125 (A.2.)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>HIST 204</td>
<td>History of American Ideals and Institutions (D.1.)</td>
<td>3</td>
</tr>
<tr>
<td>MATH 120</td>
<td>Pre-Calculus Algebra and Trigonometry (B.2.)</td>
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</tr>
<tr>
<td>PHYS 121</td>
<td>College Physics (B.1.a.)</td>
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<td>PHYS 122</td>
<td>College Physics (B.1.a.)</td>
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<td>Computer literacy elective (F.1.)</td>
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</tr>
<tr>
<td>Fine and Performing Arts elective (C.2.)</td>
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<td>3</td>
</tr>
<tr>
<td>Life sciences elective (B.1.b.)</td>
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<td>Electives and courses to complete concentration</td>
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#### Sophomore

<table>
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<tr>
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<th>Course Title</th>
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<tbody>
<tr>
<td>IT 237, IT 238</td>
<td>Industrial Electricity</td>
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</tr>
<tr>
<td>CHEM 121</td>
<td>General Chemistry (B.1.a.)</td>
<td>4</td>
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<tr>
<td>CHEM 122</td>
<td>General Chemistry (B.1.a.)</td>
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</tr>
<tr>
<td>ECON 201</td>
<td>Survey of Economics (D.3.)</td>
<td>3</td>
</tr>
<tr>
<td>PHIL 230 / PHIL 231</td>
<td>Philosophical Classics (C.1.)</td>
<td>3</td>
</tr>
<tr>
<td>POLS 210</td>
<td>American and California Government (D.1.)</td>
<td>3</td>
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<tr>
<td>PSY 201 / PSY 202</td>
<td>General Psychology (E.1.)</td>
<td>3</td>
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<tr>
<td>SPC 201</td>
<td>Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
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<td>STAT 211</td>
<td>Elementary Probability and Statistics (B.2.)</td>
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<tr>
<td>BIO 220 /FSN 210 /HE 210 / PE 250 / PSY 304 / REC 100 elective (E.2.)</td>
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#### Junior

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<tbody>
<tr>
<td>IT 305</td>
<td>Technical and Management Presentations</td>
<td>3</td>
</tr>
<tr>
<td>IT 311</td>
<td>Industrial Safety and Health Management</td>
<td>3</td>
</tr>
<tr>
<td>IT 322</td>
<td>Energy and Power</td>
<td>4</td>
</tr>
<tr>
<td>IT 323</td>
<td>Energy Management</td>
<td>3</td>
</tr>
<tr>
<td>IT 326</td>
<td>Product Evaluation</td>
<td>3</td>
</tr>
<tr>
<td>IT 329</td>
<td>Industrial Materials</td>
<td>3</td>
</tr>
<tr>
<td>IT 333</td>
<td>Electronic Computer Applications</td>
<td>4</td>
</tr>
<tr>
<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
<td>3</td>
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<tr>
<td>Literature, philosophy, arts elective (300–400 level) (C.3.)</td>
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<tr>
<td>Electives and courses to complete concentration</td>
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</table>
Senior
IT 433 Production and Process Management .......................................................... 3
IT 461 Senior Project .................................................................................. 3
IT 463 Industrial Technology Seminar ................................................................ 2
2 ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.) ............. 3
2 Arts and humanities elective (Area C) .......................................................... 3
Electives and courses to complete concentration ............................................ 35

Industrial and Technology Education Concentration
(Add courses below to basic curriculum)

Freshman
IT 125 Wood Processes .................................................................................. 3

Sophomore
IT 250 Transportation Power ........................................................................ 3

Junior
IT 327 Plastics Technology ........................................................................... 3
IT 354 Industrial Machine Tool Service Systems ........................................... 3
Directed electives ......................................................................................... 11

Senior
IT 424 Curriculum and Methods of Industrial and Technology Education .......... 3
IT 443 General Metals ................................................................................ 3
IT 444 Technical Drawing ............................................................................ 3

Industrial Management Concentration
(Add courses below to basic curriculum)

Freshman
IT 141 Plastics Processes and Applications .................................................... 2
MATH 131 Technical Calculus ........................................................................ 4

Sophomore
ACTG 211 Financial Accounting for Nonbusiness Majors .................................. 4

Junior
IT 331 Advanced Industrial Electrical Systems .............................................. 4
IT 332 Electronic Control Systems .................................................................. 4
IT 350 Quality Systems Applications ............................................................. 3

Senior
IT 406 Industrial Management and Supervision ............................................. 3
IT 418 Technical Management Problems ...................................................... 4
IT 431, IT 432 Mechanical Systems ................................................................ 6

\[1 \text{ MATH 118 and MATH 119 or MATH 116 and MATH 117 may be used in lieu of Math 120.}
\[2 \text{ To be selected in accordance with the General Education-Breadth requirements. (Please see page 114 of this catalog.)} \]
MASTER OF ARTS DEGREE IN INDUSTRIAL AND TECHNICAL STUDIES

The Master of Arts program in Industrial and Technical Studies is designed to provide preparation for professional responsibilities and leadership for a broad range of professional positions in industry and education.

The curriculum translates a contemporary body of context derived from the business-industrial-technological segment of society into awareness, understandings, experiences and competencies.

The primary characteristic of this degree program is its emphasis upon professional and technical preparation of individuals for leadership roles in industry and education.

Prerequisites

Admission as a graduate student in this program requires a 2.8 minimum grade point average or 2.8 in the last 90 quarter units of coursework taken to satisfy the requirements for the baccalaureate degree. Advancement to candidacy requires completion of 12 units of courses specified in a formal program of study with a minimum grade point average of 3.0.

Conditionally Classified Standing

The student may enroll in a graduate degree curriculum if in the opinion of the appropriate campus authority the student can remedy any deficiencies by additional preparation.

For information pertaining to specific requirements for admission to graduate standing—classified or graduate standing—conditionally classified, the student should communicate with the head of the Industrial Technology Department or the department's Graduate Coordinator.

Program of Study

The Master of Arts degree in Industrial and Technical Studies is an integrated program of 45 units of graduate work commencing in any quarter of each year, and is designed for students who have a baccalaureate degree in Industrial Technology, Industrial Education, or who have comparable technical and professional preparation. Master's level courses at the 400-500 level are offered, when possible, in the summer and in the late afternoon and evening to accommodate those individuals who are employed full-time. A thesis, project, or comprehensive examination is required.

A minimum grade point average of 3.0 must be maintained in all courses taken to satisfy the requirements for the degree. All candidates must meet the current Graduation Writing Requirement (See page 138).

400-level courses used as part of a graduate program will include an extra written or oral assignment.
# CURRICULUM FOR M.A. INDUSTRIAL AND TECHNICAL STUDIES

<table>
<thead>
<tr>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required Courses</td>
</tr>
</tbody>
</table>

- IT 505 Experimental Projects in Industrial and Technical Studies (3)
- IT 515 History and Philosophy of Industrial Education (3)
- IT 520 Organization and Administration of Industrial and Technical Studies (3)
- IT 521 Curriculum in Industrial Education (3)
- IT 522 Facility Planning (3)
- IT 527 Trends and Issues in Technological Studies (3)
- IT 580 Graduate Research in Industrial Education (3)
- IT 599 Industrial Education Thesis or Project (5)

| Professional electives | 19 |
|------------------------|

Elective courses at the 500 level chosen with approval of the adviser: 45

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

The student may be permitted a nonthesis/project option by accomplishing all of the following steps: 1) Obtaining approval of the adviser and the Graduate Studies Committee. 2) Substituting 5 units of 500-level coursework which support this professional degree and are approved in advance by the above committee. 3) Passing a comprehensive written examination covering the graduate program.
LIBERAL STUDIES
An Interdisciplinary Program

Dexter Bldg. (34), Room 211
(805) 756-2435

Faculty
Coordinator, Margaret J. Glaser

Program
B.A. Liberal Studies

The Bachelor of Arts degree program in Liberal Studies provides students with a broad, interdisciplinary university education. Students who fulfill the specified degree requirements will also complete a waiver program approved by the California Commission on Teacher Credentialing. This waiver program satisfies the subject matter content required for a Multiple Subject Teaching Credential. By selecting free electives from a set of professional education courses, students may complete 15 units toward the credential, thus enabling them to complete requirements for a Professional Clear Credential in one year of postbaccalaureate study.

All Liberal Studies students will complete 18 units in an area of emphasis. Multiple Subject Credential candidates will select their area of emphasis from among the following: art, computer concepts and application, English, foreign language, life science, mathematics, music, physical education, physical science, or social science. Courses in these areas of emphasis will be selected with the approval of the adviser. In most cases, these units will be at the upper division level and will never be double-counted for courses taken to satisfy other curriculum requirements. This area of emphasis will give depth to the student’s education in subject matter of his or her choice and may enable the credential candidate to achieve a supplemental authorization to teach a specific course at the junior high school level.

Students who choose not to pursue the Multiple Subject Teaching Credential or those who find the credential objective unrealistic, may obtain a B.A. in Liberal Studies by completing the core program and selecting a minor and an area of emphasis, in consultation with their adviser, which will prepare them for career options.
CURRICULUM FOR B.A. LIBERAL STUDIES

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. Cal Poly follows the quarter system.

**Freshman**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS 101 Orientation to Liberal Studies</td>
<td>1</td>
</tr>
<tr>
<td>BIO 101 General Biology and BIO 105 General Biology Lab (B.1.b.)</td>
<td>3,1</td>
</tr>
<tr>
<td>BIO 102 Plant Biology (B.1.b.)</td>
<td>4</td>
</tr>
<tr>
<td>BIO 103 Animal Biology</td>
<td>4</td>
</tr>
<tr>
<td>HD 298 Early and Middle Childhood</td>
<td>3</td>
</tr>
<tr>
<td>MU 100 Music Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
<td>.3</td>
</tr>
<tr>
<td>ENGL 114 Writing: Exposition (A.1.)</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 215 Writing: Argumentation or ENGL 218 Writing:</td>
<td></td>
</tr>
<tr>
<td>Argumentation and Reports (A.4.)</td>
<td>4</td>
</tr>
<tr>
<td>PSY 201/PSY 202 General Psychology (E.1.)</td>
<td>3</td>
</tr>
<tr>
<td>SPC 201 Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
<td>3</td>
</tr>
<tr>
<td>1 Fine and Performing Arts elective (C.2.)</td>
<td>3</td>
</tr>
<tr>
<td>1 Math elective (B.2.)</td>
<td>4</td>
</tr>
</tbody>
</table>

**Sophomore**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 ENGL 240 or ENGL 330-352</td>
<td>4</td>
</tr>
<tr>
<td>ECON 201 Survey of Economics or ECON 211 Principles of Economics (D.3.)</td>
<td>3</td>
</tr>
<tr>
<td>HIST 204 History of American Ideals and Institutions (D.1.)</td>
<td>3</td>
</tr>
<tr>
<td>PHIL 230/231 Philosophical Classics (C.1.)</td>
<td>3</td>
</tr>
<tr>
<td>POLS 210 American and California Government (D.1.)</td>
<td>3</td>
</tr>
<tr>
<td>PSC 101 The Physical Environment: Matter and Energy</td>
<td>4</td>
</tr>
<tr>
<td>PSC 102 The Physical Environment: Atoms and Molecules (B.1.a.)</td>
<td>4</td>
</tr>
<tr>
<td>PSC 103 The Physical Environment: Earth and the Universe</td>
<td>4</td>
</tr>
<tr>
<td>1 Computer literacy elective (F.1.)</td>
<td>3</td>
</tr>
<tr>
<td>1 Critical reading electives (C.1.)</td>
<td>6</td>
</tr>
<tr>
<td>Foreign language electives</td>
<td>4,4</td>
</tr>
<tr>
<td>1 Technical elective (F.2.)</td>
<td>3</td>
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</table>

**Junior**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ENGL 390/ENGL 392/ENGL 395</td>
<td>4</td>
</tr>
<tr>
<td>ETHS 114/ETHS 210/SOC 315/SOC 316/SPC 316</td>
<td>3</td>
</tr>
<tr>
<td>HIST 314/HIST 340/HIST 381/HIST 415</td>
<td>3</td>
</tr>
<tr>
<td>PE 310 Concepts in Physical Education</td>
<td>3</td>
</tr>
<tr>
<td>PHIL 331/PHIL 335/PHIL 337</td>
<td>3</td>
</tr>
<tr>
<td>BIO 220/FSN 210/HE 210/PE 230/PSY 304 (E.2.)</td>
<td>2</td>
</tr>
<tr>
<td>MATH 327 Introduction to Modern Mathematics</td>
<td>4</td>
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<tr>
<td>MATH 328 Introduction to Modern Mathematics (B.2.)</td>
<td>4</td>
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<tr>
<td>Restricted electives (area of emphasis)</td>
<td>9</td>
</tr>
<tr>
<td>Courses to complete major</td>
<td>9</td>
</tr>
<tr>
<td>Electives</td>
<td>3</td>
</tr>
</tbody>
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46

47
Senior

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>LS 461, 462</td>
<td>Senior Project</td>
<td>3,3</td>
</tr>
<tr>
<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
<td>3</td>
</tr>
<tr>
<td>^ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>^Arts and humanities elective (Area C)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>^Literature, philosophy, arts elective (300-400 level) (C.3.)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Restricted electives (area of emphasis)</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>^Courses to complete major</td>
<td>15</td>
<td></td>
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<tr>
<td>Electives</td>
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<tr>
<td></td>
<td>45</td>
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</tr>
</tbody>
</table>

1 To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 114 of this catalog.
2 May not be double-counted for GE&B requirement.
3 To be selected with adviser's approval.

Courses in Credential Track

(Add courses below to basic curriculum)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
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<tbody>
<tr>
<td>ED 300</td>
<td>Introduction to the Teaching Profession</td>
<td>3</td>
</tr>
<tr>
<td>BIO 306</td>
<td>Biological Applications or PSC 304 Physical Science Applications</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 260</td>
<td>Children's Literature</td>
<td>3</td>
</tr>
<tr>
<td>MATH 329</td>
<td>Mathematical Applications to Elementary Teaching</td>
<td>3</td>
</tr>
<tr>
<td>MU 301/SPC 310/TH 380</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
<td>14</td>
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</tr>
</tbody>
</table>

Students seeking a Multiple Subjects Credential may wish to complete the following sequence of courses (for a total of 14 units):

- ED 301 The Learners and the Learning: Teaching Process in Elementary School (3)
- ED 303 Effective Teaching, Classroom Management and Discipline in the Elementary School (4)
- ED 401 Teaching Reading in the Elementary Classroom (4)
- ED 402 Teaching Language Arts and Reading in the Elementary Classroom (4)

Courses in Non-Credential Track

(Add courses below to basic curriculum)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>Courses to complete a minor</td>
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<tr>
<td>Free electives</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>
MILITARY SCIENCE DEPARTMENT

Dexter Bldg. (34), Room 116
(805) 756-7682

Faculty

Department Head, Lt. Colonel Sol M. Garrett
Major Margaret M. Christensen
Major Mark M. Earley
Captain John E. Bachmann
Captain David R. Singleton

PURPOSE
The Military Science Department conducts a dynamic four-year program of instruction which develops the mental and physical qualifications of graduates in preparation for positions of leadership within the military and civilian communities. Students may enroll at any time for full academic elective credit without incurring any military service obligation. However the last two years of the program are oriented toward preparing the student for a military career. The innovative and well-taught courses complement all major areas of study by broadening the student's basic education. The complete curriculum includes both military leadership and management courses; courses which provide an awareness of the heritage of the U.S. Military; the Armed Forces' role in national defense strategy; professional military subjects; and military ethics. Students desiring to attain a highly sought-after commission as a Second Lieutenant in the U.S. army must meet eligibility requirements and complete the entire Military Science/ROTC (Reserve Officer Training Corps) Advanced Course (22 units). To be eligible for participation in the Cal Poly ROTC Program, a student must be enrolled full time (12 units) at Cal Poly, have at least two years remaining as a university student to permit completion of the advanced course prior to reaching the 30th birthday, and be physically qualified.

FINANCIAL ASSISTANCE
Many opportunities for financial assistance are available to students. Three areas of opportunities are: ROTC cadets who sign a contract for Advanced Phase, students who earn an ROTC scholarship, and cadets who train with Reserve or National Guard units. All ROTC cadets sign a contract to participate in the Advanced Phase of ROTC and receive a $100 a month allowance. Criteria to participate in the Advanced Phase are stated later. Highly competitive two-, three-, and four-year ROTC scholarships are available. The scholarship provides payment of full tuition, books, supplies, and the $100 a month allowance for the duration of the scholarship. Students interested in scholarship competition should contact the Military Science Department at the time of application to the university. Reserve or National Guard training provides an additional two sources of financial assistance: approximately $120 a month for one weekend drill and approximately $145 a month tuition assistance from the National Guard/Army Reserve "New GI Bill" benefits.

EQUIPMENT AND UNIFORMS
All necessary equipment, uniforms and textbooks for participation in the Military Science/ROTC program are furnished to the student by the United States Government free of charge. Title to this property, other than expendable items, remains with the government. Students entering into active commissioned service after graduation are granted a special $300 uniform allowance.

FOUR-YEAR PROGRAM
The four-year program elective military science curriculum is divided into two diverse phases. The basic phase is primarily for freshmen and sophomores, and the advanced phase is for junior and senior level students.

BASIC PHASE
The Basic Phase is a two-year invigorating period where students may, without obligation, investigate the ROTC Program and the military as a full- or part-time career. Students may enter and leave this
phase during any quarter. The curriculum for the basic phase is listed below and offers many challenging, exciting opportunities for all students. To become an ROTC cadet during this phase requires the student be registered for a Military Science class, completion of an ROTC enrollment form (obtained at the Military Science Department, Dexter Building, Room 115), and an interview with the ROTC Enrollment Officer. Because this phase is for students to examine the ROTC Program without penalty or obligation, participation in ROTC activities is encouraged but not mandatory. Advancement into the challenging Advanced Phase is accomplished either by successfully completing the Basic Phase classes, completing ROTC Summer Basic Camp or completing any military basic training program.

**ROTC SUMMER BASIC CAMP**

One method to qualify for the Advanced Phase is to successfully complete the six-week challenging ROTC Summer Basic Camp. Students normally attend Basic Camp between their second and third academic years. Transfer students may complete the camp during the summer immediately prior to their matriculation at Cal Poly. It is important that potential transfer students who plan to participate in the two-year ROTC program make their intentions known directly to the Military Science Department no later than March 1 of the year they plan to register at the university even though this date may precede the date of their final acceptance by the university.

The government will provide a transportation allowance to and from Basic Camp and pay at the rate of one-half of a Second Lieutenant’s basic pay. All equipment, uniforms, room, board and medical care are furnished free while at camp. A maximum of 7 units elective credit may be earned for attending Basic Camp. No military obligation is incurred as a result of attendance.

**BASIC TRAINING**

Outstanding students who have successfully served on active duty, regardless of the branch of service, are qualified to enter the Advanced Phase because they have completed basic training for their particular branch of service. Also, students who have been or are members of Reserve or National Guard units and have completed basic training are qualified for the Advanced Phase.

**ADVANCED PHASE**

The Advanced Phase is a two-year period where ROTC cadets receive advanced leadership and management training. The cadets receive many hours of hands-on, practical leadership experiences to prepare them for a military career or a management position in the civilian sector. To become a cadet in the Advanced Phase a student must complete the Basic Phase or ROTC Summer Basic Camp or Basic Training. The student must also make a commitment to attend all required training activities and sign a contract to accept a commission in the United States Army. In return for the student’s commitment, the Military Science Department will provide $100 a month, classroom instruction, real leadership opportunities, and continuous feedback on each cadet’s leadership progress. A six-week summer training camp, between the two years of the Advanced Phase, will be provided for testing and developing each cadet’s leadership abilities. All equipment, uniforms, room, board, and medical care are furnished free while at this camp. The cadets will also receive approximately $600 during the six weeks. Upon successful completion of the Advanced Phase and graduation from the university, the cadet will be commissioned as a Second Lieutenant in the United States Army.

**SIMULTANEOUS MEMBERSHIP PROGRAM**

Students can serve simultaneously in the National Guard or Army Reserve while they are cadets in ROTC and receive pay from both sources. Those who complete the ROTC Advanced Phase prior to graduation may continue serving in the Reserve or National Guard in the Simultaneous Membership Program. Since students can earn about $3,000 each year, this program provides both financial and experience benefits.
Military Science

Basic Phase

Freshman
MSC 111 Orienteering (2)
MSC 112 Survival Training: Wilderness (2)
MSC 116 Basic Military Skills (2)

Sophomore
MSC 211 Current Military Affairs (2)
1 MSC 212 Basic Camp (1-7)
MSC 213 Survival Training: Mountain (2)
MSC 215 Leadership and Management Seminar (2)
MSC 225 Advanced Survival Techniques (2)
MSC 229 Ranger Challenge (2)

Advanced Phase

Junior
MSC 311 Leadership and Management (3)
MSC 312 Leader Communication Skills (3)
MSC 313 Tactical Military Operations (3)
2 MSC 314 ROTC Advanced Camp (6)

Senior
MSC 411 Military Professionalism and Ethics (3)
MSC 412 Military Justice (2)
MSC 413 Military Organization and Management (2)
3 HIST 308 American Warfare (3)

1 Basic Camp is an optional 6-week summer training course (1-7 units) at Fort Knox, Kentucky.
2 Advanced Camp is a mandatory 6-week summer training experience at Fort Lewis, Washington (6 credits).
3 Prerequisite to commissioning.

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Military Science and other subjects.
The Physical Education and Recreation Administration Department offers undergraduate degree programs in physical education and recreation administration with a graduate degree program in physical education. The department also contributes to the general education and elective needs of all students by providing health education, basic instruction in physical education and first aid/CPR courses.

Because of an ideal geographical location, the university has become a center for workshops held by some of the State's health and physical education organizations. The department has a full range of both indoor and outdoor facilities and laboratories which accommodate an extensive physical education instructional program as well as full-scale athletic, intramural, and recreational sports programs.

**PHYSICAL EDUCATION MAJOR**

The Bachelor of Science degree in Physical Education is a broad based program offering students curricular choices for a wide range of career opportunities. These choices include the traditional concentrations in teaching and health education and the contemporary choices of a commercial and corporate fitness concentration, an individualized course of study and certificate programs in athletic coaching and aquatics specialist.

**Curricular Concentrations**

**Commercial and Corporate Fitness**

This concentration incorporates basic knowledge of business and managerial skills with the scientific and clinical knowledge of exercise physiology, human chemistry, psychology and nutrition. These graduates work in a wide range of enterprises which include: fitness programs, YMCA/YWCA, private health clubs and various wellness evaluation and rehabilitation programs.
Health Education
This concentration is designed to prepare students for careers in education, public and private health related agencies and for graduate school in the health sciences. The concentration focuses on working with others to enhance the quality of life through the mediums of physical and mental health.

Teaching
This concentration provides coursework which enables graduates to enter the teaching profession with the knowledge and skills necessary to achieve maximum success within each person’s capabilities. The single subject credential in physical education and an emphasis in adapted physical education are available as part of the program.

Individualized Course of Study
In addition to the concentrations, students may pursue department approved individual course of study and certificate programs. For majors other than physical education, the department offers certificate programs in athletic coaching and aquatics. Physical education majors who select the athletic coaching certificate would also have to complete another certificate program, concentration, or individualized course of study.

CURRICULUM FOR B.S. PHYSICAL EDUCATION
Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

**Freshman**
- PE 206–PE 229 Professional Activity/DANC 311 Orientation to Dance ................ 8
- PE 250 Health Education ........................................................................... 2
- PE 270 Introduction to Physical Education .............................................. 2
- PE 280 First Aid and CPR ......................................................................... 3
- ANT 201/GEOG 150/SOC 105 (D.4.a.) ...................................................... 3
- ECON 201/ECON 211/ECON 222 (D.3.) ................................................. 3
- ENGL 114 Writing: Exposition (A.1.) ......................................................... 4
- ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .......................... 3
- POLS 210 American and California Government (D.1.) ......................... 3
- SPC 201 Public Speaking or SPC 202 Principles of Speech Communication (A.3.) 3
- ZOO 131 General Zoology (B.1.b.) ............................................................ 4
- Critical reading elective (C.1.) ................................................................. 3
- Fine and Performing Arts elective (C.2.) .................................................. 3
- Mathematics elective (B.2.) ..................................................................... 3
- Physical sciences elective (B.1.a.) ............................................................ 3

**Sophomore**
- PE 218 Aquatics ..................................................................................... 2
- PE 252 Introduction to Athletic Training ................................................... 2
- ZOO 237 Human Anatomy ...................................................................... 3
- ENGL 215 Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.) .......................................................... 4
- FSN 210/HE 210 Nutrition (E.2.) ............................................................... 3
- HIST 204 History of American Ideals and Institutions (D.1.) ................. 3
- PHIL 230/PHIL 231 Philosophical Classics (C.1.) ................................. 3
- PSY 201/PSY 202 General Psychology (E.1.) .......................................... 3
- STAT 211 Elementary Probability and Statistics (B.2.) ........................... 3
- ZOO 331, ZOO 332 Human Physiology (B.1.b.) .................................... 3
- Computer literacy elective (F.1.) ............................................................ 3
- Technology elective (F.2.) ..................................................................... 3
- Electives and courses to complete major ............................................... 10
Commercial and Corporate Fitness Concentration
(Add courses below to basic curriculum)

Sophomore
MGT 118 Introduction to Human Relations in Business .............................................. 3
MGT 201 Principles of Management ................................................................................. 3

Junior
REC 210 Programming for Leisure ................................................................................. 3
CHEM 326 Survey of Organic Chemistry ................................................................. 4
CHEM 328 Survey of Biochemistry ............................................................................. 4
SPC 301 Business and Professional Communication .................................................. 4

Senior
PE 434 Design and Implementation of Health and Fitness Programs ......................... 3
PE 437 Directed Fieldwork ............................................................................................ 3
PE 445 Electrocardiography ......................................................................................... 3
PE 450 Lifestyle Management in a Physical Fitness Setting ......................................... 3
PE 451 Nutrition for Fitness and Sport ......................................................................... 3
PE 452 Testing and Exercise Prescription for Fitness Specialists .................................. 3

1 Commercial and corporate fitness students take CHEM 121 as their GEB B.1.a. course and CHEM 122 as an elective for prerequisite coursework for CHEM 326.

*To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 114 of this catalog.
Health Education Concentration
(Add courses below to basic curriculum)

Freshman
PE 354 School Health Programs ................................................................. 2
HD 108 Introduction to Human Development or SOC 306 The Sociology of
Family Life ........................................................................................................ 3

Sophomore
BIO 253 Orientation to the Health Professions ..................................................... 1
BACT 221 General Bacteriology ........................................................................... 4
PSY 317 Psychology of Stress ............................................................................ 3

Junior
BIO 301 Human Ecology .................................................................................... 3
PSY 301 Psychology of Personal Development .................................................. 3
PSY 205 Human Sexuality .................................................................................. 2
SOC 344 Sociology of Poverty or GEOG 320 Geography of Hunger .................. 3

Senior
PSY 330 Behavioral Effects of Psychoactive Drugs ............................................ 3
BIO 302 Human Genetics .................................................................................. 3
PE 405 Administration of Health Education ....................................................... 2
HD 308 Adulthood or PSY 459 Lifespan Development ........................................ 3

Teaching Concentration
(Add courses below to basic curriculum)

Sophomore
PE 206 Tumbling-Vaulting or PE 207 Apparatus .............................................. 2
PE 215 Field Sports .......................................................................................... 2
REC 260 Intramural and Recreational Sports .................................................... 3

Junior
PE 275 Sports Officiating .................................................................................... 2
PE 296 Planning Techniques in Physical Education ........................................... 3
PE 354 School Health Programs ......................................................................... 2
PE 384 Water Safety Instructor ......................................................................... 3
Adaptive Physical Education and Coaching Methods (PE 245, PE 321,
PE 322, PE 323/PE 325, PE 327, PE 344, PE 379, PE 407, PE 438) ......................... 4

Senior
PE 336 Teaching Gymnastics ............................................................................. 2
PE 422 Teaching Elementary Physical Education ............................................. 4
PE 423 Teaching Secondary Physical Education .............................................. 4
PE 424 Organization and Teaching Physical Education ...................................... 3
PE 440 Physical Education Practicum ............................................................... 1
DANC 381 Methods of Teaching Dance ............................................................ 3
RECREATION ADMINISTRATION MAJOR

Organizations offering leisure services and products exist as a result of the demand for increased leisure opportunity. The Bachelor of Science degree program in Recreation Administration offers professional preparation for employment in public, private, and commercial leisure service organizations. Students may pursue a concentration in either private and commercial recreation or therapeutic recreation or elect to develop a course of study in public and nonprofit recreation to include: outdoor and recreation education, aquatics, cultural arts, recreational sports and dance. In addition, leisure education courses provide university students with lifestyle management skills. The program is accredited by the National Recreation and Park Association/the American Association of Leisure and Recreation Council on Accreditation.

Curricular Concentrations

Private and Commercial Recreation
This concentration emphasizes preparation for employment in organizations that provide leisure products or services for profit or financial self-sufficiency. An emphasis on recreation business is targeted to the following settings: employee services and recreation, travel and tourism, product sales and manufacturing, and small business opportunities.

Therapeutic Recreation
This concentration prepares students for employment in recreation therapy, leisure education for the disabled, and special recreation in such settings as hospitals, correctional institutions, health organizations, residential care facilities, and community-based agencies and organizations. Coursework includes the areas of physical disabilities, developmental disabilities, mental health, and geriatrics.

CURRICULUM FOR B.S. RECREATION ADMINISTRATION

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

Freshman

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>REC 101 Introduction to Recreation and Leisure Services</td>
<td>3</td>
</tr>
<tr>
<td>REC 102 Wilderness Ethics and Safety</td>
<td>2</td>
</tr>
<tr>
<td>REC 105 Recreation Leadership</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 211 Financial Accounting for Nonbusiness Majors</td>
<td>4</td>
</tr>
<tr>
<td>BUS 101 The Business Enterprise</td>
<td>4</td>
</tr>
<tr>
<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
<td>3</td>
</tr>
<tr>
<td>CSC 120 Principles of Business Data Processing (F.1.)</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 114 Writing: Exposition (A.1.)</td>
<td>4</td>
</tr>
<tr>
<td>PHIL 230/PHIL 231 Philosophical Classics (C.1.)</td>
<td>3</td>
</tr>
<tr>
<td>1 Critical reading elective (C.1.)</td>
<td>3</td>
</tr>
<tr>
<td>1 Fine and Performing Arts elective (C.2.)</td>
<td>3</td>
</tr>
<tr>
<td>1 Life sciences elective (B.1.b.)</td>
<td>3</td>
</tr>
<tr>
<td>1 Mathematics elective (B.2.)</td>
<td>3</td>
</tr>
<tr>
<td>2 Physical or life sciences elective (B.1.)</td>
<td>3</td>
</tr>
<tr>
<td>1 Mathematics or science elective (B.1. or B.2.)</td>
<td>3</td>
</tr>
</tbody>
</table>

48
## Sophomore

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>REC 210</td>
<td>Programming for Leisure</td>
<td>3</td>
</tr>
<tr>
<td>REC 252</td>
<td>Introduction to Therapeutic Recreation</td>
<td>4</td>
</tr>
<tr>
<td>PE 280</td>
<td>First Aid and CPR</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 125/PHIL 125/SPC 125</td>
<td>Critical Thinking (A.2.)</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 215/PHIL 215/SPC 215</td>
<td>Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.)</td>
<td>4</td>
</tr>
<tr>
<td>HIST 204</td>
<td>History of American Ideals and Institutions</td>
<td>3</td>
</tr>
<tr>
<td>POLS 210</td>
<td>American and California Government</td>
<td>3</td>
</tr>
<tr>
<td>PSY 201/PSY 202</td>
<td>General Psychology (E.1.)</td>
<td>3</td>
</tr>
<tr>
<td>SPC 201</td>
<td>Public Speaking or SPC 202 Principles of Speech</td>
<td>3</td>
</tr>
<tr>
<td>STAT 211</td>
<td>Elementary Probability and Statistics (B.2.)</td>
<td>3</td>
</tr>
<tr>
<td>BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100</td>
<td>(E.2.)</td>
<td>2</td>
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</table>

1. Critical reading elective (C.1.) .... 3
2. Physical sciences elective (B.1.a.) .... 3
3. Electives and courses to complete concentration .... 10

### Total Units: 50

## Junior

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>REC 323</td>
<td>Supervisory Roles in Recreation Administration</td>
<td>3</td>
</tr>
<tr>
<td>REC 324</td>
<td>Legal and Managerial Patterns in Recreation Administration</td>
<td>3</td>
</tr>
<tr>
<td>REC 327</td>
<td>Leisure Counseling</td>
<td>3</td>
</tr>
<tr>
<td>REC 328</td>
<td>Leisure and Aging</td>
<td>3</td>
</tr>
<tr>
<td>REC 364</td>
<td>Commercial Recreation and Leisure Services</td>
<td>3</td>
</tr>
<tr>
<td>JOUR 312</td>
<td>Introduction to Public Relations</td>
<td>4</td>
</tr>
<tr>
<td>OH 337</td>
<td>Park Planning and Management</td>
<td>4</td>
</tr>
<tr>
<td>SOC 333</td>
<td>Social Research Methods</td>
<td>3</td>
</tr>
<tr>
<td>ECON 201/ECON 211/ECON 222</td>
<td>(D.3.)</td>
<td>3</td>
</tr>
<tr>
<td>HIST 315</td>
<td>Modern World History</td>
<td>3</td>
</tr>
<tr>
<td>ART/HUM 314</td>
<td>Arts and humanities elective (Area C)</td>
<td>3</td>
</tr>
<tr>
<td>LIT/PHI 314</td>
<td>Literature, philosophy, arts elective (300-400 level) (C.3.)</td>
<td>3</td>
</tr>
</tbody>
</table>
3. Electives and courses to complete concentration .... 12

### Total Units: 50

## Senior

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>REC 416</td>
<td>Physical Education and Recreation Facilities</td>
<td>3</td>
</tr>
<tr>
<td>REC 424</td>
<td>Financing Recreation and Leisure Services</td>
<td>3</td>
</tr>
<tr>
<td>REC 432</td>
<td>Internship (6)</td>
<td>6</td>
</tr>
<tr>
<td>REC 460</td>
<td>Research in Recreation Administration</td>
<td>4</td>
</tr>
<tr>
<td>REC 461</td>
<td>Senior Project</td>
<td>3</td>
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<tr>
<td>REC 462</td>
<td>Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>ANT/BUS/ECON/GEOG/POLS/SOC 462</td>
<td>elective (D.4.b.)</td>
<td>3</td>
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<tr>
<td>Technology elective (F.2.)</td>
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</tbody>
</table>
3. Electives and courses to complete concentration .... 23

### Total Units: 50

---

1. To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 114 of this catalog.
2. Therapeutic Recreation students take ZOO 131 (4) as a concentration requirement. Other students select courses in accordance with the General Education-Breadth requirements.
## Private and Commercial Recreation Concentration

(Add Courses Below to Basic Curriculum)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>REC 301</td>
<td>Outdoor Recreation Education or REC 302</td>
<td>3</td>
</tr>
<tr>
<td>REC 310</td>
<td>Program Administration in Leisure Services</td>
<td>3</td>
</tr>
<tr>
<td>REC 312</td>
<td>Employee Services and Recreation</td>
<td></td>
</tr>
<tr>
<td>REC 314</td>
<td>Travel and Tourism–Implications for Leisure</td>
<td>3</td>
</tr>
<tr>
<td>REC 316</td>
<td>Commercial Recreation Entrepreneurship</td>
<td>1</td>
</tr>
<tr>
<td>REC 464</td>
<td>Delivery of Commercial Recreational Services</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 301</td>
<td>Managerial Accounting</td>
<td>4</td>
</tr>
<tr>
<td>MKTG 204</td>
<td>Elements of Marketing</td>
<td>4</td>
</tr>
<tr>
<td>CSC elective</td>
<td></td>
<td>3</td>
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<tr>
<td>Adviser approved electives</td>
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</table>

Therapeutic Recreation Concentration

(Add Courses Below to Basic Curriculum)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>REC 320</td>
<td>Processes and Techniques in Therapeutic Recreation</td>
<td>4</td>
</tr>
<tr>
<td>REC 325</td>
<td>Recreation Therapy in a Physical Rehabilitation Setting</td>
<td>4</td>
</tr>
<tr>
<td>REC 329</td>
<td>Team Procedures and Processes for Recreation Therapists</td>
<td>4</td>
</tr>
<tr>
<td>REC 407</td>
<td>Programming and Adaptive Techniques in Therapeutic Recreation</td>
<td>4</td>
</tr>
<tr>
<td>REC 431</td>
<td>Therapeutic Recreation Internship</td>
<td>3</td>
</tr>
<tr>
<td>PSY 323</td>
<td>The Helping Relationship</td>
<td>4</td>
</tr>
<tr>
<td>PSY 307</td>
<td>Abnormal Psychology</td>
<td>3</td>
</tr>
<tr>
<td>ZOO 237</td>
<td>Human Anatomy</td>
<td>3</td>
</tr>
<tr>
<td>Therapeutic Recreation Concentration electives</td>
<td></td>
<td>7</td>
</tr>
</tbody>
</table>

Therapeutic Recreation students must take REC 431 and REC 432 concurrently.

## MASTER OF SCIENCE DEGREE IN PHYSICAL EDUCATION

### General Characteristics

The degree program is designed primarily to offer advanced study in physical education which will qualify men and women to enter the field at occupational levels requiring a master's degree. The program offers the increased depth and quality needed for (a) teaching physical education at the secondary and community college levels, (b) positions in private, governmental, and international agencies and programs, (c) self-directed study and growth in the field of physical education, or (d) continued graduate work at other institutions.

### Areas of Emphasis

Students may select one of the following areas of emphasis which is most compatible with career and personal objectives.

**Wellness Management**

Wellness Management is an extension of the Commercial/Corporate Fitness Concentration under the B.S. degree program in Physical Education. This emphasis will prepare people to: a) seek employment as a fitness/wellness program director in a variety of public and private agencies and companies, b) enter into their own business in this rapidly expanding field, and c) continue in an advanced degree program in health education, exercise science, and exercise physiology.

**Human Movement and Sport**

This emphasis is offered for students who wish advanced preparation for elementary, secondary, or college positions in physical education, or in related areas such as athletic administration and coaching. It is oriented toward a practical application and offers an opportunity for the in-depth study needed for: a) teaching physical education at all levels; b) coaching at the secondary and post-secondary levels, as well as with private and municipal agencies; c) program administration at all levels; and d) continued graduate work at other institutions.
Prerequisites

Conditionally Classified Standing
The student may enroll in a graduate degree curriculum if in the opinion of the appropriate campus authority the student can remedy any deficiencies by additional preparation.

Those applicants with undergraduate deficiencies must remove these deficiencies before advancement to classified standing or advancement to candidacy. Undergraduate preparation should include a major in physical education or equivalent academic preparation as determined by the student’s adviser. In addition, the student should have an adequate background in both activity and coaching theory classes as well as the following academic coursework: human anatomy, human physiology, physiology of exercise, kinesiology, tests and measurements, organization and administration of physical education, adapted physical education, and curriculum and methods in physical education. These deficiencies may be removed by either coursework or examination. Classes completed to remove deficiencies may not apply toward the master's degree.

Classified Standing
For admission to classified standing, an applicant must have an undergraduate major in physical education or equivalent academic preparation as determined by the departmental coordinator of graduate studies and a minimum grade point average of 2.75 in the last 90 units of undergraduate work. Students below a 2.75 GPA may appeal to the Graduate Coordinator to be “conditionally” accepted. This latter procedure will involve a review process and a specified contract to be successfully completed before admission to classified standing.

Advancement to Candidacy
For advancement to candidacy a student shall complete 18 quarter units of approved graduate-level classes with a minimum grade point average of 3.0 at Cal Poly. At least 18 units must be completed after advancement to candidacy.

Requirements for the Degree
The formal program of study must include 45 units of approved graduate work; at least 30 of these units must be completed at the 500 level, with 24 of these units taken in Physical Education.

All candidates must meet the current Graduation Writing Requirement (see page 138).

Each candidate must successfully complete a comprehensive examination before the degree is granted. This examination may take one of two forms: (1) those students presenting a thesis must successfully defend the thesis in an oral examination, or (2) those students not presenting a thesis must pass an oral examination dealing with general current knowledge of the profession and coursework taken toward the degree requirements.

If the degree is not completed within 4 years, the graduate faculty will require that a thesis candidate also be tested on coursework.

Up to 12 units may be taken in 400-level PE courses with adviser approval provided those courses were not taken as part of the student’s undergraduate program. Graduate students taking 400-level courses will be required to complete assignments beyond those normally required of undergraduate students and will be graded against more rigorous standards than those applied to undergraduate students in the same course. The following 400-level courses offered by the department are not acceptable for graduate credit: PE 400, PE 401, PE 402, PE 405, PE 424, PE 437, PE 440, PE 461, PE 462, and PE 474.

A maximum of 21 units may be taken outside of the Department in 400- and 500-level courses. If all 21 units are elected outside of the PE department, 6 units must be at the 500 level.
# CURRICULUM FOR M.S. PHYSICAL EDUCATION

<table>
<thead>
<tr>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required courses</td>
</tr>
</tbody>
</table>

- PE 517 Research Methods in Physical Education (3)
- PE 513 Evaluation of Current Studies (3)
- PE 502 Current Trends and Issues in Physical Education (3)

| Area of Emphasis | 18 |

Nine units must be selected from one of the following areas of emphasis. An additional 9 units must be taken in the area of emphasis with adviser approval.

**Wellness Management**
- PE 503 Seminar in Adult Wellness (3)
- PE 512 Critical Health Issues (3–9)
- PE 530 Advanced Physiology of Exercise (3)
- PE 536 Electrocardiography (3)

**Human Movement and Sport**
- PE 501 Administration of Adapted Physical Education Programs (3)
- PE 511 Administration of Physical Education and Athletics (3)
- PE 525 Human Performance and Learning (3)
- PE 526 Sport in American Society (3)

Electives to be selected with adviser's approval | 18

For more detailed information or advisement, students should communicate with the Coordinator of Graduate Studies for Physical Education.
Faculty Office Bldg. (47), Room 24
(805) 756-2033

Faculty

Department Head, Kathleen A. Ryan
Margaret M. Berrio    Laura A. Freberg    Ned W. Schultz
Robert L. Blodget    Laura M. King    Charles M. Slem
Robert A. Christenson    Daniel J. Levi    Josephine S. Stearns
Patricia L. Engle    Ann Morgan    W. Fred Stultz
David L. Englund    Linden L. Nelson    Bette W. Tryon
Basil A. Fiorito    Donald H. Ryujin

Programs

B.S. Human Development with Concentrations in:
- Applied Developmental Psychology
- Early Childhood Education
- Family Studies

Minors:
- Psychology
- Integrative Technology
- Gerontology

The Department consists of faculty with degrees in psychology, family studies, human development
and education who direct a program leading to a B.S. degree in Human Development and minors
in Psychology, Gerontology, and Integrative Technology, as well as a broad range of support courses
which serve the entire university community.

Human Development majors complete a core of coursework which provides them with a foundation
in life span human development and basic psychological principles as preparation for work with
children and adults. In this core program, students participate in department-operated infant, toddler,
preschool laboratories and complete internships in area schools and human services agencies as part
of the "learn by doing" educational process. Students select a curricular concentration in Early
Childhood Education, Family Studies or Applied Developmental Psychology.

The Psychology and Human Development Department's other main concerns are to provide
courses which fulfill general education requirements, support other degree programs and serve as
a personal development resource for all university students. These course offerings are designed to
acquaint students with the facts, theories and contemporary trends in psychology and human
development with a special emphasis on how these principles can be incorporated into a more
coherent and meaningful understanding of oneself and of one's interactions with others.
MINORS

Psychology Minor
The Psychology minor provides students with a broad background in the principles of psychology that develop an appreciation of the human element in the world around them, complement their professional training, and enhance their personal development and interpersonal effectiveness. Students whose primary job responsibilities will require dealing with people should find employment opportunities increased and career advancement enhanced.

Integrative Technology Minor
The Integrative Technology minor is an interdisciplinary program jointly sponsored by Industrial Engineering, Industrial Technology and Psychology and Human Development departments. The minor is for non-engineering students who wish to pursue their professional career in a corporate setting and want to learn more about the impact of technology. The minor will acquaint students with how factories operate and how technology is integrated into corporate operations. For more information, see page 336.

Gerontology Minor and Certificate Program
The Gerontology Minor and Certificate Program is an interdisciplinary program to upgrade the skills and increase the knowledge of persons already in the field of gerontology and to train students in various majors whose careers will be directly or indirectly related to gerontology. In addition, the Certificate Program trains interested persons in providing continuing education programs for senior adults and assure the availability and accessibility of these programs to the elderly population through continuing education and peer educators. For more information, see page 335.

CURRICULAR CONCENTRATIONS

Applied Developmental Psychology
This concentration is designed to prepare students for careers in human service agencies, health care settings, special needs programs, educational institutions and private or government organizations where practical aspects of human development are addressed. Students who choose this concentration study the nature of human development throughout the life span and learn to use psychological and developmental principles to assess and analyze behavior, to understand interpersonal relationships, and to implement behavior change and intervention techniques. The concentration also prepares students for graduate programs in psychology and counseling.

Early Childhood Education
Students selecting this concentration prepare for careers in preschool teaching, caregiving, and administrative positions with public or private institutions or for graduate work leading to college or university teaching and research positions. These graduates may plan for careers in programs that serve infants, preschool and school-age children. Students may also pursue coursework leading to the Multiple Subjects Credential program for public elementary school teachers.

Family Studies
This concentration is an interdisciplinary program designed to provide the knowledge and experience necessary for a variety of careers in family, social service and counseling-related agencies in the public and private sectors. The Family Studies concentration is particularly appropriate for students who wish to work in educational or helping agencies and who desire a family developmental focus rather than a broad social science perspective at the undergraduate level. Many students in this concentration will pursue further graduate-level training in a variety of specializations.
## CURRICULUM FOR B.S. HUMAN DEVELOPMENT

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

### Freshman

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>HD 101</td>
<td>Orientation to Psychology and Human Development</td>
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</tr>
<tr>
<td>HD 108</td>
<td>Introduction to Human Development</td>
<td>3</td>
</tr>
<tr>
<td>HD 130/HD 140/HD 150</td>
<td>Supervised Study of Children: Infant-Toddlers, Early Childhood or Middle Childhood</td>
<td>4</td>
</tr>
<tr>
<td>ETHS 114</td>
<td>Racism in American Culture or ETHS 210 Cultural Heritage</td>
<td>3</td>
</tr>
<tr>
<td>ANT 201/GEOG 150/SOC 105</td>
<td>(D.4.a.)</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 114</td>
<td>Writing: Exposition (A.1.)</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 125/PHIL 125/SPC 125</td>
<td>Critical Thinking (A.2.)</td>
<td>3</td>
</tr>
<tr>
<td>HIST 204</td>
<td>History of American Ideals and Institutions (D.1.)</td>
<td>3</td>
</tr>
<tr>
<td>PSY 201/PSY 202</td>
<td>General Psychology (E.1.)</td>
<td>3</td>
</tr>
<tr>
<td>1 Fine and Performing Arts elective (C.2.)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>1 Life science elective (B.1.b)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>1 Mathematics elective (B.2.)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>1 Physical or life sciences elective (with laboratory) (B.1.a.)</td>
<td>3</td>
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Electives .................................................................................................................. 6

### Sophomore

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>HD 130/HD 140/HD 150</td>
<td>Supervised Study of Children: Infant-Toddlers, Early Childhood or Middle Childhood</td>
<td>3</td>
</tr>
<tr>
<td>HD 203</td>
<td>Family Development</td>
<td>3</td>
</tr>
<tr>
<td>HD 296</td>
<td>Infancy</td>
<td>3</td>
</tr>
<tr>
<td>ECON 201/ECON 211/ECON 222</td>
<td>(D.3.)</td>
<td>3</td>
</tr>
<tr>
<td>FSN 210/HE 210 Nutrition (E.2.)</td>
<td>3</td>
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<tr>
<td>PHIL 230/PHIL 231</td>
<td>Philosophical Classics (C.1.)</td>
<td>3</td>
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<tr>
<td>POLS 210 American and California Government (D.1.)</td>
<td>3</td>
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<tr>
<td>SPC 201</td>
<td>Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
<td>3</td>
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<td>STAT 130/STAT 211/STAT 251/STAT 321 (B.2.)</td>
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<td>1 Computer literacy elective (F.1.)</td>
<td>3</td>
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<td>1 Critical reading elective (C.1.)</td>
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<td>1 Physical science elective (B.1.a.)</td>
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Electives and courses to complete concentration .................................................................. 8

### Junior

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<tbody>
<tr>
<td>HD 298</td>
<td>Early and Middle Childhood</td>
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<tr>
<td>HD 306</td>
<td>Adolescence</td>
<td>3</td>
</tr>
<tr>
<td>HD 308</td>
<td>Adulthood or PSY 318 Psychology of Aging</td>
<td>3</td>
</tr>
<tr>
<td>PSY 323</td>
<td>The Helping Relationship</td>
<td>4</td>
</tr>
<tr>
<td>PSY 329</td>
<td>Research Methods in Psychology and Human Development</td>
<td>3</td>
</tr>
<tr>
<td>BIO 302</td>
<td>Human Genetics (B.1.b.)</td>
<td>3</td>
</tr>
<tr>
<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
<td>3</td>
</tr>
<tr>
<td>1 ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>1 Literature, philosophy, arts elective (300-400 level) (C.3.)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>1 Technology elective (F.2.)</td>
<td>3</td>
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Electives and courses to complete concentration .................................................................. 20
### Senior

<table>
<thead>
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<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>HD 330</td>
<td>Supervised Internship or HD 453/PSY 453 Supervised Fieldwork</td>
<td>6</td>
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<tr>
<td>HD 413</td>
<td>Parent-Child Relationships</td>
<td>3</td>
</tr>
<tr>
<td>HD 430</td>
<td>Advanced Internship or HD 454/PSY 454 Supervised Fieldwork</td>
<td>6</td>
</tr>
<tr>
<td>HD 461</td>
<td>Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>HD 462</td>
<td>Senior Project</td>
<td>3</td>
</tr>
<tr>
<td>HD 463</td>
<td>Senior Seminar</td>
<td>2</td>
</tr>
<tr>
<td>PSY 402</td>
<td>Social Psychology</td>
<td>3</td>
</tr>
<tr>
<td>PSY 452</td>
<td>Personality</td>
<td>3</td>
</tr>
<tr>
<td>PSY 458</td>
<td>Learning and Memory</td>
<td>3</td>
</tr>
</tbody>
</table>

1 Arts and humanities elective (Area C) .................................................. 3

Electives and courses to complete concentration ..................................... 16

50

---

1 To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 114 of this catalog. Early Childhood Education concentration students see list of recommended courses for GEB areas B. and C.2.

### Applied Developmental Psychology Concentration

(Add courses below to basic curriculum)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>HD 421</td>
<td>Developmental Processes</td>
<td>3</td>
</tr>
<tr>
<td>PSY 302</td>
<td>Behavior in Organizations</td>
<td>3</td>
</tr>
<tr>
<td>PSY 304</td>
<td>Physiological Psychology or FSN 310/HE 310 Maternal and Child Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>PSY 307</td>
<td>Abnormal Psychology</td>
<td>3</td>
</tr>
<tr>
<td>PSY 317</td>
<td>Psychology of Stress</td>
<td>3</td>
</tr>
<tr>
<td>PSY 422</td>
<td>Life Span Sexuality</td>
<td>3</td>
</tr>
<tr>
<td>PSY 432</td>
<td>Psychological Testing</td>
<td>3</td>
</tr>
<tr>
<td>PSY 459</td>
<td>Life Span Development</td>
<td>3</td>
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Select two of the following ......................................................................... 6

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>PSY 301</td>
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<td></td>
</tr>
<tr>
<td>PSY 309</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSY 310</td>
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<td></td>
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<td>PSY 314</td>
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<td>PSY 315</td>
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<tr>
<td>PSY 330</td>
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Select two of the following ......................................................................... 6

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<thead>
<tr>
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<tbody>
<tr>
<td>PSY 407</td>
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<td></td>
</tr>
<tr>
<td>PSY 429</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSY 456</td>
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<td></td>
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<tr>
<td>HD/ED 444</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HD 450/HD 451</td>
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</tbody>
</table>

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### Early Childhood Education Concentration

(Add courses below to basic curriculum)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>HD 129</td>
<td>Program Planning for Young Children</td>
<td>2</td>
</tr>
<tr>
<td>HD 401</td>
<td>Foundations of Child Development</td>
<td>3</td>
</tr>
<tr>
<td>HD 404</td>
<td>Administration of Child Development Centers</td>
<td>3</td>
</tr>
<tr>
<td>HD 421</td>
<td>Developmental Processes</td>
<td>3</td>
</tr>
<tr>
<td>PSY 456</td>
<td>Behavior Disorders in Children</td>
<td>3</td>
</tr>
<tr>
<td>ART 104</td>
<td>Introduction to Art Materials</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 260</td>
<td>Children’s Literature</td>
<td>3</td>
</tr>
<tr>
<td>FSN 310/HE 310</td>
<td>Vernacular Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>MU 100</td>
<td>Music Fundamentals for the Classroom Teacher</td>
<td>3</td>
</tr>
<tr>
<td>MU 360</td>
<td>Music for Children</td>
<td>3</td>
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<tr>
<td>PE 280</td>
<td>First Aid and CPR</td>
<td>3</td>
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<tr>
<td>PSC 103</td>
<td>The Physical Environment: Earth and the Universe</td>
<td>4</td>
</tr>
<tr>
<td>TH 380</td>
<td>Children’s Drama or HD 405 Advanced Administration of Child Development Centers</td>
<td>3</td>
</tr>
</tbody>
</table>

39
Family Studies Concentration

(Add courses below to basic curriculum)

HD 303 Family Interaction ................................................................. 3
HD 351 American Families: Past, Present, and Future ........................................... 3
HD 450 Family Therapy ............................................................................. 3
HD 451 Family Crises .................................................................................. 3
HD 464 Issues in Family Life Education ......................................................... 3
HD 481 Family Theory .................................................................................. 3
PSY 307 Abnormal Psychology ...................................................................... 3
PSY 422 Life Span Sexuality ........................................................................... 3
Select from the following with adviser’s approval ........................................... 15
GEOG 308, HE 305, HIST 385, PE 250, PE 305, POLS 212, PSY 302, PSY 310, PSY 318, PSY 330, PSY 456, REC 328, SOC 301, SOC 302, SOC 326, SOC 402, SOC 413

CURRICULUM FOR PSYCHOLOGY MINOR

The minor in Psychology consists of 27 units, 12 of which can fulfill General Education and Breadth requirements. Eighteen of the 27 units are specified, with the remaining 9 units chosen from an approved list in consultation with the minor adviser. Interested students are encouraged to contact the Psychology and Human Development Department for information and application forms.

Required courses ......................................................................................... 18
PSY 201/202 General Psychology (E.1.) (3)
PSY 304 Physiological Psychology (E.2.) (3)
PSY 307 Abnormal Psychology (3)
PSY 452 Personality (3)
ANT 360 Human Cultural Adaptation (D.4.b.) (3) or
PSY 402 Social Psychology (3)
STAT 130/STAT 211/STAT 321 (B.2.) (3)

Adviser approved psychology courses (300-400 level) ...................................... 9
PSY 320 and PSY 457 may not be used to fulfill this requirement.

27

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Human Development, Psychology and other subjects.
# School of Science and Mathematics

## DEGREE PROGRAMS

<table>
<thead>
<tr>
<th>Degree</th>
<th>Program</th>
<th>Concentration/Specialization</th>
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<tbody>
<tr>
<td>B.S.</td>
<td>Biochemistry</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Biological Sciences</td>
<td>Anatomy-Physiology Concentration</td>
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<tr>
<td></td>
<td></td>
<td>Biology Concentration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marine Biology Concentration</td>
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<tr>
<td></td>
<td></td>
<td>Plant Pathology-Entomology Concentration</td>
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<tr>
<td></td>
<td></td>
<td>Plant Tissue Culture Technology Concentration</td>
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<tr>
<td>B.S.</td>
<td>Chemistry</td>
<td>Polymers and Coatings Concentration</td>
</tr>
<tr>
<td>B.S.</td>
<td>Ecology and Systematic Biology</td>
<td>Ecology Concentration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fisheries and Wildlife Concentration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Systematics Concentration</td>
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<tr>
<td>B.S.</td>
<td>Mathematics</td>
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</tr>
<tr>
<td>B.S.</td>
<td>Microbiology</td>
<td>General Microbiology Concentration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medical Laboratory Technology Concentration</td>
</tr>
<tr>
<td>B.S.</td>
<td>Physical Science</td>
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</tr>
<tr>
<td>B.S.</td>
<td>Physics</td>
<td>Electronics Concentration</td>
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<tr>
<td></td>
<td></td>
<td>Electro-optics Concentration</td>
</tr>
<tr>
<td>B.S.</td>
<td>Statistics</td>
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</tr>
<tr>
<td>M.S.</td>
<td>Biological Sciences</td>
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</tr>
<tr>
<td>M.S.</td>
<td>Chemistry</td>
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<tr>
<td>M.S.</td>
<td>Mathematics</td>
<td>Applied Mathematics Specialization</td>
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<tr>
<td></td>
<td></td>
<td>Mathematics Teaching Specialization</td>
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## MINORS

<table>
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<th>Minor</th>
<th>Code</th>
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<tbody>
<tr>
<td>Biotechnology</td>
<td>389</td>
</tr>
<tr>
<td>Mathematics</td>
<td>408</td>
</tr>
<tr>
<td>Statistics</td>
<td>417</td>
</tr>
</tbody>
</table>
The School of Science and Mathematics is composed of five departments: Biological Sciences, Chemistry, Mathematics, Physics, and Statistics. It offers nine undergraduate programs leading to Bachelor of Science degrees in Biochemistry, Biological Sciences, Chemistry, Ecology and Systematic Biology, Mathematics, Microbiology, Physical Sciences, Physics, and Statistics and three graduate programs leading to Master of Science degrees in Biological Sciences, Chemistry and Mathematics. Minors in Biotechnology, Mathematics and Statistics are also available. In cooperation with the School of Professional Studies and Education the school offers programs leading to teaching credentials in Biological Sciences, Mathematics, and Physical Sciences.

The School of Science and Mathematics has two equally important roles: (1) to provide support and breadth courses in science and mathematics for all students within the university and (2) to provide specialized coursework for students enrolled in one of the school's nine undergraduate, three minor, and three graduate programs.

The school is, as is all of Cal Poly, dedicated to undergraduate instruction. Resources are channeled for this purpose in support of the “learn by doing” approach of this university. In laboratory, students have daily access to modern instrumentation. Classroom instruction is done in relatively small classes so that a personal approach by instructors is possible. Because of its large role in offering support courses to the rest of the university, the number of faculty in each department is relatively large and favors student-faculty interaction, both academically and socially.

STUDENT SERVICES
The School Office not only assists the faculty and staff with the administration of the five instructional departments, but it acts on various student-initiated petitions (change of major, curriculum substitutions, withdrawal from the university). In addition, the Dean's Office has the dual function of counseling those on academic probation and notifying those undergraduate students who are eligible each quarter for the Dean's Honor List (undergraduate students who have completed 12 or more letter-graded units during the quarter with a 3.50 GPA or better).

FACULTY ADVISING
Faculty members take an active role in academic and career advising. Students are encouraged by all and required by some departments to obtain academic advising prior to registration each quarter. The adviser-student relationship becomes important especially when the student needs a letter of reference for a potential employer or needs career advice.

ADVISING CENTER
Science North, Bldg. 218
(805) 756-2615

A school advising office supplements the role of the faculty adviser. The Advising Center staff provide information on school programs, coordinates public relations efforts, distributes registration materials, and furnishes information on academic and career advising.

APPLYING TO GRADUATE SCHOOL
Many universities around the country offer fine masters and/or Ph.D. programs in the physical, biological and mathematical sciences. Faculty in the School of Science and Mathematics have earned master's and doctoral degrees from a wide variety of these universities and are excellent sources for information and advice about the graduate programs, prerequisites and application procedures. Applications to graduate programs should be made in the fall for admission to the following fall term. The Graduate Record Exam (GRE) should be taken early in the application cycle.
Generally, two or more letters of reference from faculty are required. Most Ph.D. granting institutions offer financial support in the form of teaching assistantships and research fellowships.

**HEALTH SCIENCES PREPROFESSIONAL PREPARATION**

Students applying to professional schools in the health sciences have need of current information in order to be competitive for admission. A Health Professions Guidance and Evaluation Committee has been established to assist students, regardless of their major, in all phases of their preparation. Please see page 62 of this catalog for more information.

**CURRICULUM FOR BIOTECHNOLOGY MINOR**

The Biotechnology Minor is a 24-unit program consisting of a core of required courses totaling 14-15 units and 9-10 units to be selected from a list of restricted elective courses. The courses in the core must be taken by all students wishing to obtain a minor in Biotechnology. Each degree program wishing to have students participate in the minor program must provide their students with a list of restricted electives. The courses in the core and the restricted electives of the minor will appear in an agreement form to be completed by the student and approved by the Department Head or Chair. Advising for students in the Biotechnology minor will take place in the student’s major department.

**Biological Sciences** students preparing for the minor should take CHEM 316, CHEM 317, and CHEM 371 to fulfill the organic chemistry and biochemistry requirements in their major. Biochemistry students preparing for the minor should take BACT 221 and BIO 303 as part of the General Education and Breadth science electives in their major.

**Note:** Courses listed in the major column of the Curriculum Evaluation Sheet or in the requirements for a concentration are not eligible to satisfy the requirements for the minor.

**Units**

**Core courses**

- BIO 375/ CHEM 375 Molecular Biology Laboratory (2)
- BIO 475/ CHEM 475 Tissue Culture Techniques (4)
- BIO 304 Molecular Genetics (3) or CHEM 373 Molecular Biology (3)
- CHEM 473 Immunochemistry (3) or ZOO 426 Immunology and Serology (4)
- CHEM 474 Protein Laboratory Techniques (2)

**Restricted electives**

- **Biochemistry Majors**
  - 9-10 units to be selected from the following list of courses. Some of the prerequisites to the courses below may be waived or substituted with approval of the instructor and adviser for students formally enrolled in the minor. With approval of the program adviser, up to 3 units may be chosen from other courses.
    - BACT 333, BACT 402, BACT 403, BACT 423, BACT 424, BIO 311, BIO 322, BIO 323, BIO 324, BIO 426, BOT 450, CHEM 378, CHEM 439

- **Biological Science Majors**
  - 9-10 units to be selected from the following courses. Select at least one course from Group A and one from Group B.
    - **Group A:** BIO 321, BIO 322, BIO 323, BIO 324, BIO 426, BOT 450, CHEM 374
    - **Group B:** BACT 333, BACT 402, BACT 403, BACT 423, BACT 424, BIO 311, CHEM 331, CHEM 372, CHEM 378, ZOO 433

- **Microbiology Majors**
  - 9-10 units to be selected from the following list. Note: BACT 333, CHEM 372, CHEM 374 not open to students in the General Microbiology Concentration. BACT 403, BIO 321, CHEM 378 not open to students in the Medical Laboratory Technology Concentration.
    - BACT 333, BACT 403, BACT 342, BIO 311, BIO 321, BIO 322, BIO 323, BIO 324, BIO 426, BOT 450, CHEM 331, CHEM 371, CHEM 372, CHEM 374, CHEM 378, CHEM 439
BIOLOGICAL SCIENCES DEPARTMENT

Fisher Science Hall (33), Room 273
(805) 756-2788

Faculty

Department Chair, V. L. Holland

Frederick P. Andoli  David V. Grady  Maria E. Ortiz
Paraschos Babos  Michael T. Hanson  Lee R. Parker
Leslie S. Bowker  Dennis N. Homan  Pratapsinha C. Pendse
Robert J. Brown  C. Dennis Hynes  Elizabeth K. Perryman
Raul J. Cano  Peter Jankay  Thomas L. Richards
Fred L. Clogston  Eric V. Johnson  Rhonda L. Riggins-Pimentel
Jaime S. Colomé  David Keil  Aryan I. Roest
Alan F. Cooper  Anthony E. Knable  Shirley R. Sparling
Alvin A. DeJong  George N. Knecht  William D. Stansfield
Douglas D. Donaldson  Richard J. Krejsa  John W. Thomas
Harry L. Fierstine  A. Mark Kubinski  Dirk R. Walters
Dennis F. Frey  Kingston L. Leong  Archie M. Waterbury
Roger D. Gambs  Royden Nakamura  Michael A. Yoshimura

Programs

B.S. Biological Sciences with Concentrations in:
- Anatomy-Physiology
- Biology
- Marine Biology
- Plant Pathology-Entomology
- Plant Tissue Culture Technology

B.S. Ecology and Systematic Biology with Concentrations in:
- Ecology
- Systematics
- Fisheries and Wildlife

B.S. Microbiology with Concentrations in:
- General Microbiology
- Medical Laboratory Technology

M.S. Biological Sciences

The department offers complete undergraduate programs leading to Bachelor of Science degrees in Biological Sciences, Ecology and Systematic Biology, and Microbiology. For qualified students, a graduate program is available leading to the Master of Science degree. In addition, courses are offered to satisfy biology requirements in other academic majors.

The department is housed in modern facilities equipped with up-to-date instrumentation. Cal Poly's geographical setting offers unusual opportunities for studying representative plants and animals of both Northern and Southern California. Graduates of the various programs enter fields in teaching; medical and biological laboratory technology; public health; wildlife management; agriculture; industry; and private, state and national park and forest services. A significant number enter graduate or professional schools for advanced study of botany, entomology, microbiology, plant pathology,
Biological Sciences 391

zoology, marine sciences, veterinary science, medicine and dentistry. The department offers courses required for preprofessional training in medicine and paramedical fields. In the teaching area, all state requirements may be met for an academic major in biological sciences leading to credentials in secondary teaching.

BIological sciences major

With the several curricular concentrations described below, this degree offers students a broad education in biology. It is suitable for preprofessional preparation in the bio-medical fields, as a base for work toward postbaccalaureate studies, and for technical competency in the concentrations offered.

Curricular Concentrations

Anatomy-Physiology
This concentration is designed for students who are interested in zoology with an emphasis in the structure and function of animals and for preprofessional students of the health sciences.

Biology
This concentration gives the student a broad training in biology. Several of the courses in the concentration are required for the single subject teaching credential in biology.

Marine Biology
Students in this concentration may look forward to professional work in the field of marine science and related enterprises.

Plant Pathology-Entomology
Students are trained to recognize, evaluate and solve plant disease and insect problems. They may be employed as technicians in research or extension service, or may continue their studies at the graduate level.

Plant Tissue Culture Technology
A program of study designed for the student who desires a career-oriented education leading to professional work in the field of botany and related subjects. Basic subject matter, skills, and laboratory experience in plant tissue culture and its applications are emphasized.

Biotechnology Minor

For information regarding the Biotechnology Minor, please see page 389.

Curriculum for B.S. Biological sciences

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. Cal Poly follows the quarter system.

Freshman

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>BOT 121, BOT 122</td>
<td>General Botany and BOT 123 Introductory Plant Taxonomy or</td>
<td>4,4,4</td>
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<tr>
<td>ZOO 131, ZOO 132, ZOO 133</td>
<td>General Zoology (B.1.b.)</td>
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<tr>
<td>CHEM 127 General Chemistry (B.1.a.)</td>
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<tr>
<td>CHEM 129 General Chemistry (B.1.a.)</td>
<td>4</td>
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</tr>
<tr>
<td>CHEM 326 Survey of Organic Chemistry (B.1.a.)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>ANT 201/GEOG 150/SOC 105</td>
<td>(D.4.a.)</td>
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<tr>
<td>ENGL 114 Writing: Exposition (A.1.)</td>
<td>4</td>
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<tr>
<td>ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.)</td>
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<tr>
<td>MATH 120, Pre-Calculus Algebra and Trigonometry (B.2.)</td>
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<tr>
<td>Computer literacy elective (F.1.) (CSC 111 recommended)</td>
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</table>

1 MATH 120 Pre-Calculus Algebra and Trigonometry (B.2.)
2 Computer literacy elective (F.1.) (CSC 111 recommended)
### Sophomore

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>BACT 221 General Bacteriology</td>
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<tr>
<td>PHYS 121 College Physics</td>
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</tr>
<tr>
<td>PHYS 122 College Physics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 123 College Physics</td>
<td>4</td>
</tr>
<tr>
<td>ZOO 131, ZOO 132, ZOO 133 General Zoology or BOT 121, BOT 122 General Botany and BOT 123 Introductory Plant Taxonomy</td>
<td>4, 4, 4</td>
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<tr>
<td>STAT 211 Elementary Probability and Statistics</td>
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<tr>
<td>ECON 201/ECON 211/ECON 222 (D.3.)</td>
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<tr>
<td>ENGL 215 Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.A.)</td>
<td>4</td>
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<tr>
<td>PSY 201/PSY 202 General Psychology (E.1.)</td>
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<tr>
<td>SPC 201 Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
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<tr>
<td>FSN 210/PE 250/PSY 304 elective (E.2.)</td>
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### Junior

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>BIO 303 Genetics</td>
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<tr>
<td>BIO 325 General Ecology</td>
<td>4</td>
</tr>
<tr>
<td>BIO 431 Physiology I: General</td>
<td>4</td>
</tr>
<tr>
<td>BIO 461 Senior Project</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 328 Survey of Biochemistry</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 311 Advanced Technical Writing or ENGL 318 Writing for Scientific Journals</td>
<td>4</td>
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<tr>
<td>LIB 301 Library Resources in Biology and Agriculture</td>
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<tr>
<td>PHIL 230/PHIL 231 Philosophical Classics (C.1.)</td>
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<tr>
<td>POLS 210 American and California Government (D.1.)</td>
<td>3</td>
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<tr>
<td>Critical reading electives (C.1.)</td>
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<tr>
<td>Fine and performing arts elective (C.2.)</td>
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<tr>
<td>Literature, philosophy, arts (300-400 level) elective (C.3.)</td>
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<tr>
<td>Electives and courses to complete major</td>
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### Senior

<table>
<thead>
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<th>Course</th>
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<tr>
<td>BIO 423 General Cytology</td>
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<tr>
<td>BIO 462 Senior Project</td>
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<tr>
<td>ENT 326 General Entomology</td>
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<td>HIST 204 History of American Ideals and Institutions (D.1.)</td>
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<tr>
<td>HIST 315 Modern World History (D.2.)</td>
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</tr>
<tr>
<td>ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.)</td>
<td>3</td>
</tr>
<tr>
<td>Arts and humanities elective (Area C)</td>
<td>3</td>
</tr>
<tr>
<td>Technology elective (F.2.)</td>
<td>3</td>
</tr>
<tr>
<td>Electives and courses to complete major</td>
<td>26</td>
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</tbody>
</table>

1. MATH 118 and MATH 119 or MATH 141 will substitute.
2. To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 114 of this catalog.
3. Of the total elective units 18-22 shall be chosen in a field of concentration in the Biological Sciences with adviser approval and 2-3 units at 300-400 level of an approved Biological Sciences elective. Additional information is available from the department.
4. BOT 326, BOT 322, CHEM 371 and CHEM 373 are recommended for students in Plant Tissue Culture Technology Concentration.
### Anatomy and Physiology Concentration

(Add Courses Below to Basic Curriculum)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZOO 303</td>
<td>Vertebrate Embryology and Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>ZOO 304</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>or ZOO 326</td>
<td>Comparative Anatomy of the Vertebrates</td>
<td>5</td>
</tr>
<tr>
<td>ZOO 422</td>
<td>Histology</td>
<td>4</td>
</tr>
<tr>
<td>ZOO 432</td>
<td>Physiology II: Comparative Systems</td>
<td>4</td>
</tr>
<tr>
<td>or ZOO 433</td>
<td>Endocrine and Reproductive</td>
<td></td>
</tr>
<tr>
<td>Adviser approved electives</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

| Total Credits | 19 |

### Biology Concentration

(Add Courses Below to Basic Curriculum)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BIO 414</td>
<td>Evolution</td>
<td>3</td>
</tr>
<tr>
<td>ZOO 237</td>
<td>Human Anatomy</td>
<td>3</td>
</tr>
<tr>
<td>ZOO 331</td>
<td>Human Physiology</td>
<td>3</td>
</tr>
<tr>
<td>ZOO 332</td>
<td>Human Physiology</td>
<td>3</td>
</tr>
<tr>
<td>Select one of the following:</td>
<td>3-4</td>
<td></td>
</tr>
<tr>
<td>BOT 333</td>
<td>Field Botany</td>
<td></td>
</tr>
<tr>
<td>CONS 311</td>
<td>Introductory Conservation</td>
<td>3</td>
</tr>
<tr>
<td>ZOO 329</td>
<td>Vertebrate Field Zoology</td>
<td>4</td>
</tr>
<tr>
<td>Adviser approved electives</td>
<td>3-4</td>
<td></td>
</tr>
<tr>
<td>BACT 342 or BIO 311 recommended</td>
<td></td>
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</table>

| Total Credits | 18-20 |

### Marine Biology Concentration

(Add Courses Below to Basic Curriculum)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIO 328</td>
<td>Marine Biology</td>
<td>4</td>
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<tr>
<td>BOT 437</td>
<td>Algology</td>
<td>4</td>
</tr>
<tr>
<td>ZOO 322</td>
<td>Ichthyology</td>
<td>4</td>
</tr>
<tr>
<td>ZOO 336</td>
<td>Invertebrate Zoology</td>
<td>4</td>
</tr>
<tr>
<td>Adviser approved elective</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>BIO 437 recommended</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Total Credits | 18 |

### Plant Pathology and Entomology Concentration

(Add Courses Below to Basic Curriculum)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BOT 323</td>
<td>Plant Pathology</td>
<td>4</td>
</tr>
<tr>
<td>BOT 325</td>
<td>Plant Nematology</td>
<td>4</td>
</tr>
<tr>
<td>BOT 425</td>
<td>Plant Virology</td>
<td>4</td>
</tr>
<tr>
<td>ENT 332</td>
<td>Economic Entomology</td>
<td>4</td>
</tr>
<tr>
<td>Adviser approved electives</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>BOT 426 or ENT 421 recommended</td>
<td></td>
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</tbody>
</table>

| Total Credits | 18 |

### Plant Tissue Culture Technology Concentration

(Add Courses Below to Basic Curriculum)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 304</td>
<td>Molecular Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIO 321</td>
<td>Biological Instrumentation</td>
<td>3</td>
</tr>
<tr>
<td>BIO 322</td>
<td>Introduction to Electron Microscopy I</td>
<td>2</td>
</tr>
<tr>
<td>BIO 324</td>
<td>Transmission Electron Microscopy Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>BOT 335</td>
<td>Plant Anatomy</td>
<td>4</td>
</tr>
<tr>
<td>BOT 450</td>
<td>Plant Cell and Tissue Culture</td>
<td>5</td>
</tr>
</tbody>
</table>

| Total Credits | 19 |
ECOLOGY AND SYSTEMATIC BIOLOGY MAJOR

The four-year program in Ecology and Systematic Biology leads to a Bachelor of Science degree. Emphasis is placed on the study of the variety of living organisms, their relationships to each other, and to their environment. The concentrations described below enable the student to tailor his or her curriculum towards specific career objectives.

Curricular Concentrations

Ecology
This concentration stresses a broad understanding of the interactions of organisms with each other and with their environment. With this foundation, graduates may pursue careers in education, ecology, environmental impact analysis, environmental monitoring or management in either government agencies or private industries. Graduates will be academically prepared for professional certification as Associate Ecologist by the Ecological Society of America.

Fisheries and Wildlife
This concentration prepares students for advanced training or employment in public and private agencies concerned with the biology and management of fish and wildlife species. By judicial selection of electives and in consultation with the student's adviser, the student will be prepared to apply for professional certification as a Wildlife Biologist by the Wildlife Society or as a Fisheries Biologist by the American Fisheries Society.

Systematics
This concentration stresses the identification and classification of living organisms. Graduates may pursue employment in teaching, in environmental impact analysis, or in museums, herbaria, zoos and botanical gardens, or go on to advanced education in taxonomy and systematics.

CURRICULUM FOR B.S. ECOLOGY AND SYSTEMATIC BIOLOGY

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. Cal Poly follows the quarter system.

Freshman

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>BOT 121, BOT 122</td>
<td>General Botany and BOT 123 Introductory Plant Taxonomy</td>
<td>4,4,4</td>
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<tr>
<td>or ZOO 131, ZOO 132, ZOO 133</td>
<td>General Zoology (B.1.b.)</td>
<td></td>
</tr>
<tr>
<td>1 CHEM 121</td>
<td>General Chemistry (B.1.a.)</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 122</td>
<td>General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 326</td>
<td>Survey of Organic Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>2 MATH 120</td>
<td>Pre-Calculus Algebra and Trigonometry (B.2.)</td>
<td>5</td>
</tr>
<tr>
<td>STAT 211</td>
<td>Elementary Probability and Statistics (B.2.)</td>
<td>3</td>
</tr>
<tr>
<td>STAT 212</td>
<td>Statistical Methods</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Computer literacy elective (F.1.) (CSC 111 recommended)</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 114</td>
<td>Writing: Exposition (A.1.)</td>
<td>4</td>
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<tr>
<td>ENGL 125/PHIL 125/SPC 125</td>
<td>Critical Thinking (A.2.)</td>
<td>3</td>
</tr>
<tr>
<td>SS 121</td>
<td>Introductory Soil Science (F.2.)</td>
<td>4</td>
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<tr>
<td>Electives and courses to complete major</td>
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<td>6</td>
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Sophomore

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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</tr>
</thead>
<tbody>
<tr>
<td>BIO 325</td>
<td>General Ecology</td>
<td>4</td>
</tr>
<tr>
<td>BACT 221</td>
<td>General Bacteriology</td>
<td>4</td>
</tr>
<tr>
<td>ZOO 131, ZOO 132, ZOO 133</td>
<td>General Zoology or BOT 121, BOT 122</td>
<td></td>
</tr>
<tr>
<td>General Botany and BOT 123 Introductory Plant Taxonomy (B.1.b.)</td>
<td>4,4,4</td>
<td></td>
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<tr>
<td>ANT 201/GEOG 150/SOC 105</td>
<td>(D.4.a.)</td>
<td>3</td>
</tr>
<tr>
<td>ECON 201/ECON 211/ECON 222</td>
<td>(D.3.)</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 215</td>
<td>Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.)</td>
<td>4</td>
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<tr>
<td>HIST 204</td>
<td>History of American Ideals and Institutions (D.1.)</td>
<td>3</td>
</tr>
<tr>
<td>4 PHYS 104</td>
<td>Introductory Physics (B.1.a.)</td>
<td>4</td>
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<tr>
<td>PSY 201/PSY 202</td>
<td>General Psychology (E.1.)</td>
<td>3</td>
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<tr>
<td>SPC 201</td>
<td>Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
<td>3</td>
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<tr>
<td>Electives and courses to complete major</td>
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49
<table>
<thead>
<tr>
<th>Junior</th>
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<tbody>
<tr>
<td>BIO 303 Genetics</td>
<td>3</td>
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<tr>
<td>BIO 414 Evolution</td>
<td>3</td>
</tr>
<tr>
<td>BIO 442 Biometry</td>
<td>4</td>
</tr>
<tr>
<td>BIO 461 Senior Project</td>
<td>3</td>
</tr>
<tr>
<td>6 BOT 333 Field Botany</td>
<td>4</td>
</tr>
<tr>
<td>7 ENGL 326 General Entomology</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 311 Advanced Technical Writing or ENGL 318 Writing for Scientific Journals</td>
<td>4</td>
</tr>
<tr>
<td>HIST 315 Modern World History (D.2.)</td>
<td>3</td>
</tr>
<tr>
<td>PHIL 230/PHIL 231 Philosophical Classics (C.1.)</td>
<td>3</td>
</tr>
<tr>
<td>POLS 210 American and California Government (D.1.)</td>
<td>3</td>
</tr>
<tr>
<td>3 Critical reading electives (C.1.)</td>
<td>6</td>
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<td>5 Electives and courses to complete major</td>
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<table>
<thead>
<tr>
<th>Senior</th>
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<tbody>
<tr>
<td>BIO 431 Physiology I: General</td>
<td>4</td>
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<tr>
<td>ZOO 437 Animal Behavior</td>
<td>4</td>
</tr>
<tr>
<td>NRM 403 Environmental Impact Analysis</td>
<td>3</td>
</tr>
<tr>
<td>3 ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.)</td>
<td>3</td>
</tr>
<tr>
<td>3 Arts and humanities elective (Area C)</td>
<td>3</td>
</tr>
<tr>
<td>3 BI 220/FSN 210/HE 210/PSY 250/PSY 304/REC 100 elective (E.2.)</td>
<td>2</td>
</tr>
<tr>
<td>3 Fine and performing arts elective (C.2.)</td>
<td>3</td>
</tr>
<tr>
<td>3 Literature, philosophy, arts (300-400 level) elective (C.3.)</td>
<td>3</td>
</tr>
<tr>
<td>5 Electives and courses to complete major</td>
<td>25</td>
</tr>
</tbody>
</table>

1 CHEM 127, CHEM 128, CHEM 129 and CHEM 328 are recommended for students planning postgraduate training.
2 MATH 118 and MATH 119 or MATH 141 will substitute.
3 To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 114 of this catalog.
4 PHYS 121, PHYS 122, PHYS 123 are recommended substitutes for students planning postgraduate training.
5 Of the total elective units, 20–26 must be selected from one of the concentrations with adviser approval.
6 BOT 437 may be substituted for BOT 333 by students in the Fisheries and Wildlife concentration.
7 ZOO 336 may be substituted for ENT 326 by students in the Fisheries and Wildlife concentration.

Ecology Concentration
(Add Courses Below to Basic Curriculum)

| BIO 415 Biogeography | 3 |
| BIO 326 Plant Ecology | 4 |
| CONS 207 Resource Survey | 3 |
| ZOO 329 Vertebrate Field Zoology | 4 |
| Select two courses from the following | 6 |
| BIO 328, BIO 334, BIO 342, CONS 320, CONS 426, CONS 431 | 20 |

Fisheries and Wildlife Concentration
(Add Courses Below to Basic Curriculum)

| CONS 320 Fishery Resource Management | 4 |
| CONS 431 Game Management | 4 |
| FOR 120/CONS 120 Fisheries and Wildlife Management | 3 |
| ZOO 321 Mammalogy or ZOO 322 Ichthyology or ZOO 323 Ornithology | 4 |
| Select with adviser approval from the following | 12 |
| BIO 328, BIO 334, BIO 437, CONS 207, CONS 221, CONS 320, CONS 422, CONS 426, CONS 427, CONS 431, CONS 433, ENT 421, NRM 203, NRM 302, NRM 406, ZOO 321, ZOO 322, ZOO 323 | 27 |
MICROBIOLOGY MAJOR

The undergraduate program leading to the Bachelor of Science degree in Microbiology involves the study of microorganisms such as bacteria, viruses, algae, protozoa, and fungi. Special emphases are placed on their structure and function as well as their interactions with each other and with human beings.

Curricular Concentrations

General Microbiology

This concentration provides students with basic concepts in microbiology along with practical skills. Graduates are prepared to enter positions in industry, various areas of research, public health, teaching, and advanced degree programs.

Medical Laboratory Technology

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

CURRICULUM FOR B.S. MICROBIOLOGY

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

Freshman

ZOO 131, ZOO 132 General Zoology or BOT 121, BOT 122 General Botany (B.1.b.) ........................................................................ 4,4
CHEM 127 General Chemistry (B.1.a.) .................................................. 4
CHEM 128 General Chemistry .......................................................... 4
CHEM 129 General Chemistry .......................................................... 4
1 MATH 118 Pre-Calculus Algebra (B.2.) ........................................ 4
   MATH 119 Pre-Calculus Trigonometry or STAT 211 Elementary Probability and Statistics (B.2.) ........................................ 3
ENGL 114 Writing: Exposition (A.1.) ........................................... 4
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) ...................... 3
HIST 204 History of American Ideals and Institutions (D.1.) .................. 3
POL S 210 American and California Government (D.1.) ...................... 3
SPC 201 Public Speaking or SPC 202 Principles of Speech Communication (A.3.) 3
2 Computer literacy elective (F.1.) (CSC 111 recommended) .................. 3
### Sophomore

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>BACT 224 General Microbiology I</td>
<td>4</td>
</tr>
<tr>
<td>BACT 225 General Microbiology II</td>
<td>4</td>
</tr>
<tr>
<td>BACT 226 General Microbiology III</td>
<td>4</td>
</tr>
<tr>
<td>BOT 121, BOT 122 General Botany or ZOO 131, ZOO 132 General Zoology</td>
<td>4,4</td>
</tr>
<tr>
<td>3 CHEM 326 Survey of Organic Chemistry (B.1.a.)</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 121 College Physics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 122 College Physics</td>
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<tr>
<td>PHYS 123 College Physics</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 215 Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.)</td>
<td>4</td>
</tr>
<tr>
<td>ECON 201 Survey of Economics or ECON 211 Principles of Economics (D.3.)</td>
<td>3</td>
</tr>
<tr>
<td>2 Critical reading elective (C.1.)</td>
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</tr>
<tr>
<td>Electives and courses to complete major</td>
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### Junior

<table>
<thead>
<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>BACT 402 General Virology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 303 Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIO 431 Physiology I: General</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 331 Quantitative Analysis</td>
<td>5</td>
</tr>
<tr>
<td>4 CHEM 371 Biochemistry Principles</td>
<td>4</td>
</tr>
<tr>
<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
<td>3</td>
</tr>
<tr>
<td>HIST 315 Modern World History (D.2.)</td>
<td>3</td>
</tr>
<tr>
<td>PHIL 230/PHIL 231 Philosophical Classics (C.1.)</td>
<td>3</td>
</tr>
<tr>
<td>PSY 201/PSY 202 General Psychology (E.1.)</td>
<td>3</td>
</tr>
<tr>
<td>2 Critical reading elective (C.1.)</td>
<td>3</td>
</tr>
<tr>
<td>2 Fine and performing arts elective (C.2.)</td>
<td>3</td>
</tr>
<tr>
<td>Electives and courses to complete major</td>
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### Senior

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>BACT 423 Medical Microbiology</td>
<td>5</td>
</tr>
<tr>
<td>BACT 424 Bacterial Cytology and Physiology</td>
<td>4</td>
</tr>
<tr>
<td>BIO 461 Senior Project</td>
<td>3</td>
</tr>
<tr>
<td>BIO 304 Molecular Genetics</td>
<td>3</td>
</tr>
<tr>
<td>ZOO 426 Serology and Immunology</td>
<td>4</td>
</tr>
<tr>
<td>2 Arts and humanities elective (Area C)</td>
<td>3</td>
</tr>
<tr>
<td>FSN 210/PE 250/PSY 304 elective (E.2.)</td>
<td>2</td>
</tr>
<tr>
<td>2 Literature, philosophy, arts elective (300-400 level) (C.3.)</td>
<td>3</td>
</tr>
<tr>
<td>2 Technology elective (F.2.)</td>
<td>3</td>
</tr>
<tr>
<td>Electives and courses to complete major</td>
<td>22</td>
</tr>
</tbody>
</table>

---

1. MATH 120 and STAT 211 or MATH 141 and STAT 211 will substitute.
2. To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 114 of this catalog.
3. CHEM 316 and CHEM 317 will substitute for CHEM 326. (Substitution strongly recommended for students in the General Microbiology Concentration.)
4. CHEM 328 may be substituted for Medical Laboratory Technology Concentration only.
General Microbiology Concentration
(Add Courses Below to Microbiology Curriculum)

**Junior and Senior Years**
- BACT 333 Industrial Microbiology ............................................ 4
- BACT 342 Sanitary Microbiology ............................................. 4
- BACT 403 General Virology Lab or BIO 463 Undergraduate Seminar ................ 2
- BACT 421 Food Microbiology ............................................... 4
- BIO 423 General Cytology ........................................................ 4
- CHEM 372 Metabolism ............................................................ 3
- CHEM 373 Molecular Biology .................................................... 3
- CHEM 374 Biochemistry Laboratory .......................................... 2

**Medical Laboratory Technology Concentration**
(Add Courses Below to Microbiology Curriculum)

**Sophomore**
- BIO 321 Biological Instrumentation ........................................ 3

**Junior and Senior Years**
- BACT 430 Medical Mycology .................................................... 4
- BIO 462 Senior Project or BACT 403 General Virology Lab .................. 2
- CHEM 335, CHEM 336 Clinical Chemistry ...................................... 3, 4
- CHEM 377 Chemistry of Drugs and Poisons ..................................... 3
- ZOO 425 Parasitology .............................................................. 4
- ZOO 428 Hematology ............................................................... 4

**MASTER OF SCIENCE DEGREE IN BIOLOGICAL SCIENCES**

**General Characteristics**
This degree offers a broad background in the biological sciences. The program is designed to offer sufficient breadth and depth to strengthen the student's academic understanding and improve competence for (a) many types of biological work which require advanced training beyond the bachelor's degree, (b) employment in industry and/or civil service, (c) teaching biological sciences at the elementary, secondary and community college levels, (d) independent research in the field of specialization, or (e) continued graduate work at other institutions.

**Prerequisites**
Admission as a conditionally classified or classified student in this program requires a minimum grade point average of 3.0 in the last 90 quarter units attempted and satisfactory scores on the Graduate Record Examination. Advancement to candidacy requires a satisfactory background in biology, and completion of 12 units of courses specified in an informal study plan with a minimum grade point average of 3.0.

Information pertaining to specific departmental requirements for admission to graduate standing-classified or graduate standing-conditionally classified may be obtained from the Chair of the Graduate Committee of the Biological Sciences Department.
Program of Study

The formal program of study for the degree must include 45 units of committee-approved graduate work, at least 30 units of which must be at the 500 level. At least 18 units of the formal program of study must be completed after the student has been advanced to candidacy. A grade point average of 3.0 or better is required in all courses taken as a graduate student. Two approaches to the M.S. degree in Biological Sciences are possible. The requirements for these two approaches are listed below.

CURRICULUM FOR M.S. BIOLOGICAL SCIENCES

<table>
<thead>
<tr>
<th>Thesis Plan Coursework Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thesis, including oral defense of thesis</td>
</tr>
<tr>
<td>Individual Study, including written report</td>
</tr>
</tbody>
</table>

| BIO 501 Cellular Biology | 3 | 3 |
| BIO 502 Biology of Organisms | 3 | 3 |
| BIO 503 Population Biology | 3 | 3 |
| BIO 590 Seminar in Biology | 3 | 3 |
| BIO 599 Thesis | 9 | – |
| BIO 500 Individual Study | – | 4 |

Comprehensive Exam:
- GRE Advanced Biology: Yes Yes
- Essay: Yes Yes

| Electives from 500-level courses | 9 | 14 |
| Electives from 400- and 500-level courses | 15 | 15 |
| | 45 | 45 |

All 45 units must be acceptable for graduate credit and in accordance with Graduate Guidelines of the Biological Sciences Department. For further information students should communicate with the head of the Biological Sciences Department or with the Chairperson of the Graduate Committee.

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Bacteriology, Biology, Botany, Conservation, Entomology, Zoology and other subjects.
CHEMISTRY DEPARTMENT

Science Building (52), Room D-1
(805) 756-2693

Faculty

Department Chair, Norman L. Eatough


Programs

B.S. Biochemistry
B.S. Chemistry with Concentration in:
- Polymers and Coatings Technology
M.S. Chemistry

The Chemistry Department has two roles in the university: to provide professional education for students who are majors in chemistry and biochemistry and who plan careers in the natural sciences and related fields, and to provide instruction in the fundamentals of chemistry to students with majors in fields related to chemistry, especially in the life sciences, agriculture, and engineering.

The Chemistry Department provides curricula leading to the Bachelor of Science in Chemistry, the Bachelor of Science in Chemistry with a concentration in Polymers and Coatings, the Bachelor of Science in Biochemistry, and the Master of Science in Chemistry; the B.S. in Chemistry is certified by the American Chemical Society.

The baccalaureate curricula in biochemistry and chemistry include required courses in general chemistry, analytical chemistry, inorganic chemistry, organic chemistry, and physical chemistry. Advanced undergraduates choose electives from courses which cover a broad range of specialized topics, such as agricultural chemistry, environmental chemistry, food chemistry, geochemistry, glass chemistry, immunochemistry, industrial catalysis, nuclear chemistry, nutritional biochemistry, pharmacology, and polymer chemistry. The Polymers and Coatings concentration includes the required courses in the chemistry curriculum and electives in the area of polymers, coatings, surface chemistry and materials engineering.

The curriculum emphasizes laboratory work, especially work with many kinds of current instrumentation, across the fields of chemistry. It also emphasizes project work: every undergraduate completes a senior project, an intensive research project designed and carried out by the student and supervised by a faculty adviser. A senior project may be pure or applied research in chemistry or biochemistry or it may be interdisciplinary work which combines chemistry with another field such as art, biology, civil or environmental engineering, psychology, or soil science. Under the department’s cooperative education program, many bachelor’s and master’s degree candidates teach or work full-time in industry or government for one or two quarters, for pay and academic credit.
Career opportunities for chemists are increasing. There are openings in traditional areas such as clinical chemistry, environmental analysis, the health professions, industrial research and production, pharmacology, product quality control, and teaching at the secondary or university level; newer opportunities lie in such related areas as library science, market research, patent law, and safety engineering. The concentration in polymers and coatings gives students the background and practical experience to move into a rewarding career in a wide range of fields including textiles, paints and varnishes, rubber, plastics, adhesives and resins. There is a rapidly increasing number of career opportunities in the expanding fields of biotechnology and polymers and coatings. A major in biochemistry or chemistry or a minor in biotechnology prepares students for direct entry into these careers, as well as for postgraduate education in a professional specialty.

**Biotechnology Minor**

For information regarding the Biotechnology minor, see page 389.

**CURRICULUM FOR B.S. CHEMISTRY**

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

**Freshman**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>CHEM 127</td>
<td>General Chemistry (B.1.a.)</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 128</td>
<td>General Chemistry</td>
<td>4</td>
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<tr>
<td>CHEM 129</td>
<td>General Chemistry</td>
<td>4</td>
</tr>
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<td>CHEM 156</td>
<td>General Chemistry Laboratory</td>
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<tr>
<td>CSC 110</td>
<td>Computers and Computer Applications or CSC 111</td>
<td>3</td>
</tr>
<tr>
<td>MATH 131, MATH 132, MATH 133</td>
<td>Technical Calculus or MATH 141, MATH 142, MATH 143</td>
<td>4,4,4</td>
</tr>
<tr>
<td>ANT 201/GEOG 150/SOC 105</td>
<td>General Science (D.4.a.)</td>
<td>3</td>
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<tr>
<td>BIO 101/BOT 121/ZOO 131</td>
<td>General Science (B.1.b.)</td>
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</tr>
<tr>
<td>ENGL 114</td>
<td>Writing: Exposition (A.1.)</td>
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<tr>
<td>ENGL 215/PHIL 125/SPC 125</td>
<td>Critical Thinking (A.2.)</td>
<td>3</td>
</tr>
<tr>
<td>HIST 204</td>
<td>History of American Ideals and Institutions (D.1.)</td>
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**Sophomore**

<table>
<thead>
<tr>
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<tr>
<td>CHEM 253</td>
<td>Chemical Literature</td>
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<td>CHEM 316</td>
<td>Organic Chemistry</td>
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<td>CHEM 317</td>
<td>Organic Chemistry</td>
<td>5</td>
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<td>CHEM 318</td>
<td>Organic Chemistry</td>
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<tr>
<td>CHEM 331</td>
<td>Quantitative Analysis I</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 332</td>
<td>Quantitative Analysis II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 241, MATH 242 or STAT or CSC courses</td>
<td>Technical Calculus (B.1.a.)</td>
<td>4,4</td>
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<tr>
<td>PHYS 131</td>
<td>General Physics (B.1.a.)</td>
<td>4</td>
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<tr>
<td>PHYS 132</td>
<td>General Physics</td>
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<tr>
<td>PHYS 133</td>
<td>General Physics</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 215</td>
<td>Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.)</td>
<td>4</td>
</tr>
<tr>
<td>SPC 201</td>
<td>Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
<td>3</td>
</tr>
</tbody>
</table>
Junior

CHEM 305 Physical Chemistry (B.1.a.) ............................................................. 3
CHEM 306 Physical Chemistry ........................................................................ 3
CHEM 307 Physical Chemistry ........................................................................ 4
CHEM 355 Physical Chemistry Laboratory ..................................................... 1
CHEM 356 Physical Chemistry Laboratory ..................................................... 1
CHEM 459 Undergraduate Seminar ................................................................ 2
ECON 201 Survey of Economics or ECON 211 Principles of Economics (D.3) 3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) ........................................ 3
POLS 210 American and California Government (D.1.) ............................... 3
PSY 201/PSY 202 General Psychology (E.1.) .............................................. 3
BIO 220/FSN 210/PE 250/PSY 304/REC 100 elective (E.2.) ......................... 2
1 Critical reading electives (C.1.) ................................................................. 6
1 Fine and performing arts elective (C.2.) .................................................... 3
2 Physics elective (200-level and above) ...................................................... 3
Electives to complete major or concentration ............................................ 4

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Senior

CHEM 439 Instrumental Analysis .................................................................... 5
CHEM 461 Senior Project ................................................................................ 2
CHEM 481 Inorganic Chemistry .................................................................... 3
HIST 315 Modern World History (D.2.) ...................................................... 3
1 ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) ............................ 3
1 Arts and humanities elective (Area C) ....................................................... 3
1 Literature, philosophy, arts elective (300-400 level) (C.3.) ....................... 3
1 Technology elective (F.2.) .......................................................................... 3
Electives to complete major or concentration ............................................ 14
Electives ........................................................................................................ 9

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1 To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 114 of this catalog.
2 May not be PHYS 215.

Major in Chemistry

Select 18 units of approved chemistry electives (listed below). At least three courses must be chosen from List B.

List A

CHEM 252 Laboratory Glassblowing ............................................................. 1
CHEM 335 Clinical Chemistry ........................................................................ 3
CHEM 336 Clinical Chemistry ........................................................................ 3
CHEM 341 Environmental Chemistry I ......................................................... 3
CHEM 342 Environmental Chemistry II ....................................................... 3
CHEM 344 Chemical Process Principles ....................................................... 3
CHEM 371 Biochemical Principles ................................................................. 4
CHEM 372 Metabolism .................................................................................. 3
CHEM 373 Molecular Biology ........................................................................ 3
CHEM 374 Biochemistry Laboratory ............................................................ 2
CHEM 377 Chemistry of Drugs and Poisons ................................................ 3
CHEM 378 Biochemical Pharmacology ....................................................... 3
CHEM 385 Geochemistry ............................................................................... 3
CHEM 400 Special Problems .......................................................................... 1-3
CHEM 447 Polymers and Coatings Laboratory I .......................................... 2
CHEM 448 Polymers and Coatings Laboratory II .......................................... 2
CHEM 470 Selected Advanced Topics ........................................................... 1-3
CHEM 471 Selected Advanced Laboratory ................................................... 1-3
CHEM 473 Immunochemistry ....................................................................... 3
CHEM 474 Protein Techniques Laboratory .................................................. 2
COOP 486 Cooperative Education Experience ........................................... 6
List B
(Select at least 3 courses)
CHEM 419 Intermediate Organic Chemistry .................................................. 3
CHEM 444 Polymers and Coatings I ................................................................. 3
CHEM 445 Polymers and Coatings II ................................................................. 3
CHEM 446 Surface Chemistry ............................................................................ 3
CHEM 457 Qualitative Organic Analysis .......................................................... 3
CHEM 458 Instrumental Organic Qualitative Analysis ....................................... 2
CHEM 462 Senior Project .................................................................................... 2
CHEM 482 Synthetic Inorganic Chemistry ......................................................... 3

Polymers and Coatings Concentration
(Add Courses Below to Basic Curriculum)
CHEM 444 Polymers and Coatings I ................................................................. 3
CHEM 445 Polymers and Coatings II ................................................................. 3
CHEM 446 Surface Chemistry ............................................................................ 3
CHEM 447 Polymers and Coatings Lab I ............................................................ 2
CHEM 448 Polymers and Coatings Lab II .......................................................... 2
CHEM 449 Internship in Polymers and Coatings .............................................. 2
MET 306 Materials Engineering ...................................................................... 3

CURRICULUM FOR B.S. BIOCHEMISTRY

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

Freshman
CHEM 127 General Chemistry (B.1.a.) ............................................................. 4
CHEM 128 General Chemistry .......................................................................... 4
CHEM 129 General Chemistry .......................................................................... 4
BOT 121/ZOO 131/BACT 221 (B.1.b.) ............................................................... 4
CSC 110 Computers and Computer Applications or CSC 111 Introduction to
Computer Applications for the Sciences (F.1.) .............................................. 3
MATH 131, MATH 132 Technical Calculus or MATH 141, MATH 142
Calculus I, II (B.2.) ......................................................................................... 4,4
PHYS 121, PHYS 122 College Physics or PHYS 131, 132 General Physics (B.1.a.) ..... 4,4
ANT 201/GEOG 150/SOC 105 (D.4.a.) ............................................................ 3
ENGL 114 Writing: Exposition (A.1.) ............................................................... 4
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .................................... 3
HIST 204 History of American Ideals and Institutions (D.1.) ......................... 3

Sophomore
CHEM 253 Chemical Literature ...................................................................... 2
CHEM 316 Organic Chemistry .......................................................................... 4
CHEM 317 Organic Chemistry .......................................................................... 5
CHEM 318 Organic Chemistry .......................................................................... 5
CHEM 331 Quantitative Analysis I ................................................................. 5
PHYS 123 College Physics or PHYS 133 General Physics ................................ 4
ECON 201 Survey of Economics or ECON 211 Principles of Economics (D.3.) .. 3
ENGL 214 Writing: Argumentation or ENGL 218 Writing: Argumentation
and Reports (A.4.) ......................................................................................... 4
PHIL 230/PHIL 231 Philosophical Classics (C.1.) ........................................... 3
POLS 210 American and California Government (D.1.) ................................. 3
PSY 201/PSY 202 General Psychology (E.1.) .............................................. 3
SPC 201 Public Speaking or SPC 202 Principles of Speech Communication (A.3.) ......................................................................................... 3
BIO 220/FSN 210/PE 250/PSY 304/REC 100 elective (E.2.) ......................... 2
Elective ............................................................................................................ 2
Junior

1 CHEM 301 Biophysical Chemistry ................................................................. 3
2 CHEM 302 Biophysical Chemistry ................................................................. 4
3 CHEM 371 Biochemical Principles ................................................................. 4
4 CHEM 372 Metabolism ................................................................................... 3
5 CHEM 373 Molecular Biology ......................................................................... 3
6 CHEM 374 Biochemistry Laboratory .............................................................. 2
7 CHEM 459 Undergraduate Seminar ............................................................... 2
8 HIST 315 Modern World History (D.2.) ......................................................... 3
9 ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) ................................... 3
10 Critical reading electives (C.1.) .................................................................. 6
11 Fine and performing arts elective (C.2.) ....................................................... 3
12 Life sciences electives (300-level recommended) (B.1.b.) ............................. 6
13 Literature, philosophy, arts elective (300-400 level) (C.3.) ......................... 3
14 Electives ........................................................................................................ 3

Senior

1 CHEM 461 Senior Project ................................................................................ 2
2 Approved Chemistry electives ....................................................................... 9
3 Arts and humanities elective (Area C) ............................................................ 3
4 Technology elective (F.2.) ........................................................................... 3
5 Electives ........................................................................................................ 26

Electives ............................................................................................................. 48

1 CHEM 305, CHEM 306, CHEM 355 will substitute.
2 To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 114 of this catalog.
3 CHEM 156, CHEM 252, CHEM 300-, 400-, and 500-level courses (except CHEM 326 and CHEM 328).

MASTER OF SCIENCE DEGREE IN CHEMISTRY

General Characteristics

This program is designed to provide training at the graduate level for those who will be seeking employment in industry, government, and education, and for those who will be continuing their graduate or professional education at other institutions.

The hallmark of the program is flexibility. Students can choose to do a traditional research thesis, or choose either the extra coursework and comprehensive examination, or industrial internship non-thesis option. The internship program, which is one of the largest in the U.S., provides the student with a six-month, full-time, full-pay industrial position. The internship takes the place of the traditional research thesis and the internship allows students to demonstrate in practice their mastery of chemistry by completing a project. A limited number of graduate student assistant instructor positions are available. Applicants to all programs follow the same admissions procedures.

Prerequisites

Admission to the program as a classified graduate student normally requires a baccalaureate degree in chemistry or biochemistry and a minimum grade point average of 3.0 in the last 90 quarter units of coursework attempted. Applicants with majors in other areas may be admitted conditionally. More detailed information pertaining to specific departmental requirements may be obtained from the Departmental Graduate Coordinator or the Chair of the Chemistry Department.

Advancement to candidacy requires completion of any prerequisites or conditions, completion of 12 units of coursework specified in the formal study plan with a minimum grade point average of 3.0, and, for thesis students, approval of the thesis proposal.
**CURRICULUM FOR M.S. CHEMISTRY**

Required courses:  

- 500-level CHEM courses (18)  
- CHEM 590 Graduate Seminar (3)  
- CHEM 598 Internship (3-6) or  
  - CHEM 599 Thesis (3)  
  
or additional courses and comprehensive examination if the coursework option is chosen (6)

Additional courses at 400 or 500 level:  

- Twelve units from the Chemistry Department and six units outside of the Chemistry Department  

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Chemistry and other subjects.
The Mathematics Department offers a complete undergraduate program of courses leading to a Bachelor of Science degree in mathematics. It also offers a program of courses for students who wish to minor in mathematics as well as graduate courses for programs of study leading to a Master of Science degree. In addition, the Mathematics Department offers courses that serve many other departments in the university. The applied flavor generated by these courses, and close interdepartmental relations, increase both the usefulness of and the demand for the graduates who complete a degree in mathematics.

The undergraduate program in mathematics at Cal Poly consists of a central core of courses taken by all students majoring in mathematics. These courses give a solid basis for more advanced work in a program of study that can be tailored to fit the needs and objectives of each individual student. Advanced coursework beyond the central core is chosen in close consultation with faculty advisors.

The rich variety of courses available in the department permits the student not only to obtain a broad exposure to those fields of mathematics which are most useful in the physical sciences and engineering, but also to obtain experience with the mathematics that is used in business, management sciences, and operations research. Students wishing to prepare for a teaching career in junior or senior high school may make a selection of courses especially designed to satisfy California single credential requirements. All of these programs provide adequate mathematical foundation for the student contemplating the pursuit of an advanced degree in mathematics.
CURRICULUM FOR B.S. MATHEMATICS

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. Cal Poly follows the quarter system.

**Freshman**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>MATH 141 Calculus I (B.2.)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 142 Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 143 Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>MATH 170 Theory of Equations</td>
<td>2</td>
</tr>
<tr>
<td>CSC 118 Fundamentals of Computer Science I (F.1.)</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 131 General Physics (B.1.a.)</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 132 General Physics (B.1.a.)</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 114 Writing: Exposition (A.1.)</td>
<td>4</td>
</tr>
<tr>
<td><em>CSC 201 FORTRAN Programming or CSC 207 BASIC Programming</em></td>
<td>3</td>
</tr>
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Electives and courses to complete major 13

**Sophomore**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>MATH 202 Orientation to the Mathematics Major</td>
<td>1</td>
</tr>
<tr>
<td>MATH 206 Linear Algebra I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 241 Calculus IV</td>
<td>4</td>
</tr>
<tr>
<td>MATH 242 Differential Equations</td>
<td>4</td>
</tr>
<tr>
<td>MATH 248 Methods of Proof in Mathematics</td>
<td>4</td>
</tr>
<tr>
<td>CSC 218 Fundamentals of Computer Science II or CSC 410 Computer Fundamentals for Educators</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 133 General Physics (B.1.a.)</td>
<td>4</td>
</tr>
<tr>
<td>STAT 321 Statistical Analysis (B.2.)</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 215 Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.)</td>
<td>4</td>
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<tr>
<td>HIST 204 History of American Ideals and Institutions (D.1.)</td>
<td>3</td>
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<tr>
<td>POLS 210 American and California Government (D.1.)</td>
<td>3</td>
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<tr>
<td>SPC 201 Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
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Electives and courses to complete major 12

**Junior**

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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>MATH 300/MATH 316/MATH 318</td>
<td>3-4</td>
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<tr>
<td>MATH 335 Graph Theory or MATH 336 Combinatorial Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>MATH 412 Advanced Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>STAT 322 Statistical Analysis</td>
<td>3</td>
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<tr>
<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
<td>3</td>
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<tr>
<td>PHIL 230/PHIL 231 Philosophical Classics (C.1.)</td>
<td>3</td>
</tr>
<tr>
<td>PSY 201/PSY 202 General Psychology (E.1.)</td>
<td>3</td>
</tr>
<tr>
<td><em>ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.)</em></td>
<td>3</td>
</tr>
<tr>
<td>BIO 220/FSN 210/PE 250/PSY 304 elective (E.2.)</td>
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<td>Critical reading electives (C.1.)</td>
<td>6</td>
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<tr>
<td>Life sciences elective (B.1.b.)</td>
<td>3</td>
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Electives and courses to complete major 13-12

**Senior**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>MATH 459 Undergraduate Seminar</td>
<td>2</td>
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<tr>
<td>MATH 461 Senior Project</td>
<td>3</td>
</tr>
<tr>
<td>MATH 462 Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>MATH 481 Modern Algebra</td>
<td>4</td>
</tr>
<tr>
<td>HIST 315 Modern World History (D.2.)</td>
<td>3</td>
</tr>
<tr>
<td><em>Arts and humanities elective (Area C)</em></td>
<td>3</td>
</tr>
<tr>
<td><em>Economics elective (D.3.)</em></td>
<td>3</td>
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</table>
### Mathematics

<table>
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<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 206 Linear Algebra I (4)</td>
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<td>MATH 248 Methods of Proof in Mathematics (4)</td>
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<tr>
<td>MATH 412 Advanced Calculus I (4)</td>
</tr>
<tr>
<td>MATH 481 Modern Algebra I (4)</td>
</tr>
</tbody>
</table>

Select one course from the following: 3-4

<table>
<thead>
<tr>
<th>Course</th>
</tr>
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<tbody>
<tr>
<td>MATH 316 Transform Engineering Methods in Discrete-Time Systems (4)</td>
</tr>
<tr>
<td>MATH 317 Topics in Engineering Mathematics (4)</td>
</tr>
<tr>
<td>MATH 318 Advanced Engineering Mathematics (4)</td>
</tr>
<tr>
<td>MATH 335 Graph Theory (3)</td>
</tr>
<tr>
<td>MATH 336 Combinatorial Mathematics (3)</td>
</tr>
<tr>
<td>MATH 341 Theory of Numbers (4)</td>
</tr>
</tbody>
</table>

Complete one of the following tracks: 6-8

<table>
<thead>
<tr>
<th>Course</th>
</tr>
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<tbody>
<tr>
<td>MATH 304 Vector Analysis (4) and MATH 418 Partial Differential Equations (4)</td>
</tr>
<tr>
<td>MATH 306 and MATH 406 Linear Algebra II, III (4) (4)</td>
</tr>
<tr>
<td>MATH 335 Graph Theory (3), MATH 336 Combinatorial Mathematics (3), and MATH 437 Game Theory (3)</td>
</tr>
<tr>
<td>MATH 408 Functions of a Complex Variable (4) and MATH 409 Complex Analysis (4)</td>
</tr>
<tr>
<td>MATH 442 Euclidean Geometry (4) and MATH 443 Modern Geometries (4)</td>
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### CURRICULUM FOR MATHEMATICS MINOR

<table>
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<tr>
<td>MATH 206 Linear Algebra I (4)</td>
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<td>MATH 248 Methods of Proof in Mathematics (4)</td>
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<tr>
<td>MATH 412 Advanced Calculus I (4)</td>
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<td>MATH 481 Modern Algebra I (4)</td>
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Select one course from the following: 3-4

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>MATH 316 Transform Engineering Methods in Discrete-Time Systems (4)</td>
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<tr>
<td>MATH 317 Topics in Engineering Mathematics (4)</td>
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<tr>
<td>MATH 318 Advanced Engineering Mathematics (4)</td>
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<tr>
<td>MATH 335 Graph Theory (3)</td>
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<tr>
<td>MATH 336 Combinatorial Mathematics (3)</td>
</tr>
<tr>
<td>MATH 341 Theory of Numbers (4)</td>
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</table>

Complete one of the following tracks: 6-8

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>MATH 304 Vector Analysis (4) and MATH 418 Partial Differential Equations (4)</td>
</tr>
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<td>MATH 306 and MATH 406 Linear Algebra II, III (4) (4)</td>
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<td>MATH 335 Graph Theory (3), MATH 336 Combinatorial Mathematics (3), and MATH 437 Game Theory (3)</td>
</tr>
<tr>
<td>MATH 408 Functions of a Complex Variable (4) and MATH 409 Complex Analysis (4)</td>
</tr>
<tr>
<td>MATH 442 Euclidean Geometry (4) and MATH 443 Modern Geometries (4)</td>
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</tbody>
</table>
MASTER OF SCIENCE DEGREE IN MATHEMATICS

General Characteristics

A graduate of this program with a specialization in Applied Mathematics will be prepared for employment as a mathematician in government or industry. A graduate of this program with a specialization in Mathematics Teaching will have satisfied the fifth year requirement for a secondary credential. Students who complete either specialization will be qualified for teaching in a community college and will be prepared to pursue further graduate study.

Prerequisites

Prerequisite to entering the program with a classified or conditionally classified status, the student must have a bachelor's degree from an accredited institution with a minimum grade point average of 2.5 in the last 90 quarter units attempted. Advancement to candidacy requires approval of a formal program of study by the departmental graduate study committee and completion of 12 units of the courses specified in the informal study plan with a minimum grade point average of 3.0.

For information pertaining to specific departmental requirements for admission to graduate standing—classified or graduate standing—conditionally classified, the student should communicate with the Chair of the Mathematics Department.

CURRICULUM FOR M.S. MATHEMATICS,
SPECIALIZATION IN APPLIED MATHEMATICS OR IN
MATHEMATICS TEACHING

<table>
<thead>
<tr>
<th>Units</th>
<th>Required courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>MATH 506 Topics in Modern Algebra (4)</td>
</tr>
<tr>
<td></td>
<td>MATH 508 Introduction to Topology (4)</td>
</tr>
<tr>
<td></td>
<td>MATH 515 Real Analysis (4)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Units</th>
<th>Specialization courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>500-level courses selected according to specialization:</td>
</tr>
<tr>
<td></td>
<td>For specialization in Mathematics Teaching: MATH 580 and 510 and 4 additional units selected from MATH 505, 507, 580.</td>
</tr>
<tr>
<td></td>
<td>For specialization in Applied Mathematics: MATH 512, 580 and 4 additional units selected from: MATH 513, 516, 518, 580.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Units</th>
<th>MATH, CSC, STAT electives</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Select from any MATH, CSC, or STAT 400- or 500-level courses as approved by the advising committee.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Units</th>
<th>Electives</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Select additional units according to specialization with approval of adviser.</td>
</tr>
<tr>
<td></td>
<td>Satisfactorily complete the comprehensive examinations.</td>
</tr>
</tbody>
</table>

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Mathematics and other subjects.
The Physics Department offers curricula in physics and in physical sciences leading to the Bachelor of Science degree. It serves all schools of the university by offering courses which provide the scientific foundations for work taken by students in their major fields. The department also contributes to the general education of all students by increasing their understanding of the process of scientific discovery, of the nature of the physical universe, and of the potential impact of science on society.

The department's goal in training physics majors is to prepare them for entry into positions as physicists, to prepare them for further training as physics teachers, or to give them a strong foundation in science that will enable them to enter other related professions. The program also prepares students for possible further formal education in graduate school. Graduates are engaged in many fields and industries, including computers, electronics, aerospace, energy production and utilization, and the development of material resources and products. To prepare physics majors effectively for employment, the department provides a comprehensive laboratory program, with facilities which include specialized laboratories in electrical measurements, optics, solid state physics, nuclear physics, and atomic physics. Student activities include a chapter of the national Society of Physics Students and a chapter of the national physics honor society, Sigma Pi Sigma.

The B.S. degree in physics offers a variety of electives available in the typical undergraduate physics curriculum. This degree would be the choice of most physics students, those who seek the broad foundation of physics needed as preparation for graduate studies in physics or for many industrial positions. The department also offers two challenging concentrations which will provide a more specialized foundation for persons who desire to enter industrial or governmental careers at the B.S. level. The Electronics concentration is designed for students wishing to acquire the working knowledge of electronics for use in experimental physics. The Electro-optics concentration provides background in optical devices and techniques used in this expanding field.
High school students planning to major in physics should include in their high school program as much as possible of the following: six semesters of college preparatory mathematics, two of physics and two of chemistry.

The Bachelor of Science in Physical Science is a degree major designed primarily to provide undergraduate preparation for the student who intends to be a secondary school teacher of one or more of the physical sciences. It may also serve students who plan to enter another field in which a physical science background would be useful, but students intending to do graduate study in either chemistry or physics should elect a chemistry or physics major. Students planning to qualify for a teaching credential in physical science should plan their electives to include the education courses indicated. The Physical Science degree program is administered jointly by the Chemistry and Physics Departments.

**CURRICULUM FOR B.S. PHYSICS**

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. Cal Poly follows the quarter system.

**Freshman**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 131 General Physics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 132 General Physics</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 127 General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 128 General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 326 Survey of Organic Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>MATH 141 Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 142 Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 143 Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 114 Writing: Exposition</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 125/PHIL 125/SPC 125 Critical Thinking</td>
<td>3</td>
</tr>
<tr>
<td>SPC 201 Public Speaking or SPC 202 Principles of Speech Communication</td>
<td>3</td>
</tr>
<tr>
<td>BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100</td>
<td>2</td>
</tr>
</tbody>
</table>

1 Life sciences elective (B.1.b.)

**Sophomore**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 133 General Physics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 206 Instrumentation in Experimental Physics</td>
<td>2</td>
</tr>
<tr>
<td>PHYS 207 Instrumentation in Experimental Physics</td>
<td>2</td>
</tr>
<tr>
<td>PHYS 211 Modern Physics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 213 Introduction to Nuclear Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 243 Introductory Nuclear Physics Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>PHYS 256 Electrical Measurements Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>PHYS 257 Electrical Measurements Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>MATH 241 Calculus IV</td>
<td>4</td>
</tr>
<tr>
<td>MATH 242 Differential Equations</td>
<td>4</td>
</tr>
<tr>
<td>MATH 318 Advanced Engineering Mathematics</td>
<td>4</td>
</tr>
<tr>
<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
<td>3</td>
</tr>
<tr>
<td>ECON 201/ECON 211/ECON 222 (D.3.)</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 215 Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.)</td>
<td>4</td>
</tr>
<tr>
<td>PHIL 230/PHIL 231 Philosophical Classics (C.1.)</td>
<td>3</td>
</tr>
</tbody>
</table>

2 Computer literacy elective (F.1.)

1 Critical reading electives (C.1.)

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Physics

Junior

PHYS 301 Thermal Physics I ............................................. 3
PHYS 302 Analytic Mechanics ........................................... 3
PHYS 303 Analytic Mechanics .......................................... 3
PHYS 323 Optics ............................................................. 4
PHYS 341 Quantum Physics Laboratory .............................. 1
PHYS 342 Quantum Physics Laboratory .............................. 2
PHYS 363 Undergraduate Seminar ..................................... 2
PHYS 405 Quantum Mechanics .......................................... 3
MATH 304 Vector Analysis (B.2.) ...................................... 4
MATH 418 Partial Differential Equations ........................... 4
PSY 201/PSY 202 General Psychology (E.I.) ........................ 3
1 Arts and humanities elective (Area C) ............................. 3
1 Fine and performing arts elective (C.2.) .......................... 3
1 Literature, philosophy, arts elective (300-400 level) (C.3.) ................................. 3
Electives to complete major or concentration ........................... 9

Senior

PHYS 408 Electromagnetic Fields and Waves ......................... 4
PHYS 409 Electromagnetic Fields and Waves ........................ 3
PHYS 461 Senior Project ................................................... 2
PHYS 462 Senior Project ................................................... 2
HIST 204 History of American Ideals and Institutions (D.I.) .... 3
HIST 315 Modern World History (D.2.) ............................. 3
POLS 210 American and California Government (D.I.) .......... 3
1 ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) ............ 3
1 Technology elective (F.2.) .............................................. 2
Electives to complete major or concentration ........................... 9
Electives ................................................................. 9

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1 To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 114 of this catalog.
2 CSC 118, CSC 120 or any course requiring one of these courses as a prerequisite.

Major in Physics

(Add Courses Below to Basic Curriculum)

Select 18 units of approved physics electives (listed below). One of the following courses must be selected: PHYS 403, PHYS 406, PHYS 411. For students anticipating an industrial career PHYS 411, PHYS 451, PHYS 413, PHYS 423 are suggested electives. For students anticipating graduate work in physics, PHYS 406, PHYS 423, and PHYS 424 are suggested electives.

PHYS 317 Special Theory of Relativity ................................ 3
PHYS 401 Thermal Physics II ............................................. 3
PHYS 403 Nuclear Physics .................................................. 3
PHYS 406 Quantum Mechanics .......................................... 3
PHYS 410 Physics of the Solid Earth .................................... 3
PHYS 411 Solid State Physics ............................................. 3
PHYS 413 Advanced Topics in Solid State Physics .................. 3
PHYS 416 Theoretical Acoustics ........................................ 3
PHYS 423 Advanced Optics .............................................. 3
PHYS 424 Theoretical Physics ............................................. 3
PHYS 451 Solid State Physics Laboratory ............................ 1
PHYS 470 Selected Advanced Topics ................................. 1-3
PHYS 471 Selected Advanced Laboratory ............................ 1-3
Physics 413

Electronics Concentration
(Add Courses Below to Basic Curriculum)

Students will not be allowed to enroll in EE 301 until they have demonstrated competency in material covered in EE 211, EE 212, EL 208, and EL 219 by means of an examination offered at the end of the spring quarter. Physics majors should have completed PHYS 206, PHYS 207, PHYS 256, PHYS 257 and MATH 318 before attempting this examination. If the competency exam is passed, the physics student will be allowed in EE/EL courses with physics courses substituting for EE/EL prerequisites.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 301 Linear Systems Analysis</td>
<td>3</td>
</tr>
<tr>
<td>EE 341 Linear Analysis Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>EE 302 Linear Control Systems</td>
<td>3</td>
</tr>
<tr>
<td>EE 342 Control Systems Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>EL 307 Digital Integrated Electronics</td>
<td>3</td>
</tr>
<tr>
<td>EL 347 Digital Integrated Electronics Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>EL electives to be selected from the following list:</td>
<td>6</td>
</tr>
<tr>
<td>EL 303, EL 343, EL 308, EL 348, EL 309, EL 349, EL 328</td>
<td>18</td>
</tr>
</tbody>
</table>

Electro-optics Concentration
(Add Courses Below to Basic Curriculum)

Students will not be allowed to enroll in EE 301 until they have demonstrated competency in material covered in EE 211, EE 212, EL 208, and EL 219 by means of an examination offered at the end of the spring quarter. Physics majors should have completed PHYS 206, PHYS 207, PHYS 256, PHYS 257 and MATH 318 before attempting this examination. If the competency exam is passed, the physics student will be allowed in EE/EL courses with physics courses substituting for EE/EL prerequisites.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 423 Advanced Optics</td>
<td>3</td>
</tr>
<tr>
<td>EE 301 Linear Systems Analysis</td>
<td>3</td>
</tr>
<tr>
<td>EE 341 Linear Analysis Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>EL 403 Fiber Optics Communication</td>
<td>3</td>
</tr>
<tr>
<td>EL 443 Fiber Optics Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>EL 418 Electro-Optical Engineering</td>
<td>3</td>
</tr>
<tr>
<td>Electives to be selected from the following list:</td>
<td>4</td>
</tr>
<tr>
<td>EE 302, EE 342, EL 307, EL 347, EL 308, EL 348, EL 309, EL 349, EL 328, EL 414</td>
<td>18</td>
</tr>
</tbody>
</table>

CURRICULUM FOR B.S. PHYSICAL SCIENCE

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. Cal Poly follows the quarter system.

Freshman

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 131, PHYS 132</td>
<td>General Physics or PHYS 121, PHYS 122 College Physics (B.1.a.)</td>
<td>4,4</td>
</tr>
<tr>
<td>CHEM 127</td>
<td>General Chemistry (B.1.a.)</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 128</td>
<td>General Chemistry (B.1.a.)</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 129</td>
<td>General Chemistry (B.1.a.)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 141, MATH 142, MATH 143</td>
<td>Calculus I, II, III or MATH 131, MATH 132, MATH 133 Technical Calculus (B.2.)</td>
<td>4,4,4</td>
</tr>
<tr>
<td>ENGL 114</td>
<td>Writing: Exposition (A.1.)</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 125/PHIL 125/SPC 125</td>
<td>Critical Thinking (A.2.)</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 215</td>
<td>Writing: Argumentation or ENGL 218</td>
<td>Writing: Argumentation and Reports (A.4.)</td>
</tr>
<tr>
<td>PHIL 230/PHIL 231</td>
<td>Philosophical Classics (C.1.)</td>
<td>3</td>
</tr>
</tbody>
</table>

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### Sophomore

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOL 201</td>
<td>Physical Geology</td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td>Chemistry electives (CHEM 326/CHEM 316 and CHEM 328/CHEM 371)</td>
<td>4,4</td>
</tr>
<tr>
<td>2</td>
<td>200-level MATH, CSC, or STAT electives</td>
<td>4,4</td>
</tr>
<tr>
<td>3</td>
<td>Adviser approved Physics elective</td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td>Physics electives (PHYS 133/PHYS 123 and PHYS 211/PHYS 210)</td>
<td>4,4</td>
</tr>
<tr>
<td>BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>CSC 110 - Computers and Computer Applications or CSC 410 Computer Fundamentals for Educators (F.1.)</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>HIST 204 - History of American Ideals and Institutions (D.1.)</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>HIST 315 - Modern World History (D.2.)</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>POLS 210 - American and California Government (D.1.)</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>PSY 201/PSY 202 - General Psychology (E.1.)</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>SPC 201 - Public Speaking or SPC 202 - Principles of Speech Communication (A.3.)</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Chemistry electives
- CHEM 301 - Biophysical Chemistry or CHEM 305 Physical Chemistry (B.1.a.)
- CHEM 305 Physical Chemistry (B.1.a.)

#### Adviser approved electives
- Astronomy and/or earth science elective
- Chemistry elective
- Physical Science electives (300-400 level)
- Physical Science electives (300-400 level)

#### Critical reading electives
- (C.1.)

#### Life science elective
- (B.1.b.)

#### Electives
- (B.1.a.)
- (D.4.a.)
- (D.4.a.)
- (D.4.b.)
- (F.2.)
- (C.2.)
- (C.3.)
- (F.2.)
- (F.2.)
- (F.2.)
- (F.2.)

### Junior

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTR 301</td>
<td>The Solar System or ASTR 302 - Stars and Galaxies</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 301</td>
<td>Biophysical Chemistry or CHEM 305 Physical Chemistry (B.1.a.)</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Adviser approved Astronomy and/or earth science elective</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Adviser approved Chemistry elective</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Adviser approved Physical Science electives (300-400 level)</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>ECON 201/ECON 211/ECON 222 (D.3.)</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Critical reading electives (C.1.)</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>Life science elective (B.1.b.)</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Electives</td>
<td>12</td>
</tr>
</tbody>
</table>

### Senior

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 461, PHYS 461, or PSC 461</td>
<td>Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Adviser approved Physical Sciences elective (300-400 level) (Prospective teachers take PSC 424)</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Adviser approved Physics elective (300-400 level)</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.)</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Arts and humanities elective (Area C)</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Fine and performing arts elective (C.2.)</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Literature, philosophy, arts elective (300-400 level) (C.3.)</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Technology elective (F.2.)</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Electives</td>
<td>23</td>
</tr>
</tbody>
</table>

### Electives
- 12 units

### 47 units

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1. A choice of the PHYS 121, PHYS 122, PHYS 123 sequence or CHEM 326 or CHEM 328 restricts the Physics and Chemistry electives available to the student later in this program.
2. To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 114 of this catalog.
3. Students planning on qualifying for a teaching credential must take ED 302, ED 305, ED 403, ED 404, ED 405, ED 409, ED 410, ED 420.

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

Faculty Office Building (47), Room 28A
(805) 756-2709

Faculty

Department Chair, James C. Daly

Jay L. Devore  Roxy L. Peck  Kent D. Smith
John E. Groves  John M. Rogers  Sing-Chou Wu
Y. Leon Maksoudian  Robert K. Smidt

Programs

B.S. Statistics  Minor: Statistics

The Statistics Department has two primary purposes—to offer introductory statistics courses to students from many different majors at Cal Poly, and to offer a curriculum of diverse statistics courses for those students pursuing a Bachelor of Science degree in Statistics.

In this age of high technology it has become increasingly easy to record and store information resulting from experiments, surveys, and historical studies. It is the responsibility of the professional statistician to determine the best ways to collect, summarize and analyze these data. Because of the increasing number of quantitative studies that are conducted in fields ranging from medicine to agriculture to business, the professional statistician is in great demand. The National Science Foundation estimates that statistics is one of the few areas that will have more openings in the 1990's than there are individuals with degrees in that area. Recent graduates of the program at Cal Poly are working for companies in fields as diverse as insurance, weapons testing, aircraft manufacturing, banking, and computer manufacturing.

The statistics degree program requires students to have a substantial amount of coursework in mathematics and computer science. With this basis the students take courses in the following statistics areas—analysis of variance, regression analysis, statistical use of computers, sampling methods, nonparametric analysis, multivariate analysis, and mathematical statistics. In the various courses the students make use of computer systems available at Cal Poly. Throughout the program faculty encourage students to work on practical, realistic problems that require the understanding of all aspects of the data acquisition and analysis problem.
CURRICULUM FOR B.S. STATISTICS

Indented courses to be taken in sequence. For course prerequisites, please refer to the “Course Descriptions” section of this catalog. Cal Poly follows the quarter system.

Freshman

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSC 118</td>
<td>Fundamentals of Computer Science I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 141</td>
<td>Calculus I (B.2.)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 142</td>
<td>Calculus II (B.2.)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 143</td>
<td>Calculus III (B.2.)</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 114</td>
<td>Writing: Exposition (A.1.)</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 125/PHIL 125/SPC 125</td>
<td>Critical Thinking (A.2.)</td>
<td>3</td>
</tr>
<tr>
<td>HIST 204</td>
<td>History of American Ideals and Institutions (D.1.)</td>
<td>3</td>
</tr>
<tr>
<td>POLS 210</td>
<td>American and California Government (D.1.)</td>
<td>3</td>
</tr>
<tr>
<td>PSY 201/PSY 202</td>
<td>General Psychology (E.1.)</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 111/112</td>
<td>General Physics</td>
<td>5</td>
</tr>
</tbody>
</table>

Sophomore

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Statistics and other subjects.

1. To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 114 of this catalog.
2. Of the total elective units, at least 15 units must be selected with the approval of adviser in one field in which statistics is applied.
3. Selected from the following list of courses: MATH 306, MATH 313, MATH 336, MATH 406, MATH 412, MATH 431, MATH 437.

**CURRICULUM FOR STATISTICS MINOR**

Select 6 units from the following ................................................. 6

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Select 9 units from the following ............................................. 9

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Select from any 400 level STAT course .................................... 6

Courses may be selected from the following content areas with approval of Statistics Department Minor Coordinator ............................................. 6

Sample Survey
Design of Experiment
Multivariate Techniques
Quality Control
Regression
Special Topics

---

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Courses of Instruction
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ATHLETICS

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UNIVERSITY LIBRARY

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COURSE DESCRIPTIONS

Courses are listed alphabetically by prefix abbreviation. Prefixes and page numbers on which they begin are listed below.

Some courses will be shown as cross-listed in the title line. These courses cannot be repeated for credit under the separate prefixes.

All credits are in quarter units. Cal Poly operates on a four quarter system.

Course Numbering System

The numbering system used is a three-digit system. Courses are generally numbered according to the plan shown below.

010-099 Nondegree credit or short courses.
100-299 Courses taught primarily in the freshman and sophomore years.
300-399 Courses primarily for advanced undergraduate students.
400-499 Courses for advanced undergraduates. Certain 400-level courses can be used in graduate programs. See Graduate Studies, page 138.
500-599 Graduate courses.
600-699 Courses for professional advancement within a special field and do not carry credit for degree requirements in any of the curricula.

Prerequisites

Prerequisites indicate recommended preparation. Course prerequisites cited in this catalog are intended to inform the student of any previous work needed for the course. Eligibility of students who do not meet the stated prerequisites is determined by their academic advisers and the appropriate instructor. The instructor may drop a student from the class if the prerequisites have not been met.

Modes of Instruction

The mode of instruction is included in each course description; for supervision courses, no mode is indicated. Some courses have more than one mode of instruction.

Activity:
Class meets for 2 hours per unit of credit.

Laboratory:
Class meets for 3 hours per unit of credit.

Lecture:
Class meets for 1 hour per unit of credit.

Experimental courses:

New courses which are not included in the catalog. Course descriptions appear in the quarterly Class Schedule. Experimental courses may be distinguished by an “X” in the course number.

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ACTG–ACCOUNTING

ACTG 204 Income Tax for the Nonaccountant (2)
Federal and state income taxation of individuals. 2 lectures. Prerequisite: Sophomore standing.

ACTG 211 Financial Accounting for Nonbusiness Majors (4)
Introduction to financial accounting theory and practice with an emphasis on financial statement preparation and analysis. Not open to Business Administration majors. 4 lectures.

ACTG 221, 222 Financial Accounting I and II (4) (4)
Introduction to financial accounting theory and practice. 4 lectures. Sequence courses.

ACTG 301 Managerial Accounting (4)
Applications of accounting to management decision-making, planning and control including cost behavior, budget preparation, and performance reporting. Microcomputers used for problem solving and analyses. 4 lectures. Prerequisite: MATH 221, STAT 252, ECON 222, CSC 120, and ACTG 211 or ACTG 221 or consent of instructor.

ACTG 302 Microcomputer Applications in Accounting (2)
Microcomputer applications in accounting. Advanced electronic spreadsheets, including integration with word processing and database software. Selection and use of accounting software on microcomputers. 1 lecture, 1 activity. Prerequisite: ACTG 211 or ACTG 221 and CSC 120.

ACTG 304 Tax Accounting (4)
Federal and state income taxation of individuals. 4 lectures. Prerequisite: ACTG 211 or ACTG 222 or consent of instructor.

ACTG 321, 322 Intermediate Accounting I and II (4) (4)
Rigorous coverage of financial accounting fundamentals. 321 emphasizes mastery of the accounting model, institutional and theoretical structures, and accounting for current items. 322 emphasizes accounting for long-term monetary items and corporate equities. 4 lectures. Prerequisite: ACTG 222 and junior standing. For ACTG 322: Completion of ACTG 321 with a grade of C or better.

ACTG 323 Advanced Accounting I (4)
Specialized topics in financial accounting: Business combinations, governmental entities, international accounting, accounting for changing prices, special revenue recognition areas, and interim and segment reporting. 4 lectures. Prerequisite: ACTG 322.

ACTG 400 Special Problems for Advanced Undergraduates (1–4)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units. Prerequisite: Junior standing or consent of instructor.

ACTG 402 Advanced Cost Accounting (4)
Process and standard costs; overhead costs, budgeting. Use of cost accounting data in economic analyses and managerial control. 4 lectures. Prerequisite: ACTG 301.

ACTG 404 Taxation of Partnerships, Estates and Trusts and Complex Capital Transactions (4)
Federal and state income taxation of sales and exchanges and Subchapter S corporations, partnerships, estates and trusts. Federal and state gift and death taxes. 4 lectures. Prerequisite: ACTG 304.

ACTG 405 Corporate Tax Accounting and Tax Administration (4)
Federal and state income taxation of regular corporations, tax research, tax administration, and IRS practice. 4 lectures. Prerequisite: ACTG 304.

ACTG 431 Professional Accounting (4)
Development of the accounting profession. Past, present and future. Emphasis on contemporary issues confronting the professional accountant and his/her social and ethical responsibilities and opportunities. 4 lectures. Prerequisite: ACTG 323 or consent of instructor.

ACTG 446 Auditing (4)
Professional auditing: theory, philosophy and problems. 4 lectures. Prerequisite: ACTG 323 or consent of instructor. Recommended: MGT 321.
ACTG 447  Advanced Auditing (4)
Advanced coverage of selected topics including assessing materiality and audit risk, applying non-statistical and statistical sampling, auditing computerized accounting systems, performing other attestation and accounting services, and researching auditing problems. 3 lectures, 1 activity. Prerequisite: ACTG 446. MGT 321 recommended.

ACTG 461, 462  Senior Project (2) (2)
Selection and analysis of a problem under faculty supervision. Problems typical of those which graduates must solve in their fields of employment. Formal report is required. Minimum 120 hours total time. Prerequisite: Completion of graduation writing requirement.

ACTG 470  Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

ACTG 500  Individual Study (1–4)
Advanced study planned and completed under direction of departmental faculty member. Open only to graduate students demonstrating ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head.

AE–AGRICULTURAL ENGINEERING

AE 121  Agricultural Mechanics (2)  GEB F.2.
Identification and use of tools and materials; shop safety and fire prevention; tool sharpening and care; concrete mixes and materials; simple electric wiring; metal work; pipe fitting; basic woodworking; estimating quantities and costs. Students are required to meet safety regulations in laboratory work. 1 lecture, 1 laboratory.

AE 124  Small Power Units (2)
Operating principles of the small internal combustion engine. Maintenance and trouble-shooting applications of small power units to mowers and other landscape equipment. Repair procedures related to economic justifications. 1 lecture, 1 two-hour activity.

AE 128  Agricultural Mechanics (3)
Introduction to agricultural engineering and mechanized agriculture. Career opportunities. Problem solving techniques. Selection of materials for agricultural construction. Laboratory skills development in wood, metal, concrete and pipework. 2 lectures, 1 laboratory. Prerequisite: Majors only, MATH 116 or equivalent, high school drafting or concurrent enrollment in ETME 131 or AE 133.

AE 131  Agricultural Surveying (2)
Introduction to basic surveying techniques as applied to agriculture. Keeping field notes; land measurement by tape; differential and profile leveling; contour and plane table mapping; land surveying and identification; fundamentals of land grading. 1 lecture, 1 laboratory. Prerequisite: MATH 116.

AE 133  Agricultural Drafting (3)
Technical drawing oriented toward working drawings of agricultural engineering components and systems. Freehand sketching and instrument techniques. Multiview projection and pictorial drawings. Not open for credit to students with previous college level drafting course work. 1 lecture, 2 laboratories.

AE 134  Agricultural Electrification (3)
Fundamentals of electric wiring and code regulations, electrical distribution and the wiring of agricultural structures. Selection, installation, and maintenance of electric motors. Emphasis on practical applications. 2 lectures, 1 laboratory. Prerequisite: MATH 117 or MATH 118.

AE 141  Agricultural Tractors and Equipment Skills (3)
Skills in the practical operation of tractors and equipment. Supervised operation on modern farm and utility-industrial equipment. 2 lectures, 1 laboratory.
AE 142 Agricultural Power and Machinery Management (4)
Evaluation of agricultural tractors and machinery performance. Power applications and hydraulic systems. Evaluation of performance of tillage, seeding and planting, weed control, hay and grain harvesting, and farm processing equipment. Emphasis on management. Selection, operation, maintenance, and cost analysis. 3 lectures, 1 laboratory. Prerequisite: MATH 116.

AE 143 Power and Machinery (4)
Performance of tractors and machinery. Evaluation of tillage, planting, and harvesting operations. Analysis and development of optimum mechanical systems. Use of microcomputers for evaluation, analysis, and report presentation. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: AE 128, MATH 116 or equivalent.

AE 200 Special Problems for Undergraduates (2–4)
Individual investigation, research, studies or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

AE 203 Agricultural Systems Analysis (3)
Agricultural Systems Analysis investigates the interrelationships between sub-components in an overall system. Problem solving algorithms, network analysis, project planning techniques, and optimization. 2 lectures, 1 laboratory. Prerequisite: MATH 116 or equivalent.

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

AE 232 Agricultural Structures Planning (3)
Environmental factors affecting crop storage structures and animal housing. Insulation, heating, ventilation, water supply, and waste disposal. Functional planning of production systems. Application of solar energy to agriculture. 2 lectures, 1 laboratory. Prerequisite: AE 128, PHYS 132 and college drafting.

AE 234 Agricultural Power Transmission and Mechanics (3)
Elements in the utilization and transmission of power in agricultural equipment. Emphasis on V-belt, roller chain, gear, and shaft drive. 2 lectures, 1 laboratory. Prerequisite: AE 142, PHYS 121.

AE 236 Principles of Irrigation (4)
Land grading design, operation, management, and evaluation of irrigation methods. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: MATH 141, AE 237, SS 121, a computer programming course.

AE 237 Engineering Surveying I (2)
Use and care of tapes, levels, transits, and electronic distance measuring instruments (EDMI). Keeping field notes, measurements by tape. Differential and profile leveling. Turning angles and determining directions of lines. Map reading. 1 lecture, 1 laboratory. Prerequisite: MATH 119 or an understanding of trigonometric functions.

AE 238 Engineering Surveying II (2)

AE 239 Engineering Surveying III (2)
Topographic mapping using a total station instrument. Use of minicomputer for data reduction, development of contour maps, and layout of property surveys, subdivisions, etc. 1 lecture, 1 laboratory. Prerequisite: AE 238.

AE 240 Agricultural Engineering Laboratory (1–2)
Individual projects. Total credit limited to 4 units, with a maximum of 2 units per quarter. 1 or 2 laboratories. Prerequisite: Consent of instructor.
AE 301  Closed Circuit Hydraulics (3)
Selection, application and use of hydraulic components from manufacturer's specifications and literature. Use of standardized circuit design procedures with related calculation and selection criteria. 2 lectures, 1 laboratory. Prerequisite: AE 234.

AE 312  Hydraulics (4)
Static and dynamic characteristics of liquids, flow in open and closed channels, uniform and nonuniform flow, flow measurement, pumps. 3 lectures, 1 laboratory. Prerequisite: PHYS 132, ME 211.

AE 321  Agricultural Safety (3)
Principles of agricultural safety. Accident causation and prevention, hazard identification and abatement, laws and regulations. Machinery, electrical, chemical, livestock, shop and fire safety. Rural crime prevention and safety program development. 3 lectures. Prerequisite: Junior standing.

AE 323  Agricultural Products Handling (3)
Application of product handling techniques and equipment to the processing of agricultural commodities. 2 lectures, 1 laboratory. Prerequisite: PHYS 123 or consent of instructor.

AE 324  Principles of Agricultural Electrification (4)
R-L-C circuit fundamentals. Applications of electricity in agriculture including circuit fundamentals. Materials, code regulations, electrical measurements, system planning, motors, basic electronics, and an introduction to computer usage. 3 lectures, 1 laboratory. Prerequisite: AE 134, MATH 119 or MATH 120, PHYS 123.

AE 326  Energy Systems for Agriculture (3)
Theory and application of energy sources and systems. Covering such sources as heat systems, biomass, direct energy conversion, and power application to the soil. 2 lectures, 1 laboratory. Prerequisite: ME 211, ME 302. ME 302 may be taken concurrently.

AE 328  Measurements and Computer Interfacing (3)
Transducers and engineering measurements in agricultural engineering. Transducer characteristics, signal processors and controllers, instrumentation techniques and the use of the computer in the measurement interface. 2 lectures, 1 laboratory. Prerequisite: CSC 251, EE 311.

AE 331  Irrigation Theory (3)
Plant-water-soil relations using evapo-transpiration, plant stress, soil moisture deficiency, frequency and depth of irrigation, salinity, infiltration, drainage and climate control. Miscellaneous course fee required—see Class Schedule. 3 lectures. Prerequisite: AE 236, SS 121, MATH 141 or consent of instructor.

AE 335  Agricultural Power (3)
Principles of spark ignition and compression ignition engines and related accessories. Service, trouble-shooting, and repair procedures. 1 lecture, 2 laboratories.

AE 337  Landscape Irrigation (3)
Design of landscape irrigation systems including soil factors, hydraulics, site information, selection of system components, back flow prevention, plumbing codes and cost estimating. 2 lectures, 1 laboratory. Prerequisite: SS 121 or consent of instructor.

AE 339  Agricultural Mechanics Skills (2)
Advanced shop skills. Carpentry, electricity, plumbing, surveying, power mechanics, tractor equipment operation and maintenance. 2 lectures, 2 laboratories weekly for five weeks per session—two sessions per quarter. Prerequisite: Agricultural teacher candidates starting/returning from student teaching, senior or graduate standing or consent of instructor.

AE 340  Irrigation Water Management (4)
Soil-plant-water relationships, evapotranspiration rates and irrigation schedules. Water quality, salinity and drainage. Water rights and irrigation institutions. Water measurement. For non-AE majors only. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: MATH 118, SS 121.
AE 341 Gasoline Engine Diagnosis (3)
Use of modern engine testing equipment in the evaluation of engine components and accessories such as: cylinder condition, ignition systems, electrical and electronic systems and fuel systems. 2 lectures, 1 laboratory. Prerequisite: AE 335.

AE 342 Diesel Fuel Systems (3)
Use of modern test and service equipment in evaluating and servicing diesel fuel systems. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: AE 335 or equivalent or consent of instructor.

AE 343 Project Analysis (5)
Analysis of projects for structural design, applied elements of statics, dynamics, strength of materials, fabrication, and fasteners. 3 lectures, 2 laboratories. Prerequisite: AE 133 or equivalent, PHYS 121, AE 234.

AE 344 Agricultural Equipment Projects (3)
Construction of special agricultural equipment related to any agricultural enterprise. 1 lecture, 2 laboratories. Prerequisite: AE 343.

AE 345 Aerial Photogrammetry (3)
Object recognition, three-dimensional equipment, and interpretation. Print alignment, stereoscopic viewing, scales, elevation determination, and application. Familiarization with geological, agricultural, land and crop management, engineering surveys, construction data, topographic detail, drainage elevation and control. Color photo techniques and uses for pest and disease location and control. 2 lectures, 1 laboratory. Prerequisite: MATH 116.

AE 347 Principles of Agricultural Machinery (4)
Principles of the design of machine elements and mechanisms, machinery testing, motion, linkages, strength of materials. Basic metallurgy, friction studies, steering geometry and systems. 3 lectures, 1 laboratory. Prerequisite: AE 142, AE 343 or concurrently.

AE 399 Graphical Interface Computing in Agriculture (1)
Macintosh or similar computer and available software as an effective educational tool. Applications of word processing, spreadsheets, graphics, drawing/drafting, data base and some basic programming to the problems and designs encountered in the Agricultural Engineering and Agricultural Engineering Technology programs. 1 laboratory. Prerequisite: AG 250 or ARCH 250 or CSC 251.

AE 400 Special Problems for Advanced Undergraduates (2-4)
Individual investigation, research, studies, or surveys of selected problems in agriculture. Total credit limited to 8 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

AE 403 Agricultural Systems Engineering (3)
Engineering principles combined with mathematical optimization techniques to evaluate parameters in agricultural production and processing systems. Project planning techniques, linear and nonlinear modeling, response surface methodology. 2 lectures, 1 laboratory. Prerequisite: CSC 251, IE 314, MATH 242, STAT 321.

AE 405 Fertigation (1)
Fertilizer and chemical injection through irrigation systems. Hardware, fertilizer compounds, and distribution uniformity. Matching chemicals and equipment to specific irrigation methods. Miscellaneous course fee required—see Class Schedule. 1 laboratory. Prerequisite: AE 236 or AE 340, SS 121.

AE 414 Irrigation Engineering (4)
Irrigation system design for engineers. Drip, sprinkler, and surface systems; pump selection; irrigation hardware; canal control. Economics of system design and operation. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: AE 236, AE 312, AE 331.

AE 415 Hydrology (3)
Collection, organization and use of precipitation and runoff data, flood frequency and economics of structures, stream gauging and use of hydrograph, principles of groundwater management and flood routing. 3 lectures. Prerequisite: MATH 141 or consent of instructor.
AE 421 Equipment Engineering (4)
Design and construction of specialized agricultural components and equipment. 2 lectures, 2 laboratories. Prerequisite: CE 205, ME 212, ETWT 144.

AE 422 Equipment Engineering (3)
Analysis and design of agricultural equipment with emphasis on man-machine-plant-automata relationships and concepts. 2 lectures, 1 laboratory. Prerequisite: AE 421.

AE 425 Computer Controls for Agriculture (3)
Computer activated controls as applied to agricultural machinery, agricultural structures, processing and irrigation industries. Encompassing control logic to evaluate stability behavior of systems of computer interfacing, data input and control output. 2 lectures, 1 laboratory. Prerequisite: AE 324, CSC 110 or AG 250.

AE 427 Agricultural Process Engineering (3)
Agricultural engineering principles applied to air, water, air-water mixtures, drying, heating, refrigeration, fluid flow, size reduction, fan laws and materials handling. 2 lectures, 1 laboratory. Prerequisite: AE 312, AE 333, ME 302.

AE 430 Finite Element Analysis (3)
Introduction to the theory of finite element analysis and its application to drainage, pipe flow, fruit and vegetable damage predictions, structural strength, heat transfer, and other agricultural engineering applications. 2 lectures, 1 laboratory. Prerequisite: CE 204, MATH 242, ME 302.

AE 432 Agricultural Buildings (4)
Selection of buildings, storage units, and related equipment for production agriculture. Design of beams and column members in wood and steel. Environmental factors affecting crop storage and animal housing. Farmstead layouts. Working drawings and cost estimates. 3 lectures, 1 laboratory. Prerequisite: AE 133, AE 231, AE 343.

AE 433 Agricultural Structures Design (4)
Structural analysis and design of agricultural service and processing buildings. Emphasis on use of wood, metals, and reinforced concrete in light construction. 3 lectures, 1 laboratory. Prerequisite: AE 232, CE 205.

AE 435 Drainage (3)
Flow of water in porous media. Intrinsic permeability and hydraulic conductivity. Flow nets, wells and ground water, design of sub-surface drains. 2 lectures, 1 laboratory. Prerequisite: AE 312, AE 331, or AE 340 or SS 432 and consent of instructor.

AE 437 Conservation Engineering (3)
Engineering solutions of soil and water conservation problems. Applications of engineering fundamentals of hydraulics, hydrology, and soils used in the design and construction of soil and water conservation structures. 2 lectures, 1 laboratory. Prerequisite: AE 312, AE 415, SS 121, or consent of instructor.

AE 440 Agricultural Irrigation Systems (4)
On-farm irrigation system evaluation and management. Drip, micro-spray, furrow, border strip, sprinkler systems. Irrigation efficiency and uniformity. Pumping costs. For non-AE majors only. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: SS 121.

AE 445 Remote Sensing (3)
Digital analysis of LANDSAT images. Topographic map production with stereoscopic map plotting instruments. Emphasis on laboratory experience. Some computer experience required. 2 lectures, 1 laboratory. Prerequisite: SS 121.

AE 448 Bioconversion (3)
Thermal mechanics and physical techniques for converting biomass into useful energy forms for agriculture and industry. Laboratory exercises include experiments with methane and alcohol production and combustion of agricultural residue. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: MATH 117 or equivalent, or consent of instructor.
AE 450  Advanced Graphical Interface Computing (1)
Macintosh or similar computer as an effective intellectual tool. Applications in problem solving, project planning, numerical analysis, advanced word processing, spreadsheets and modeling. Communications and data transfer. 1 laboratory. Prerequisite: AE 399 or equivalent.

AE 451  Advanced CAD for Agricultural Engineering (1)
Computer aided drafting on the Macintosh or similar computer using Versacad software. Drawing setup. 2-D projections including automatic dimensioning and hatching. Isometric construction, drawing layers, library symbols. Use of 3-D drawing software. 1 laboratory. Prerequisite: AE 399 or equivalent.

AE 461, 462  Senior Project (2) (3)
Solution of an engineering problem in agriculture. Involves research methodology: problem statement, analysis, synthesis project design, construction (when feasible), and evaluation. Project requires 150 hours with a minimum of faculty supervision.

AE 463  Undergraduate Seminar (2)
Group discussion of current agricultural engineering topics presented by individual members of the class. Placement opportunities and requirements. 2 seminars.

AE 464  Professional Practice (3)
Contracts, specifications, and legal aspects of agricultural engineering. Safety and human factors. Engineering ethics and professional registration. 3 lectures. Prerequisite: Senior standing.

AE 470  Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

AE 471  Selected Advanced Laboratory (1-3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

AE 492  Pumps and Pump Drivers (3)
Pump characteristics and system head. Not positive suction head. Series and parallel operation. Pump contracts and protection. Selection of pumping systems for different water sources. Design of pump intakes for surface water supplies. Driver selection. Servicing motors and engines. Hand pumps and wind mills. 2 lectures, 1 laboratory. Prerequisite: Senior standing.

AE 500  Individual Study (1-3)
Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of instructor.

AE 521  Engineering of Agricultural Systems (4)
Problem solving by analyzing the need, establishing boundaries and developing creativity. Examples worked through in practicability analysis, transportation problems, linear programming and system analysis with an emphasis on optimum system operation. 3 lectures, 1 laboratory. Prerequisite: Consent of instructor.

AE 522  Instrumentation Control/Microprocessors (4)
Engineering input/output instrumentation for sensing and controlling functions through data acquisition, analysis and response to agricultural processing. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: BASIC language programming or consent of instructor.
AE 529 Small Farm Mechanization (3)
Principles of farm machinery used for tillage, seeding, weeding, harvesting and transport of agricultural crops. Small-scale equipment, suitable for subsistence farming in developing countries. Small tractors, hand tools, animal power, and fuel from renewable sources. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: AE 143 or equivalent, graduate standing, or consent of instructor.

AE 531 Water Wells (3)
Groundwater resources drilling methods and development of wells. Water well design for pollution prevention. Well rehabilitation. Destruction of abandoned wells. Design of domestic water systems. Water quality standards and water conditioning for different applications. 2 lectures, 1 laboratory. Prerequisite: Graduate standing.

AE 533 Irrigation Project Design (4)
Formation of water user associations and social/financial aspects of development of irrigation projects. Engineering solutions for improved water delivery and canal automation. Interaction between engineering and social factors. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: AE 340, consent of instructor.

AE 581 Graduate Seminar in Agricultural Engineering (3)
Current engineering problems and recent developments as they relate to agriculture. Problem identification, statement and research methodology emphasized in problem solution. 3 seminars.

AERO—AERONAUTICAL ENGINEERING

AERO 102 General Aviation (3)

AERO 121 Aerospace Fundamentals (1)
Introduction to the engineering profession including the aeronautical and aerospace fields. Engineering approach to problem-solving and analysis of data obtained from experiments. Basic nomenclature and design criteria used in the aerospace industry. Applications to basic problems in the field. 1 laboratory.

AERO 200 Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

AERO 202 Aeronautical Engineering Analysis (2)
Introduction to problem solving techniques in aeronautical engineering using digital computers. Primary emphasis on the solution of problems in aerodynamics, aerospace structures, aircraft design, stability and control, and flight simulation. 2 laboratories. Prerequisite: CSC 251, MATH 143

AERO 210 History of Aviation (3) GEB F.2.
History of technological innovations which led to modern aviation. People and circumstances that contributed to the major breakthroughs in aeronautics and astronautics. Discussion of current events in aviation. 3 lectures.

AERO 240 Additional Engineering Laboratory (1–2) (CR/NC)
Total credit limited to four units, with not more than two units in any one quarter. Credit/No Credit grading. 1 or 2 laboratories.

AERO 301, 302, 303 Aerothermodynamics (5) (5) (3)
Properties and characteristics of fluids, fluid statics and dynamics, the thermodynamic relations, laminar and turbulent subsonic flows as applied to flight vehicles. Introduction to heat transfer. 5 lectures, fall and winter; 3 lectures, spring. Prerequisite: ME 212, MATH 242.
AERO 304 Experimental Aerothermodynamics (2)
Laboratory experiments verify the momentum and energy equations. Fan performance, boundary layer measurements, diffuser performance, heat transfer and solar collector performance experiments are evaluated. 1 lecture, 1 laboratory. Prerequisite: AERO 301, AERO 302, ENGL 218. Concurrent: AERO 303.

AERO 306 Aerodynamics I (5)

AERO 307 Wind Tunnel and Flight Test Laboratory (3)
Wind tunnel testing of basic aerodynamic properties of airfoils, finite wings, aircraft models, and aircraft flight performance. Emphasis on both static and dynamic responses of aircraft. Various measurement techniques, data reduction schemes, and analysis methods. 1 lecture, 2 laboratories. Prerequisite: ENGL 218.

AERO 324 Stress Analysis (4)

AERO 400 Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

AERO 401 Propulsion Systems (4)
Power plant types, components, characteristics, and requirements. Principles of thrust and energy utilization. Thermodynamic processes and performance of turboprop, turboshaft, turbofan, turbojet, ramjet, and rocket engines. 3 lectures, 1 laboratory. Prerequisite: AERO 303.

AERO 404 Gas Dynamics (4)
Fundamental theory of one dimensional gas dynamics: Isentropic flow, flow in converging-diverging nozzles, shock propagation, normal and oblique shock theory, Prandtl-Meyer expansions, Fanno line flow, and measurement methods. 4 lectures. Prerequisite: AERO 303.

AERO 405 Aerodynamics II (3)
Review of gas dynamics, shock-wave and boundary-layer interaction, compressible subsonic and transonic flows over airfoils, 2-dimensional supersonic flows around thin airfoil, finite wing in supersonic flow. 3 lectures. Prerequisite: AERO 404.

AERO 408 Aerospace Structural Analysis (4)

AERO 409 Flight Test (3)
Flight test instrumentation, obtaining of data and methods of data reduction for determining aircraft and engine performance, aircraft stability and control and structural integrity. Evaluation of factory data, including weight and balance compliance with specifications. 1 lecture, 2 laboratories. Prerequisite: AERO 201.

AERO 410 Experimental Stress Analysis (2)
Employing the knowledge of stress analysis and aerospace structural analysis in an individual and group design project dealing with aerospace structures. 2 laboratories. Prerequisite: CE 206.

AERO 411 Space Technology (3)
Motion of a body in the central force field. Space vehicle trajectories, guidance systems, power generators for interplanetary travel, structural loading, and principles of space vehicle design. 3 lectures. Prerequisite: Consent of instructor.
AERO 412 Composite Structures Analysis and Design (4)

AERO 416 Helicopter Technology (3)
Introduction to analysis of rotary wing aircraft. Types of flight control mechanisms. Performance and stability of helicopters. 3 lectures. Prerequisite: AERO 306.

AERO 418 Introduction to Flight Simulation (3)
Developmental and training flight simulators. Flight dynamics of rigid aircraft. Alternative simulation system configurations. Cockpit instrumentation and controls. Interface systems. Host computers. Peripheral processors, Visual, sound, and motion systems. Simulation software. Operation of flight simulators. Applications of flight simulation in the aerospace industry. 2 lectures, 1 laboratory. Prerequisite: MATH 242, AERO 420 or EE 309 and EE 319 or CSC 360 or ME 422.

AERO 420 Stability and Control of Aircraft (5)
Equations of steady and unsteady motion of the airplane in six degrees of freedom and the aerodynamic forces involved. Static and dynamic longitudinal and directional stability. Lateral motion and response to controls. 5 lectures. Prerequisite: AERO 306.

AERO 423 Flight Control Systems (3)

AERO 443 Flight Vehicle Design (2)
Introduction to the aircraft design sequence AERO 444, AERO 445. Designed to prepare students for participation in aircraft design exercises. 2 laboratories. Prerequisite: AERO 306, AERO 324, senior standing.

AERO 444, 445 Flight Vehicle Design (4) (4)
Preliminary layout of a typical transport aircraft and a space vehicle using design and calculation techniques developed in previous aeronautical engineering courses. Design of selected component structures and preparation of necessary drawings. 2 lectures, 2 laboratories. Prerequisite: AERO 443.

AERO 456 Aircraft Vibration and Flutter (3)
Analysis of vibration and flutter for fixed and rotary wing aircraft and other structures. History of aeroelasticity; analysis of structures using matrix methods. Formulation of dynamic equations by Lagrangian approach. Solution to obtain eigenvalues and eigenvectors. Unsteady aerodynamics and Theodorsen's lift deficiency function. 3 lectures. Prerequisite: MATH 318.

AERO 461, 462 Senior Project (2) (3)
Selection and completion of a project which is typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: Senior standing.

AERO 470 Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

AERO 471 Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.
AERO 500 Individual Study (1–3)
Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.

AERO 515 Continuum Mechanics (3)
Rules of index notation and transformation laws of Cartesian tensors as applied to a continuous medium. Application of these methods to fluids and solids provides the student with a unified understanding of the fundamental laws of physics for a continuum. 3 seminars. Prerequisite: MATH 318, AERO 303, and AERO 408, graduate standing or consent of instructor.

AERO 520 Theoretical Aerodynamics (3)
Fundamentals of analytic aerodynamics; potential flow, Kutta-Joukowski theorem, Schwarz-Christoffel transformation, lifting line theory, thin wing theory, three-dimensional lift and drag of wings, slender body theory. 3 lectures. Prerequisite: AERO 306, graduate standing or consent of instructor.

AERO 522 Boundary-Layer Theory (3)
Concept of boundary-layer. Boundary-layer equations, similarity of transportation, integral methods for steady, two-dimensional laminar and turbulent boundary layers. 3 lectures. Prerequisite: AERO 303, graduate standing or consent of instructor.

AERO 523 Turbulent Flow (3)

AERO 526 Computational Fluid Dynamics I (3)
Basic principles underlying the fluid dynamics Navier-Stokes equation. Relations between time-accurate and relaxation methods. Implicit and explicit methods combined with flux splitting and space factorization. Considerations of accuracy, stability of numerical methods, and programming complexity. 3 lectures. Prerequisite: AERO 303, graduate standing or consent of instructor.

AERO 527 Computational Fluid Dynamics II (3)
Numerical methods for solving elliptic, parabolic, and hyperbolic sets of partial differential equations. Application to potential flow, Euler equations, boundary-layer equations, and Navier-Stokes equations. Computational problems are assigned. 3 lectures. Prerequisite: AERO 526.

AERO 530 Advanced Structural Analysis (3)

AERO 535 Fatigue and Fracture Mechanics Analysis (3)
Advanced flight vehicle and fracture mechanics analysis and design. Fundamentals and applications of modern fatigue analysis in the aerospace industry. 3 seminars. Prerequisite: AERO 408, graduate standing or consent of instructor.

AERO 540 Elements of Rocket Propulsion (3)
Analysis and design of liquid and solid rockets using basic design parameters such as droplet atomization, droplet and particle combustion, heat transfer, combustion stability and control, and thermochemical computations. 3 lectures. Prerequisite: AERO 401, graduate standing or consent of instructor.

AERO 541 Fuels and Propellants (3)
Combustion, chemical reaction thermodynamics, and emission control. Laminar and turbulent flame theory; ignition, detonation, droplet combustion. Performance of rocket engines with NASA computer codes. Fundamentals of solid, liquid, and hybrid propellant combustion. Advanced propulsion systems: SCRAMJET, ion, and nuclear propulsion. High temperature gas dynamics. 3 lectures. Prerequisite: AERO 401, graduate standing or consent of instructor.
AERO 545  Non-Impulsive Orbit Design (3)
Review of ion chemical design, 2-body orbital mechanics, and expected perturbing forces. Emphasis on Encke methods of perturbed orbit determination. 1 lecture, 2 activities. Prerequisite: AERO 411.

AERO 550  Advanced Flight Dynamics (3)
Derivation of full six degrees of freedom of motion of missiles and space vehicles in both linear and nonlinear applications; closed form and computer numerical integrations; advanced dynamic flight testing and dynamic wind tunnel testing. 3 lectures. Prerequisite: AERO 420, graduate standing or consent of instructor.

AERO 555  Flight Simulation (4)
Flight simulation facilities development and applications. Six-degree-of-freedom flight dynamics models. Function generation. Effects of real time hardware in simulation systems. Host computer executive programs. Peripheral processors. High speed drivers and system. Interface systems. Avionics systems simulation. 3 lectures, 1 laboratory. Prerequisite: AERO 418, graduate standing or consent of instructor.

AERO 570  Selected Advanced Topics (3)
Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

AERO 590  Graduate Seminar (1)
Current developments in the field of Aeronautical Engineering. Participation by students, faculty and guest lecturers. 1 two-hour seminar. Prerequisite: Graduate standing or consent of instructor.

AERO 599  Design Project (Thesis) (2) (2) (5)
Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis. Prerequisite: Graduate standing.

AG—AGRICULTURE

AG 243  Competitive Intercollegiate Rodeo (2) (CR/NC)
Beginning through advanced skills in the event areas of college rodeo. Areas include saddle bronc, bareback, and bull riding; calf, team, and breakaway roping; steer wrestling, goat tying, and barrel racing. Minimum of 10 hours of laboratory per week. Total credit limited to 8 units. Credit/No Credit grading. Enrollment limited to those qualified to compete in intercollegiate rodeo. Consent of coach required.

AG 250  Computer Application to Agriculture (3)  GEB F.1.
Microcomputers and commercial software used in agricultural industries. Word processing, spreadsheets, data base management programs, and programs applied to agriculturally oriented problems. 3 lectures.

AG 301  Agriculture and American Life (3)  GEB F.2.
Relationship of agriculture and natural resources to man and his society. Impact of soil, water, and land uses on animal and crop production within the United States. Relative importance of resources used and commodities produced. Not open to students with majors in agriculture. 3 lectures. Prerequisite: Junior standing.

AG 339  Internship in Agriculture (1-12) (CR/NC)
Selected students will spend up to 12 weeks with an approved agricultural firm engaged in production or related business. Time will be spent applying and developing production and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Credit/No Credit grading. Prerequisite: Consent of internship instructor.

AG 500  Individual Study (1-6)
Advanced independent study planned and completed under the direction of a member of the school faculty. Total credit limited to 6 units. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.
AG 539 Graduate Internship in Agriculture (1–9)
Application of theory to the solution of problems of agricultural production or related businesses in the field. Analyze specific management problems and perform general management assignments detailed in a contract between the student, the firm or organization, and the faculty adviser before the internship commences. Degree credit limited to 6 units. Prerequisite: Consent of internship instructor.

AG 599 Thesis (1–9)
Systematic research of a significant problem. Thesis will include problem identification, significance, methods, data analysis, and conclusion. Students must enroll every quarter in which advisement is received. Degree credit limited to 6 units. Prerequisite: Graduate standing and consent of instructor.

AGB–AGRIBUSINESS

AGB 100 Orientation to Agribusiness (1) (CR/NC)
Understanding the depth and breadth of agribusiness, the agricultural industry, the university, and the Agribusiness Department. Emphasis on career and curriculum orientation. Credit/No Credit grading only. 1 activity.

AGB 102 Introduction to Agricultural Economics (3)
Introduction to the economic aspects of agribusiness. Role of agricultural resources, major agricultural resource issues, and their policy remedies. 3 lectures.

AGB 109 Farm Bookkeeping (4)
Farm record keeping for tax, management and credit purposes using the cash method of accounting. An overview of the accrual system and measures of farm profits. Not for credit towards B.S. degree for majors in the School of Agriculture. For technical students only. 3 lectures, 1 activity.

AGB 200 Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

AGB 201 Agribusiness Sales and Service (3)
Emphasis on relationship selling focusing on building trust and providing valuable service. Critical skills of self-management, communication, and interpersonal values through role playing and presentations. Sales opportunities in the entire food industry surveyed, ranging from input industries such as seeds and fertilizers, to output industries such as produce and wine. 3 lectures.

AGB 203 Agribusiness Organization (3)
Organizational management of agribusiness. Primary functions and skills necessary for successful management of agribusiness related firms. Planning, organizing, leading and control. 3 lectures.

AGB 212 Agricultural Economics (3)
Changes in agriculture and agricultural production in response to changing economic conditions. Optimum methods of agricultural production. Impact of technological change. Evaluating market structure and price formulating factors for agricultural products and inputs. 3 lectures. Prerequisite: AGB 102, ECON 201, or ECON 211.

AGB 213 Agricultural Economic Analysis (4)
Role of price in the economy, the firm as a decision-making unit, the production function, single input-output analysis, substitution relationships, products combinations, risk analysis, consumption and market demand influence, population and technological changes. 4 lectures. Prerequisite: AGB 212, MATH required for major.

AGB 300 Successful California Farms (2)
Visits to successful California farms involving many types of farming. Farm resources and organization, techniques of operation, yields, problems. Different regions visited on different trips. Miscellaneous course fee required—see Class Schedule. Can only be taken once for credit in the major.
AGB 301 Agricultural Marketing (3)
Agricultural commodity marketing systems from farm to consumer. Middlemen types and marketing alternatives. Role of futures markets in pricing and risk minimization. Storage, transportation and grading systems. Selected topics such as foreign trade and marketing orders. 3 lectures. Prerequisite: AGB 212 or ECON 201 or ECON 212.

AGB 302 Agricultural Cooperative Organization and Management (3)
Purpose, kinds, organization and management of agricultural cooperatives. Emphasis on California cooperatives, their characteristics, operation and future. One-day field trip visiting agricultural cooperatives included. 3 lectures. Prerequisite: AGB 203.

AGB 304 Agribusiness Marketing Management (3)
Marketing management applied to agricultural and food industries. Marketing concept, role of today’s middlemen and growing importance of consumerism, ecology and conservation in today’s changing market place. Exploration of marketing mix decisions including planning, product management, pricing, promotion and distribution. 3 lectures. Prerequisite: AGB 212, ECON 201, or ECON 211.

AGB 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: AGB 212, ECON 201 or ECON 211 or ECON 222.

AGB 307 World Agricultural Resources (3)
World agricultural production areas with emphasis on natural and human resources, existing production, economic implications, population growth and potential food supply. 3 lectures. Prerequisite: AGB 212, ECON 201 or ECON 211 or ECON 222.

AGB 310 Agribusiness Credit and Finance (3)
Fundamentals of financing California’s agribusiness industry. Principles of making investment decisions and costs of credit. Developing credit strategies within the framework of sources of credit and types of loans available to farms, ranches, and other agribusiness firms. 3 lectures. Prerequisite: One quarter of accounting or farm records.

AGB 312 Agricultural Policy (3)
Agricultural policy objectives and formulation, resource allocation and production adjustments. Survey of State and Federal agricultural policy and the trade policies of other countries as they influence the planning and practices of agribusiness. 3 lectures. Prerequisite: AGB 212, ECON 201 or ECON 211 or ECON 222.

AGB 314 Fair Management (3)
Principles and procedures in organizing, managing and promoting fairs. Emphasis on California and Western fairs. Career opportunities, programs and problems in fair management and growth of fairs in America. A one-day field trip is required. 3 lectures. Prerequisite: Junior standing.

AGB 315 Land Economics (3)
Supply of land, population pressure on land, input-output relations affecting land use, economic returns, land values, development and investment costs, locational factors, conservation, institutional factors, leasing, land use planning, taxation, public regulations. 3 lectures. Prerequisite: AGB 212, ECON 201 or ECON 211 or ECON 222.

AGB 317 Agriculture–Consumer Relationships (3)
Basic facts, public opinion and ways of developing greater understanding of agriculture, its nature, characteristics, problems and relationship to nonfarm persons. Consumer education programs and procedures. Field trip is required. 3 lectures. Prerequisite: Upper division standing.

AGB 318 Agricultural Trade Policies (3)
Analysis of American trade policies and their relationship to agriculture. International trade pacts and their influence on agricultural production and marketing. 3 lectures. Prerequisite: AGB 212, ECON 201 or ECON 221 or ECON 222.
AGB 321 Farm Records (4)
Fundamentals of record keeping, kinds of records, inventory, depreciation, payrolls, cash and accrual basis of income tax reporting, financial statements and analysis. 3 lectures, 1 activity. Prerequisite: Upper division standing.

AGB 322 Principles of Farm Management (4)
Organization and operation of farm and ranch businesses. Identification of factors affecting profitability. Evaluation of the business for increased efficiency and profit. Application of budgeting to laboratory farms and independent analysis of a farm. 3 lectures, 1 activity. Prerequisite: AGB 321 or ACTG 211.

AGB 323 Agribusiness Managerial Accounting (4)
Agribusiness management with an emphasis on using accounting procedures that will provide useful information in making management decisions, setting objectives, and controlling operations. 3 lectures, 1 activity. Prerequisite ACTG 211.

AGB 324 Agricultural Property Management and Sales (4)
Economic, legal and real estate principles in the investment, development, mortgaging and transferring of agricultural real estate. 3 lectures, 1 activity. Prerequisite: AGB 310 or consent of instructor.

AGB 326 Farm Appraisal (4)
Methods of farm appraisal, use of county records, appraisal practice on different types of farms, discussions with professional appraisers. 3 lectures, 1 activity. Prerequisite: AGB 212, ECON 201 or ECON 222 and junior standing.

AGB 331 Farm Accounting (4)
Application of commercial accounting process to farm and ranch accounting problems. Emphasis on accounting systems that facilitate financial statement presentation, tax preparation and ADP enterprise analysis. Income tax laws pertaining to agriculture. 3 lectures, 1 activity. Prerequisite: ACTG 211.

AGB 336 Commodity Markets in Agribusiness (4)
Commodity market history, performance, and use in management of agribusiness. Techniques of analysis, hedging, speculation with applications to the agricultural business firm. 4 lectures. Prerequisite: AGB 212 or consent of instructor.

AGB 360 Agribusiness Research Methods (3)
Concepts of research methodology and data presentation in agribusiness. Emphasis on advanced computer applications to problems in the field. Selection of methodology compatible with the problem. 3 lectures. Prerequisite: STAT 212 or STAT 252.

AGB 400 Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head or instructor.

AGB 401 Agribusiness Labor Relations and Personnel Management (4)
Agricultural labor trends and problems as determined by changes occurring in farming and farm related industries. Labor-management relations in agriculture; principles and procedures in organizing and managing the agricultural business personnel program. 4 lectures. Prerequisite: Senior standing.

AGB 405 Agribusiness Marketing Research Methods (3)
Collecting, tabulating and analyzing data for use in market research and sales. Techniques for determining market potential. Surveys, trends, correlation, market factor derivation, test marketing. Routing techniques, sampling procedures. 3 lectures. Prerequisite: AG 250, AGB 304, STAT 212 or STAT 252.

AGB 406 Agribusiness Marketing Communication (3)
Principles, methods and materials for communicating ideas, information and skills to management, staff members, stockholders, customers and general public. Agricultural business public relations programs. Organization and presentation of surveys, studies, reports and publications. 2 lectures, 1 activity. Prerequisite: AGB 405, or consent of instructor.
AGB 409 California Agricultural Law (3)
Historical and current sources of law, examination of judicial systems, application of contracts, agency, labor law, torts, property and water law, partnerships, corporations and corporate finance applicable to agricultural enterprises. 3 lectures. Prerequisite: BUS 207, senior standing or consent of instructor.

AGB 410 Management Practices in Agricultural Lending (3)
Advanced loan analysis for major types of farms. Legal and tax ramifications in lending. Capitalization of agricultural lending institutions. Risk assessment and management for agricultural producers and their creditors. Interest rate expectations and effect on lender behavior. 3 lectures. Prerequisite: ACTG 211, AGB 310 and senior standing.

AGB 413 Crop Management Problems (3)
Management problems of crop farms and orchards. Crop enterprise costing procedures, equipment costing and replacement, scheduling of operations to obtain efficiencies. Determination of most profitable rotations and levels of input use. Planning for changes in operation, orchard development, investment analysis. 2 lectures, 1 activity. Prerequisite: AGB 322.

AGB 415 Livestock Management Problems (3)
Analysis of actual livestock enterprise. Budgeting a ranch by enterprises. Analysis of internal problems such as bull purchase economics, feed buying chart, feedyard economics, cattle price relationships, livestock systems. 2 lectures, 1 activity. Prerequisite: AGB 322.

AGB 416 Dairy Management Problems (3)
Analysis of actual dairy enterprise. Budgeting a dairy farm by enterprises. Analysis of problems such as load by load milk-feed analysis, value of milk quotas, most profitable concentrate to hay feeding. 2 lectures, 1 activity. Prerequisite: AGB 322.

AGB 418 U.S. and Asia Pacific Agricultural Trade (3)
Agricultural infrastructures and trade policies of major U.S. trading partners in the Asia Pacific region. Particular emphasis on Japan's influence on California agricultural trade. Cultural and geo-political influences on the development of agricultural policy in the Asia Pacific region. 3 lectures. Prerequisite: AGB 318 or consent of instructor.

AGB 421 Agribusiness 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 activity. Prerequisite: AG 250, AGB 213, STAT 212 or STAT 252.

AGB 427 Agricultural Estate Planning (3)
Principles and procedures in agricultural estate planning and conservation. Determining beneficiary needs, assets, valuation, and taxes. Utilizing wills, property transfers, gifts, insurance, business continuation agreements, trusts and other tools in estate planning. 3 lectures. Prerequisite: Senior standing.

AGB 431 Agricultural Price Analysis (3)
Application of statistical tools for price analysis. Emphasis on price making process for specific agricultural commodities. Utilization of market reports and production estimate data in price forecasting and analysis. 2 lectures, 1 activity. Prerequisite: AG 250, STAT 212 or STAT 252.

AGB 433 Linear Programming in Agriculture (3)
Application of linear programming to modern commercial agriculture; assumptions and data requirements; graphic and simplex solutions; preparation, coding and solutions of models simulating current problems. 2 lectures, 1 activity. Prerequisite: AG 250, AGB 213.

AGB 440 Field Studies in Agribusiness (2)
Visitation to selected agribusinesses. Organization, operation, services and problems considered. Miscellaneous course fee required—see Class Schedule. Prerequisite: Senior standing or consent of instructor. Can only be taken once for credit in the major.
AGB 445 Produce Marketing (2)
Directed group study of fresh fruit and vegetable marketing. Includes analysis of terminal markets, retail marketing (supermarkets, farmer's markets, roadside stands), limited preserving and ripening, grading and inspection, economics of transportation, international marketing. 2 seminars. Prerequisite: Senior standing and AGB 304.

AGB 450 Agribusiness Strategy Formulation (4)
Development of strategy for farms and farm-related businesses where uncontrollable environment makes output and results highly unpredictable; emphasis on the total enterprise. Case analysis. 4 lectures. Prerequisite: Senior standing and AGB 323.

AGB 455 Advanced Fair Management Seminar (2)
Advanced studies in fair management with emphasis on budgets, contracts, entertainment, carnivals, exhibit programs, crowd control, master planning maintenance. 2 seminars. Prerequisite: AGB 314.

AGB 460 Research Methodology in Agribusiness (1)
Empirical application of the scientific method as it relates to the design and development of Senior Project. 1 seminar. Prerequisite: Senior standing.

AGB 461, 462 Senior Project (2) (3)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: Senior standing and AGB 460.

AGB 463 Undergraduate Seminar (2)
Individual or group presentation for discussion of subjects and problems within the agribusiness field. 2 seminars. Prerequisite: Completion of AGB 461.

AGB 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

AGB 471 Selected Advanced Laboratory (1-3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

AGB 510 World Agricultural Development (3)
Special problems of agriculture in less-developed countries considering the role of economic, social and institutional policies in directing development. 3 seminars. For students in M.S. in Agriculture Program/Specialization in International Agriculture Development.

AGB 515 International Agricultural Marketing (3)
Organization and function of international agricultural markets with emphasis on developing countries. Factors inhibiting development of an improved agricultural market structure. 3 seminars. Prerequisite: AGB 510.

AGB 516 Agricultural Program Management in Developing Countries (3)
Overall context of decision making by program managers in developing countries. Case studies and proposal writing for effective program management. 3 seminars. Prerequisite: AGB 510, AGB 515.

AGB 524 Agribusiness Managerial Leadership and Communication (4)
Current issues in agriculture addressed through the case analysis method. Emphasis on communication skills and leadership qualities, identifying key success requirements. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

AGB 544 Advanced Farm and Ranch Management (4)
Application of microeconomic, quantitative, and qualitative methods to the evaluation of problems peculiar to the management of the agricultural production unit. Emphasis on methods which will strengthen decision making for efficient resource utilization to enhance quantity and minimize cost of production. 4 seminars. Prerequisite: Graduate standing or consent of instructor.
AGB 553  Agribusiness Policy and Program Analysis (4)
Economic, political, and social objectives of domestic agricultural policies and programs. Consequences of government's policies and programs to control production, allocate resources, support market prices, and provide benefits to food and fiber producers, marketers, and consumers. Topical analysis of current effort of government to direct agriculture. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

AGB 554  Managing Price Risk in Agribusiness (4)
Examination of alternatives available to the agribusiness manager to manage price risk. Use of forward contracts, cooperative seasonal pools, and hedging with futures contracts and options. Futures markets, their function and operation. Analysis of cash-futures price relationships, hedging guidelines, and other topics necessary for successful hedge program execution. Student involvement in a speculation and hedging simulation. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

AGB 563  Agricultural Trade and Market Development (4)
Changing agricultural trade prospects in a dynamic world economy. Interface between strategies of government and private firms to create and expand foreign markets for U.S. agricultural products. Impacts of agricultural trade policies, agricultural market development, and the activities of agricultural export marketing firms. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

AGB 581  Graduate Seminar in Agribusiness (3)
Group study of selected developments, trends and problems in the field. 3 seminars. Prerequisite: Graduate standing.

AGED-AGRICULTURAL EDUCATION

AGED 202  Introduction to Agricultural Education (2)
Overview of agricultural education programs including goals and purposes. Kinds of classes and types of programs. Qualifications essential to success in teaching agriculture. Planned program of studies to meet requirement for teaching. 2 lectures.

AGED 220  Agriculture Youth Conferences (2) (CR/NC)
Problems encountered and practices applied during the conduct of the annual FFA State Convention. Methods, procedures and materials adapted for use by the student in developing the committee system to produce conferences, conventions and/or workshops of all kinds and sizes. Total credit for AGED 220 and AGED 221 limited to 6 units. Credit/No Credit grading only. 2 activities. Prerequisite: Consent of instructor.

AGED 221  Agriculture Youth Conferences (3) (CR/NC)
Problems encountered and practices applied during the conduct of the annual FFA State Convention. Methods, procedures and materials adapted for use by the student in developing the committee system to produce conferences, conventions and/or workshops of all kinds and sizes. Total credit for AGED 220 and AGED 221 limited to 6 units. Credit/No Credit grading only. 3 activities. Prerequisite: Consent of instructor.

AGED 303  F.F.A. Programs and Activities (2)
Implementation processes and operational procedures for conducting an F.F.A. Chapter activities program appropriate to community, school and student needs. F.F.A. leadership training, proficiency awards, foundation programs and educational field days. 2 activities. Prerequisite: AGED 202 and consent of instructor.

AGED 339  Supervised Agricultural Experiences (2)
Application of the principles and practices for initiating, conducting and integrating Supervised Occupational Experience Programs (S.O.E.P.) for vocational agricultural students. Student and instructor record keeping, S.O.E.P., management, and relationships between F.F.A. and S.O.E.P. will be demonstrated and practiced. 2 activities. Prerequisite: AGED 202 or consent of instructor.

AGED 350  Undergraduate Field Experience (1) (CR/NC)
Presentations and group discussions of activities and programs unique to teaching vocational agriculture in California secondary schools. Credit/No Credit grading only. 1 lecture. Prerequisite: AGED 202 or consent of instructor. Concurrent: AGED 351.
AGED 351  Undergraduate Field Experience (1) (CR/NC)
Observation of the practices and techniques utilized by vocational agriculture teachers in conducting organized instruction in vocational agriculture classrooms, shops, school farms, laboratories. SOEP visits and FFA activities. Credit/No Credit grading only. Prerequisite: AGED 202 or consent of instructor. Concurrent: AGED 350.

AGED 404  Agricultural Leadership (2)
Emphasis is upon equipping current and prospective leaders in agriculture with the background and skills to achieve their potential. Class members will be encouraged to assess their status as leaders and to identify means whereby their effectiveness can be improved. Prerequisite: PSY 201 or PSY 202.

AGED 410  Computer Applications in Agricultural Education (2)
Development of computer literacy for teaching agriculture. Analysis and specialization of hardware. Instruction in video and telecommunication technology, CATI and Agridata network systems and software applicable to vocational agriculture. Recommended for Agricultural Science majors and required for teaching credential candidates. Prerequisite: AG 250 or CSC 110 and consent of instructor.

AGED 412  Teaching Resources (1)
Survey of teaching resources for the vocational agriculture teacher. Utilization of time management principles in the development of effective course and unit planning. Systematic filing practices, use of audiovisual materials. 1 lecture. Prerequisite: Senior standing.

AGED 424  Organizing and Teaching Agriculture (3)
Determining course objectives, content, and calendar for use by the teacher in classroom, shop and field instruction while assigned to community schools. Concurrent with student teaching. 3 activities. Prerequisite: AGED 438 and consent of instructor.

AGED 438  Instructional Processes in Agricultural Education (3)
Preparation for student teaching in agriculture. Orientation to classroom situation. Development of plans for teaching including daily lessons and unit plans; utilization of source information and resources. Class demonstration in teaching procedures; analysis and evaluation. 1 lecture, 2 activities.

AGED 440  Student Teaching in Agricultural Education (6-12) (CR/NC)
Off-campus assignment to a selected cooperating public school. Participation in all phases of agriculture teacher duties and activities including departmental organization and administration. Prior approval and appointment necessary. Total credit limited to 18 units. Credit/No Credit grading only.

AGED 441  Student Teaching Practicum (2)
Problems encountered and practices applied during student teaching. Methods, procedures and materials adapted for use by the teacher concurrent with student teaching. 2 activities. Prerequisite: Consent of instructor.

AGED 461, 462  Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

AGED 463  Undergraduate Seminar (2)
Group discussion of current agricultural education topics presented by individual class members. Topics or papers presented by guest speakers. Placement opportunities and requirements. 2 seminars.

AGED 470  Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

AGED 471  Selected Advanced Laboratory (1-3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.
AGED 513  Field Experience—Vocational Agriculture (1–3)
Practice and techniques in management and supervision of vocational agriculture programs. Relationships among students, staff, community and school groups. Budgeting, staffing, records, reporting. Student activities and Future Farmers of America programs. Total credit limited to 6 units. Prerequisite: Prior approval and appointment.

AGED 520  Program Development in Agricultural Education (3)
Development of up-to-date approaches to a total integrated program based on occupational opportunities and community needs. Philosophy, organization and administration of agricultural education programs. Development in such areas as curriculum, supervised occupational experience, Future Farmers of America, and summer programs. 3 seminars.

AGED 522  Instructional Programs in Agricultural Mechanics (3)
Organizing the vocational agriculture mechanics curriculum and determining course content. Student demonstrations and presentations; evaluation and analysis. 1 seminar, 2 laboratories.

AGED 580  Special Problems in Agricultural Education (1–3)
Individual study of modern issues and problems conducted through research, planning and development. Field problems and in-service study in agricultural industry encouraged. Final written report required. Total credit limited to 9 units with not more than 3 units in any one quarter. Prior approval of instructor required.

ANT–ANTHROPOLOGY

ANT 201  Cultural Anthropology (3)  GEB D.4.a.
Meaning and significance of culture to human beings. Examination of how cultures differ in their impact on behavior. How cultures develop and change. 3 lectures.

ANT 202  World Prehistory (3)
Development of human cultures in both the Old and New Worlds from the earliest times until the dawn of history; cultural growth. 3 lectures.

ANT 203  Physical Anthropology (3)

ANT 310  California Archaeology (3)
California Indians. Field studies in locating, surveying, and analyzing aboriginal sites. Site excavation. Laboratory techniques for recording, preserving, and reporting of artifacts. Relating observations and finds to the natural environment in which a site is located. Integrating knowledge of natural and social sciences to use of archaeology. 2 lectures, 1 laboratory. Prerequisite: ANT 201 or consent of instructor.

ANT 325  Material Culture (3)
Description of processes of invention and diffusion. Role of environment and primitive technology on culture. Major preindustrial inventions and their social correlations. 3 lectures. Prerequisite: ANT 201 or consent of instructor.

ANT 333  Language and Culture (3)
Interrelationship between language and other facets of culture. Speech in its social setting. Emphasis on social and cultural factors which influence language variation and language diversity. 3 lectures. Prerequisite: ANT 201 or consent of instructor.

ANT 341  Comparative Societies (3)
Comparative study of contemporary peoples and cultures representing the major cultural types. 3 lectures. Prerequisite: ANT 201.

ANT 360  Human Cultural Adaptation (3)  GEB D.4.b.
Examination of social and cultural systems as means by which humans adapt to their physical, biotic and social environments. 3 lectures. Prerequisite: Any course in GEB area D.4.a.
ANT 401  Culture and Health (3)
Relationship between culture and health. Ecological factors influencing health and illness. Impact of Western culture on world health. Health systems throughout the world. Theories of causation, diagnosis methods, treatment modes. Care providers. Health-care needs of U.S. ethnic groups. 3 lectures. Prerequisite: ANT 201 or consent of instructor.

ANT 420  Development Anthropology (3)
Application of the basic concepts of anthropology to problems of development. Major theories of change and development. Sociocultural dimensions of economic development. Context of development in the Third World. Roles that anthropologists and other social scientists play in the development process. 3 lectures. Prerequisite: ANT 201 or consent of instructor.

ANT 444  Sex, Death and Human Nature (3)
How Darwinian processes of differential reproduction and mortality influence human interests, passions, and behaviors. Theories of inclusive fitness, parental investment and senescence. Sex differences, sexual attraction, life histories, violence and aggression, including rape, homicide and infanticide. 3 lectures. Prerequisite: One upper division ANT course or consent of instructor.

ANT 450  Area Studies (3)
Comparative analysis of cultures within a selected region (e.g., Southeast Asia, Subsaharan Africa). Class Schedule will list topic selected. Total credit limited to 12 units. 3 lectures. Prerequisite: ANT 201 or consent of instructor.

ANT 470  Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topics selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

ARCE—ARCHITECTURAL ENGINEERING

ARCE 221  Elementary Structures (3)
Forces on building structures. Static equilibrium and stability of structural systems. Shear and bending moment diagrams. 3 lectures. Prerequisite: PHYS 131, MATH 142.

ARCE 222  Mechanics of Structural Members I (3)
Stress-strain relationships. Stresses and deformations in structural members due to axial force, shear, torsion, and moment. 3 lectures. Prerequisite: ARCE 221.

ARCE 223  Mechanics of Structural Members II (3)

ARCE 226  Structural Systems for Architects (3)
Concepts of structural integrity and stability, structural subsystems, methods of analysis. 3 lectures. Prerequisite: ARCE 222.

ARCE 227  Structural Analysis I (2)
Analysis of statically determinate trusses, beams, frames, cables, and arches. 2 lectures. Prerequisite: ARCE 221.

ARCE 240  Additional Engineering Laboratory (1-2)
Total credit limited to 4 units, with a maximum of 2 units per quarter. 1 or 2 laboratories.

ARCE 302  Structural Analysis II (3)

ARCE 303  Steel Design I (3)
Analysis and design of steel structural members subjected to bending, shear and axial forces. 3 lectures. Prerequisite: ARCE 223
ARCE 304 Timber Design (3)
Analysis and design of timber structural members subjected to bending, shear, and axial forces. Wood diaphragms, shear walls and their connections. 3 lectures. Prerequisite: ARCE 223.

ARCE 305 Masonry Design (2)
Design of load-bearing walls, shear walls, columns and beams in masonry. 2 lectures. Prerequisite: ARCE 223.

ARCE 306 Matrix Analysis of Structures (3)
Analysis of statically indeterminate structures by direct stiffness method including continuous beams, plane trusses, and introduction to three-dimensional structures. 3 lectures. Prerequisite: ARCE 302.

ARCE 309 Survey of Soil Mechanics and Foundation Engineering (3)
Fundamentals of foundation engineering, evaluation of soil reports, principles of determination of bearing capacity, soil classification, selection of types of foundations, evaluation of expansive properties of foundation soils, discussion of basic laboratory tests. 3 lectures. Prerequisite: ARCE 226.

ARCE 311 Structures for Landscape Architects (3)
Structural concepts related to landscape architecture. Design of retaining walls, decks, trellises, bridges and large-scale covered spaces. 3 lectures.

ARCE 321 Timber Design (3)
Design of timber structures. Limitations and potential of the material in relation to the design and construction process. For architecture and construction students. 2 lectures, 1 laboratory. Prerequisite: ARCE 226, ARCH 232.

ARCE 322 Steel Design (3)
Design of steel structures. Limitations and potential of the material to the design and construction process. For architecture and construction students. 2 lectures, 1 laboratory. Prerequisite: ARCE 226, ARCH 232.

ARCE 323 Concrete and Masonry Design (3)
Design of reinforced concrete and masonry structures. Limitations and potential of the material to the design and construction process. For architecture and construction students. 2 lectures, 1 laboratory. Prerequisite: ARCE 226, ARCH 232.

ARCE 325 Dynamics (3)
Static and dynamic loads, rigid body dynamics. Vibrations of spring-mass systems. Degrees of freedom and vibration modes. 3 lectures. Prerequisite: ARCE 221 and MATH 242.

ARCE 351 Structural Computing Applications I (1)
Introduction to word processing, graphics, spread sheets, and Basic programming. 1 laboratory. Prerequisite: CSC 251.

ARCE 352 Structural Computing Applications II (1)
Introduction to structural analysis software for personal computers. 1 laboratory. Prerequisite: ARCE 302, CSC 251.

ARCE 353 Structural Computing Applications III (1)
Introduction to structural analysis software for the main-frame computer. 1 laboratory. Prerequisite: ARCE 302, CSC 251.

ARCE 371 Structural Systems Laboratory (3)
Studies in the relationship of structural framing to overall building geometry with emphasis on the statical stability of structural configurations. 3 laboratories. Prerequisite: ARCE 223. Prerequisite or corequisite: ARCE 302.

ARCE 372 Steel Design Laboratory (3)
Design project utilizing structural steel. 3 laboratories. Prerequisite: ARCH 231 or ARCH 457 or ARCH 458 or ARCH 459. ARCE 302, ARCE 303, ARCE 352 or ARCE 353 and ARCE 371.
ARCE 400  Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

ARCE 403  Steel Design II (3)
Advanced topics in design of steel structures with emphasis on plate girders, plastic design of continuous beams and frames and composite steel-concrete design. 3 lectures. Prerequisite: ARCE 303, ARCE 372, or equivalent.

ARCE 412  Dynamics of Framed Structures (3)

ARCE 414  Precast Concrete (3)
Precast and prestressed concrete principles, materials and techniques of construction. Concrete mixes, forming, casting, finishing, curing and erection methods of precast concrete. Design potentials, aesthetics, cost and construction time as related to buildings and other structures. 3 lectures. Prerequisite: ARCE 323 or ARCE 444 or equivalent.

ARCE 421  Soil Mechanics (3)
Principles of soil mechanics, including rudiments of geology, soil classification, gravimetric and volumetric relations, compaction, methods and testing, shear strength of soil and strength theories. 2 lectures, 1 laboratory. Prerequisite: ARCE 222, GEOL 201 or consent of instructor.

ARCE 422  Foundation Design (3)
Soil-bearing capacity and settlement characteristics of soils. Sizing and design of spread footings. Design and analysis of earth-retaining structures. 3 lectures. Prerequisite: ARCE 421. Corequisite: ARCE 444.

ARCE 423  Advanced Foundation Design (3)
Design and analysis of beams on elastic foundations and mat foundations. Pile foundations and sheet pile retaining structures. 3 lectures. Prerequisite: ARCE 422.

ARCE 444  Reinforced Concrete Design I (4)
Theory and design of basic reinforced concrete elements: columns, beams, tee beams and one way slabs. 4 activities. Prerequisite: ARCE 371 and ARCE 372.

ARCE 445  Prestressed Concrete Design (4)
Design and analysis of prestressed concrete structures. 4 activities. Prerequisite: ARCE 444.

ARCE 446  Concepts of Advanced Structural Systems (3)
Concepts and issues involved in the design of complex structures including tall buildings, shells, arches and tension structures. 3 activities. Prerequisite: ARCE 371 or consent of instructor.

ARCE 447  Reinforced Concrete II (3)
Advanced topics in the design of concrete structures. 3 activities. Prerequisite: ARCE 444 or equivalent.

ARCE 451  Timber and Masonry Design Laboratory (3)
Design projects utilizing timber and masonry. Relationship of structural detailing to overall structural behavior. Production of structural calculations and drawings. 3 laboratories. Prerequisite: ARCE 304, ARCE 305, ARCE 371 or consent of instructor.

ARCE 452  Reinforced Concrete Design Laboratory (3)
Design projects utilizing reinforced concrete. Layout of the structure and preliminary design. Production of design calculations and structural drawings. Two-way slab design. 3 laboratories. Prerequisite: ARCE 444 or consent of instructor.

ARCE 453  Senior Integrated Design Project (3)
Projects by individuals or teams which involve, but are not limited to, physical modeling and testing of integrated design projects which may include students from other disciplines. 3 laboratories. Prerequisite: ARCE 451 and ARCE 452.
ARCE 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

ARCE 471 Selected Advanced Laboratory (1-3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

ARCE 480 Senior Seminar (1)
Discussion of selected topics that are of current interest to the structural engineering profession. 1 seminar. Prerequisite: Senior standing.

ARCE 481 Structural Models Laboratory (1)
Application of techniques of physical modeling to obtain solutions to structural design problems. 1 laboratory. Prerequisite: ARCE 226 or ARCE 302.

ARCE 483 Seismic Design (4)
Introduction to dynamic response analysis of building structures with emphasis on earthquake ground motion. Earthquake resistant design of buildings in accordance with building codes. Application of computer programs and physical models for seismic design. Laboratory studies utilizing physical models for studying the behavior of building structures subjected to simulated ground motions. 3 lectures, 1 activity. Prerequisite: ARCE 325, ARCE 371, CSC 331.

ARCE 490 History of Structures (3)
Tracing developments in structural materials, structural understanding and complete structures from ancient times through the industrial revolution and the present day. 3 lectures. Prerequisite: Junior standing.

ARCE 504 Finite Element Method for Building Structures (3)
Basic concepts of equilibrium and compatibility. Stiffness and flexibility properties of various types of finite elements. Development and application of displacement and force methods. Elastic stability and dynamic response of buildings to earthquake, wind, and moving loads. Use of finite-element computer programs. 3 lectures. Prerequisite: MATH 242, ARCE 306, or consent of instructor.

ARCE 521 Architectural Structures (3)
Static and dynamic loads, structural equilibrium and stability, structural configurations and systems, response to dynamic loads, behavior of structures. 2 seminars, 1 activity. Prerequisite: Graduate standing in Architecture.

ARCE 522 Structural Systems (3)
Exploration of the relationship between structural systems and architectural form. Understanding of structural stability and structural order is developed through construction of a series of small scale models. Historical perspectives are presented along with the effects of available materials and technology on structural possibilities. 3 seminars. Prerequisite: Graduate standing in Architecture.

ARCE 523 Seismic Design for Architects (3)
Introduction to the earthquake resistant design of buildings. Observed behavior of buildings during earthquakes. Recent developments of seismic design procedures, provisions, and building codes. Influence of architectural form on seismic response. 3 lectures. Prerequisite: Graduate standing in Architecture.

ARCH—ARCHITECTURE

ARCH 106 Materials of Construction (3)
Use and application of construction processes and materials. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory.

ARCH 111 Introduction to Drawing and Perspective (3)
Basic techniques used in graphic communication. Orthographic and isometric projection. Mechanical perspective, shades and shadows. 3 laboratories.
ARCH 112 Basic Graphics (3)
Drawing as a communication tool in the environmental design fields. Exercises to develop basic skills and speed in the representation of ideas. Use of various drawing media. 3 laboratories. Prerequisite: ARCH 111, or consent of instructor.

ARCH 113 Graphic Analysis and Communication Skills (3)
Further development of freehand graphic communication skills for representation of conceptual ideas analysis, and design concepts. Demonstrates the link between graphics, design process and communications. 3 laboratories. Prerequisite: ARCH 111, ARCH 112.

ARCH 202 Creative Problem-Solving (3)
Techniques for stimulating creative behavior applied to general and environmental problems. Development of problem-solving and decision-making skills and knowledge. 3 lectures.

ARCH 204 Architectural Theory (3)
Theories of architectural design. 3 lectures. Prerequisite: EDES 101.

ARCH 207 Environmental Control Systems I (4)
Theory and application of climate, energy use and comfort as determinants of architectural form. Emphasis on architectural methods of ventilating, cooling, heating, and lighting for envelope-load dominated buildings. 2 lectures, 2 laboratories. Miscellaneous course fee required—see Class Schedule. Prerequisite: PHYS 131, PHYS 132, PHYS 137.

ARCH 206, 209 Architectural Design Basics (2) (2)
Introduction to the elements and theories of the environmental and architectural design processes. 2 laboratories. Prerequisite: ARCH 112.

ARCH 219 History of Architecture (3)
Architectural design theories and practices of late 19th and 20th century to the present including Beaux Arts, Art Nouveau, Expressionism, de Stijl, International Style, Facist ideologies, Regionalism, post-World War II amalgamations of twentieth century idioms and recent reactions to contemporary standardization. 3 lectures. Prerequisite: ENGL 114 and HIST 204.

ARCH 231 Architectural Practice (3)
Wood construction methods and processes. Construction documents used as communication medium for such methods and processes. Miscellaneous course fee required—see Class Schedule. 3 laboratories. Prerequisite: ARCH 106 and ARCH 111.

ARCH 240 Additional Architectural Laboratory (1–2)
Total credit limited to 4 units, with a maximum of 2 units per quarter. 1 or 2 laboratories.

ARCH 250 Computer Applications (3) GEB F.1.
Introduction to the application of computers in architecture. Operating systems, applications, graphics systems. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory.

ARCH 251 Environmental Design Fundamentals (5)
Development of abilities in environmental perception, techniques for analysis of the built environment, creative problem solving techniques and appropriate communication skills. 5 laboratories. Prerequisite: ARCH 111, ARCH 112, ARCH 113. EDES 101 or consent of department head.

ARCH 252, 253 Architectural Design Fundamentals (5) (5)
Continuation of ARCH 251. Development of concepts pertaining to architectural form, space, structure, and organization. Consideration of function, site, climatic forces, and contextual issues which shape the built environment. One designated field trip required. 5 laboratories. Prerequisite: ARCH 251.

ARCH 270 Selected Topics (1–3)
Directed group study of selected topics. Class Schedule will list topic selected. Open to first-, second-, third-year students. Total credit limited to 6 units. 1 to 3 lectures.

ARCH 302 Principles of Architectural Design (3)
Basic theory of the art of architecture and its application in architectural design. 3 lectures. Prerequisite: ARCH 204.
ARCH 307 Environmental Control Systems II (4)
Theory and application in the integration of environmental control systems and architectural form. Comprehensive techniques for achieving an architecture of the well-tempered environment. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: ARCH 207, ARCH 250.

ARCH 310 Architectural Design Methods and Theories (4)
Analysis of design process, methods of analysis, synthesis, and evaluation in design. Relation between methods used and theories of design. 4 lectures. Prerequisite: ARCH 253.

ARCH 312 Home and Community Design (3) GEB F.2.
Historical development of the home and city and the effect of location, climate, social and technological factors on homes and cities. Considerations and design methodology; furniture, landscape, and relation of home to community environment. For non-Architecture majors. 3 lectures. Prerequisite: Junior standing.

ARCH 313, 314, 315 Advanced Delineation (2) (2) (2)
Development of proficiency in architectural presentation. Projects and critiques. 2 laboratories. Prerequisite: ARCH 253.

ARCH 316 California Architecture and the California Dream (3) GEB C.3.
Development of California Architecture as the symbolic expression of the myth of the California Dream. Focus on tracing California's unique contribution to architecture and urban patterns in the United States. 3 lectures. Prerequisite: ENGL 114.

ARCH 317 History of Architecture (3) GEB C.3.
Architecture of the Ancient Near East, Egypt, Greece, Rome, Ancient America, China, Japan, India and Islam. Philosophies and conditions which influenced the built environment. 3 lectures. Prerequisite: ENGL 114.

ARCH 318 History of Architecture (3) GEB C.3.
European architecture of the Middle Ages and the Early Renaissance. 3 lectures. Prerequisite: ENGL 114.

ARCH 319 History of Architecture (3) GEB C.3.
European Architecture AD 1500 to AD 1900 including European Colonial expansion. 3 lectures. Prerequisite: ENGL 114.

ARCH 341, 342 Architectural Practice (4) (4)
Construction systems in masonry, steel, and concrete and combinations of these materials. Preparation of outline specifications. Production of design development drawings. 2 lectures, 2 laboratories. Prerequisite: ARCH 231, ARCH 233, ARCH 253. Concurrent enrollment recommended in: ARCH 351, or ARCH 352, or ARCH 353.

ARCH 337 Photographic Presentation (2)
Media presentations in architecture with emphasis on black and white and color print photographic presentations, formats, and techniques applicable to architecture subjects and to design communication. 1 lecture, 1 laboratory. Prerequisite: ARCH 111, ARCH 112, ARCH 113, ART 221 or equivalent.

ARCH 338 Media Presentations in Architecture (2) (CR/NC)
Media presentations in architecture with emphasis on photographic color slide presentations, formats and techniques applicable to architectural subjects and to design communication. For students in SAED. Credit/No Credit grading only. 1 lecture, 1 laboratory. Prerequisite: ARCH 111, ARCH 112, ARCH 113.

ARCH 339 Video Presentations in Architecture (2) (CR/NC)
Media presentations in architecture with emphasis on video format and creative camera and editing techniques as applicable to subjects in architecture and design communication. Open to students in SAED. Credit/No Credit grading only. 1 lecture, 1 laboratory. Prerequisite: ARCH 111, ARCH 112, ARCH 113.
ARCH 350 Computer Applications in Architecture (3)
Applications of computer systems to large-scale data processing, analysis, optimization and evaluation of design program elements. 2 lectures, 1 activity. Prerequisite: ARCH 250.

ARCH 351, 352, 353 Architectural Design (5) (5) (5)
Continuation of ARCH 253. Development and exploration of architectural theories, building systems, and design processes involved in creating appropriate architecture. Miscellaneous course fee required—see Class Schedule. 5 laboratories. Prerequisite: ARCE 226, ARCH 231, ARCH 253. Concurrent enrollment required in ARCH 341 or ARCH 342.

ARCH 358 Prefabrication (2)
History, theory and application of factory fabricated building systems. Materials and techniques, creative design by such methods. 1 lecture, 1 laboratory. Prerequisite: Third-year standing.

ARCH 400 Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

ARCH 401 Toward a Barrier-Free Environment (3)
Exploring the interface between the built environment and human behavior. Physical and psychological design determinants. Attitudes towards deviancy, accessible environments and persons with disabilities. Legal, ethical, human factors. 3 lectures. Prerequisite: Junior standing or consent of instructor.

ARCH 407 Environmental Control Systems III (4)
Theory and application of mechanical and electrical systems for comfort. Emphasis on internal-load dominated buildings. Consideration of artificial lighting, H.V.A.C. systems, acoustics, water and waste systems. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: ARCH 307.

ARCH 411 Climatic Determinants of Building Design (2)
Influence of solar radiation and climatic conditions on siting and design of buildings. Architectural principles and energy conservation. 2 lectures. Prerequisite: PHYS 132, ARCH 309.

ARCH 413 The Built Environment: Issues and Education (3)
Identification of major issues in the design and creation of the built environment. Strategies for developing instructional units related to critical thinking and problem solving in the K-12 school setting. 1 lecture, 2 activities. Prerequisite: Junior standing.

ARCH 441, 442 Professional Practice (3) (3)
Basic elements of architectural practice. Office organization, procedures, contracts, specifications; construction cost analysis and comprehensive client services. Professional ethics. 1 lecture, 2 activities. Prerequisite: ARCH 353 and concurrent enrollment in ARCH 452 or ARCH 453.

ARCH 445 Urban Design in Architecture (3)
Design role of the urban architect. Economic, environmental and technological forces impacting on architectural practice in urban areas. 3 lectures. Prerequisite: ENGL 114.

ARCH 446 The Small Scale Master Builder (4)
Principles of practice as owner-designer-builder, selling or leasing products. Comparison with traditional practice. Potential income, constraints on design decisions, and ethics. Analysis of factors and methods relevant to such practice, including financing, taxes, accounting, market analysis, and development potential. Starting with little or no capital. 4 lectures. Prerequisite: Fourth-year standing.

ARCH 447 Design Regulations (3) (Also listed as CRP 447)
Practical application of fundamental building code requirements and zoning regulations in the design process. Codes and regulations used including city zoning regulations, city parking and driveway standards, the Uniform Building Code, and architectural barrier laws. 3 lectures. Prerequisite: ARCH 342.
ARCH 451 Architectural Design (5)
Continuation of ARCH 351, 352, 353. Problems of increasing architectural complexity involving the comprehensive integration of architectural theory, design processes, and building systems with emphasis placed on multifunction singular buildings. Miscellaneous course fee required—see Class Schedule. 5 laboratories. Prerequisite: ARCH 307, ARCH 342, ARCH 351, ARCH 352, ARCH 353, ARCE 321, ARCE 322, ARCE 323.

ARCH 452 Architectural Design (5)
Continuation of ARCH 351, 352, 353. Problems of increasing architectural complexity involving the comprehensive integration of architectural theory, design processes, and building systems with emphasis placed on multibuilding, multifunctional projects. Miscellaneous course fee required—see Class Schedule. 5 laboratories. Prerequisite: ARCH 307, ARCH 342, ARCH 451, ARCE 321, ARCE 322, ARCE 323.

ARCH 453 Architectural Design (5)
Continuation of ARCH 351, 352, 353. Problems of increasing architectural complexity involving the comprehensive integration of architectural theory, design processes, and building systems with emphasis placed on multibuilding, multifunctional projects in an urban context. Miscellaneous course fee required—see Class Schedule. 5 laboratories. Prerequisite: ARCH 307, ARCH 342, ARCH 452, ARCE 321, ARCE 322, ARCE 323.

ARCH 455 Human Factors Applications in Architecture (3)
Human factors applications: human factors taxonomy, standardized information system, ergonomic research methods, evaluation procedures, and application strategies. 3 lectures. Prerequisite: Consent of instructor.

ARCH 457 Computer Graphics in Architecture I (2)
CAD on the Macintosh. 2D and 3D applications. Computer graphics and associated architectural applications. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 laboratory. Prerequisite: ARCH 250.

ARCH 458 Computer Graphics Applications in Architecture II (2)
Computer graphics techniques on the IBM, 2D and 3D. Computer graphics and associated architectural applications. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 activity. Prerequisite: ARCH 250.

ARCH 459 Computer Graphics Applications in Architecture III (2)
Application computer programming in advanced areas of architectural applications with emphasis in integrated data processing techniques, office automation, computer aided design, graphics and office communication as pertaining to architectural practice on the mainframe computer. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 activity. Prerequisite: ARCH 250.

ARCH 463 Undergraduate Seminar (2) (CR/NC)
Discussion and lectures on problems of practice in architecture. Professional ethics. Students present organized material on some subject of interest in architecture. 2 seminars. Prerequisite: Fourth-year standing in architecture. Credit/No Credit grading only.

ARCH 470 Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

ARCH 471 Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

ARCH 480 Special Studies in Architecture (1–12)
Special issues and problems through research, field trips, design projects, and other forms of investigation and involvement. Course requirements are determined prior to each individual project through a contractual agreement between students and department. The departmental Off Campus Study Guidelines apply except when superceded by guidelines and practices of the London Study Program of the School of Liberal Arts. Total credit limited to 36 units. Prerequisite: Junior standing.
ARCH 481  Senior Architectural Design Thesis Project (6)
Comprehensive building design and research project in an architectural concentration area. Demonstration of professional competency in integration of architectural theory, principles and practice with creative, organizational and technical abilities in architectural programming, design and design research. Total credit limited to 18 units, with a maximum of 6 units per quarter. Miscellaneous course fee required—see Class Schedule. 6 laboratories. Prerequisite: ARCH 442, ARCH 453 and fifth year standing.

ARCH 491  Design Project (2)
Comprehensive architectural design project chosen by the student to challenge technical, creative, and organizational abilities. Project to involve community or field contact on a team basis. Construction or projects involving other disciplines encouraged. 2 laboratories. Prerequisite: Fifth-year standing.

ARCH 501  Environmental Control Systems (3)
Comparative analysis and evaluation of mechanical and electrical building systems in high-rise and special purpose low-rise buildings. 3 seminars. Prerequisite: ARCH 407.

ARCH 510, 511  Environmental Design Methods (3) (3)
Application of systematic, step-by-step procedures to rational and intuitive judgmental tasks. Methods for formulation, idea production, evaluation, and testing applied to planning, testing, design information systems, communication between designer and client, user participation in design, and other current topics. 511 focuses on specific problem area among topics and may be repeated up to 9 units. 3 lectures. Prerequisite: Graduate standing.

ARCH 513  Natural Architectural Lighting (3)
Perception and awareness of light; natural light as generator of urban spaces and building forms. Principles of design in lighting fundamentals and techniques. 3 lectures. Prerequisite: ARCH 407 or consent of instructor.

ARCH 519  Theory of Architecture (3)
Comparative analysis of the major historic influences which have contributed to the development of architectural design theories. Class Schedule will list topic selected. Total credit limited to 9 units. 2 lectures, 1 seminar. Prerequisite: ARCH 319 or graduate standing.

ARCH 531  Habitability (3)
Habitability standards and concepts significant for architectural design and practice. Behavioral analysis of habitats, facilities and urban systems. Design and development of structures and systems responsive to human needs. Habitability and environmental specifications, human factors, human engineering, behavioral sciences. 3 seminars. Prerequisite: ARCH 453.

ARCH 532  Quantitative Methods in Architecture (3)
Roles of research in environmental design analysis. Approaches to research, hypothesis testing, data banks, and information systems for design. Use of research findings in various decision-making systems. 3 seminars. Prerequisite: Graduate standing.

ARCH 533  Architectural Programming (3)
Information management in the design process. Techniques for gathering, analyzing, and transforming data for use as design information. Variety of approaches to pre-design planning. 3 seminars. Prerequisite: ARCH 453.

ARCH 537  Principles of Development (3)
Theory and application of the architect’s role in real estate development. Topics include financing, corporate structuring, feasibilities, market studies, and proposal presentation. Emphasis on the influence of design on the success of the development process. 3 seminars. Prerequisite: Graduate standing in Architecture, or consent of instructor.

ARCH 551  Architectural Design (5)
Professional initiative and responsibility in integrating architectural design theory and practice with fields influencing the total environment. Building types considered as the coordinating factor. Total credit limited to 15 units with no more than 5 units in any one quarter. 5 laboratories. Prerequisite: Graduate standing.
ARCH 561  Advanced Design (3)
Continuation of ARCH 551. Advanced studies integrating architectural design theory and practice with fields influencing the shaping of the total environment. Total credit limited to 9 units. 3 laboratories. Prerequisite: Graduate standing.

ARCH 563  Professional Seminar (2)
Problems and topics in the field of the architectural profession. Seminar drawn upon expertise of visiting professionals in addition to topics presented by regular faculty and students. 2 seminars. Prerequisite: Graduate standing.

ARCH 580  Seminar in Theory of Architecture (3)
Directed group study of selected topics in the theory of architecture for graduate students. Class Schedule will list specific topics selected. Total credit limited to 9 units. 3 seminars. Prerequisite: ARCH 453.

ARCH 598  Master's Design Project (3-6)
Completion of an architectural design project demonstrating individual creative ability at an advanced level. Total credit limited to 9 units. 3 or 6 laboratories. Prerequisite: Consent of graduate adviser, consent of graduate committee, and ARCH 561.

ARCH 599  Master's Thesis (3-6)
Completion of a thesis embodying original research in an area of environmental design. Total credit limited to 9 units. Prerequisite: Consent of graduate adviser, consent of graduate committee and ARCH 561.

ART

Analysis, history and practice of the art of drawing. Drawing problems progress from simple geometric shapes to more sophisticated subject matter, expanding visual awareness. Lectures on historical methods and the importance of drawing. Development of individual techniques. 1 lecture, 3 activities.

ART 104  Introduction to Art Materials (3)
Manipulation and experimentation with a wide variety of art media and techniques. Evaluation of expressive and design qualities in group and individual projects. 3 activities.

ART 108  Fundamentals of Sculpture (4)  GEB C.2.
Three-dimensional form through problems in modeling, casting, carving and assembly. Emphasis on expression, aesthetics and history. Miscellaneous course fee required—see Class Schedule. 1 lecture, 3 activities.

ART 111  Introduction to Art (4)  GEB C.2.
Designed to acquaint the non-art major with painting, sculpture, drawing, crafts, architecture, and printmaking. Development of vocabulary, analytic skills, and research techniques for the understanding of art objects. 4 lectures.

ART 112  Survey of Western Art (3)  GEB C.2.
History of major art movements in western civilization from Greek art to the present. Representative periods of western culture, such as the Classic tradition, the Middle Ages, the Italian Renaissance, the Renaissance in Northern Europe, Baroque and Rococo, Romanticism, Neo-Classicism and Modernism. 3 lectures.

ART 131  2-Dimensional Design Fundamentals (3)
Basic design theory in black, white and greys covering the visual elements and principles in two dimensions. 1 lecture, 2 activities.

ART 132  Beginning Color Theory (3)
Basic design color theory developed through exercises in hue, value and intensity. 1 lecture, 2 activities. Prerequisite: ART 131.
ART 133  Color and Design (3)
Advanced color problems in two-dimensional design theory covering compositional, optical and psychological aspects of visual communication. 1 lecture, 2 activities. Prerequisite: ART 131, ART 132.

ART 134  3-Dimensional Design I (3)
Research in application of principles and elements of three-dimensional design concepts. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories.

ART 135  3-Dimensional Design II (3)
Exploration of 3-dimensional forms and materials. Introduction of product design including concept and assembly methods. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories. Prerequisite: ART 134.

ART 200  Special Problems for Undergraduates (1–2)
Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of instructor.

ART 201  Intermediate Drawing (3)
Development of additional drawing techniques with emphasis on form and composition. 3 activities. Prerequisite: ART 101.

ART 204  Beginning Watercolor (3)
Transparent watercolor painting. Course emphasizes: proper use of watercolor paper, brush techniques, pigment mixing, use of color, use of washes, wet-into-wet, indirect methods, composition and presentation. 3 activities. Prerequisite: ART 101.

ART 206  Printmaking Techniques—Intaglio (3)
The major intaglio processes for fine art prints. Technical surveys, expressive principles, history and production. Engraving, etching, aquatint, drypoint, softground, lift-ground, mezzotint, collograph, and embossing techniques included. Presentation, preservation, equipment maintenance and safety will be covered. 3 activities. Prerequisite: ART 133 and ART 201.

ART 207  Printmaking Techniques—Serigraphy (3)
The major silkscreen processes for fine art prints. Technical surveys, expressive principles, history, and production. Processes covered include: paper stencil, cut film stencil, tusche-glue stencil, and photo stencil. Frame construction, paper preservation, and presentation techniques will be included. 3 activities. Prerequisite: ART 133 and ART 201.

ART 211  Art History—Prehistoric through the European Middle Ages (4)
Nature and development of outstanding works of art from ancient cultures in Europe, Egypt and the Eastern Mediterranean. Emphasis upon the study of painting, sculpture and related visual arts that coincide with historical background factors. 4 lectures.

ART 212  Art History—European Renaissance through Baroque Eras (4)
Studies concentrate upon significant visual expressions of the Renaissance and Baroque eras in painting, sculpture and architecture. Relevancy of historical background factors to art expression emphasized. 4 lectures. Prerequisite: ART 211 or ART 212.

ART 213  Art History—European 18th and 19th Century Art (4)
Painting, sculpture and the related visual arts culminating with Romanticism, Neoclassicism, and Realism. Historical factors and artistic leaders pertinent to art expression of these eras emphasized. 4 lectures. Prerequisite: ART 211 or ART 212.

ART 221  Basic B/W Photography (3)
Fundamental techniques in black and white photography. Mechanics of cameras and equipment, optics, composition, filters, subject content, developing, printing, and mounting. Understanding photographic principles, producing a quality continuous tone print, and print presentation. 35mm camera with manual adjustment capability required. 2 lectures, 1 laboratory.
ART 222 35mm Intermediate B/W Photography (3)
Control of tonal range using 35mm cameras and available daylight illumination. Composition and visual communication. Assignments range from close-ups to architecture. Emphasis on "photographic seeing" and professional quality enlargements. 2 lectures, 1 laboratory. Prerequisite: ART 221.

ART 224 35mm Advanced B/W Photography (3)
Advanced B/W photography using 35mm cameras. Artificial light including studio electronic flash, tungsten studio light, and hand strobe. Professional quality developing and printing. Includes portrait, close-ups, product, and action. 2 lectures, 1 laboratory. Prerequisite: ART 221, ART 222.

ART 228 35mm Color Slide Photography (2)
Introductory nonlaboratory course in color slide photography featuring 35mm camera handling, slide film, indoor and outdoor photography, composition, slide presentation. 2 lectures.

ART 230 Beginning Graphic Design (3)
Basic terminology, studio skills, assembly methods, photographic reproduction processes, and specification for graphic designers. Familiarization with the various services available. 2 lectures, 1 laboratory. Prerequisite: ART 131, ART 132, ART 133.

ART 242 Glassblowing (4)
Techniques in the offhand process of working with glass from a furnace. Overview of glass history. Development of tools and forming processes studied while students develop 3-dimensional projects. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 activities.

ART 243 Glassforming (3)
Techniques in the processes of fusing, forming, and assembling glass. Introduction to the use of line, color, and texture related to glass as a transparent or opaque material. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 activities.

ART 245 Ceramics (3)
Basic clay working with emphasis on design quality, hand building, and use of the potter's wheel. Sketchbook required. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories.

ART 255 Jewelry Design (3)
Nonferrous metal techniques including cutting, forming, soldering, and forging with emphasis on design and craftsmanship. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories.

ART 301 Advanced Drawing (3)
Development of advanced methods and techniques in the study of form and structure. Emphasis on problem solving. 3 activities. Prerequisite: ART 131 and ART 201.

ART 302 Life Drawing I (3)
Development of methods and techniques in the study of form and structure as it relates to human proportion and anatomy analysis. 3 activities. Prerequisite: ART 201.

ART 303 Life Drawing II (3)
Advanced problems in life drawing. Advanced methods and techniques in the study of the human form as it relates to proportion, anatomy analysis and composition. 3 activities. Prerequisite: ART 302.

ART 304 Advanced Watercolor (3)
Transparent watercolor painting. Design and composition of painting, use of drawing and advanced watercolor techniques. 3 activities. Prerequisite: ART 204.
ART 305  Painting Techniques (3)
Physical characteristics of painting media, creative understanding of pictorial space and color. 3 activities. Prerequisite: ART 101.

ART 306  Figure Painting (3)
Comparative development of proportion and structure of the human head and figure as it relates to color and value. Mixing of pigment color and its implementation to figure painting. Continued emphasis with figure, its artistic placement in space and pictorial composition. Total credit limited to 6 units. 3 activities. Prerequisite: ART 204, ART 302.

ART 307  Graphic Rendering (3)
Problems in felt-marker rendering techniques relative to various graphic design applications. 2 lectures, 1 laboratory. Prerequisite or concurrent: ART 301 and ART 302.

ART 308  Sculpture (3)
Advanced exploration of three-dimensional form through problems in modeling, casting, carving, and techniques of assembly. Miscellaneous course fee required—see Class Schedule. 3 activities. Prerequisite: ART 108.

ART 311  Art History—Modern Art (4)
History of painting and sculpture from the French Revolution to World War I. Covers such major movements as Neo-Classicism, Romanticism, Impressionism, Post-Impressionism, Fauvism, Cubism, Expressionism, and Dada. 4 lectures. Prerequisite: ART 111, ART 112 or ART 213.

ART 312  Art History—Contemporary Art (4)
History of major art movements and ideologies from Surrealism to the present. Major emphasis will be placed on developments in painting and sculpture after World War II. 4 lectures. Prerequisite: ART 311, a 200-level art history course.

ART 314  History of Photography (4)
Photography and significant photographers from the invention of the camera obscura to the present day. Evolution of visual ideas in the medium with regard to changes in technology and society. Relationship to other visual arts and cultural impact. 4 lectures. Prerequisite: Any lower division art history course for Art majors; junior standing for all other students.

ART 316  Design History (3)
Survey of design history from Russian avant-garde to the present. Emphasis placed on Constructivism, Streamlining, and development of the Modern Movement in design. 3 lectures. Prerequisite: Any lower division art history course for Art majors; junior standing for all other students.

ART 320  Fashion Photography (3)
Posing and directing models in fashion photography using 35mm and medium format cameras in black and white and color. Various studio lighting setups and locations techniques as they apply to advertising and editorial fashion photography. 2 lectures, 1 laboratory. Prerequisite or concurrent: ART 224.

ART 321  Photographic Expression: B/W (4)
Advanced techniques including multiple exposure, multiple printing, high contrast and series. Emphasis on personal expression and developing style, introduction to symbology, visual source development and the work of contemporary creative photographers. 2 lectures, 2 laboratories. Prerequisite: ART 224 and ART 314.

ART 322  Color Photography I, Negative (3)
Fundamental techniques in color photography. Theory of color, visual concepts, exposing, and processing color negatives, printing from color negatives, finishing and presentation. Studio electronic flash and available light. 2 lectures, 1 laboratory. Prerequisite: ART 224.
ART 323  Color Photography II, Positive (3)
Applied techniques in exposing and processing 35mm color transparencies; color printing from color slides; finishing and presentation. Emphasis on analyzing color slides to produce quality color prints; both documentary and creative assignments. 2 lectures, 1 laboratory. Prerequisite: ART 228, ART 322.

ART 325  4x5 Camera Techniques, B/W (3)
Basic techniques using 4x5 view cameras. Architecture, landscapes, portraiture, and other outdoor subjects used to help the student master the use of large format cameras. Other topics include exposure techniques, perspective, and sharpness correction, lighting and composition. Sensitometric approach to B/W film development and print quality emphasized. 2 lectures, 1 laboratory. Prerequisite: ART 323.

ART 326  4x5 Camera/Commercial (3)
Professional techniques with large format cameras. Outdoor and studio photography presented using B/W film and color transparencies. Topics include studio lighting for glass and metal, copying, interiors, and product photography. 2 lectures, 1 laboratory. Prerequisite: ART 325.

ART 327  Portraiture (3)
Studio and environmental portraiture. Emphasis on light ratios/patterns; posing; personality portrayal. Retouching of film and print. 2 lectures, 1 laboratory. Prerequisite: ART 224, ART 325.

ART 329  Editorial and Corporate Photography (3)
Creating, lighting and executing editorial photography. Producing photography for corporate needs i.e. annual reports, brochures and in-house publications. Emphasis on selecting subject matter, handling lights and color film. 2 lectures, 1 laboratory. Prerequisite: ART 326.

ART 331  Typographic Design (3)
Principles of letterforms and how these principles affect the communication of ideas through graphic design. Analysis of type style, structure, and form. 3 activities. Prerequisite: Junior standing. ART majors: ART 135, ART 230 (or concurrent). GRC majors: ART 133.

ART 332  Symbology (3)
Use of symbolism, metaphor and connotative imagery in graphic design. Exploration of various problem solving methods for image-making. 3 activities. Prerequisite: ART 331, junior standing.

ART 333  Corporate Identity (3)
Design and implementation of corporate logos. Development of graphic standards manuals for use of identity for diverse applications. 3 activities. Prerequisite: ART 332, junior standing.

ART 334  Computer Assisted Graphic Design (3)
CAD applications in graphic design, solving problems in corporate identity, poster design, typographic layout and signage systems. Instructions in the various capabilities and functions of CAD, specifically oriented to graphic design applications. 2 lectures, 1 laboratory. Prerequisite: ART 331 and CSC 110.

ART 336  Display and Exhibition (2)
Problem solving in the discipline of display and exhibition of works in an art gallery. Experience in the design and installation of exhibitions through the use of models and direct application. Total credit limited to 6 units. 1 lecture, 1 laboratory. Prerequisite: ART 133 and ART 134.

ART 342  Cold Forming Techniques for Glass (3)
Techniques focusing on the various processes of controlling glass forms through engraving, beveling, cutting and polishing. Assembly techniques including adhesives and mechanical joints. Miscellaneous course fee required– see Class Schedule. 1 lecture, 2 activities. Prerequisite: ART 242, or ART 243.
ART 343 Glass Casting (3)
Various aspects of glass as a transparent substance. Glass castings will be produced in lab exercises that will involve the student’s interpretation of glass as a spatial material as well as a sculptural form. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories. Prerequisite: ART 242, ART 243, ART 342.

ART 345 Ceramic Form Design (3)
Development of hand, wheel, mold, jigger, and press forming skills. Design of single and multiple forms. Miscellaneous course fee required—see Class Schedule. 3 activities. Prerequisite: ART 245.

ART 346 Ceramic Surface Design (3)
Use of clay, slip, engobe, glaze, raku and stoneware firing processes. Contemporary craftmaker’s skills are developed through practice of historic and industrial techniques. Miscellaneous course fee required—see Class Schedule. 3 activities. Prerequisite: ART 245.

ART 355 Metalsmithing (3)
Intermediate fabrication. Investigation of surface design techniques for nonferrous metals including etching, enameling, mokume, inlay, and various texturing processes. Miscellaneous course fee required—see Class Schedule. 3 activities. Prerequisite: ART 255.

ART 356 Jewelry Casting (3)
Introduction to casting for the jeweler with emphasis on lost wax techniques including design, wax working, casting and finishing. Miscellaneous course fee required—see Class Schedule. 3 activities. Prerequisite: ART 255.

ART 400 Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Senior standing and consent of instructor.

ART 404 Airbrush Techniques (2)
Materials, equipment, techniques and applications of the airbrush for designers and photographers. 2 activities. Prerequisite: ART 133.

ART 408 Illustration (3)
Development of techniques and conceptual skills in illustration for use in the fields of graphic design and advertising. Total credit limited to 6 units. For Applied Art and Design majors only. 3 activities. Prerequisite: ART 204, ART 302, ART 331.

ART 424 Multi-Media Photography (4)
Multi-media presentation, synchronizing color slides, music, narration, and video. Contemporary, creative photography techniques applied. Creative seeing and interpretation that communicates to the viewer. 2 lectures, 2 laboratories. Prerequisite: ART 323.

ART 426 Illustration Photography I—B/W (3)
Principles of lighting and design as applied to subjects and small product studio photography. 35mm and 4x5 cameras used. Emphasis on creative problem solving, tabletop composition and lighting to produce quality image. 2 lectures, 1 laboratory. Prerequisite: ART 326 and senior standing.

ART 427 Illustration Photography II—Color (3)
Applied principles of design and color to produce a photograph that sells an idea, product, or service. 35mm and 4x5 cameras used. Emphasis on thinking, planning, interpreting, and presenting an idea photographically. 2 lectures, 1 laboratory. Prerequisite: ART 426 and senior standing.

ART 428 Commercial Photography (4)
Professional photographic techniques using large and small format cameras, color and B/W materials. Incorporates personal style. Emphasis on commercial and illustrative applications in studio and on location. Portfolio quality prints. 2 lectures, 2 laboratories. Prerequisite: ART 427 and senior standing.

ART 431 Package Design (3)
Graphics for food, beverage and related packaging. Positioning of products through research into typography, imagery and color. For Applied Art and Design majors only. 3 activities. Prerequisite: ART 333 and senior standing.
ART 432 Advertising Design (3)
Development of print advertising from concept to marker rendering. Emphasis on art direction, photo direction and copywriting. For Applied Art and Design majors only. 3 activities. Prerequisite: ART 431 and senior standing.

ART 433 Editorial Design (3)
Design of editorial material, printed collateral, magazine layouts and annual reports. For Applied Art and Design majors only. 3 activities. Prerequisite: ART 432 and senior standing.

ART 434 Computer Assisted Graphic Design (3)
CAD applications in graphic design, solving problems in corporate identity, poster design, typographic layout and signage systems. Instructions in the various capabilities and functions of CAD, specifically oriented to graphic design applications. 2 lectures, 1 laboratory. Prerequisite: ART 331 and CSC 110.

ART 460 Professional Practices (2)
Professional practices in the art and design field, legal and ethical questions, taxes, contracts, fees and copyrights. Current job opportunities, resume and portfolio preparation with visiting professionals. For Applied Art and Design majors only. 2 lectures. Prerequisite: Senior standing.

ART 461 Senior Project (3)
Selection and completion of a project under faculty supervision. Minimum of 90 hours time. Results presented in a formal report. Prerequisite: Senior standing and ART 460.

ART 462 Senior Portfolio Project (1)
Preparation of portfolio system for entrance into the professional job market. 1 activity. Prerequisite: Senior standing and ART 461.

ART 463 Undergraduate Seminar (2)
Analysis of selected problems and topics for undergraduates. 2 seminars. Prerequisite: Senior standing.

ART 464 Graphics and Animation Techniques for Microcomputers (3)
Original and available software to investigate graphics generation and realtime animation techniques. Topics include BASIC vs. assembly language, brush painting, page flipping, Color graphics, sound, and music. Educational and commercial applications and marketing. 3 lectures. Prerequisite: CSC 110 or CSC 410 and CSC 207.

ART 465 Contemporary Photography Seminar (2)
Survey of significant photographers and developments in the field since 1950. The interaction between photography and the other visual arts as well as its social impact during this period. Student presentations on selected research topics. Total credit limited to 4 units. 2 seminars. Prerequisite: ART 314.

ART 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

ART 471 Selected Advanced Laboratory (1-3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

ASCI—ANIMAL SCIENCE

ASCI 100 Enterprise Project (1-4) (CR/NC)
Selection and completion of a management/production project under faculty supervision. Project participation is subject to approval by the project supervisor and the Cal Poly Foundation. Degree credit limited to 12 units. Credit/No Credit grading only.
ASCI 101 Introduction to the Animal Sciences (2) (CR/NC)
Economic, environmental and societal impact of the livestock, poultry and horse industries. Basic terminology, anatomy, and physical requirements of animals. Career and academic planning. Co-curricular, extra-curricular, and post-graduate opportunities. Required of all first-time students in the Animal Sciences and Industry Department. Credit/No Credit grading only. 2 lectures.

ASCI 111 Market Beef Production (3)
Introduction to modern beef production. Problems and responsibilities of the beef industry as it relates to diet/health issues and new advances. Study of industry characteristics, types, breeds, market classes and grades, carcass characteristics and merchandising cattle. 3 lectures.

ASCI 112 Elements of Swine Production (3)
History, development and importance of swine industry. Types, breeds, market classes and grades of swine. Basic principles and practices of swine feeding and management. 3 lectures.

ASCI 113 Elements of Sheep Production (3)
Role of sheep in world agriculture. Types, breeds, market grades of products and merchandising. Survey of types of sheep operations and geographic influence on management. Social concerns including humane care, residues and diet/health issues. 3 lectures.

ASCI 114 Elements of Horse Production (3)
Status of the horse industry. Breeds of horses and their uses. Anatomy and parts of the horse. Unsoundnesses, ailments and their treatments. Early history of the horse. 3 lectures.

ASCI 131 Beginning Western Riding (3)
Designed to teach basic riding to students with no previous experience. Proper and safe catching, grooming, saddling, bridling, mounting and riding techniques. Fundamental care of the horse. Proper attire and advanced sign-up required. Miscellaneous course fee required—see Class Schedule. 3 laboratories.

ASCI 200 Special Problems for Undergraduates (2–3)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 3 units per quarter. Prerequisite: Consent of department head.

ASCI 202 Feeds and Feeding (3)
Simple use of food nutrients. Identification and classification of feeds for each class of livestock. Digestion and utilization of feeds. Feeding standards and computation of simple rations for livestock. Economy in feeding and purchasing feeds by nutritive values. 3 lectures.

ASCI 226 Livestock Evaluation (3)
Utilization of objective and subjective estimation measures in establishing economic worth of domestic animals of the three meat animal species and horses. 1 lecture, 2 laboratories.

ASCI 230 General Animal Science (4)
Role of animal agriculture in food production and human nutrition. Discussion of breeds, types of enterprises, nutrition, reproduction and management of beef cattle, sheep and swine. Commentary on the horse as a recreational animal. Credit not allowed for Animal Science majors. 3 lectures, 1 laboratory.

ASCI 234 Horseshoeing (2)
Fundamentals of the farrier's work. Anatomy and physiology of the horse's leg and foot. Evaluation of proper hoof care, trimming and shoeing. Foot and leg conformation of horses as it relates to sound locomotion. Handling a horse for the farrier. 1 lecture, 1 laboratory combined.

ASCI 240 Applied Feeds and Feeding (2)
Introduction to feedstuffs, identification and quality evaluations. Proximate analysis, digestibility and energy values of feeds. Mechanics of ration formulation and feeds selection based on nutrient content and market values for the various species of domestic livestock. 1 lecture, 1 activity. Prerequisite or concurrent: ASCI 202.
ASCI 241 Applied Beef Cattle Practices (2)
Application of operational practices in the purchasing, management, and marketing of beef cattle. Equipment, preventive veterinary practices, live animal evaluation, performance records, carcass evaluation, and ranch evaluation. 1 lecture, 1 activity.

ASCI 242 Applied Swine Management Practices (2)
Application of operational practices in the management and merchandising of swine. Housing and equipment, routine veterinary practices, live animal evaluation, performance evaluations, farrowing and post-farrowing practices, and carcass appraisal. 1 lecture, 1 activity.

ASCI 243 Applied Sheep Management Practices (2)

ASCI 244 Applied Horse Practices (2)
History and location of horse unit facilities and breeds maintained. Common knots, proper techniques in safely catching, leading, grooming, and restraining horses. Evaluation of desirable and faulty conformation. Preventive health program. Determining the age of a horse by dentition. Pedigree analysis. 1 lecture, 1 activity. Prerequisite or corequisite: ASCI 114 recommended.

ASCI 260 Preparation of Livestock for Shows and Sales (2)
Techniques, equipment and knowledge necessary in order to properly condition, groom, and present livestock for evaluation and merchandizing. Total credit limited to 8 units. 2 laboratories.

ASCI 302 Applied Animal Nutrition (3)
Feedstuff evaluation and analysis. Advancements in feedstuff evaluation and application to ration formulation. Principles and practices in livestock ration formulation. Linear programming principles as applied to computer formulated rations. 2 lectures, 1 laboratory. Prerequisite: ASCI 202, ASCI 240, CHEM 326.

ASCI 304 Animal Breeding (3)
Application of genetic principles for livestock improvement. Improving production through a study of selection techniques, mating systems, and performance evaluation using current technology. 3 lectures. Prerequisite: BIO 303.

ASCI 311 Commercial Beef Management (3)
Management practices involved in the commercial beef cattle breeding enterprise. Trends and economic considerations relative to California and the U.S. Principles of selection, basic reproductive physiology, breeding systems, range management, nutrition, health programs and marketing phases of the enterprise. 3 lectures. Prerequisite: ASCI 111.

ASCI 312 Swine Management (3)
Management practices involved in commercial and purebred swine enterprises. Methods of production and marketing, performance testing programs and carcass evaluation techniques. Nutritional requirements, rations, feed additives, diseases and parasites, facilities and equipment. 3 lectures. Prerequisite: ASCI 112, ASCI 242.

ASCI 313 Sheep Management (3)
Management practices of purebred and commercial sheep operations. Techniques, equipment, feeds, health care products and decision making throughout a production cycle from selection to culling. Exposure to emerging technologies and scientific advancements that will affect the sheep industry. 3 lectures. Prerequisite: ASCI 113. Recommended: ASCI 243.

ASCI 323 Beef Husbandry (4)
Management practices of purebred beef operations. Breeding programs and selection practices using the latest technologies, including the use of computers for the selection of bulls and replacement females. 3 lectures, 1 laboratory. Prerequisite: ASCI 111 and ASCI 311.
ASCI 326  Advanced Livestock Evaluation (2)
Application of deductive and inductive logical processes in appraising the relative merit of individual animals within a group sample. Oral expression of the selection rationale. 2 laboratories. Prerequisite: ASCI 226.

ASCI 329  Principles of Range Management (3)
Characteristics, history and multiple uses of rangeland. Principles of range plant physiology and ecology in relation to range condition, trend, utilization and improvement practices. Principles of proper grazing practices and nutrition of livestock. 3 lectures. Prerequisite: One course each in soil science, animal science and botany or crop science.

ASCI 331  Applied Range Management Practices (2)
Basic taxonomy and values of common range plants. Evaluation of range sites, soils, condition, trend and grazing utilization. Application of range technology, improvement and management practices to field situations. 1 lecture, 1 activity. Prerequisite: One course each in soil science, animal science and botany or crop science: ASCI 329 recommended.

ASCI 333  Equine Reproduction (5)
Management of the breeding farm, breeding problems, diseases, study of estrus cycles, servicing the mare, handling stallions. Breeding systems, teasing, embryo transfer, ultrasound pregnancy diagnosis, new developments in breeding technology. Miscellaneous course fee required—see Class Schedule. 4 lectures, 1 laboratory. Prerequisite: ASCI 114, ASCI 244.

ASCI 334  Feed Mill Operation (4)
Survey of the livestock feed industry. General operation of a feedmill facility including receiving, storing, processing, handling, mixing, packaging, and delivery of formula feeds. Application and development of material flow diagrams and equipment evaluation. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: ASCI 202, ASCI 240 or consent of instructor.

ASCI 341  Evaluation and Management of Livestock Production Tests (2)
Organization and rationale for livestock tests, health and nutritional management, structural and reproductive soundness evaluation, administrative functions, and accumulation and analysis of performance information. 1 lecture, 1 laboratory. Prerequisite: Upper division status and consent of instructor.

ASCI 400  Special Problems for Advanced Undergraduates (2-4)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 4 units per quarter. Prerequisite: Prior consent of department head.

ASCI 401  Reproductive Physiology (4)
Reproductive efficiency of farm animals. Anatomy and physiological factors involved in reproduction. Male and female systems, pregnancy, estrual behavior, semen collection and evaluation, artificial insemination, pregnancy testing, and hormone therapy. 3 lectures, 1 laboratory. Prerequisite: VS 123.

ASCI 402  Animal Nutrition (4)
Metabolism of proteins, carbohydrates, fats, minerals, and vitamins. Relationship of proper nutrition to livestock production. 3 lectures, 1 laboratory. Prerequisite: ASCI 302, CHEM 328.

ASCI 404  Applied Animal Genetics (3)
Genetic improvement of economic traits in farm animals. Application of advanced genetic concepts to animal improvements through analysis of performance data. 2 lectures, 1 laboratory. Prerequisite: ASCI 304.

ASCI 434, 435  Advanced Western Riding/Training (4) (4)
Training the young horse for work on a snaffle bit. Requires learning gaits, leads, backing, stopping, turning, trailer loading, rope work, and trail riding. Students must provide equipment. Advanced sign-up with instructor required. 4 laboratories. Prerequisite: ASCI 434: ASCI 114, ASCI 244, ASCI 260. ASCI 435: ASCI 434 and consent of instructor.
ASCI 461, 462 Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

ASCI 463 Undergraduate Seminar (2)
Major developments in the chosen field of the student. Discussion of new developments, policies, practices, and procedures. Each individual is responsible for the development and presentation of a topic in the chosen field. 2 seminars.

ASCI 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

ASCI 471 Selected Advanced Laboratory (1-3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

ASCI 475 The Practice of Animal Science (2)
Scientific and husbandry principles in the optimization of the art of animal production. Case studies diagnosed, interpreted and resolved. Current scientific literature reviewed and applied to production cases. Professional expertise from animal industry leaders is utilized. 2 seminars. Prerequisite: Senior standing and consent of instructor.

ASCI 581 Graduate Seminar in Animal Production (3)
Current findings and research problems in the field and their application to the industry. 3 seminars.

ASTR—ASTRONOMY AND ASTROPHYSICS

ASTR 101 Introduction to the Solar System (3) GEB B.1.a.
Descriptive astronomical properties of the earth, moon, other planets and their satellites. Comets, asteroids and other members of the solar system. Theories of the formation of the solar system. Opportunities for telescope observations of the moon and planets. Not open to students who have completed or are taking ASTR 301, or PHYS 132. 3 lectures.

ASTR 102 Introduction to Stars and Galaxies (3) GEB B.1.a.
Descriptive astronomical properties of the sun, stars, galaxies, and interstellar material. Expanding universe and cosmological models. Opportunities for telescope observations and star identification. Not open to students who have completed or are taking ASTR 301, ASTR 302, or PHYS 132. ASTR 101 is not a prerequisite. 3 lectures.

ASTR 301 The Solar System (3) GEB B.1.a.
Quantitative and descriptive properties of the solar system including the physics of the planets, their satellites, comets and interplanetary media. Possible origins of the solar system. Not open to students who have completed ASTR 101. 3 lectures. Prerequisite: PHYS 132 or PHYS 123.

ASTR 302 Stars and Galaxies (3) GEB B.1.a.
Quantitative and descriptive properties of the stars, galaxies and interstellar media; including stellar structure and evolution, structure and make-up of galaxies and cosmological models. Not open to students who have completed ASTR 102. 3 lectures. Prerequisite: PHYS 132 or PHYS 123. ASTR 301 is not a prerequisite.

ASTR 303 Relativity and Cosmology (3) GEB B.1.a.
Introduction to the basic ideas of Einstein's theories of relativity and cosmology. The structure and evolution of the universe. The principle of relativity, the speed of light, gravity and the equivalence principle. Curved spacetime, black holes, the expanding universe, the big bang, and nucleosynthesis. 3 lectures. ASTR 302 is not a prerequisite. Prerequisite: PHYS 122 or PHYS 132.
BACT–BACTERIOLOGY

BACT 221  General Bacteriology (4)  GEB B.1.b.
Morphology, metabolism, classification and identification; bacteriology of air, soil, water, and foods with applications to industry, agriculture, medicine, and public health. 2 lectures, 2 laboratories. Prerequisite: One quarter of chemistry.

BACT 224  General Microbiology I (4)  GEB B.1.b.
Anatomy, physiology, and systematics of prokaryotic and eukaryotic microorganisms and the viruses. 2 lectures, 2 laboratories. Prerequisite: CHEM 129 and BOT 121 or ZOO 131.

BACT 225  General Microbiology II (4)  GEB B.1.b.
Genetics and molecular biology of prokaryotic and eukaryotic microorganisms and the viruses. Fundamentals of medical microbiology, immunology, host-parasite relations, antimicrobial agents and systematics. 2 lectures, 2 laboratories. Prerequisite: BACT 224.

BACT 226  General Microbiology III (4)  GEB B.1.b.
Anatomy and physiology of prokaryotic and eukaryotic microorganisms found in nature and involved in nutrient recycling. Microbial associations with plants and animals. Systematics. 2 lectures, 2 laboratories. Prerequisite: BACT 221 or BACT 224.

BACT 222  Dairy Bacteriology (4)  GEB B.1.b.
Advanced course for practical work demonstrating the domestic and industrial importance of microorganisms involved in milk and dairy products; milk, milk powders, fermented milks, evaporated and condensed milks, butter, cheese, cheese starters, and ice cream. 2 lectures, 2 laboratories. Prerequisite: BACT 221 or BACT 224.

BACT 333  Industrial Microbiology (4)  GEB B.1.b.
Microbial biotechnology in producing pharmaceuticals, food additives, and industrial chemicals. Consideration of selected large-scale processes for producing primary and secondary metabolites. 2 lectures, 2 laboratories. Prerequisite: BACT 221 or BACT 224, CHEM 326 or equivalent.

BACT 342  Sanitary Microbiology (4)  GEB B.1.b.
Principles of disease prevention and control. Water-, food-, and air-borne microbial contaminations and epidemiology of ensuing diseases. Laboratory techniques in detection and control of wastes and disease-causing microorganisms. 2 lectures, 2 laboratories. Prerequisite: BACT 221 or BACT 224.

BACT 402  General Virology (3)
Virus-host interactions. Structure and function of viruses as obligate intracellular parasites of microbes, plants, and animals. Epidemiology, pathogenesis, prophylaxis, chemotherapy, and manipulation of viruses which parasitize man. 3 lectures. Prerequisite: BACT 225 and CHEM 328 or equivalent. Recommended: ZOO 426.

BACT 403  General Virology Laboratory (2)
Methods of culture, characterization and identification of viruses, with emphasis on viruses parasitic in man and animals. 2 laboratories. Prerequisite or concurrent: BACT 402 and consent of instructor.

BACT 421  Food Microbiology (4)
Physiological activities of microorganisms involved in the preparation, preservation, deterioration and toxicity of foods and related products. 2 lectures, 2 laboratories. Prerequisite: BACT 221 or BACT 224. Recommended: CHEM 326.

BACT 423  Medical Microbiology (5)

BACT 424  Bacterial Cytology and Physiology (4)
Cellular structure and life processes of bacteria; chemical composition, growth and metabolism. General biological implications. 3 lectures, 1 laboratory. Prerequisite: BACT 225 and CHEM 326. Recommended: CHEM 328 or equivalent.
BACT 430 Medical Mycology (4)
Morphology, physiology, infectivity, and immunogenicity of fungi pathogenic for man and other mammals. Host-parasite interactions. Demonstration and isolation of pathogenic fungi from clinical material. 2 lectures, 2 laboratories. Prerequisite: BACT 423.

BIO–BIOLOGY

BIO 100 Orientation to Biological Sciences (1) (CR/NC)
Career opportunities in the biological sciences, designing a career goal and a survey of departmental facilities and procedures related to research, study and graduation. Credit/No Credit grading only. 1 lecture.

BIO 101 General Biology (3) GEB B.1.b.
Principles of cellular biology, heredity, ecology, and evolution, with emphasis on their relationship to human affairs. Not open to students who have completed BOT 121 or ZOO 131. 3 lectures.

BIO 102 Plant Biology (4) GEB B.1.b.
Structural and functional aspects of plants. Survey of algae, fungi and plants including field trips to observe them in their natural environment. Emphasis on plants of importance to humans. One Saturday field trip. 3 lectures, 1 laboratory. Prerequisite: BIO 101, BIO 105.

BIO 103 Animal Biology (4) GEB B.1.b.
Structural and functional aspects of animals with specific emphasis on humans. Survey of major animal phyla including local field trips to observe them in their natural environment. One Saturday field trip. Not open for credit to students who have completed BIO 128 or ZOO 131. 3 lectures, 1 laboratory. Prerequisite: BIO 101, BIO 105.

BIO 105 General Biology Laboratory (1) GEB B.1.b.
Observations and experiences involving basic principles in the biological sciences. Emphasis on the diversity of living systems. Cell structure and function. Genetics and ecological relationships. 1 laboratory. Concurrent or previous enrollment in BIO 101.

BIO 127 Natural History: Animal Adaptations (3) GEB B.1.b.
Interpretation of structural and functional adaptations of animals; emphasis on phenomena readily observed in the field. Laboratory exercises emphasize insects as examples. 2 lectures, 1 laboratory.

BIO 128 Natural History: Animal Communities (3) GEB B.1.b.
Examination of local biotic communities, emphasizing identification and natural history of the animals which inhabit them. Field experience in local communities. 2 lectures, 1 laboratory, 2 Saturday field trips. Recommended: BIO 127.

BIO 129 Natural History: Plant Communities (3) GEB B.1.b.
Principles of field biology and ecology; laboratory and field study of land and freshwater plant communities, emphasizing identification of plants inhabiting them. 1 lecture, 2 laboratories, Saturday field trips. Recommended: BIO 128.

BIO 220 Physiology and Biological Adaptation (4) GEB B.1.b. and E.2.
Physiological principles with integration of principles of adaptation of life processes among living organisms. 4 lectures. Prerequisite: Completion or simultaneous enrollment in college level chemistry.

BIO 253 Orientation to the Health Professions (1) (CR/NC)
Participation in hospital activities and mental health services. Intended for medically oriented students. Total credit limited to 6 units with a maximum of 1 unit per quarter. Credit/No Credit grading only. 1 activity. Prerequisite: Instructor’s consent and one quarter of college chemistry and ZOO 131.

BIO 300 Biology of Cancer (2)
BIO 301 Human Ecology (3)  
Examination of the ways in which humans are dependent on their environment, their ability to modify it, and the results of such modification. 3 lectures. Prerequisite: One quarter of biological science.

BIO 302 Human Genetics (3)  
Basic principles of human inheritance. Transmission of genetic traits, chromosomal anomalies of humans, gene action, mutations and mutagenic agents, eugenics, and principles of genetic counseling. 3 lectures. Prerequisite: One quarter of biological science (preferably BIO 101 or ZOO 131).

BIO 303 Genetics (3)  
Principles of heredity and variation. 3 lectures. Prerequisite: One quarter of college biology and one quarter of college mathematics. Recommended: STAT 211.

BIO 304 Molecular Genetics (3)  
Introduction to the structures, functions, and regulatory mechanisms of nucleic acids in biological systems. 3 lectures. Prerequisite: One quarter of college biology. Recommended: BIO 303 and one course in biochemistry.

BIO 306 Applications of Biological Concepts (4)  
Applications of basic biological concepts with special reference to how these concepts can be presented and developed in elementary schools. Emphasis is on hands-on activities, problem solving and computer assisted instruction modules in biology. 2 lectures, 2 laboratories. Prerequisite: BIO 101, BIO 102, BIO 103, and BIO 105, BIO 127, BIO 128, and BIO 129 or equivalent.

BIO 311 Radiation Biology (3)  
Review of production and characteristics of non-ionizing and ionizing radiation; interaction and effect of radiation on living cells, tissues, organs, and organisms; introduction to use of radioisotopes; radiation protection and dosimetry; impact of nuclear energy on the biological world. 3 lectures. Prerequisite: CHEM 122 or CHEM 128 and one of the following: BIO 101, BOT 121, ZOO 131.

BIO 321 Biological Instrumentation (3)  
Theory and operation of instruments commonly used in biological investigation. 1 lecture, 2 laboratories. Prerequisite: BOT 121 or ZOO 131.

BIO 322 Introduction to Electron Microscopy (2)  
Introduction to principles and theory of scanning and transmission electron microscopy including instruments utilized in study of biological and nonbiological specimens. 1 lecture, 1 activity. Prerequisite: BOT 121 or ZOO 131 or consent of instructor.

BIO 323 Scanning Electron Microscopy Laboratory (1)  
Techniques of using the scanning electron microscope including preparing, examining and interpreting biological and nonbiological materials. 1 laboratory. Prerequisite or concurrent enrollment in: BIO 322.

BIO 324 Transmission Electron Microscopy Laboratory (2)  
Applications of transmission electron microscope including in-depth training in specimen preparation and use of the microscope. Design of experiments and interpretation of results will be included in laboratory. 2 laboratories. Prerequisite or concurrent enrollment in: BIO 322.

BIO 325 General Ecology (4)  
Interactions between living organisms and their environment in terrestrial and aquatic habitats. 3 lectures, 1 laboratory. Prerequisite: BOT 122 and ZOO 132.

BIO 328 Marine Biology (4)  
Biological and environmental studies of marine organisms, with emphasis on their economic importance. 2 lectures, 2 laboratories. Prerequisite: BOT 122 and ZOO 133, or consent of instructor.

BIO 330 Biology of Aging (3)  
Theories of aging, the biological principles involved, and the current status of research in the field. 3 lectures. Prerequisite: College-level course in biology. Recommended: An introductory course in chemistry.
BIO 334  Limnology (3)  
Biological, physical, and chemical dynamics of freshwater ecosystems. 2 lectures, 1 laboratory. Prerequisite: BIO 325. Recommended: One college level course in chemistry.

BIO 342  Computer Applications in Biology (3)  
Applications of computers and data processing technology to the understanding and solving of specific problems in biology. 2 lectures, 1 laboratory. Prerequisite: One college level course in biological science and one course in computer science.

BIO 375  Molecular Biology Laboratory (2) (Also listed as CHEM 375)  
Techniques used in molecular biology and biotechnology, plasmid DNA extraction, agarose gel electrophoresis, restriction endonuclease mapping, transduction, transformation, and gene cloning. 2 laboratories. Prerequisite: BACT 221 or BACT 224 and BIO 304 or CHEM 373.

BIO 400  Special Problems for Advanced Undergraduates (1-2)  
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

BIO 414  Evolution (3)  
Scientific evaluation of the theories, mechanisms, and evidences concerning biological evolution. 3 lectures. Prerequisite: BIO 303.

BIO 415  Biogeography (3)  
Plant and animal distribution patterns in relation to past and present physical and biotic factors; continent by continent survey of biogeography with major emphasis on North America. 3 lectures. Prerequisite: BIO 325.

BIO 423  General Cytology (4)  
Detailed study of the structure and function of animal and plant cells. 3 lectures, 1 laboratory. Prerequisite: ZOO 131 and BOT 121 and organic chemistry or biochemistry.

BIO 424  Organizing and Teaching Biological Sciences (3)  
Objectives, content, techniques, material, and recent trends of successful instruction in secondary school biology. 3 lectures. Prerequisite: Consent of instructor.

BIO 426  Cytogenetics (4)  
Cytological basis of genetics. Correlation between genetic principles and chromosome behavior by studying mitotic and meiotic cells. Cytological study of hybrids, polyploids and chromosomal aberrations in plants and animals. 3 lectures, 1 laboratory. Prerequisite: BIO 303.

BIO 431  Physiology I: General (4)  
Functioning, control, and integration of physiological phenomena at various levels from cell to organism. 2 lectures, 2 laboratories. Prerequisite: CHEM 326; BOT 122 or ZOO 132.

BIO 437  Marine Resources (3)  
Resource status of present and potential biological marine resources of the sea. Identification, life history, ecology, culture and economics of pertinent organisms. 3 lectures. Prerequisite: BOT 122 and ZOO 133.

BIO 442  Biometry (4)  
Design of biological experiments with emphasis on sampling methods, data collection, mensuration, and analysis of field and laboratory data. 3 lectures, 1 laboratory. Prerequisite: One year of biology and STAT 212 or STAT 321.

BIO 461, 462  Senior Project (3) (2)  
Projects are selected from typical problems which graduates may meet in areas of their future employment. Results are presented in written reports. Minimum 150 hours total time.

BIO 463  Undergraduate Seminar (2)  
Study and discussion of recent developments in the field of biology. 2 seminars. Prerequisite: Senior standing.
BIO 470 Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

BIO 471 Selected Advanced Laboratory (1–2)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topics selected. Total credit limited to 4 units. 1 to 2 laboratories. Prerequisite: Consent of instructor.

BIO 475 Tissue Culture Techniques (4) (Also listed as CHEM 475)
Introduction to the principles and methods of tissue culture with emphasis on the manipulation and study of animal cells. 2 lectures, 2 laboratories. Prerequisite: BACT 221 or BACT 224, BIO 303 and CHEM 328 or CHEM 371.

BIO 500 Individual Study (1–3)
Advanced study planned and completed with the approval of and under the direction of a member of the department faculty. A written scholarly presentation of the results of each BIO 500 project must be included in the graduate student’s departmental file. Not open for credit to students in the thesis program. Total credit limited to 4 units. Prerequisite: Graduate standing and consent of instructor.

BIO 501 Cellular Biology (3)
Consideration of recent studies on the energetics, synthesis, regulation, genetics, transport, movements, reproduction, and differentiation of cells. 2 seminars, 1 activity. Prerequisite: Graduate standing and/or consent of instructor.

BIO 502 Biology of Organisms (3)
Consideration of recent advances in the knowledge of organisms; their morphology, systems of maintenance, organization and integration, responsiveness and behavior, development and reproductive processes. 2 seminars, 1 activity. Prerequisite: Graduate standing and/or consent of instructor.

BIO 503 Population Biology (3)
Consideration of current theory and practice in evolution, genetics, ecology and systematics of organisms. 2 seminars, 1 activity. Prerequisite: Graduate standing and/or consent of instructor.

BIO 515 History of Biology (3)
Analysis of historical attempts to solve biological problems. 3 seminars. Prerequisite: Graduate standing and/or consent of instructor.

BIO 524 Developmental Biology (3)
Developmental phenomena of higher and lower plants, vertebrate and invertebrate animals at the molecular, cellular, histological and organ levels. Each quarter will emphasize a different biological description. Total credit limited to 9 units, with a maximum of 3 units per quarter. 2 seminars, 1 laboratory. Prerequisite: Graduate standing and/or consent of instructor.

BIO 531 Theory and Prediction in Ecology (2)
Directed group study and lectures on selected topics in ecology. Emphasis on an in-depth study of a restricted topic. 2 seminars. Prerequisite: Graduate standing and/or consent of instructor.

BIO 542 Multivariate Biometry (4)
Design of biological experiments involving multivariate observations. Experimental design, sampling, computer analysis, and interpretation of results. 3 seminars, 1 laboratory. Prerequisite: STAT 313, BIO 442.

BIO 543 Morphometrics (3)
Biological phenomena from problem definition and field collection of data through multivariate analysis of data and presentation of results. 2 seminars, 1 laboratory, 2–4 weekend field trips. Prerequisite: BIO 542.
BIO 570  Selected Topics in Biology (1–3)
Directed group study of selected topics for graduate students. Class Schedule will list topics for selection. Total credit limited to 9 units. 1 to 3 seminars. Prerequisite: Graduate standing and/or consent of instructor.

BIO 590  Seminar in Biology (1)
Problems and topics in advanced biology selected according to the interest and needs of the students enrolled. Total credit limited to 5 units. 1 two-hour seminar. Prerequisite: Graduate standing and/or consent of instructor.

BIO 599  Thesis (3)
Individual research under the general supervision of the faculty, leading to a graduate thesis of suitable quality. Total credit limited to 9 units. Prerequisite: Graduate standing, consent of instructor, and consent of thesis committee.

BOT–BOTANY

BOT 121  General Botany (4)  
Introduction to structures and functions of seedbearing plants. 2 lectures, 2 laboratories.

BOT 122  General Botany (4)  
Structure, reproduction, classification, and biological and economic importance of fungi, cyanobacteria, algae, and plants from bryophytes to angiosperms. 2 lectures, 2 laboratories. Prerequisite: BOT 121.

BOT 123  Introductory Plant Taxonomy (4)  
Introduction to classification and identification of vascular plants, emphasizing the families of major economic importance; field and herbarium techniques. 2 lectures, 2 laboratories. Prerequisite: BOT 121.

BOT 238  Native Plant Materials (3)  
Classification, identification, and associations of native plants. Factors which affect plant growth in natural environments. Miscellaneous course fee required–see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: BOT 121.

BOT 322  Introductory Plant Physiology (4)  
Consideration of the principal physiological processes of plants including water relations, mineral nutrition, photosynthesis, respiration, and growth of the plant. 3 lectures, 1 laboratory. Prerequisite: BOT 121 and CHEM 326.

BOT 323  Plant Pathology (4)  
Comprehensive study of the causes and effects of disease in plants. Designed to lead to an understanding of the science and modern control methods. 2 lectures, 2 laboratories. Prerequisite: BOT 122 or BOT 123.

BOT 324  Ornamental and Forest Pathology (4)  
Causes and effects of diseases of important ornamental and forest plants, disease agents (life cycle, host range, environmental relationships), and modern approach to control. 2 lectures, 2 laboratories. Prerequisite: BOT 121.

BOT 325  Plant Nematology (4)  
Plant parasitic nematodes, their morphology, classification, and the damage they cause plants, alone or in combination with other pathogens. 2 lectures, 2 laboratories. Prerequisite: BOT 323 or BOT 324.

BOT 326  Plant Ecology (4)  
Plant communities, population dynamics, and effects of the following environmental factors on plant growth and development: soil, water, temperature, light, atmosphere, topography, organisms, and fire. 3 lectures, 1 laboratory. Prerequisite: BOT 123.
BOT 333 Field Botany (4)  
Plant communities of California. Field identification of native and introduced plants in nature. Factors affecting plant distribution and relationships. Emphasis on local species. Several field trips. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: BOT 123.

BOT 334 Morphology of Vascular Plants (4)  
Phylogenetic relationships of the plant kingdom as illustrated by comparative morphology of the vascular plants including living and fossil forms. 2 lectures, 2 laboratories. Prerequisite: BOT 123.

BOT 335 Plant Anatomy (4)  
Microscopic study of vascular plants dealing with the origin, development and structure of cells, tissues and organs. 2 lectures, 2 laboratories. Prerequisite: BOT 122.

BOT 425 Plant Virology (4)  
Plant pathogenic viruses, their plant, insect, nematode and fungal host-pathogen relationships, symptom recognition, isolation and identification methods. 2 lectures, 2 laboratories. Prerequisite: BOT 323 or BOT 324.

BOT 426 Mycology (4)  
Comparative morphology and nuclear behavior of the fungi. Summary of the science with special attention given to forms important in agriculture, medicine and industry. 2 lectures, 2 laboratories. Prerequisite: BOT 122 or consent of instructor.

BOT 431 Advanced Plant Pathology (4)  
Methods, instruments, and materials used in diagnosis of plant diseases and in plant disease research. 2 lectures, 2 laboratories. Prerequisite: BOT 323 or BOT 324.

BOT 437 Algology (4)  
Classification of marine and fresh-water algae. Consideration of ecological, physiological and economic aspects. 2 lectures, 2 laboratories. Prerequisite: BOT 122.

BOT 443 Systematic Botany (3)  
Current theory of and approaches to botanical systematics, including use of morphological, cytological, biochemical, ecological and evolutionary data in classification. Rules of botanical nomenclature. 2 lectures, 1 laboratory. Prerequisite: BOT 123.

BOT 450 Plant Cell and Tissue Culture (5)  
Theory, methodology and potential of plant cell transformation and tissue culture including micropropagation, callus, suspension and protoplast cultures. 3 lectures, 2 laboratories. Prerequisite: BOT 322.

BUS–BUSINESS

BUS 100 Study Skills Adjunct (2) (CR/NC)  
Offered concurrently with BUS 101 to assist students in developing and improving their study skills, textbook comprehension, critical analysis, application and retention of the subject matter presented in the specific content course. Credit/No Credit grading only. 1 lecture, 1 activity.

BUS 101 The Business Enterprise (4)  
Orientation to the business administration program. Examination of the business enterprise, stressing its historical, environmental, and economic setting. Business organization and functions. 4 lectures.

BUS 200 Special Problems for Undergraduates (1–2)  
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

BUS 201 Business Law Survey (3)  
Overview of business law for other than business majors. Similar in scope to BUS 207, but in less detail. Not acceptable for credit toward Business Administration degree. 3 lectures.
BUS 205 Consumer Law (3)
Concepts of legal and self-protection in the marketplace. Procedures to use administrative agencies and court system. Specific interest areas: landlord-tenant; sales and warranties; consumer protection groups; home, auto, insurance purchases, etc. 3 lectures.

BUS 207 Business Law (4)
American legal system, contracts, agency, business organizations, and real property. 4 lectures. Prerequisite: Sophomore standing.

BUS 308 Advanced Business Law (4)
Legal aspects of management decisions, including problems arising in sales, commercial paper, personal property and bailments, secured transactions, bankruptcy, and securities regulation, with emphasis on the uniform commercial code. 4 lectures. Prerequisite: BUS 207 or equivalent and junior standing.

BUS 400 Special Problems for Advanced Undergraduates (1-4)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units. Prerequisite: Senior standing or consent of instructor.

BUS 404 Governmental and Social Influences on Business (4) GEB D.4.b.
Analysis from legal, economic, political, and ethical perspectives, of the changing domestic and international environments of the business enterprise. Topics include administrative law and regulatory policy, antitrust law, public policy analysis, and the interaction of business and government. 4 lectures. Prerequisite: Senior standing.

BUS 411 Legal Aspects of High Technology Management (4)
Practical legal decisions required to conduct business for or with high technology companies. Examination of methods to protect high technology developments, including copyrights, patents, trade secrets, trademarks and contracts. 4 lectures. Prerequisite: BUS 207 or equivalent.

BUS 430 Internship (4-8) (CR/NC)
Placement as an employee in a business firm approved by the department head. Periodic written progress reports required. Collateral reading correlated with the work experience. Credit/No Credit grading. Prerequisite: BUS 207 or equivalent.

BUS 461, 462 Senior Project (2) (2)
Selection and analysis of a problem under faculty supervision. Problems typical of those which graduates must solve in their fields of employment. Formal report is required. Minimum 120 hours total time. For Finance and Marketing Concentration students only.

BUS 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1-3 lectures. Prerequisite: Consent of instructor.

BUS 490 The Legal Environment of International Business (4)
U.S. Law, International Law and Foreign Law affecting international business. The cultural and political settings of foreign law. The world's legal traditions and systems. Case analysis. 4 lectures. Prerequisite: Senior standing, a course in American business law, one Political Science course, or consent of instructor.

BUS 500 Independent Study (1-4)
Advanced study planned and completed under the direction of a member of the Business Administration department faculty. Open only to graduate students who have demonstrated ability to do independent work. Prerequisite: Formal petition with approval.

CE–CIVIL ENGINEERING

CE 111 Civil Engineering Fundamentals I (1) (CR/NC)
Description of the field of civil engineering and the function of the professional civil engineer. Introduction to the major subdivisions of civil engineering including environmental, geotechnical, structural, and water resource engineering. Credit/No Credit grading only. 1 lecture.
CE 112  Civil Engineering Fundamentals II (2)
Continuation of CE 111. Application of basic design criteria to specific design problems, use of Civil Engineering department library computer programs for planning, analysis, and design. 1 lecture, 1 laboratory. Prerequisite: MATH 141, PHYS 131.

CE 200  Special Problems for Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

CE 202, 203  Mechanics of Materials (3) (2)
Stresses, strains and deflections due to axial, torsional, and flexural loading. Statically indeterminate members and columns. Mohr’s Circle and column buckling. Emphasis on problem solving. May not be substituted for CE 204 or CE 205. CE 202: 3 lectures. CE 203: 1 lecture, 1 laboratory. Prerequisite: ETME 205.

CE 204, 205  Strength of Materials (3) (2)
Stresses, strains and their relations applied to axial, torsional and flexural loads. Statically indeterminate axial members, beams and shafts. Columns, dynamic loads, repeated loads. Tension, compression, bending, shear, and torsion tests. Use of the SR-4 strain rosette for determining principal strains. CE 204: 3 lectures; CE 205: 2 lectures. Prerequisite: ME 211, CE 204 (for CE 205).

CE 206  Strength of Materials Laboratory (1)

CE 221  Fundamentals of Transportation Engineering (4)
Review of highway, air, rail, mass transit and other modes of transportation. Evolution of U.S. transportation systems. Transportation planning and operations. Feasibility analysis. Systems analysis, policy and management. 3 lectures, 1 laboratory. Prerequisite: MATH 141.

CE 259  Civil Engineering Materials (2)
Experimental determination of mechanical properties of concrete, asphalt, and soils as required for engineering applications. Experimental verification of assumptions made in mechanics of materials procedures. Use of strain measuring devices. Preparation of technical reports. 2 laboratories. Prerequisite: CE 204.

CE 336  Water Resources Engineering (4)
Hydraulics of open channel flow, flow through hydraulic structures, stream flow and stream flow hydrographs, hydrologic routing. 4 lectures. Prerequisite: ME 341.

CE 337  Hydraulics Laboratory (1)
Application of basic fluid dynamic principles to various mechanical systems. Exposure to experimental problems and techniques with guided laboratory projects related to civil engineering discipline. 1 laboratory. Prerequisite: ME 341.

CE 352, 353  Structural Analysis I, II (3) (3)
General structural theorems, energy methods, influence diagrams, deflection of structures, analysis of statically determinate and indeterminate structures. Introduction to matrix methods of analysis and dynamic response. 3 lectures. Prerequisite: CE 204, CE 205.

CE 355  Reinforced Concrete Design (3)
Analytical and design principles of reinforced concrete in designing civil engineering systems. Origin of code requirements. Fundamentals of proportioning. Details of elements and structural systems. 3 lectures. Prerequisite: CE 259, CE 353.

CE 381  Geotechnical Engineering (4)
Elementary mass-volume relations, clay-water interaction, soil classification, geostatic stress distributions, 1-D and 2-D steady-state flow. Consolidation settlement and rate of consolidation. Shear strength under drained and undrained conditions. Standard laboratory testing will be performed. 3 lectures, 1 laboratory. Prerequisite: CE 205, ME 341.
CE 400  Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

CE 405  Advanced Strength of Materials (3)

CE 407  Structural Dynamics (4)
Effect of vibration and transient loads on structural elements. Dynamics load factors, support motion, damping and natural frequencies of multidimensional structural systems. Modal analysis. 3 lectures, 1 laboratory. Prerequisite: CE 353, ME 212.

CE 421  Traffic Engineering (4)
Elements of ground circulation and planning. Driver and vehicle performance. Traffic counting analysis and control. Planning of ground transportation units and terminals as elements of complete transportation systems. 3 lectures, 1 laboratory. Prerequisite: CE 221.

CE 422  Highway Geometrics and Design (4)
Location and safe geometric design of highway and other transportation facilities. Earthwork and drainage related to highway, railway, dock, and airport design. Theory and practice in design of alignments, highway cross-sections, intersections, interchanges, and freeways in urban and rural areas. 2 lectures, 2 laboratories. Prerequisite: CE 421.

CE 424  Public Transportation (4)
Interdisciplinary aspects of public transportation problems, systems-team design approach to solutions. History and present state of public transportation; role of public transportation in urban environment; legislative, political, social, and economic aspects of public transportation systems. Methodology and procedures for transit planning. Review of transit studies. 3 lectures, 1 laboratory. Prerequisite: Senior standing.

CE 431  Coastal Hydraulics (3)
Waves and their characteristics, types of waves, water wave theories, orbital velocities, refraction of waves, wave diffraction, wave reflection, application of linear theory to wave forces on cylindrical structures, submerged pipelines and vertical flat barriers (sea walls), wave uprush, rubble mound breakwaters. 3 lectures. Prerequisite: ME 341.

CE 434  Groundwater Hydraulics and Hydrology (3)

CE 440  Hydraulic Systems Engineering (3)

CE 453  Structural Steel Design (3)
Design and behavior of the elements of steel structures. Proportioning of members and connections. Introduction to plastic design. 3 lectures. Prerequisite: CE 353.

CE 454  Structural Design (4)
Design of reinforced concrete, steel and timber structures. Loading standards, code design methods, connection design. Comprehensive design projects. 2 lectures, 2 laboratories. Prerequisite: CE 353, CE 355, CE 453.

CE 461, 462  Senior Project (2) (2)
Selection and completion of a project which is typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time. Prerequisite: Senior standing.
CE 464  Professional Practice (3)
Principles of professional engineering practice, the consulting engineer, engineering management, engineer-client relationships, professional ethics, marketing of engineering services, engineering agreements, case studies, analysis of uncertainty in engineering design. 3 seminars. Prerequisite: Upper division standing.

CE 470  Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

CE 471  Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

CE 481  Analysis and Design of Shallow Foundations (4)
Subsurface exploration and sampling techniques. Stress distribution beneath footings. Bearing capacity and settlement analyses for footings and mats. Methods for reducing settlement and accelerating consolidation. Compaction and soil improvement. Computer-aided analysis and design. Laboratory and standard field testing. 3 lectures, 1 laboratory. Prerequisite: CE 381.

CE 487  Rock Mechanics (3)
Methods for describing rock properties and application of rock mechanics for surface and underground excavations and foundations. Classification; stress and deformation, rock strength, underground openings, rock slope engineering and foundations. 3 lectures. Prerequisite: CE 381.

CE 500  Individual Study (1–3)
Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.

CE 521  Airfield and Highway Pavement Designs (4)
Theories, principles, and procedures in the structural design of highway and airfield pavements. Design of rigid and flexible pavements. Construction and maintenance procedures for pavements and stabilized bases. 3 lectures, 1 laboratory. Prerequisite: CE 259, graduate standing.

CE 522  Advanced Transportation Design (4)
Application of computers to advanced highway and transportation systems and geometrics. Use of computers for the solution of transportation planning, design, and operations. Use of traffic signal timing, and urban traffic demand forecasting. 2 lectures, 2 laboratories. Prerequisite: CE 422 or graduate standing.

CE 523  Transportation Systems Planning (4)
Planning of urban and statewide transportation systems. Air, water, rail, highway, and pipeline systems separately and in combination. Selection of routes and types of systems based on economic, social, technological, and other characteristics. Planning of terminals for all types of transportation systems. 3 lectures, 1 laboratory. Prerequisite: CE 421, ECON 211, or graduate standing.

CE 525  Airport Planning and Design (4)
Historical background of aviation and airport development; financing; estimating demand; aircraft characteristics; air traffic control; site selection; airport configuration; geometric design of landing area; planning and development of terminal areas; lighting; pavement design and drainage; design of heliports. 3 lectures, 1 laboratory. Prerequisite: CE 221 or graduate standing.

CE 527  Traffic Engineering–Operations and Controls (4)
Techniques for making traffic engineering investigations. Traffic laws and ordinances, speed regulation, curb parking regulations. Through controls, one-way streets, right-of-way regulations. Design and application of signs, markings, lighting. Traffic engineering. 3 lectures, 1 laboratory. Prerequisite: CE 421 or graduate standing.
CE 528 Transportation Analysis (4)
Principles and applications of engineering systems analysis to transportation using examples from specific modes such as highways and traffic. Identification of transportation benefits, user and non-user impacts, vehicle operating characteristics, traffic volume estimates, taxation, construction programming and scheduling. 3 lectures, 1 laboratory. Prerequisite: CE 421, IE 314, or graduate standing.

CE 529 Modeling and Simulation in Transportation (4)
Theory and operation of transportation systems, the systems approach, simulation techniques. Use of available software packages. Applications in California. Simulation model development, calibration and use. 2 lectures, 2 laboratories. Prerequisite: CE 421, CE 523, or graduate standing.

CE 533 Advanced Water Resources Engineering (3)
Matrix and simulation methods in hydrology, statistical studies in hydrology and their applications to civil engineering problems. Generalized hydrologic characteristics. Hydrologic simulation, computer applications, urban and small watershed hydrology, macroscopic and microscopic approach. Storm water management models. Hydrologic design. 3 lectures. Prerequisite: CE 336 or graduate standing.

CE 554 Matrix Analysis of Structures (3)
Matrix terminology and operations. Matrix procedures for analysis of continuous beams, plane frames, and space frames under static and quasi-static loading. Stiffness and flexibility methods. Computer applications. Special techniques for larger systems. 3 lectures. Prerequisite: CE 352, CE 353, CE 407 concurrently, or graduate standing.

CE 555 Advanced Civil Engineering Materials Laboratory (2)
Fundamental properties of new and advanced materials. Experimental techniques. Fracture characteristics and composite response of cement matrix composites. New materials and products to advanced applications such as automation. 2 laboratories. Prerequisite: CE 259 or graduate standing.

CE 558 Introduction to Finite Element Analysis (3)
Formulation of the finite element method. Finite elements and their properties. Analysis of plates, shells and framed structures under static and dynamic loads. Digital computer implementation of the finite element method. 3 lectures. Prerequisite: CE 554.

CE 559 Advanced Structural Design (3)
Advanced analysis, design and behavior of structural concrete. Reinforced, prestressed, and precast concrete elements. Linear and nonlinear structural systems. Origin of code requirements. Detailed design of components of civil engineering systems. Beams, slabs, columns, continuous systems, walls, connections, and composite systems. 3 lectures. Prerequisite: CE 355 or graduate standing.

CE 570 Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 seminars. Prerequisite: Graduate standing or consent of instructor.

CE 571 Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

CE 573 Public Works Administration (3)
Management and engineering of transportation and related systems in public jurisdictions. Traffic systems, streets and highways, illumination, distribution systems, etc. Personnel management, financing, public relations, and contract management. 3 seminars. Prerequisite: Graduate standing.

CE 574 Computer Applications in Civil Engineering (3)
Overview of computer application, hardware and software alternatives, use of selected application programs, CAD, microcomputers, management and application of resources. 1 lecture, 2 laboratories. Prerequisite: Graduate standing.
CE 581 Advanced Soil Mechanics (3)
Advanced shear strength theories, computer-aided prediction of stress, strain, and deformation for general loading. 3 lectures. Prerequisite: CE 381, graduate standing or consent of instructor.

CE 582 Advanced Geotechnical Testing (3)
Effective stress testing with laboratory and in situ testing including laboratory permeability, consolidation, and shear strength testing with triaxial apparatus. Cone penetrometer and flat-plate dilatometer testing. 1 lecture, 2 laboratories. Prerequisite: CE 581, graduate standing or consent of instructor.

CE 583 Soil Dynamics (3)
Machine and earthquake-induced ground motion, wave propagation through soil. Behavior of soil and foundations under cyclic and dynamic loading. Evaluation of design loading and soil response parameters. Analysis of liquefaction potential. 3 lectures. Prerequisite: CE 407, CE 481, graduate standing or consent of instructor.

CE 584 Lateral Support Systems (3)
Classical and modern earth pressure theories. Lateral earth pressure calculations for general surface and subsurface conditions. Analysis and design of cantilever reinforced concrete walls, cantilever and anchored sheetpile walls. Braced excavations, reinforced earth, and tie-back walls. 3 lectures. Prerequisite: CE 381, graduate standing or consent of instructor.

CE 585 Slope Stability Analysis (3)
Analysis of stability by planar, circular arc, piecewise-linear, and composite-surface techniques. Analysis of earth dams and reservoirs for both static and steady flow conditions. Stability under earthquake loading. Computer-aided analysis, field reconnaissance and slope stabilization techniques. 3 lectures. Prerequisite: CE 381, graduate standing or consent of instructor.

CE 586 Advanced Foundation Design (3)
Design and analysis of beams on elastic foundations and mat foundations. Pile foundations and sheet pile retaining structures. 3 lectures. Prerequisite: ARCE 422 or CE 481.

CE 587 Analysis and Design of Deep Foundations (3)
Bearing capacity analysis, settlement analysis. Design of single piles and pile groups for vertical, lateral, and combined loading. Analysis and design of drilled piers and caissons. 3 lectures. Prerequisite: CE 481, graduate standing or consent of instructor.

CE 591 Graduate Seminar (2)
Current trends and characteristics of civil engineering. Group discussions of skills, techniques and practices. Reports and discussions by students, based on topics of interest to persons preparing for a career in civil engineering. 1 seminar, 1 laboratory. Prerequisite: Graduate standing in Civil/Environmental Engineering or consent of instructor.

CE 599 Design Project (Thesis) (2) (2) (5)
Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master’s degree, culminating in a written report/thesis. Prerequisite: Graduate standing.

CHEM–CHEMISTRY

CHEM 106 Introductory Chemistry (3)
Introductory course in chemistry. Measurement, metric system, properties of matter, chemical symbols, atomic structure, chemical formulas, nomenclature, chemical equations, the mole concept, stoichiometry. Not open to students who have credit in a college chemistry course. 3 lectures. Prerequisite: MATH 103 or equivalent.

CHEM 121 General Chemistry (4)
Fundamental principles including atomic structure, bonding, nomenclature, chemical equations, states of matter, solutions, and energy with attention to applications to related fields. Intended primarily for students whose majors are not in the Schools of Engineering or Science and Mathematics. Not open to students with credit for CHEM 124 or CHEM 127. 3 lectures, 1 laboratory. Prerequisite: CHEM 106 or equivalent or consent of instructor.
CHEM 122 General Chemistry (4)  GEB B.1.a.
Continuation of CHEM 121. Colloids, kinetics, equilibrium, acids and bases, electrochemistry, nuclear chemistry, nonmetals, applications to related fields. Intended primarily for students whose majors are not in the Schools of Engineering or Science and Mathematics. Not open to students with credit for CHEM 125 or CHEM 128. 3 lectures, 1 laboratory. Prerequisite: CHEM 121.

CHEM 124 General Chemistry (4)  GEB B.1.a.
Atomic structure, chemical equations, stoichiometry (mass balance in chemical reactions), naming of simple inorganic compounds, solutions. Introduction to carbon compounds emphasizing fuels and polymers. Intended primarily for engineering majors, except Engineering Technology and Industrial Technology. Not open to students with credit for CHEM 121 or CHEM 127. 3 lectures, 1 laboratory. Prerequisite: CHEM 106 or equivalent or consent of instructor.

CHEM 125 General Chemistry (4)  GEB B.1.a.
Introduction to chemical thermodynamics (energy balance in chemical reactions), equilibrium, rates of reaction, acids and bases, coordination compounds, oxidation-reduction reactions, electrochemistry, corrosion, nuclear chemistry. Intended primarily for students whose majors are in the School of Engineering. Not open to students with credit for CHEM 122 or CHEM 128. 3 lectures, 1 laboratory. Prerequisite: CHEM 124.

CHEM 127 General Chemistry (4)  GEB B.1.a.
Introduction to atomic theory, chemical reactions, bonding, stoichiometry, nomenclature, gas laws, colligative properties, colloids, and solutions. Intended primarily for students whose majors are in the School of Science and Mathematics. Not open to students with credit in CHEM 121 or CHEM 124. 3 lectures, 1 laboratory. Prerequisite: High school algebra and chemistry or CHEM 106.

CHEM 128 General Chemistry (4)  GEB B.1.a.
Continuation of CHEM 127. Oxidation-reduction reactions, electrochemistry, kinetics, equilibria, thermodynamics, acids and bases. Intended primarily for students whose majors are in the School of Science and Mathematics. Not open to students with credit in CHEM 122 or CHEM 125. 3 lectures, 1 laboratory. Prerequisite: CHEM 127.

CHEM 129 General Chemistry (4)  GEB B.1.a.
Acid and base equilibria, buffers, transition elements, solubility, complex ions, hybridization, nuclear chemistry. Laboratory study of the chemical properties and semi-micro qualitative analysis of the representative group elements of the periodic table. Intended primarily for students whose majors are in the School of Science and Mathematics. 3 lectures, 1 laboratory. Prerequisite: CHEM 125 or CHEM 128.

CHEM 156 General Chemistry Laboratory (1)  GEB B.1.a.
Additional laboratory to be taken with CHEM 129. Includes chemical properties and semi-micro qualitative analysis of the transition and post-transition metal ions of the periodic table, methods of inorganic synthesis. 1 laboratory. Prerequisite: CHEM 122, CHEM 125, or CHEM 128.

CHEM 200 Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: CHEM 121, CHEM 124, or CHEM 127 and consent of department head.

CHEM 252 Laboratory Glassblowing (1)
Techniques of glassblowing applied to the making of simple laboratory apparatus. 1 laboratory. Prerequisite: CHEM 121, CHEM 124 or CHEM 127.

CHEM 253 Chemical Literature (2)
Information searches in primary and secondary chemical literature and computer database. Organizing and presenting chemical information in written documents. 1 lecture, 1 activity. Prerequisite: CHEM 316 or CHEM 326.
CHEM 301 Biophysical Chemistry (3) 
Basic physical chemistry for the study of biological systems. Kinetic- molecular theory, gas laws, principles of thermodynamics as applied to biochemical systems. Not open to students with credit in CHEM 305. 3 lectures. Prerequisite: CHEM 328 or concurrent CHEM 371, PHYS 123 or PHYS 133, MATH 132 or MATH 142.

CHEM 302 Biophysical Chemistry (4) 
Application of physical chemistry to biochemical systems. Buffers, electrochemistry, reaction rate theory, enzyme kinetics, viscosity, surface and transport properties of macromolecules. Not open to students with credit in CHEM 306. 3 lectures, 1 laboratory. Prerequisite: CHEM 301 or CHEM 305; CHEM 328 or CHEM 371.

CHEM 305 Physical Chemistry (3) 
Introduction to chemical thermodynamics. Thermochemistry. Phase equilibria. Chemical equilibrium. 3 lectures. Prerequisite: PHYS 123 or PHYS 133, CHEM 125 or CHEM 129, MATH 132 or MATH 142.

CHEM 306 Physical Chemistry (3) 
Applications of chemical thermodynamics. Electrochemistry. Kinetic theory of gases. Chemical kinetics. 3 lectures. Prerequisite: CHEM 305.

CHEM 307 Physical Chemistry (4) 
Introduction to quantum theory. Chemical bonding and molecular structure. Spectroscopy and diffraction. 3 lectures, 1 laboratory. Prerequisite: CHEM 302 or CHEM 306 and CHEM 356, or consent of instructor.

CHEM 316 Organic Chemistry (4) 
Structure, bonding, nomenclature, isomerism, stereochemistry and physical properties of organic compounds. Reactions and mechanisms of alkanes, alkenes, alkynes, cycloalkanes. Laboratory techniques in organic preparations. 3 lectures, 1 laboratory. Prerequisite: CHEM 122, CHEM 125 or CHEM 128.

CHEM 317 Organic Chemistry (5) 
Reactions and reaction mechanisms of organic halides, alcohols, phenols, epoxides, ethers, carboxylic acids and their derivatives, aldehydes, ketones; acidity and basicity; infrared and NMR spectroscopy. 3 lectures, 2 laboratories. Prerequisite: CHEM 316.

CHEM 318 Organic Chemistry (5) 
Chemistry of amines, aromatic compounds, heterocycles, macromolecules, some biomolecules, carbanions, rearrangements; mass spectrometry. Practice in organic synthesis. 3 lectures, 2 laboratories. Prerequisite: CHEM 122.

CHEM 326 Survey of Organic Chemistry (4) 
Structure, nomenclature, some characteristic reactions of functional groups and applications of organic chemicals in agriculture, medicine, industry and the home. A terminal survey course not open to students with credit in CHEM 316. 3 lectures, 1 laboratory. Prerequisite: CHEM 122, CHEM 125 or CHEM 128.

CHEM 328 Survey of Biochemistry (4) 
Fundamental chemistry of carbohydrates, proteins, fats, vitamins, enzymes and hormones as applied to their function in plant and animal metabolism. Special reference to the application of chemistry to the areas of agriculture, human health and nutrition, and the production of food and animal feeds. 3 lectures, 1 laboratory. Prerequisite: CHEM 326.

CHEM 331 Quantitative Analysis I (5) 
Introduction to the principles of analytical chemistry. Sampling, interpretation of data, and the application of chemical equilibria to analytical problems. Survey of important analytical methods emphasizing the theory and implementation of titrimetric methods. 3 lectures, 2 laboratories. Prerequisite: CHEM 129.
CHEM 332 Quantitative Analysis II (4)  
Theory and analytical techniques associated with gravimetric analysis and titrimetric precipitometry. Continuation of redoximetry. Introduction to instrumental methods of analysis, with theory and application of electrogravimetry, potentiometry and spectrophotometry. 2 lectures, 2 laboratories. Prerequisite: CHEM 331.

CHEM 335 Clinical Chemistry (3)  
Basic principles of physiological chemistry including clinical significance of medical laboratory data. Introduction to medical laboratory techniques used in the quantitative determination of glucose, protein, hemoglobin and lipids in biological fluids including blood, serum, and urine. 2 lectures, 1 laboratory. Prerequisite: CHEM 328 or CHEM 371, and CHEM 331.

CHEM 336 Clinical Chemistry (4)  
Advanced principles of physiological chemistry including clinical significance of medical laboratory data. Theoretical and practical aspects of diagnostic enzymology and biochemical profiling. Medical laboratory techniques used in the determination of renal and liver function, electrolytes, enzymes, hormones, and toxic substances. 3 lectures, 1 laboratory. Prerequisite: CHEM 335.

CHEM 341 Environmental Chemistry I (3)  
Nature, composition, reactions, redox equilibria and complexation in natural water systems. Microorganisms as aquatic catalysts, heterogeneous reactions, chemical aspects of water treatment and pollution. 3 lectures. Prerequisite: CHEM 129 and CHEM 326 or CHEM 316.

CHEM 342 Environmental Chemistry II (3)  
Nature and composition of the atmosphere. Oxides of carbon, sulfur and nitrogen. Organic and inorganic pollutants, particulate matter, photochemical smog. Environmental chemistry of soil and mineral resources. 3 lectures. Prerequisite: CHEM 129 and CHEM 326 or CHEM 316.

CHEM 344 Chemical Process Principles (3)  
Fundamental terms, concepts, and principles used in the chemical processing industries. 3 lectures. Prerequisite: CHEM 316 or consent of instructor.

CHEM 350 Chemical Safety (1)  
Laboratory regulations, equipment hazard analysis, hazardous chemicals, classification of chemicals, toxic materials handling, reaction hazards, radiation, emergency procedures, safety management programs and legal concerns. Includes project. 1 lecture. Prerequisite: CHEM 326 or equivalent.

CHEM 355 Physical Chemistry Laboratory (1)  
Experimental studies of gases, solutions, thermochemistry and chemical equilibria. 1 laboratory. Corequisite: CHEM 305.

CHEM 356 Physical Chemistry Laboratory (1)  
Experimental studies of phase rule, electrochemistry and chemical kinetics. 1 laboratory. Corequisite: CHEM 306.

CHEM 371 Biochemical Principles (4)  
Chemical and physical factors in biological processes. Chemistry and function of major cellular constituents: proteins, nucleic acids, lipids, carbohydrates, vitamins. 3 lectures, 1 laboratory. Prerequisite: CHEM 326 or CHEM 317. Strongly recommended: CHEM 331.

CHEM 372 Metabolism (3)  
Intermediary metabolism, regulation and integration of metabolic pathways, bioenergetics, photosynthesis, electron transport, nitrogen fixation, biochemical function of vitamins and minerals. 3 lectures. Prerequisite: CHEM 371.

CHEM 373 Molecular Biology (3)  
CHEM 374 Biochemistry Laboratory (2)  
Experiments in metabolism, including animal and microbial studies; isolation and characterization of enzymes and nucleic acids. 2 laboratories, offered during the same day or on consecutive days to simulate biochemical research conditions. Prerequisite: CHEM 371.

CHEM 375 Molecular Biology Laboratory (2) (Also listed as BIO 375)  
Introduction to techniques used in molecular biology and biotechnology; plasmid DNA extraction, agarose gel electrophoresis, restriction endonuclease mapping, transduction, transformation, and gene cloning. 2 laboratories. Prerequisite: BACT 221 or BACT 224 and BIO 304 or CHEM 373.

CHEM 377 Chemistry of Drugs and Poisons (3)  
Introduction to pharmacology: history, sources, development and testing, physical and chemical properties, biochemical and physiological effects, mechanisms of action, and the therapeutic uses and toxicology of common drugs and poisons acting on the nervous, cardiovascular, immune and hormone systems, and on cancer, infectious disease, etc. Especially applicable to students in nonbiochemical disciplines. 3 lectures. Prerequisite: CHEM 328 or CHEM 371 or consent of instructor.

CHEM 378 Biochemical Pharmacology (3)  
Consideration of current selected topics in pharmacology including drug design, biochemical mechanisms of drug activity and issues pertaining to the disposition of drugs to the public. Lecture, professional consultation, library research, and student presentations. 3 lectures. Prerequisite: CHEM 377 or equivalent as determined by instructor.

CHEM 385 Geochemistry (3)  
Application of chemical principles to terrestrial and extraterrestrial systems. Formation of the elements; chemical influences on the earth’s formation; chemical evolution studies; age-dating techniques; reactions in sea water; petroleum and ore formation; distribution and movement of the elements. 3 lectures. Prerequisite: CHEM 316, CHEM 331.

CHEM 400 Special Problems for Advanced Undergraduates (1–2)  
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Junior standing and consent of department head.

CHEM 419 Intermediate Organic Chemistry (3)  
The synthesis of functional groups in biochemical systems. Mechanisms of acid-base reactions, nomenclature, stereochemistry, spectroscopy, cycloaddition. 3 lectures. Prerequisite: CHEM 318.

CHEM 435 Food Analysis (4)  
Techniques used commercially in the chemical analysis of seed and cereal crops, fruit and vegetable crops, forage crops, meat and meat products, milk and dairy products, eggs and poultry products. Vitamin determinations, microbiological assay, quality control, taste testing, legal specifications, grading and labeling. 3 lectures, 1 laboratory. Prerequisite: CHEM 328 or CHEM 371.

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 or CHEM 371.

CHEM 439 Instrumental Analysis (5)  
Theory, practice and method selection of modern instrumental analytical techniques, including spectroscopic, electrochemical, chromatographic and thermal methods. Current industrial applications. Laboratory work emphasizes optimization of experimental parameters. 3 lectures, 2 laboratories. Prerequisite: CHEM 331, CHEM 356 or CHEM 302. Recommended: CHEM 307.

CHEM 444 Polymers and Coatings I (3)  
Physical properties of polymers and coatings and their measurement. Molecular weight averages, glass transition, thermodynamics of polymers. Viscoelastic properties, rheology, molecular weight determination. Thermal analysis, spectroscopic analysis, mechanical testing. 3 lectures. Prerequisite: CHEM 317.
CHEM 445  Polymers and Coatings II (3)
Introduction to polymerization methods and mechanisms. Chemistry of initiators, catalysts and inhibitors. Uses of representative polymer types. Synthesis, film formation, structure and properties of polymers commonly used in coatings and adhesives. 3 lectures. Prerequisite: CHEM 317.

CHEM 446  Surface Chemistry of Materials (3) (Also listed as MET 446)

CHEM 447  Polymers and Coatings Laboratory I (2)

CHEM 448  Polymers and Coatings Laboratory II (2)
Experimental techniques of producing and characterizing coatings. Compounding and formulating modern protective coatings. Modern methods of testing protective coatings. Surface preparation techniques. 2 laboratories. Prerequisite: CHEM 446, CHEM 447.

CHEM 449  Internship in Polymers and Coatings (2)
Selected students will spend up to 12 weeks with an approved polymers and coatings firm engaged in production or related business. Time will be spent applying and developing production and technical skills and abilities in the polymers and coatings industry. Prerequisite: Consent of instructor.

CHEM 457  Qualitative Organic Analysis (3)
Experimental determination of the identity of organic compounds. Emphasis on chemical methods. 1 lecture, 2 laboratories. Prerequisite: CHEM 317.

CHEM 458  Instrumental Organic Qualitative Analysis (2)
Separation, purification, and identification of organic molecules using chemical and instrumental methods, including nuclear magnetic resonance, infrared and ultraviolet spectroscopy and mass spectroscopy. 2 laboratories. Prerequisite: CHEM 318.

CHEM 459  Undergraduate Seminar (2)
Oral presentation of current developments in chemistry based on current literature. Preparation for employment and for independent work in chemistry. 2 seminars. Prerequisite or corequisite: CHEM 253 and junior standing.

CHEM 461, 462  Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time. Prerequisite: CHEM 459.

CHEM 470  Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: CHEM 301, or CHEM 305, or CHEM 317 or consent of instructor.

CHEM 471  Selected Advanced Laboratory (1-3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

CHEM 473  Immunochemistry (3)
Theory and practice of immunochemistry including the structure, genetics, chemical modification and production of antibodies, immunochemical techniques and the biochemistry of the immune defense process. 3 lectures. Prerequisite: CHEM 371 or consent of instructor.
CHEM 474  Protein Techniques Laboratory (2)
Experiments in protein affinity chromatography, electrophoresis and blotting, immunoprecipitation techniques, antibody-enzyme conjugation, and immunoassay. 2 laboratories. Prerequisite: CHEM 473 or ZOO 426.

CHEM 475  Tissue Culture Techniques (4) (Also listed as BIO 475)
Introduction to the principles and methods of tissue culture with emphasis on the manipulation and study of animal cells. 2 lectures, 2 laboratories. Prerequisite: BACT 221 or BACT 224, BIO 303 and CHEM 328 or CHEM 371.

CHEM 481  Inorganic Chemistry (3)
Systematic study of important elements based on periodic grouping and atomic structure with emphasis on chemical bonding, coordination compounds, and acid-base relationships. 3 lectures. Prerequisite: CHEM 306 or consent of instructor.

CHEM 482  Synthetic Inorganic Chemistry (3)
Inorganic systems. Historical development of inorganic compounds and their uses. Emphasis on symmetry, isomerism, structure, and methods of synthesis. Laboratory involves preparation of inorganic compounds using high temperature, inert atmosphere, photolysis, electrolytic and other synthetic techniques. 2 lectures, 1 laboratory. Prerequisite: CHEM 481 or consent of instructor.

CHEM 500  Individual Study (1–3)
Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated the ability to do independent work. Total credit limited to 4 units. Prerequisite: Graduate standing and consent of department graduate coordinator.

CHEM 501  Physical Chemistry–Thermodynamics (3)
Deductive systematization of classical thermodynamics and its chemical applications. Introduction to statistical thermodynamics and its application to the calculation of thermodynamic properties. 3 seminars. Prerequisite: CHEM 307, CHEM 316 or consent of instructor.

CHEM 502  Physical Chemistry–Quantum Chemistry (3)
Theory and methods of quantum chemistry with application to the investigation of molecular structure, chemical bonding, and molecular spectra. 3 seminars. Prerequisite: CHEM 405 or consent of instructor.

CHEM 503  Kinetics and Catalysis (4)
Reaction rates and mechanisms of homogeneous and heterogeneous, noncatalyzed and catalyzed reactions. Interdisciplinary laboratory skills development related to industrial catalysis research. 2 lectures, 2 laboratories. Prerequisite: CHEM 307, CHEM 318 or consent of instructor.

CHEM 514  Advanced Organic Chemistry–Synthesis (3)

CHEM 515  Advanced Organic Chemistry–Mechanisms (3)
Advanced study of organic reaction mechanisms and physical organic methods. Mechanistic topics may include carbocations, carbanions, free radicals, carbenes and pericyclic reactions. Physical organic methods may include kinetics, solvent effects, isotope effects, linear free energy relationships and stereochemistry. 3 seminars. Prerequisite: CHEM 318.

CHEM 516  Advanced Organic Chemistry–Natural Products (3)
Structure determination and total synthesis of compounds of biological origin. 3 seminars. Prerequisite: CHEM 318.

CHEM 528  Nutritional Biochemistry (3)
Nutritional aspects of biochemistry. Lecture, library research and student presentations. Topics include vitamins and minerals, essential and energy providing nutrients, deficiency, degenerative and genetic diseases of metabolism. Emphasis on current research and controversy. 3 lectures. Prerequisite: CHEM 328 or CHEM 372 or consent of instructor.
CHEM 541 Synthetic Methods (2-4)
Techniques for synthesis of organic and inorganic substances. Use of modern equipment and methods; inert atmosphere, low and high temperature, low and high pressure, semi-micro technique, separation and purification techniques. 2 to 4 laboratories. Prerequisite: CHEM 318.

CHEM 572 Advanced Biochemistry (3)
Protein structure and function. Lecture, library research and student presentations. Topics encompass considerations of the physical structure of proteins, domain theory, protein folding, and current methods of structural analysis as well as methods for determining enzyme mechanisms including kinetics, isotope effects, stereochemistry, cryoenzymology, trapping of intermediates, and transition state analogues. 3 lectures. Prerequisite: CHEM 371 and CHEM 302 or CHEM 306 or equivalents as determined by instructor.

CHEM 573 Advanced Biochemistry (3)
Advanced study of nucleic acid structure and function. Format includes lecture, library research and student presentations. Topics include immunochromistry or mechanisms of genetic regulation and cell differentiation, advances in knowledge of nucleic acid sequence and organization, chromosome structure, and molecular aspects of genetic diseases, including cancer. 3 lectures. Prerequisite: CHEM 373 or equivalent.

CHEM 574 Advanced Biochemistry (3)
Advanced study of membranes and metabolism. Lecture, library research and student presentations. Membrane structure and function, hormone interactions, mitochondria structure and function, immunochromistry and neurochemistry. 3 lectures. Prerequisite: CHEM 373 or equivalent as determined by instructor.

CHEM 590 Graduate Seminar (1)
Advanced topics in chemistry, including original work by faculty, guests, and graduate students. Topics vary each quarter. Total credit limited to 3 units. Required of all graduate students in chemistry. 1 seminar. Prerequisite: Graduate standing in chemistry, or consent of instructor.

CHEM 598 Internship (3-6)
Supervised technical field experience in areas such as chemical sales, manufacturing, process development, clinical chemistry, analytical chemistry, pollution control. Prerequisite: Graduate standing or consent of instructor, and approval of the department head and school dean.

CHEM 599 Thesis (3) (3) (3)
Individual research under the general supervision of the staff leading to a graduate thesis of suitable quality. Prerequisite: Graduate standing in chemistry.

CM—CONSTRUCTION MANAGEMENT

CM 201 Introduction to Construction Management (3)
Overview of the construction industry and its markets, impact, practices, methods, and ethics. 3 lectures. Prerequisite: Second-year standing.

CM 321 Concrete Technology (2)
Modern concepts which form the basis for solutions to problems of concrete construction. Includes significant developments in concrete chemistry and strength theory. Development of a rational basis for writing concrete specifications and for proportioning concrete mixes. 2 lectures. Prerequisite: ARCE 222.

CM 322 Concrete Technology Laboratory (1)
Concrete mix design, physical properties of concrete, use of admixtures, concrete batching, concrete curing, testing of concrete and concrete specifications. Includes mix design, batching and physical testing of the designed mixes. 1 laboratory. Concurrent: CM 321 recommended.

CM 325 Construction Management Practices (3)
Overview of construction methods, building systems, construction and contract documents, cost estimating and scheduling and other practices used in the contracting process. For non-majors. 2 lectures, 1 activity. Prerequisite: Second year standing or consent of instructor.
CM 331  Construction Cost Control (3)
Basic application of construction cost control systems and the use of cost information and associated reports. 3 lectures. Prerequisite: CM 201 or consent of instructor.

CM 332  Cost Alternatives Evaluation (4)
Basic principles of economic evaluations between cost alternatives. 4 lectures. Prerequisite: CM 201 or consent of instructor.

CM 333  Construction Contracts Administration (3)
Administration of construction documents including invitation to bid, addenda, proposals, change orders, subcontracts, liens, claims, waivers, and arbitration. 3 lectures. Prerequisite: CM 201 or consent of instructor.

CM 341  Wood and Masonry Construction Practices (3)
Building systems, equipment, materials, and techniques. Construction practices related to residential and light commercial structures. One designated field trip required. 3 laboratories. Prerequisite: Third-year standing.

CM 342  Concrete, Formwork and Structural Steel Construction Practices (3)
Building systems, equipment, materials, and techniques. Construction practices related to large commercial, institutional and industrial structures. One designated field trip required. 3 laboratories. Prerequisite: Third-year standing.

CM 343  Earthwork and Civil Works Construction Practices (3)
Earthwork and civil works construction methods, stressing field operations management, engineering estimating. 3 laboratories. Prerequisite: Third year standing.

CM 350  Computer Applications in Construction Management (2)
Application of computer systems to control construction operations in the building industry. Development of construction management games. 2 lectures. Prerequisite: CSC 110 or ARCH 250.

CM 351  Building Support System Construction Practices (3)
Equipment, materials and techniques of installation and construction of water supply, waste water, fire protection and other piping systems. Emphasis on the role of specialty contractors in the construction process. 3 activities. Prerequisite: ARCH 231, PHYS 133 or PHYS 137.

CM 352  Building Support System Construction Practices (3)
Equipment, materials and techniques of installation and construction of electrical power systems. Includes conveyance systems. Emphasis on the role of specialty contractors in the construction process. 3 activities. Prerequisite: ARCH 231, PHYS 133 or PHYS 137.

CM 353  Building Support System Construction Practices (3)
Equipment, materials and techniques of installation and construction of environmental systems. Emphasis on the role of specialty contractors in the construction process. 3 activities. Prerequisite: ARCH 231, PHYS 133 or PHYS 137.

CM 400  Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

CM 412  Survey of Building Codes and Regulations (2)
Building codes and legal problems related to the construction industry. Contractor's licensing laws, labor and lien laws. 2 lectures. Prerequisite: Fourth year standing.

CM 431  Management of Interdisciplinary Functions in Construction (3)
Management activities applicable to the building process including conceptual, planning, design, bid, negotiation, construction, and occupancy phases of public and private projects. Emphasis on the integration of planning, design and construction efforts to achieve maximum project quality and value. 3 lectures. Prerequisite: Upper division standing.

CM 433  Economic Analysis for Engineers (2)
Engineering economics, and engineering studies including feasibility and alternate problem analysis. 2 lectures.
CM 441 Building Estimating I (3)
Procedures for determining quantities of materials for the construction of buildings. 3 activities. Prerequisite: CM 341, CM 342, CM 343.

CM 442 Building Estimating II (2)
Procedures for estimating costs of buildings. 2 activities. Prerequisite: CM 441.

CM 443 Principles of Construction Management (3)
Applications of a broad range of construction management techniques to case studies involving a variety of operations in construction firms. 3 activities. Prerequisite: Fourth-year standing.

CM 451 Principles of Heavy Construction (4)
Methods and procedures, field operations for heavy process construction projects. 4 laboratories. Prerequisite: ARCE 309 and fourth-year standing or consent of instructor.

CM 452 Project Controls (4)
Planning, organization, scheduling, and control of construction projects. 4 laboratories. Prerequisite: Fourth-year standing or consent of instructor.

CM 453 Project Development (4)
Methods and procedures used in the development of a residential, commercial, or industrial project. 4 laboratories. Prerequisite: Fourth year standing, CRP 212, LA 213 or consent of instructor.

CM 461, 462 Senior Project (2) (1) (CR/NC)
Selection and completion of a comprehensive project under faculty supervision. Problems to involve the student's technical and creative skills. Construction and team projects encouraged. To be completed in two consecutive quarters. 90 hours minimum total time. Credit/No Credit grading only. Prerequisite: CM 341, CM 342, CM 343.

CM 470 Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

CM 471 Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

CM 531 Construction Cost and Material Control (3)
Advanced theory and practice of cost and material control for construction projects. Emphasis on computer applications. 2 lectures, 1 activity. Prerequisite: CM 331 or consent of instructor.

CM 533 Case Histories in Contract Administration (3)
Common points of disputes between design professional, owner, and contractor. Methods of avoidance and dispute resolution. 3 activities. Prerequisite: CM 333, 4th year architectural practice or consent of instructor.

CM 542 Construction Estimating and Bidding Strategy (3)
Advanced theory and practice of cost estimating techniques. Includes standard, conceptual and parameter estimating, risk analysis. Emphasis on computer applications. 2 lectures, 1 activity. Prerequisite: CM 420 or consent of instructor.

CM 552 Construction Project Scheduling (3)
Basic and advanced network scheduling techniques as applied to architectural building projects. Emphasis on computer applications. 2 lectures, 1 activity. Prerequisite: CM 542 or consent of instructor.

CM 570 Selected Advanced Topics in Construction Management (3)
Directed study of selected topics in Construction Management. Class Schedule will list topic selected. Total credit limited to 9 units. 3 seminars. Prerequisite: Graduate standing or consent of instructor.
CONS 120  Fisheries and Wildlife Management (3) (Also listed as FOR 120)  GEB F.2.
Survey of fisheries and wildlife resources and management practices. Relationships to recreational
values, land management, food production, and preservation. 3 lectures.

CONS 207  Resource Survey (3)
Introduction to survey and analysis methods used in assessing biological resources. Inventory meth-
ods of vegetation and wildlife sampling and questionnaire surveys. 2 lectures, 1 laboratory.

CONS 210  Biology and Conservation of Endangered Species (3)
Importance of species diversity. Past and present causes of endangerment and extinction. Biological
attributes which predispose species to extinction. Modern recovery efforts, including habitat preser-
vation and captive propagation. Emphasis on North American plants and animals. 3 lectures. Prereq-
uisite: One course in Biological Sciences.

CONS 221  Wildlife Techniques (3)
Techniques for terrestrial wildlife investigations. Field and lab procedures including telemetry, mark-
ing, capture, age and sex determination, and population analysis. 2 lectures, 1 laboratory. Prerequi-
site: CONS 120.

CONS 311  Introductory Conservation (3)
Basic principles and problems of conservation. Interrelationships of living organisms and their biotic
and abiotic environments. Regional and global perspectives on manipulations and alterations in
marine, freshwater and terrestrial ecosystems. 3 lectures. Prerequisite: One course in Biological
Sciences.

CONS 320  Fishery Resource Management (4)
Management of recreational and commercial fisheries to produce sustained annual crops of fishes.
Survey, inventory, and evaluation techniques used for the management of a fishery. Methods of
dealing with fish populations, aquatic habitats, and user groups. 3 lectures, 1 laboratory. Prerequisite:
BIO 325 or consent of instructor.

CONS 422  Freshwater Fisheries (3)
Freshwater fish and fishery resources of the Pacific Coast. Identification, life history, ecology and
economics of important western and local species. Field trips to various warm and cold water fishery
facilities. 2 lectures, 1 laboratory. Prerequisite: ZOO 322.

CONS 426  Resource Population Dynamics (3)
Growth, fluctuations, balance, and natural mechanisms controlling terrestrial wildlife populations. 3
lectures. Prerequisite: BIO 325 or one course in ecology.

CONS 427  Habitat Management (4)
Habitat design, development, and management of wetlands and uplands that support wildlife.
Habitat development planning project required. 3 lectures, 1 laboratory. Some weekend labs neces-
sary. Prerequisite: BIO 325 or consent of instructor.

CONS 431  Game Management (4)
General principles, problems and techniques of increasing the harvest of waterfowl, upland game,
and big game. Identification and life histories of important western game species. Several weekend
field trips. 3 lectures, 1 laboratory. Prerequisite: BIO 325 or ASCI 229.

CONS 433  Aquaculture (4)
Propagation and rearing of fishes, invertebrates and algae from marine and freshwater habitats.
Current methodologies and general life histories. Global perspective with focus on aquacultural
development in developed and undeveloped countries. 3 lectures, 1 laboratory. Prerequisite: BOT
122, ZOO 132, ZOO 133.
COOP–COOPERATIVE EDUCATION

COOP 486 Cooperative Education Experience (6)
Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 18 units. May not be taken CR/NC. Prerequisite: Sophomore standing and consent of instructor.

COOP 586 Cooperative Education Experience (6)
Advanced study analysis and full-time work experience in student’s career field. Current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 12 units. May not be taken CR/NC. Prerequisite: Graduate standing, consent of adviser and COOP instructor.

CPE–COMPUTER ENGINEERING

CPE 461, 462 Senior Project (3) (2)
Selection and completion of a project under faculty supervision. Project results are presented in a formal report. Miscellaneous course fee required—see Class Schedule. Minimum 150 hours total time. Prerequisite: CSC 304, EL 309, EL 319.

CPE 463 Undergraduate Seminar (1) (CR/NC)
Discussion of new developments in the field of computer engineering. Fields of employment and job considerations. Credit/No Credit grading only. 1 seminar. Prerequisite: Senior standing.

CRP–CITY AND REGIONAL PLANNING

CRP 101 Introduction to the Profession of City and Regional Planning (1) (CR/NC)
Orientation to the jobs and responsibilities of professional planners working in the public and private sectors. Credit/No Credit grading only. 1 lecture.

CRP 111 Introduction to Drawing and Perspective (3)
Basic techniques used in graphic communication. Orthographic and isometric projection. Mechanical perspective, shades and shadows. 3 laboratories.

CRP 112 Basic Graphics (3)
Drawing as a communication tool in the environmental design fields. Exercises to develop basic skills and speed in the representation of ideas. Use of various drawing media. 3 laboratories. Prerequisite: CRP 111.

CRP 201, 202 Environmental Design Fundamentals (3) (3)

CRP 203 Applied Design and Planning Fundamentals (3)
Applications of basic design fundamentals and the design of environments through design exercises. 3 laboratories. Prerequisite: CRP 202, LA 213.

CRP 211 Introduction to Urbanization (3) GEB F.2.
Evolution, planning, and design of cities. Interpretation of environmental, social, economic, and technological factors that have influenced the physical organization, planning, and design of cities. 3 lectures.

CRP 212 Introduction to Urban Planning (3) GEB F.2.
Problems and responses to contemporary urban growth and change. Development of theories of urban planning and design. Introduction to zoning, planning regulations and codes, professional practice. Relationship of environmental design disciplines, citizen groups, and individuals to planning. 3 lectures.
CRP 213  Information for Urban and Regional Planning (3)
Sources of information and data related to city and regional planning, architecture, and environmental design. Search, selection, reduction of data, and application to program development. 3 lectures. Prerequisite: CRP 212.

CRP 214  Urban and Regional Processes (3)
How cities and regions work, grow or decline; their relationship to public and private actions. Spatial analysis and locational theories. Integrated perspective for environmental design professions. 3 lectures. Prerequisite: CRP 212.

CRP 215  Regional Planning and Economic Development (3)
Introduction to regional development and planning. Patterns of regional growth within the context of national and regional economic development, the public role in development and the critical issues confronted by regional planners. 3 lectures. Prerequisite: CRP 212.

CRP 216  Computer Applications for Planning (3)
Introduction to the use of computer facilities and software programs with special applications for planners including drawing, design, graphs, data base, spreadsheets, statistical applications. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories. Prerequisite: CSC 110.

CRP 218  Exploring Future Environments (3)
Examination and implications of emerging and potential social, technical, and resource changes for human living environments. Futures scenario explorations of characteristics for environmentally and socially sustainable rural and urban communities. Guest lecturers and discussions. 3 lectures.

CRP 240  Additional Planning Laboratory (1–2)
Total credit limited to 4 units, with a maximum of 2 units per quarter. 1 or 2 laboratories.

CRP 243  Site Planning (3)
Art and science of arranging structures, circulation systems, utilities and plant material on natural and urban sites to support human behavior in three-dimensional spaces while minimizing disruption to natural systems. Emphasis on special types including planned unit developments, waterfronts, hillsides, campuses and commercial centers. 3 laboratories. Prerequisite: LA 213.

CRP 314  Planning Theory (3)
Theory of planning and the role of theory in planning. Role of planner in society, purpose of planning, administrative framework in which planning takes place, and the rational model. 3 lectures. Prerequisite: CRP 212.

CRP 347, 348  Urban and Regional Design (3) (3)
Three-dimensional design of urban and regional areas within the comprehensive planning process. Effect of human activities on the form of the natural and built environment at differing scales. Miscellaneous course fee required—see Class Schedule. 3 laboratories. Prerequisite: CRP 203.

CRP 351, 352, 353  Planning Laboratory (4) (4) (4)
Case study application of planning theory to the community, its components, and to the city and the region. Relationships of city spaces and structures. Redevelopment. Field trips. Individual team, and interdisciplinary approaches. Computer applications. Miscellaneous course fee required—see Class Schedule. 4 laboratories. Prerequisite: CRP 213, CRP 214, CRP 216, LA 213, GEOL 201, STAT 211.

CRP 360  Urban Aesthetics (1–3)
Aesthetics as an important aspect of the physical and social organization of cities. Identification, study, and evaluation of aesthetic design in the context of the present. 1–3 lectures. Prerequisite: Junior standing and consent of instructor.

CRP 400  Special Problems for Advanced Undergraduates (1–2)
Individual or group investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.
CRP 407 Environmental Law (3) (Also listed as NRM 407)
Detailed examination of the law governing use and protection of natural resources with focus on the legal institutions entrusted with the public duty of protecting the environment. 3 lectures. Prerequisite: Senior standing, POLS 206, or consent of instructor.

CRP 408 Water Resource Law and Policy (3) (Also listed as NRM 408)
Detailed examinations of the various legal systems of water use, regulation and management in California and the United States. Discussion of the key concepts and principles of state, federal and interstate water quality control; focusing on issues and problems, why conflicts occur and how solutions evolve. 3 lectures. Prerequisite: NRM 302 or instructor approval, senior standing.

CRP 409 Planning Internship (2-4) (CR/NC)
Work experience as a supervised employee in a government or related agency. Prior contract specifying the product of internship required between student, agency and faculty. Thirty hours work experience per unit of credit. Total credit limited to 4 units. Credit/No Credit grading. Prerequisite: Consent of instructor.

CRP 420 Planning Law (4)
Public controls protecting natural environmental systems. Land use and environmental controls. Review of control mechanisms. State and federal legislation. Legal implications of controls, public planning and policy issues. 4 lectures. Prerequisite: CRP 351, urban planning laboratory, or consent of instructor.

CRP 430 Planning Administration (3)
Relationships of planning agencies to other governmental bodies, public agencies and citizen groups. The public planning agency and the private practitioner. Public and personnel relations. Current topics in planning administration. 3 lectures. Prerequisite: Senior standing.

CRP 435 Transportation Theory (4)
Circulation and transportation elements of the General Plan. Transportation planning theory, methods and tools related to systematic analysis of city and regional transportation problems including environmental impact assessment. Application of techniques for assessing transportation systems, gravity models, route selections, land use models and relationship to transportation. 3 lectures, 1 laboratory. Prerequisite: CRP 212, or consent of instructor.

CRP 444 Infrastructure and Planning Management (4)
Basic infrastructure systems necessary to support urban development. Basic components of systems and how they are planned, financed and managed. 4 lectures. Prerequisite: CRP 352, ENVE 331 or senior standing.

CRP 447 Design Regulations (3) (Also listed as ARCH 447)
Practical application of fundamental building code requirements and zoning regulations in the design process. Codes and regulations used including city zoning regulations, city parking and driveway standards, the Uniform Building Code, and the architectural barrier laws. 3 lectures. Prerequisite: ARCH 342, or consent of instructor.

CRP 451 Planning Laboratory (4)
Case study application of planning theory and methods to regional and environmental systems. Regional spatial development and resource use. Interrelationships between natural, economic, social and political systems. Field trips. Individual, team and interdisciplinary approaches. Miscellaneous course fee required—see Class Schedule. 4 laboratories. Prerequisite: CRP 353, NRM 304.

CRP 452 Planning Laboratory (4)
Case study application of planning theory and methods to regional and environmental systems. Regional spatial development and resource use. Interrelationships between natural, economic, social and political systems. Field trips. Individual, team and interdisciplinary approaches. Miscellaneous course fee required—see Class Schedule. 4 laboratories. Prerequisite: CRP 451.

CRP 453 Planning and Design Laboratory (4)
For the final laboratory application, the student may choose between a regional rural planning focus and an urban and regional design focus. Miscellaneous course fee required—see Class Schedule. 4 laboratories. Prerequisite: CRP 348, CRP 452.
CRP 457 Planning Information Systems (3)
Use of a problem-oriented system to retrieve statistical information pertinent in planning. Miscellaneous course fee required—see Class Schedule. 3 lectures. Prerequisite: CRP 353.

CRP 461, 462 Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results presented in a formal report. To be completed in two consecutive quarters. Minimum 120 hours time. Prerequisite: CRP 353.

CRP 463 Undergraduate Seminar (2)
Discussion and lectures on problems of professional practice in planning. Professional ethics. Students present organized material on some subject of interest. 2 seminars. Prerequisite: CRP 452.

CRP 470 Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

CRP 471 Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

CRP 472 Planning Colloquium (1) (CR/NC)
Panel discussion by two or more faculty members and invited guests on controversial or topical planning related subject matter at campus and/or off-campus locations. Topics to be announced in advance by CRP Department. Total credit limited to 3 units. Credit/No Credit grading only. 1 seminar. Prerequisite: Upper division standing.

CRP 500 Individual Study (2–3)
Independent research, studies, or surveys of selected subjects. Total credit limited to 9 units. Prerequisite: Graduate standing with minimum of 12 core units.

CRP 501 Foundations of Urban and Regional Planning (4)
Origins and evolutionary stages of settlement patterns and the use of land and natural environment. Changes and the dynamics involved in the development of cities and regions through the modern epoch. 4 lectures. Prerequisite: Graduate standing.

CRP 502 Planning Principles and Practice (4)
Purposes of planning and its political and social context. Methodology of planning and its process. Major substantive content and issues of city and regional planning. Professional roles, strengths and weaknesses of contemporary planning. 4 lectures. Prerequisite: CRP 501 or consent of instructor.

CRP 505 Principles of Regional Planning (4)
History, development and major philosophical approaches of regions and regional planning, both in urban-centered and resource-based regions. Effects of relaxing natural, economic and infrastructure limiting factors on growth and development of regions. Normative hierarchical emphasis of contemporary regional planning compared to emerging paradigms that alter the regional/local planning relationship. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

CRP 510 Planning Theory (4)
Theory of planning. Development of contemporary planning thought from varying sources and perspectives. Intensive study of planning literature. Alternative value systems and planning processes. Current approaches and philosophies in the United States and other countries. 4 seminars. Prerequisite: CRP 502 or consent of instructor.

CRP 513 Survey and Research Methods (4)
Design and execution of field surveys, reduction of data to produce information for planning. Miscellaneous course fee required—see Class Schedule. 3 seminars, 1 supervision. Prerequisite: Graduate standing, STAT 211 or equivalent, or consent of instructor.
CRP 515 Graphic Communication for Planners (3)
Basic techniques used in graphic communication. Orthographic, isometric and perspective drawing. Introduction to various drawing media and delineation and presentation techniques for planners. Designed to develop three-dimensional visualization, graphic skills and basic proficiency in the exploration and communication of information and design ideas. Miscellaneous course fee required—see Class Schedule. 3 laboratories. Prerequisite: Graduate standing.

CRP 516 Quantitative Methods in Planning (4)
Problem recognition, data selection, analysis and synthesis with applications of system design, statistical techniques and symbolic modeling to urban design and regional growth and development policies. Miscellaneous course fee required—see Class Schedule. 3 seminars, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

CRP 520 Feasibility Studies in Planning (4)
Base studies and economic development. Fiscal effectuation of policies and plans. Tax base and tax policies related to land use planning. Social accounting and overhead. Cost benefit studies and economic feasibility of plans. Long-range financial planning. Phasing and time scheduling. Miscellaneous course fee required—see Class Schedule. 4 seminars. Prerequisite: CRP 502 or consent of instructor.

CRP 525 Plan Implementation (4)
Zoning theory and legal background as a device to guide urban growth. Zoning ordinance, districting plan. Subdivision regulations, Capital Improvement program, mandatory referral, eminent domain. Official plan lines, building, health, sanitation, housing and fire codes. Grants administration. 4 seminars. Prerequisite: CRP 353 or consent of instructor.

CRP 548 Principles of Urban Design (3)
Introduction to the philosophy and theory particular to environmental design. Exploration of evaluation criteria and critical analysis of man's environment related to design and human needs. Spatial and form relationships, scale, human activities, concept formation, visual organization of the city, landscaping and architecture. 3 seminars.

CRP 552 Urban Planning Laboratory (4)

CRP 553 Project Planning Laboratory (4)
Project-scale planning problems. Arranging structures, circulation systems, utilities and plant material on natural and urban sites to support human activity while minimizing disruption to natural systems. Includes planned unit developments, waterfronts, hillsides, campuses and commercial centers. Field trips. Miscellaneous course fee required—see Class Schedule. 4 laboratories. Prerequisite: CRP 515.

CRP 554 Regional Planning Laboratory (4)
Application of advanced planning theory and methods to regional problems and issues. Research, analysis, synthesis and implementation practice. Interrelationships between natural, economic and political regions, technology, resource use. Field trips. Individual, team and interdisciplinary approaches. Miscellaneous course fee required—see Class Schedule. 4 laboratories. Prerequisite: CRP 502, CRP 505.

CRP 570 Selected Topics in Planning (3)
Directed group study of selected topics in planning theory. Total credit limited to 9 units. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

CRP 598 Research Design and Methods (2)
Investigation of appropriate topics and research methodologies for preparing a master's thesis for professional planners. Prerequisite: Second-year graduate standing.
CRSC—CROP SCIENCE

CRSC 100 Enterprise Project (1–4) (CR/NC)
Selection and completion of a management/production project under faculty supervision. Project participation is subject to approval by the department head and the Cal Poly Foundation. Degree credit limited to 12 units. Credit/No Credit grading only.

CRSC 101 Orientation to Crop Science (1) (CR/NC)
Understanding the depth and breadth of field crops, fruit and vegetable production and plant protection. Examination of the potential career opportunities and introduction to both student and professional organizations and affiliations. Required of all Crop Science Department students. Credit/No Credit grading only. 1 activity.

CRSC 109 Principles of Agricultural Pest Management (4)
Identification and control of common insect and vertebrate pests of agricultural crops and stored products. Safe use and handling procedures of insecticides, rodenticides, and avicides. Natural, cultural, mechanical, and chemical controls of injurious insects, mites, mammals, and birds. 3 lectures, 1 laboratory. Open only to students seeking two-year technical certificate.

CRSC 123 Forage Crops (4)
Production, harvest, utilization and value of important forage crops. Adaptation, identification and relative merits of grasses and legumes will be covered. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory.

CRSC 131 Introduction to Crop Science (4)
Production principles for field and vegetable crops. Fundamental botany, taxonomy and cultural practices. Soil tillage, fertilization, seed selection, planting and harvesting methods, irrigation, weed control, pest control, and crop rotation. Production practices for cotton. A field trip to a major California production area is required. Not open to students with credit in CRSC 131. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory.

CRSC 132 Grain Crops (4)
Production, adaptation, distribution, and utilization of major grain crops harvested by combine, including wheat, barley, oats, corn, rice, sorghum, rye, triticale, and millets. Field trips to major California cereal production areas. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: CRSC 131 or CRSC 230.

CRSC 133 Row Crops (4)
Adaptation, production, processing, and utilization of major row crops such as potatoes, tomatoes, dry beans, and sugar beets. Field trip to a major California row crop production area required. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: CRSC 131 or VGSC 230.

CRSC 200 Special Problems for Undergraduates (2–4)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

CRSC 221 Weed Control (4)
Identification, life histories, and control of common, noxious, and poisonous California weeds. Weed control chemicals and equipment for cultivated crops, irrigation systems, range, wastelands. 3 lectures, 1 laboratory. Prerequisite: BOT 121 or CRSC 131 or FRSC 131.

CRSC 493 CRP 599 Thesis/Project (6)
Individual research under the general supervision of the faculty, leading to a graduate thesis or project of suitable quality. Prerequisite: Advancement to candidacy.
CRSC 231 Commercial Seed Production and Conditioning (4)
Production and conditioning of certified and commercial seed including seed analysis, germination, quality control, cleaning and storage techniques, and seed laws. Field trip to a seed conditioning plant required. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: CRSC 132 or CRSC 133.

CRSC 304 Plant Breeding (4)
Application of principles of plant improvement through plant introduction, selection, hybridization, and in vitro techniques. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: BIO 303.

CRSC 311 Applied Insect Pest Management (4)
Principles of controlling insect pests including biological, cultural, physical, mechanical, and chemical controls. Identification of insects injurious to California field, fruit, and vegetable crops including stored products and livestock. Insecticide formulation and methods of application. 3 lectures, 1 laboratory. Prerequisite: CHEM 121 or introductory courses in biology, botany or zoology or consent of instructor.

CRSC 322 Crop Technology (4)
Recent developments in technology relating to advancements in crop production under different cropping systems. Field trip required. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: CRSC 133 or FRSC 133, BOT 121, junior standing, or consent of instructor.

CRSC 327 Vertebrate Pest Management and Control (4)
Vertebrate pests injurious to crops, livestock, other animals, stored products, and man. Life habits, identification, control methods, and materials. Related laws and regulations. 3 lectures, 1 laboratory. Prerequisite: At least one course in production agriculture and junior standing.

CRSC 333 Nutriculture (4)
Development, practices, history, and future of crop production using nutrient solutions. Research applications, commercial applications, production problems, marketing, and economics. Field trip to a commercial greenhouse operation required. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: CHEM 122, CRSC 133, SS 221 or consent of instructor.

CRSC 400 Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Any CRSC 100- or 200-level course or consent of department head.

CRSC 405 Advanced Weed Science (4)
Classification and structure of herbicides. Physiological processes affecting and affected by herbicides, mode of action, factors influencing herbicide performance. Influence of plants and soil on the action of herbicides, symptoms of herbicide injury to plants. Principles, development and application of biological means of weed control including the concept of allelopathy. Field trip required. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: CRSC 221, CHEM 326, or consent of instructor.

CRSC 410 Crop Physiology (4)
Life processes of plants, such as photosynthesis and respiration, and the application of knowledge of these processes to crop production practices. 3 lectures, 1 laboratory. Prerequisite: CRSC 131, CRSC 230, FRSC 131, FRSC 230 or VGSC 230; and CHEM 328.
CRSC 411 Experimental Techniques and Analysis (4)
Principle experimental designs used in agriculture and methods of analysis of data collected from each. Field practice in planning and layout of typical experiments. 3 lectures, 1 laboratory. Prerequisite: Junior standing and MATH 117 or equivalent, and STAT 211 or consent of instructor.

CRSC 421 Oil and Fiber Crops (4)
Culture, harvest, grading, and marketing of cotton, soybean, sunflower, safflower, and other oil and fiber crops. Field trips to major centers of production and marketing required. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: CRSC 133, CRSC 221 and BOT 121.

CRSC 423 Tropical Crop Production (4)
Production distribution, adaptation and utilization of major field and vegetable crops of economic importance in tropical and subtropical areas. 3 lectures, 1 activity. Prerequisite: CHEM 121 or CRSC 230 or consent of instructor.

CRSC 431 Advanced Insect Pest Management (4)
Strategies, economics and case histories of insect pest management. Insect population monitoring and modeling. Insect identification. Field trips required. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: CRSC 311 or consent of instructor.

CRSC 441 Biological and Cultural Control of Insects (4)
Biological control of insects to include history of classical methods, augmentation and inundative release of beneficial insects, nematodes, microbials, and other biорational agents. Cultural techniques encompassing rotations, exclusion, quarantine, and trap crops. Field trips to insectories. 3 lectures, 1 laboratory. Prerequisite: CRSC 311 or consent of instructor.

CRSC 461, 462 Senior Project (3) (3)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 180 hours total time. Prerequisite: CRSC 411.

CRSC 463 Undergraduate Seminar (2)
Oral presentation and leadership of group study on recent developments in the major field. 2 seminars.

CRSC 470 Selected Advanced Topics (2-4)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 2–4 lectures. Prerequisite: Consent of instructor.

CRSC 521 Advanced Field Crop Production (4)
Production and management of field crops under both intensive and extensive cultural practices; interaction between the various growth factors at various levels of production and interaction of cultural practices and plant requirements. 3 lectures, 1 laboratory. Prerequisite: Graduate standing and consent of instructor.

CRSC 525 International Intensive Farming Systems (4)
Diverse and integrated agricultural methods with concentration on small-scale, intensive farms. Emphasis placed on international agricultural development for self-sufficiency and profit. Farm design, tools, fertilization, cropping systems, irrigation, crop production, storage and marketing. 3 lectures, 1 laboratory. Prerequisite: Graduate standing and consent of instructor.

CRSC 581 Graduate Seminar in Crop Production (3)
Group study and oral reports on current technical problems and research results pertaining to field and vegetable crops production or marketing. 3 seminars. Prerequisite: Graduate standing.
CSC--COMPUTER SCIENCE

CSC 110 Computers and Computer Applications (3) GEB F.1.
The computer as a problem-solving tool. A working introduction to microcomputers and network computer systems and related concepts, including programming in a modern language and the demonstrated ability to make effective use of applications software packages. Credit not allowed for CSC majors. 2 lectures, 1 activity.

CSC 111 Introduction to Computer Applications for the Sciences (3) GEB F.1.
Fundamental concepts of computing. Techniques for problem solving with computers. Writing and running programs in BASIC. Examples of applications and applications software drawn from the sciences. Credit not allowed for CSC majors. 2 lectures, 1 laboratory.

CSC 112 Pascal Programming (3) GEB F.1.
Fundamental concepts of computing. Techniques for problem solving with computers. Writing and running programs in the programming language Pascal. Hands-on experience with text editors and other programming support tools. Credit not allowed for CSC majors. 2 lectures, 1 activity.

CSC 118 Fundamentals of Computer Science I (4) GEB F.1.
Introduction to programming. Emphasis on structured programming, top-down design, successive decomposition, and modularity. Data types, program control statements, input-output, subroutines, arrays and records, and the use of library modules. 3 lectures, 1 activity.

CSC 120 Principles of Business Data Processing (4) GEB F.1.
Fundamental concepts of digital computing. Survey of computing devices, languages, methods and applications for business data processing. Credit not allowed for CSC majors. 4 lectures. Prerequisite: High school algebra.

CSC 200 Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

CSC 201 FORTRAN Programming (3)
Programming in extended FORTRAN language with emphasis on program efficiency and advanced features. Comparison of FORTRAN implementations. 3 lectures. Prerequisite: CSC 118, and MATH 131 or MATH 141.

CSC 203 COBOL Programming (3)
Structure of the Common Business-Oriented Language (COBOL). Coding fundamentals and program logic. Writing of complete COBOL programs applied to typical business data processing problems. 3 lectures. Prerequisite: Any computer programming course.

CSC 204 C and UNIX (3) GEB F.1.
Extensive programming in the C language. Operators, standard I/O functions, strings, pointers and arrays, data types and storage classes. The UNIX programming environment: features of the UNIX shell, shell programming and using UNIX system functions from C. Credit not allowed for CSC majors. 3 lectures.

CSC 207 BASIC Programming (3)
Advanced programming methods using the BASIC language. Language features, data types, file structures, error handling, and string processing. Structured programming and problem solving techniques in BASIC. 3 lectures. Prerequisite: Knowledge of a high level programming language, e.g. FORTRAN, Pascal, Modula 2 or C, or consent of instructor.

CSC 209 Selected Programming Languages (3)
Language to be studied will be selected from high level programming languages or current interest and will be announced prior to registration for the quarter. Emphasis on language syntax and usage, and unique features. Intended for proficient programmers who want to learn another programming language. Total credit limited to 6 units. 3 lectures. Prerequisite: CSC 218.
CSC 215  Computer Architecture I (4)
Elements of architecture and assembly language. Primarily designed for majors. 3 lectures, 1 laboratory. Prerequisite: EL 219 (or concurrent) and CSC 218.

CSC 218  Fundamentals of Computer Science II (3)
Advanced structured programming, emphasis on development and use of classical algorithms. Recursion, dynamic data structures, and algorithms for their implementation. 3 lectures. Prerequisite: CSC 118.

CSC 219  Linear Programming (3)
Introduction to linear programming, the simplex algorithm, duality, sensitivity and post optimal analysis. Use of linear programming techniques to solve linear optimization models. 3 lectures. Prerequisite: 6 units of college mathematics.

CSC 221  Assembly Language Programming (4)
Techniques of structured assembly language programming on micro-computers. Credit not allowed for CSC majors. 3 lectures, 1 laboratory. Prerequisite: A minimum of 3 units of high level languages, e.g. FORTRAN, Pascal, Modula 2 or C.

CSC 240  Programming Environments I (3)
Use of interactive multiprocessing programming environments (such as UNIX) and the basic software development tools of the environment. Development of programs using the environment's systems programming language. 3 lectures. Prerequisite: CSC 218.

CSC 245  Discrete Structures (3)
Introduction to discrete structures of computing. Propositional and predicate calculus. Selected elements of computability, algorithm complexity and correctness. Induction and recurrence relations. Applications of graph theory and finite state machines. 3 lectures. Prerequisite: CSC 118, EL 219, MATH 143.

CSC 251  Digital Computer Applications (2)
Programming techniques and procedures with applications to engineering problems in FORTRAN. Introduction to numerical methods and simulation. 2 activities. Prerequisite: MATH 142 or MATH 132, PHYS 131 or PHYS 121.

CSC 255  Computer Graphics Applications (4)
For students who wish to learn to use computer graphics in their own disciplines. Plotter and interactive graphic display characteristics and programming. Use of computer graphics facilities. Introduction to interactive graphic display characteristics. Credit not allowed for both CSC 255 and CSC 455. 3 lectures, 1 laboratory.

CSC 311  Numerical Engineering Analysis (3)
An intensive survey of numerical analysis techniques used for solving problems in electrical and electronic engineering. Areas include solution of nonlinear equations, solution of linear systems, interpolation, numerical integration, ordinary differential equations, eigenvalues and eigenvectors. 3 lectures. Prerequisite: Knowledge of a high level programming language, e.g. FORTRAN, Pascal, Modula 2 or C, and MATH 242 or equivalent.

CSC 315  Computer Architecture II (4)
Intermediate architecture topics. Levels of virtual machines and their languages. Special emphasis on level 1 and microprogramming. Design of conventional machines, study of tradeoffs in various designs. 3 lectures, 1 laboratory. Prerequisite: CSC 215, CSC 345, EL 219.

CSC 316  Computer Architecture III (4)
Microprocessor architecture and interfacing. Emphasis on study of one microprocessor and how it interfaces with other chips such as serial and parallel I/O, static and dynamic RAM, ROM, DMA's and FDC's. 3 lectures, 1 laboratory. Prerequisite: CSC 315.
CSC 331 Numerical Linear Analysis (3)
Introduction to methods currently available to engineers, scientists and mathematicians for solving nonlinear equations. Computer methods in matrix algebra. Solution of a system of linear equations by direct and iterative methods. Curve fitting techniques. Applications to problems in engineering and science. 3 lectures. Prerequisite: MATH 133 or MATH 143 or equivalent, and knowledge of a high level of programming language, e.g. FORTRAN, Pascal, Modula 2, or C.

CSC 332 Numerical Analysis I (3)
Computer solutions of nonlinear equations and systems of linear equations. Polynomial interpolation. Numerical quadrature. Introduction to the solution of ordinary differential equations. 3 lectures. Prerequisite: MATH 143 or equivalent and knowledge of a high level of programming language, e.g. FORTRAN, Pascal, Modula 2, or C.

CSC 333 Numerical Analysis II (3)
Solution of systems of differential equations, predictor-corrector methods, stiff equations. Approximation methods: cubic splines, B-splines, Bezier curves, least squares, methods for solving boundary value problems. 3 lectures. Prerequisite: CSC 332 or equivalent.

CSC 342 Programming Environments II (4)
Windowing workstation programming environment and the software development tools of that environment. Development of window-oriented programs using the environment's programming language. 3 lectures, 1 laboratory. Prerequisite: CSC 240 and CSC 345.

CSC 345 Data Structures (3)
Specification and implementation of data structures as abstract data types. Introduction to the analysis of algorithms through the analysis of different implementations of particular abstract data types. 3 lectures. Prerequisite: CSC 218.

CSC 346 File Structures (3)

CSC 347 Introduction to Database Systems (4)
Introduction to the basic methods and principles of database management systems (DBMS) and of application development using DBMS. Topics covered: DBMS objectives and architecture, database models, data definition and manipulation languages, query languages, database and application design, development tools. 3 lectures, 1 laboratory. Prerequisite: CSC 345.

CSC 350 Discrete Dynamic Systems (3)
Analytical and simulation modeling and analysis of systems. Statistics and techniques of performance measurement and evaluation. Operational analysis. Introduction to discrete event and continuous simulation. 3 lectures. Prerequisite: Knowledge of a high level of programming language, e.g. FORTRAN, Pascal, Modula 2, or C, STAT 211 or STAT 321 or consent of instructor.

CSC 351 Programming Languages I: Design (3)
Comparison of structure and semantics of various high level programming languages. BNF grammars. Language design issues and techniques, including parameter passing, storage allocation and mapping and binding time. 3 lectures. Prerequisite: CSC 215, CSC 245, CSC 345.

CSC 353 Computer Systems Programming (3)
Design of assemblers, macroprocessors, linkers and loaders. Advanced macrowriting, I/O programming, and interrupt handlers. 3 lectures. Prerequisite: CSC 215, CSC 240, CSC 345.

CSC 357 Computer-Based Writing Tools (4)
Automated and conceptual tools for creating, organizing, and formatting traditional and electronic documents. Introduction to desktop publishing. 3 lectures, 1 laboratory. Prerequisite: One programming course and completion of English composition requirement.
CSC 360 Continuous Dynamic Systems (3)
Modeling, computer simulation and analysis of dynamic systems represented by ordinary differential equations. Applications of high level languages for continuous system simulation. Selected applications. 3 lectures. Prerequisite: MATH 242 and knowledge of a high level programming language, e.g. FORTRAN, Pascal, Modula 2, or C.

CSC 400 Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

CSC 401 Real-Time Programming and Ada (3)

CSC 404 Computer Networks (4)
Fundamentals of communication technology for asynchronous and synchronous transmission systems. Introduction to communication network architecture and topologies. Layered protocols, protocol standards and network design. Introduction to communication system analysis and performance evaluation. 3 lectures, 1 laboratory. Prerequisite: CSC 315 or CSC 453 or consent of instructor.

CSC 410 Computer Fundamentals for Educators (3)
GEB F.1.
For students who plan to participate in the expanding role of computers in the field of education. Computer fundamentals, programming techniques, problem solving. Computers as teacher's aid and administrative tool. Credit not allowed for CSC majors. 2 lectures, 1 activity. Prerequisite: Junior standing or consent of instructor and knowledge of a high level programming language, e.g. FORTRAN, Pascal, Modula 2, or C.

CSC 411 Advanced Programming for Educators (3)
Intermediate and advanced techniques of programming in a high level language for microcomputers. Arrays, string processing, user defined functions, error trapping, subroutines, and files. 3 lectures. Prerequisite: CSC 110 or CSC 410 or consent of instructor.

CSC 413 Authoring Languages (4)
Introduction to the fundamental concepts of authoring languages. Survey of the attributes and applications of authoring languages. 3 lectures, 1 laboratory. Prerequisite: CSC 112 or CSC 118.

CSC 414 Authoring Languages and Systems (4)
Advanced techniques utilizing the computer to assist individualized instruction. Comparison between authoring languages and authoring systems. Emphasis on advanced features of authoring languages and their applications in computer-based education. 3 lectures, 1 laboratory. Prerequisite: CSC 413.

CSC 415 Microcomputer Systems (4)
Recent advances in microcomputer architectures. RISC, parallel processing advances and component communication. 3 lectures, 1 laboratory. Prerequisite: CSC 316.

CSC 416 Computer Applications in School Administration (3)
Applications of computer techniques to data processing and other management applications in the administration of schools and school districts. Credit not allowed for CSC majors. 3 lectures. Prerequisite: CSC 410.

CSC 419 Mathematical Programming (3)
Extensions of linear programming, introduction to nonlinear programming, dynamic programming and dynamic optimization procedures with industrial applications. 3 lectures. Prerequisite: CSC 219 and MATH 133 or MATH 143.

CSC 420 Artificial Intelligence (4)
Programs and techniques that characterize artificial intelligence. Programming in LISP. 3 lectures, 1 laboratory. Prerequisite: CSC 345.
CSC 421 Knowledge Based Systems (4)
In-depth treatment of knowledge representation, utilization and acquisition in a programming environment. Emphasis on the use of domain-specific knowledge to obtain expert performance in programs. 3 lectures, 1 laboratory. Prerequisite: CSC 420.

CSC 427 Computer-Based Educational Systems I (4)
Introduction to the design and implementation of computer-based educational systems. Emphasis on sound generation and videodisc overlay to create a multi-media learning environment. 3 lectures, 1 laboratory. Prerequisite: CSC 414.

CSC 431 Numerical Analysis III (3)
Methods for solving special systems of equations. Iterative and direct methods. Solution of partial differential equations by the finite difference method. Method of characteristics. Methods for finding eigenvalues and eigenvectors including the QR method. 3 lectures. Prerequisite: CSC 332 or equivalent.

CSC 440 Software Engineering I (3)
Introduction to the software lifecycle. Methods and tools for the analysis, design, and specification of large, complex software systems. Project documentation, organization and control, communication, and time and cost estimates. Group laboratory project. 2 lectures, 1 laboratory. Prerequisite: CSC 345.

CSC 441 Software Engineering II (3)
Continuation of the software lifecycle. Methods and tools for the implementation, integration, testing and maintenance of large, complex software systems. Program development and test environments. Group laboratory project. 2 lectures, 1 laboratory. Prerequisite: CSC 440.

CSC 444 Health Information Systems (3)
Their design, implementation, and applications including the evaluation of medical data as input to health care agencies' quality assurance systems for improving the quality of patient care and determining medical necessity. Credit not allowed for CSC majors. 3 lectures. Prerequisite: CSC 110 or CSC 410 or consent of instructor.

CSC 445 Theory of Computing I (3)
Topics chosen from such areas of theoretical computer science as theory of automata (including cellular automata), formal language theory, computation theory, computational complexity, and program verification. 3 lectures. Prerequisite: CSC 245.

CSC 447 Principles of Database Systems (3)
Implementation issues for the relational model including transaction management (concurrency control and recovery), query processing and distributed databases. 3 lectures. Prerequisite: CSC 346, CSC 347.

CSC 450 Programming Languages II: Description and Analysis (3)
Regular languages and finite automata. Lexical analysis and parsing functions of compilers. Context-free languages and pushdown automata. Continuation of CSC 351. 3 lectures. Prerequisite: CSC 351.

CSC 451 Programming Languages III: Compiler Implementation (3)

CSC 453 Introduction to Operating Systems (4)
Introduction to sequential and multiprogramming operating systems; kernel calls, interrupt service mechanisms, scheduling, files and protection mechanisms, conventional machine attributes that apply to operating system implementation, virtual memory management, and I/O control systems. 3 lectures, 1 laboratory. Prerequisite: CSC 315, CSC 353.

CSC 454 Implementation of Operating Systems (4)
Design and implementation of multiprogramming kernels, systems programming methodology, interprocess communications, synchronization, device drivers and network access methods. 3 lectures, 1 laboratory. Prerequisite: CSC 453.
CSC 455Computer Graphics (4)
Graphics hardware and primitives. DDA, polygon filling, windowing and clipping. 2D and 3D transformations, 3D rendering, backface removal, depth sorting. Shading and illumination techniques. Basic fractal forgeries. 3 lectures, 1 laboratory. Prerequisite: CSC 345 and knowledge of C.

CSC 456Computer Graphics II (4)
Parametric representations. Curves and surface patches (B-splines, Catmull-Rom, Bezier), Oslo-algorithm. Ray-tracing polyhedra, general conics. Principles of solid modeling. Pattern and texture mapping, fractal geometry. 3 lectures, 1 laboratory. Prerequisite: CSC 455 and knowledge of C.

CSC 461, 462Senior Project (2) (3)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: Recommended; CSC 440 for CSC 461; CSC 441 for CSC 462.

CSC 463Undergraduate Seminar (2) (CR/NC)
Reports and discussions by students, based on their senior projects and on other topics relating to computer usage and programming which are of interest to persons preparing for a career in computer science. Offered only on a Credit/No Credit basis. 2 activity periods.

CSC 470Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

CSC 500Directed Study (2-3) (CR/NC)
Individual directed study of advanced topics. Total credit limited to 4 units. Credit/No Credit grading only. Prerequisite: Fully classified graduate standing and consent of instructor.

CSC 501Languages and Translators (4)
Advanced programming language and translator concepts. Language concepts to be covered will be selected from current state-of-the-art languages and current issues in language design. Compiler concepts will include retargetable code generation, use of translator-writing systems, and error recovery. 4 seminars. Prerequisite: CSC 451, graduate standing or consent of instructor.

CSC 502Database Systems (4)
Topics in database systems: recovery, integrity, concurrency, security, data models, distributed databases, database machines, database system implementation, and semantic database design. 4 seminars. Prerequisite: CSC 447, graduate standing or consent of instructor.

CSC 503Operating Systems (4)
General concepts of computer architecture and operating systems. Design features of advanced computers, general time-sharing systems and schemes for dynamic memory allocation, scheduling and protection. Dynamic linkage between subroutines. Intercommunication between input/output and processors. 4 seminars. Prerequisite: CSC 453, graduate standing or consent of instructor.

CSC 504Advanced Computer Architecture (4)
Comparative study and design of multiprocessor, dataflow, RISC, high level language and other new computer architectures. VLSI processor design techniques. 3 seminars, 1 laboratory. Prerequisite: CSC 315, graduate standing or consent of instructor.

CSC 505Theory of Computing II (4)
Advanced topics in theoretical computer science from such areas as automata theory, cellular theory, computational complexity, and program verification. 4 seminars. Prerequisite: CSC 445, graduate standing or consent of instructor.

CSC 506Artificial Intelligence (4)
Advanced programming approach to the study of artificial intelligence. Experience in developing programming tools such as discrimination nets, pattern matching and agendas. Extensive programming in at least one AI language. 3 seminars, 1 laboratory. Prerequisite: CSC 420, graduate standing or consent of instructor.
CSC 507 Computer Simulation I (4)
Principles and organization of simulation software. Executive programs for interactive control of continuous, discrete and combined system simulations. Specification, design and development of simulation support packages. Structure and techniques for development of real-time, queue management, graphics interface, and validation components of simulation systems. 4 seminars. Prerequisite: CSC 350 and CSC 360, graduate standing or consent of instructor.

CSC 517 Computer Simulation II (4)
Advanced topics in simulation. Simulation languages and systems, distributed simulation, training systems. Management of simulation projects. Verification and validation methodologies. 3 seminars, 1 laboratory. Prerequisite: CSC 507, graduate standing or consent of instructor.

CSC 527 Computer-Based Educational Systems II (3)
Comparison of several authoring languages and systems as they affect the design of multi-media computer-based educational systems. Emphasis on features for special purposes such as education of the handicapped. 3 seminars. Prerequisite: CSC 427, graduate standing or consent of instructor.

CSC 531 Numerical Methods I (4)
Introduction to advanced methods used in numerical analysis. Finite element methods for one and two-dimensional problems. Study of transforms including the Fast Fourier Transform and the Fast Hartley Transform. Review of the software supporting these methods. 4 seminars. Prerequisite: CSC 332 or equivalent, graduate standing or consent of instructor.

CSC 559 Practicum in Computer Science I (1) (CR/NC)
Preliminary planning and feasibility studies for the practicum projects of CSC 560. Credit/No Credit grading only. 1 activity. Prerequisite: Consent of instructor.

CSC 560 Practicum in Computer Science II (5) (CR/NC)
Documentation and solution of practical problems in computer science selected from business, industrial, and scientific organizations under guidance of lecturers from cooperating organizations and members of the computer science faculty. Credit/No Credit grading only. 1 seminar, 4 activities. Prerequisite: CSC 559 and consent of instructor.

CSC 570 Advanced Topics in Computer Science (2-3)
Directed group study of selected topics for graduate students. Topics will normally consist of continuations of those in CSC 501–CSC 506 and other topics as needed. Class Schedule will list topic selected. Topic credit limited to 9 units. 2 to 3 seminars. Prerequisite: Graduate standing and evidence of satisfactory preparation in computer science.

CSC 590 Seminar in Computer Science (3)
Current problems and research in the field of computer science through discussions and selected readings. Group study of selected advanced topics. 3 seminars. Prerequisite: Graduate standing.

CSC 599 Thesis/Project (2-3) (2-3)
Individual research or activity under faculty supervision leading to an acceptable thesis or project. Prerequisite: Graduate standing and consent of instructor.

DANC–DANCE

DANC 131 Beginning Ballet (2)
Fundamentals of ballet technique stressing alignment, turn-out, five basic positions, seven movements of dance, and terminology. 2 activities.

DANC 132 Beginning Modern Dance (2)
Fundamentals of modern technique stressing alignment, off-centered use of torso, floorwork, movement phrases, and improvisation exercises. 2 activities.

DANC 133 Beginning Jazz Dance (2)
Introduction of jazz dance techniques stressing a variety of styles, alignment, isolation, polyrhythms, syncopation, improvisation, and phrasing. Performance technique and presentation of simple dance phrases. 2 activities.
DANC 134  Beginning Social Dance (2)
Selected ballroom dances including the cha-cha-cha, foxtrot, jitterbug, merengue, rumba, samba, tango, waltz and discotheque. Emphasis on alignment, etiquette, leading and following, performance techniques, and presentation of simple dance phrases. 2 activities.

DANC 135  International Folk Dance (1) (CR/NC)
Introduction to international folk dances including round, longway, and square sets. Study of various dance steps, formation, positions, and customs. Credit/No Credit grading only. 1 activity.

DANC 221  Dance Appreciation (3)
Major dance artists of the Modern period. Includes consideration of cultural contexts as well as styles and forms used in dance. An introductory survey of major experiments in dance. 3 lectures.

DANC 231  Intermediate Ballet (2)
Continuation of training in basic technical skills in ballet stressing phrasing, performance, and more complex step patterns. 2 activities. Prerequisite: Consent of instructor.

DANC 232  Intermediate Modern Dance (2)
Continuing study of DANC 132 with emphasis on various movement styles, phrasing, more complex step patterns, and performance. 2 activities. Prerequisite: Consent of instructor.

DANC 233  Intermediate Jazz Dance (2)
Continuation of DANC 133 with emphasis on more extensive movement vocabulary. 2 activities. Prerequisite: Consent of instructor.

DANC 234  Intermediate Social Dance (2)
Continuation of DANC 134. Emphasis on variations, styles, and performance skill. 2 activities. Prerequisite: Consent of instructor.

DANC 311  Orientation to Dance (3)
Orientation to various aspects and types of dance integrated with brief history and theory. Course covers elements, various movement techniques, forms and styles, rhythms, creativity, composition and presentation. 1 lecture, 2 activities. Prerequisite: Junior standing or consent of instructor.

DANC 320  Dance Notation (3)
Introduction to the major dance notation systems, emphasizing the theory, reading, and writing of Labonotation. 1 lecture, 2 activities. Prerequisite: One DANC activity class or consent of instructor.

DANC 321  History of Dance (3)  GEB C.3.
History of dance from prehistoric time to the present. 3 lectures. Prerequisite: One DANC activity class or consent of instructor.

DANC 340  Dance Improvisation and Composition (3)
Principles of dance composition and improvisation. Exploring movement potentials through studies in use of various stimuli, process of construction, and structuring of compositional forms. 1 lecture, 2 activities. Prerequisite: Consent of instructor.

DANC 345  Choreography and Workshop in Concert Preparation (3)
Problems connected with dance choreography. Workshops in concert preparation for Cal Poly's major dance production. Total credit limited to 9 units. 1 seminar, 2 laboratories. Prerequisite: By audition only.

DANC 346  Dance Production (3)
Directed experience in production of annual Orchesis dance concert and other public performances. Total credit limited to 12 units. 3 laboratories. Prerequisite: DANC 345 or consent of instructor.

DANC 381  Methods of Teaching Dance (3)
Development of teaching techniques, methods, curricular materials and evaluation procedures related to the teaching and learning of folk, square, social, round dances, all forms of dance. Emphasis on folk, modern, ballet, jazz dance forms. 1 lecture, 2 activities. Prerequisite: DANC 311 or consent of instructor.
DANC 470  Selected Advanced Topics (1–3)
Directed study of selected topics for advanced dance students. Class Schedule will list topics selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

DANC 471  Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for dance students. Class Schedule will list topics selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

DH-DAIRY HUSBANDRY

DH 100  Enterprise Project (1–4) (CR/NC)
Selection and completion of a management/production project under faculty supervision. Project participation is subject to approval by the project supervisor and the Cal Poly Foundation. Degree credit limited to 12 units. Credit/No Credit grading only.

DH 101  Dairy Feeds and Feeding (4)
Introduction to Dairy Cattle/Ruminant Nutrition. Classification and metabolism of nutrients. Nutrient content and identification of feeds common to dairy cattle. Nutrient analysis procedures and requirements. Ration formulation, feeding practices for maximizing growth and milk production. 3 lectures, 1 laboratory.

DH 121  Elements of Dairying (4)
General information on statistics and opportunities in the dairy industry. Composition and food value of dairy products. Common tests to determine quality of products. Principles and practices of the feeding and management of dairy cattle. 3 lectures, 1 laboratory.

DH 133  Fitting and Showing Dairy Cattle (2)
Selection, preparation, presentation of dairy cattle for shows, sales, and photographing. 1 lecture, 1 laboratory.

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

DH 200  Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

DH 221  Milk Production (4)
Factors affecting milk production. Dairy production problems and methods. Practice in many of the frequently used dairy production skills. 3 lectures, 1 laboratory. Prerequisite: DH 101, DH 121, DH 142.

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

DH 230  General Dairy Husbandry (4)  GEB F.2.
Selection, breeding, feeding, and management of dairy cattle. Composition and food value of dairy products. Milk pricing, political influences, dairy industry statistics and opportunities. Producing and handling products. For non-Dairy majors. 3 lectures, 1 laboratory.

DH 233  Advanced Dairy Cattle Selection (2)
Advanced practice in the comparative evaluation of dairy cattle. Detailed scoring and classifying cattle on conformation. Functional anatomy and relationship to production. Visits to breeding establishments and shows. 1 lecture, 1 laboratory. Prerequisite: DH 142.

DH 301  Advanced Dairy Cattle Feeding (3)
Nutrition requirements of dairy cattle. Successful, economical feeding practices, ration formulation utilizing the computer. 2 lectures, 1 activity. Prerequisite: DH 101 or ASCI 101 and computer literacy elective.
DH 323 Breeds, Pedigrees and Management of Dairy Cattle (4)
Origin of modern dairy cattle breeds, organization of cattle clubs. Breed families and herds. Practice in compiling pedigrees. Methods and problems in establishing and managing a purebred dairy herd. 3 lectures, 1 laboratory. Prerequisite: DH 221, DH 222.

DH 330 Artificial Insemination (3)

DH 400 Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

DH 422 Breeding and Selection of Dairy Cattle (4)
Evaluation of inherited characteristics in dairy cattle from an economic standpoint. Proving and selecting sires and dams. 3 lectures, 1 laboratory. Prerequisite: BIO 303, DH 142.

DH 432 Advanced Dairy Herd Management (4)
Dairy herd management skills needed in dairy operations. Instruction and lab experience in management, records, feeding and nutrition, herd health, milk secretion, reproduction, mating and selection. 3 lectures, 1 laboratory. Prerequisite: DH 301, DH 323, DH 330, and DH 422.

DH 461, 462 Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

DH 463 Undergraduate Seminar (2)
Reports on student papers, bulletins, periodical articles, and dairy research experiments. Sources of dairy husbandry information. Practice in oral reporting. Recent developments and research work in the dairy industry. 2 lectures.

DH 470 Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

DPT–DAIRY PRODUCTS TECHNOLOGY

DPT 100 Enterprise Project (1–4) (CR/NC)
Selection and completion of a management/production project under faculty supervision. Project participation is subject to approval by the project supervisor and the Cal Poly Foundation. Degree credit limited to 12 units. Credit/No Credit grading only.

DPT 134 Introduction to Dairy Products Technology (4)
Science and technology in the development and manufacture of dairy food products. Equipment and dairy processing techniques for fluid milk, butter, cheeses, ice cream, yogurt, concentrated dairy foods and dried dairy foods. 3 lectures, 1 laboratory.

DPT 222 Frozen Dairy Foods (4)
Selection of ingredients, calculating, and processing ice cream, ice milk, and sherbet mixes. Equipment and methods required to process, freeze, package, and harden ice cream and related products. 3 lectures, 1 laboratory. Prerequisite: DH 121.

DPT 230 General Dairy Manufacturing (4)
Composition and properties of fluid milk and manufactured milk products. Chemistry and microbiology of dairy products. Processes and equipment involved in the manufacture of butter, cheeses, and other fermented dairy products, frozen, condensed, and dried dairy foods. Elective course for nondairy students. Survey course for dairy husbandry majors. 3 lectures, 1 laboratory.

DPT 233 Milk Processing and Marketing (4)
Composition and properties of fluid milk and its constituents. Equipment used to handle, process, and distribute fluid milk and related products. Product promotion, advertising and merchandising. Survey of national and local dairy marketing organizations. 3 lectures, 1 laboratory. Prerequisite: DPT 134.
DPT 234 Dairy Foods Evaluation (2)
Basic principles of sensory examination of dairy foods. Physiology of the various senses and their relationship to distinguishing the quality of dairy products by sight, flavor, body and texture. Product defects, causes, and methods of prevention. 1 lecture, 1 laboratory.

DPT 326 Fermented Dairy Foods (3)
Methods, ingredients, and equipment used in the manufacture of fermented dairy products, such as sour cream, buttermilk, and yogurt. Plant practice and field trips to study commercial applications. 2 lectures, 1 laboratory. Prerequisite: BACT 221.

DPT 331 Concentration and Fractionation of Dairy Fluids (3)
Technology of evaporation and membrane separation processes applied to dairy fluids. Design and performance of evaporators and membrane processing systems (microfiltration, ultrafiltration, reverse osmosis). 2 lectures, 1 laboratory. Prerequisite: FSN 217 and DPT 134 or DPT 230.

DPT 332 Dairy Inspection (3)
California dairy codes and score cards used for dairy plants and farms. Quality tests of dairy products. Practice in inspecting and scoring dairy farms and factories. Organizational structure of inspection services. 2 lectures, 1 laboratory. Prerequisite: DPT 233, BACT 221.

DPT 334 Technology of Cheese Manufacture (4)
Chemistry and microbiology of cheese manufacture. Equipment, techniques and ingredients used to produce, handle, package, preserve and age different cheese varieties. Cheesemaking laboratory instruction in University dairy plant. 3 lectures, 1 laboratory. Prerequisite: BACT 221, DPT 233 or consent of instructor.

DPT 336 Drying and Butter Technology (3)
Equipment, ingredients, and methods needed to manufacture butter, dairy spreads, and dried dairy products. Practice in university dairy plant and field trips to commercial operations. 2 lectures, 1 laboratory. Prerequisite: FSN 217 and DPT 134.

DPT 401 Physical and Chemical Properties of Dairy Products (3)
Composition, structure and properties of milk and other dairy foods. Physical and chemical changes which occur during processing and storage of dairy products. Objective measurement of physical and chemical properties. 2 lectures, 1 laboratory. Prerequisite: CHEM 328.

DPT 402 Quality Assurance and Control of Dairy Products (3)
Current methods used to evaluate dairy products with respect to plant economics and consumer safety. Accurate procedures for chemical and biological testing, statistical approach to sampling, and design and interpretation of HACCP programs for assuring product quality and safety. 2 lectures, 1 laboratory. Prerequisite: DPT 233.

DPT 433 Dairy Plant Management and Equipment (4)
Basic management principles applied to the dairy industry. Industrial organization and control. Dairy plant location, design facilities and layout. Survey of financing applied to the dairy industry. Maintenance and operation of the equipment. 3 lectures, 1 laboratory. Prerequisite: PHYS 121 and junior standing.

DPT 522 Bioseparation Processes in Dairy Product Technology (3)
Physical and chemical principles governing bioseparation processes in dairy product technology. Factors influencing mass transport phenomena as it relates to filtration, size exclusion chromatography, ion exchange, dialysis, centrifugation, crystallization and other unit operations. Laboratories emphasize application of bioseparations of commercial importance. 2 lectures, 1 laboratory. Prerequisite: DPT 401 or FSN 407, FSN 435. CHEM 302 recommended.

ECON—ECONOMICS

ECON 105 Personal and Consumer Economics (3)
Personal choices—goals, saving, investment, buying methods, borrowing, taxes, insurance. Practical applications of principles of marginalism, indexing, expected value. Emphasizes personal welfare with some social welfare analysis and contemporary consumer issues. 3 lectures.
ECON 200 Special Problems for Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Sophomore standing and consent of department head.

ECON 201 Survey of Economics (3)
Basic material covered in Principles of Economics, ECON 211, 212 in a less detailed and technical manner. For majors requiring one quarter of economics. Not open to students with previous credit in ECON 211 or 212 or equivalent. 3 lectures. Prerequisite: Sophomore standing.

ECON 211 Principles of Economics (3)
Macroeconomics: principles and applications in the theory of national income, output and employment. Determination and measurement of the national product. Inflation, money, banking, monetary and fiscal policies. Not open to majors in Economics and Business. Not open to students with credit in ECON 222. 3 lectures. Prerequisite: Sophomore standing.

ECON 212 Principles of Economics (3)
Microeconomics: principles and applications in the theory of producer and consumer behavior, and the distribution of factor income with focus on the output market. Effect on the national economy. Not open to majors in Economics and Business. Not open to students with credit in ECON 221. 3 lectures. Prerequisite: Sophomore standing.

ECON 221 Microeconomics (4)
Microeconomic principles. Marginal and equilibrium analysis of commodity and factor markets in determination of price and output. Mathematical and statistical analysis and computer simulation. Not open to students with credit in ECON 212 or equivalent. 4 lectures. Prerequisite: Sophomore standing, CSC 120, STAT 251, and STAT 252.

ECON 222 Macroeconomics (4)
Macroeconomics analysis and principles. Aggregate output, employment, prices, and economic policies for changing these variables. Mathematical and statistical analysis and computer simulation. Not open to students with credit in ECON 211 or equivalent. 4 lectures. Prerequisite: ECON 221.

ECON 301 Introduction to Managerial Economics (4)
Fundamental principles and analytical tools of economics useful in managerial decision making. Risk evaluation, supply and demand analysis, price setting and capital budgeting. Case studies of managerial decision making with microcomputer applications. 3 lectures, 1 activity. Prerequisite: CSC 120, ECON 212 or ECON 221.

ECON 304 Comparative Economic Systems (3)
Analysis of economic principles and institutions applicable to capitalism, socialism, and communism. 3 lectures. Prerequisite: ECON 201 or ECON 211 or ECON 222.

ECON 306 Applied Forecasting (4)
Causes and measurement of business fluctuations. Techniques of forecasting with microcomputer applications. 3 lectures, 1 laboratory. Prerequisite: ECON 201 or ECON 211 or ECON 222, CSC 120 and STAT 252.

ECON 311, 312 Intermediate Microeconomics (4) (4)
Economics of prices and markets. Demand and supply. Returns and costs, factor pricing and income distribution, welfare and economic progress. 4 lectures. Prerequisite: ECON 212 or ECON 221, MATH 221, MATH 222, STAT 251, STAT 252. For ECON 312: ECON 311.

ECON 313 Intermediate Macroeconomics (4)
Economic activity related to production and resource use to meet goals of society. Income, employment, economic growth and progress of the United States and its regions. Application of theory with microcomputer simulation models. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: ECON 211 or ECON 222, CSC 120, MATH 221, MATH 222, STAT 251, STAT 252, ECON 337.

ECON 314 Monetary and Fiscal Policies (4)
National economic fluctuation models and related corrective monetary and fiscal policies on income, employment, output, growth and prices. Application of theory with microcomputer simulation models. 3 lectures, 1 laboratory. Prerequisite: ECON 313.
ECON 317 Development of Economic Analysis (3)
Analysis of ideas related to the development of economic theory in the Western civilization from the Greeks through the classical, neoclassical, and Keynesian to the current post-Keynesian concepts. 3 lectures. Prerequisite: Junior standing, ECON 211, ECON 212 or ECON 221, ECON 222.

ECON 323 European Economic History (3)
Analysis of the growth, development, and economic institutions of the European economies from about 1600 to the present. Includes the relationship of European economies to colonial empires, industrial development, role of banking, transportation, government actions, economic imperialism, international trade. 3 lectures. Prerequisite: ECON 201 or ECON 211 or ECON 222.

ECON 324 American Economic History (3)
Topical economic analysis of major events and institutions of American economic history as viewed against their causes, origin and development. Economic development of America from an under-developed nation. Agriculture, transportation, monetary and banking policies, business, labor, and growth of governmental activities. 3 lectures. Prerequisite: ECON 201 or ECON 211 or ECON 222.

ECON 325 Underdevelopment and Economic Growth (3)  GEB D.4.b.
Economic development: the less developed world and the American interest. 3 lectures. Prerequisite: ECON 201 or ECON 211 or ECON 222.

ECON 330 Economics of Energy and Resources (3)
Economic theory and public policies as applied to problems of natural resources and energy. Dynamic resource and energy models developed with reference to public and private sector growth. Application of the principles of capital theory emphasized. 3 lectures. Prerequisite: ECON 201 or ECON 211 or ECON 222.

ECON 335 Environmental Economics (3)
Economic dimensions of environmental abuse and protection. Use of simple economic models in developing and evaluating environmental policies. Elements of cost-benefit analysis. Overview of current environmental problems. Requirements for economic growth with environmental quality in the future. 3 lectures. Prerequisite: ECON 201 or ECON 211 or ECON 221.

ECON 337 Money, Banking and Credit (4)
Principles and practices of monetary banking and credit institutions as applied to business activity and public policy. Use of mathematical analysis and computer simulation. 4 lectures. Prerequisite: ECON 211 or ECON 222, CSC 120, MATH 221.

ECON 339, 340 Econometrics (4) (4)
Application of statistical methods useful in economics. General linear regression model. Specific issues and problems related to economic models: multicollinearity, autocorrelation, heteroskedasticity, dummy variables, lagged variables, and simultaneous equation estimation. Application and evaluation of selected examples of empirical economic research. Microcomputer applications. 3 lectures, 1 laboratory. Prerequisite: CSC 120, MATH 143, MATH 204, STAT 322.

ECON 400 Special Problems for Advanced Undergraduates (1-4)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units. Prerequisite: Consent of department head.

ECON 401 International Trade (4)
Theory of comparative advantage, gains from trade, and recent developments in trade theory; examination of tariffs, quotas, exchange controls, other trade barriers and underlying policy issues; review of U.S. commercial policy, GATT, the common market, regional and world economic organizations. 4 lectures. Prerequisite: ECON 211, ECON 212 or ECON 221, ECON 222.

ECON 403 Industrial Organization (4)
Application of basic tools of economics to American Industry. Case studies of individual firms and industries. Performance of various business structures, such as monopoly and oligopoly. Effects of government regulation and antitrust policy. 4 lectures. Prerequisite: ECON 212, or ECON 221.
ECON 404  International Monetary Economics (4)
Nature of international payments, U.S. balance of payments. Theory and practice of foreign exchange rate determination under the gold standard, paper standard, and IMF system; international money and capital markets; problems of international liquidity and monetary stability. 4 lectures. Prerequisite: ECON 401.

ECON 410  Public Finance and Cost-Benefit Analysis (4)
Principles of rational decision making with respect to government revenues and spending. Measurement of costs and benefits, and criterion selection. Taxation, user fees, deficit financing, public goods, neighborhood effects and zoning. Microcomputer applications. 3 lectures, 1 activity. Prerequisite: ECON 312, CSC 120.

ECON 413  Labor Economics (4)
Wage determination theory, basic economic factors that affect the labor movement, economic impact of union activities on employment, output, income, wages, prices, and national economic policy. 4 lectures. Prerequisite: ECON 401.

ECON 430  Internship (2-8) (CR/NC)
Placement of student for part-time supervised work experience in a business enterprise or government agency approved by the department head. Collateral reading correlated with work assignments and periodic written progress reports required. Credit/No Credit grading. Prerequisite: Junior standing.

ECON 433  Transportation Economics (4)
Analysis of the allocation of resources to the U.S. transport sector and specific transport modes as a result of their natural economic characteristics and public policy. 4 lectures. Prerequisite: ECON 201 or ECON 211 or ECON 222.

ECON 434  Urban Economics (4)
Application of basic tools of economic analysis to problems of urban regions. Causes and possible cures for inadequate growth rate, income levels, and the quality of life in urban regions. 4 lectures. Prerequisite: ECON 201 or ECON 211 or ECON 222.

ECON 461, 462  Senior Project (2) (2)
Selection and analysis of a problem under faculty supervision. Problems typical of those which graduates must solve in their fields of employment. Formal report is required. Minimum 120 hours total time.

ECON 463  Undergraduate Seminar (2)
Seminar in applications of economic theory with emphasis on current problems. 2 seminars. Prerequisite: ECON 462.

ECON 470  Selected Advanced Topics (1-4)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

ECON 500  Independent Study (1-3)
Advanced study planned and completed under the direction of a departmental faculty member. Open only to graduate students demonstrating ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head.

ED—EDUCATION

ED 125  Efficient Reading (2) (CR/NC)
Development of reading efficiency required in modern business, industry, and the professions. Total credit limited to 4 units. Credit/No Credit grading only. 1 lecture, 1 activity.

ED 300  Introduction to the Teaching Profession (3) (CR/NC)
Supervised observation and participation in cooperating schools. Tasks to acquaint the student with appropriate responsibilities of public school teachers and with the role of the public service agencies. Total credit limited to 6 units. Credit/No Credit grading only.
ED 301 The Learners and the Learning: Teaching Process in Elementary School (3)
Current theories of human learning and the social, emotional and cognitive development of students and teachers. The application of this knowledge to elementary school teaching will be emphasized. 2 seminars, 1 activity. Prerequisite: Junior standing.

ED 302 Multicultural Education in the Secondary School (3)
Multicultural elements which influence the academic and social environment of the American secondary school; professional responsibilities and legal requirements; review of successful programs aimed at relieving tension created by cultural differences in rural and urban settings. 2 lectures, 1 activity. Prerequisite: Any course in GEB Area D.

ED 303 Effective Teaching, Classroom Management and Discipline in the Elementary School (4)
Instructional skills that can serve as guidelines for teaching. Effective classroom management, discipline and group dynamics. 3 seminars, 1 activity. Prerequisite: Junior standing.

ED 305 Teaching and Learning Processes in the Secondary School (3)
Learning processes: selected theories of learning related to teaching; theories of human development and learning; psychological principles involved in the teaching-learning event; self-evaluation of the prospective teacher. 3 lectures. Prerequisite: Any course in GEB Area D.

ED 400 Special Problems for Undergraduates (1-3)
Individual investigation, research, studies or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Junior standing and consent of instructor.

ED 401 Teaching Reading in the Elementary School (4)
Application of reading approaches, methods, and materials in the elementary classroom along with supervised field experience in teaching reading in an elementary school setting. Methods for teaching reading and discussions pertaining to field experience activities, observations, and participation. 3 seminars, 1 activity. Prerequisite: Junior standing.

ED 402 Teaching Language Arts and Reading in the Elementary School (4)
Selection, organization, and presentation of lessons in all language arts areas. Integration of language arts with other curriculum areas and particularly reading. Cultural factors which influence language acquisition and the learning of English as a second language. 3 seminars, 1 activity. Prerequisite: ED 301, ED 303, and ED 401, or consent of instructor.

ED 403 Teaching Reading in the Secondary School (5)
Discussion of reading approaches, methods and materials in the secondary classroom with supervised field experience in teaching reading in a secondary school. 3 seminars, 2 activities. Prerequisite: ED 302, ED 305, or consent of instructor.

ED 405 Diagnosis, Prescription and Evaluation (2)
Diagnosis of student learning problems. Prescription and direction of student learning programs. Evaluation of student achievement. 1 seminar, 1 activity. Prerequisite: Any course in GEB Area D.2.

ED 406 Teaching Science and Mathematics in the Elementary School (4)
Curriculum and methods in teaching science and mathematics. Selecting, organizing, presenting, and evaluating science and mathematics lessons at the appropriate level throughout the curriculum. Emphasis on thinking processes, manipulative and process skills within the context of the state curriculum frameworks. 2 seminars, 2 activities. Prerequisite: ED 301, ED 303, or consent of instructor.

ED 407 Teaching Multicultural and Social Science Education in the Elementary School (4)
Curriculum and methods of teaching social science and multicultural education in the elementary school. Emphasis on thinking processes, problem solving, and process skills within the context of the state History/Social Science Framework. 3 seminars, 1 activity. Prerequisite: ED 301, ED 303, ED 401, ED 402, or consent of multiple subject coordinator. Concurrent: ED 410.
ED 409  Teaching in the Secondary School  (3)
Principles of effective teaching. Instructional planning and related management techniques. Taken immediately prior to preliminary student teaching. 2 seminars, 1 activity. Prerequisite: ED 305.

ED 410  Preliminary Student Teaching  (6) (CR/NC)
Part-time assignment in a classroom. Includes teaching activities under the direction of a selected cooperating teacher in consultation with a university supervisor. Assignment consists of an entire morning in the classroom (or the equivalent) for one quarter. Credit/No Credit grading only. Prerequisite: Completion of courses and requirements to preliminary student teaching and approval of campus screening committee for credential candidates.

ED 420  Student Teaching  (12) (CR/NC)
Full-time assignment in a classroom. Includes teaching activities under the direction of a selected cooperating teacher in consultation with a university supervisor. Assignment consists of an entire teaching day in the school for one quarter. Credit/No Credit grading only. Prerequisite: Completion of all courses and requirements prerequisite to full-time student teaching and approval by campus screening committee for credential candidates.

ED 421  Student Teaching Practicum  (3)
Emphasis on solving problems related to field experience. Refining of organizational and instructional strategies, including an interdisciplinary approach to curriculum. Preparation for a job search. Professional and legal responsibilities of classroom teachers. 2 seminars, 1 activity. Concurrent enrollment in ED 420 required.

ED 422  Student Teaching Practicum  (Single Subjects)  (3)
Practices and problems of student teaching. Current innovations in teaching procedures and materials. Taken concurrently with single subject student teaching. 2 lectures, 1 activity.

ED 426  Bilingual Reading Methods and Field Experience in the Elementary School  (4)
Patterns of classroom organization, application of reading programs, approaches, methods and supervised field experiences in elementary classrooms with bilingual students. 3 seminars, 1 activity. Prerequisite: ED 301 and ED 303 and consent of instructor.

ED 440  Educating the Exceptional Individual  (4)
Characteristics, incidence, and etiology of individuals with exceptional needs. Problems, assessment, and approaches toward accommodating exceptional students in the regular classroom. 4 seminars. Prerequisite: Any course in GEB Area E.1. or E.2.

ED 444  The Atypical Infant  (4) (Also listed as HD 444)
Exploration of issues pertinent to the development of atypical infants. The readings and assignments will be used to relate theory and research to intervention efforts with handicapped, developmentally delayed infants, and other at-risk infants. 3 seminars, 1 activity. Prerequisite: Junior standing, HD 296 and ED 440 or consent of instructor.

ED 450  Behavior Disorders and Classroom Management Strategies  (4)
Assessment of students with disruptive classroom performance. Basic strategies for facilitating social-emotional techniques which shift disruptive behavior to appropriate behavior. Evaluation of classroom modifications. 3 seminars, 1 activity. Prerequisite: ED 440 or consent of instructor.

ED 470  Selected Advanced Topics  (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

ED 480  Computer Based Curriculum  (3)
Computer assisted instruction and computer based technology. Lesson planning and integration of technology into the K-12 curriculum. Familiarization with available educational courseware and software. Emphasis on classroom application. 2 seminars, 1 activity. Prerequisite: Completion of computer literacy GEB F.1. course, CSC 410 or CSC 416, or equivalent.
ED 500  Individual Study (1-3)
Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Only 6 units may be applied to degree requirements. Prerequisite: Consent of department head, graduate major adviser, and supervising faculty member.

ED 501  Problems and Practices in Curriculum Development (3)
Overview of major curriculum trends; planning and development of a comprehensive curriculum project geared to individual needs and interests. Emphasis on practicality. 3 seminars. Prerequisite: Graduate standing.

ED 503  Seminar in Language Arts Curriculum and Methods (3)
Language arts curriculum: objectives, methods, content, materials, evaluation, current trends and research. 3 seminars. Prerequisite: Graduate standing.

ED 504  Seminar in Science and Mathematics Curriculum and Methods (4)
In-depth study of science and mathematics curriculum. Objectives, methods, content, materials, evaluation, current trends, and assessments. 3 seminars, 1 activity. Prerequisite: Graduate standing.

ED 505  Seminar in Social Studies Curriculum and Methods (3)
In-depth study of the social studies curriculum: objectives, methods, content, materials, evaluation, current trends. 3 seminars. Prerequisite: Graduate standing.

ED 506  Models of Instruction (4)
Analysis of a wide variety of approaches to elementary and secondary teaching that guide instruction in the classroom and in other educational settings. In-depth analysis and implementation of selected teaching strategies. 3 seminars, 1 activity. Prerequisite: Graduate standing.

ED 507  Instructional Materials and Technology (3)
Examination of commercial and teacher-made supplemental materials, software, and technological tools in curriculum, and their implementation. Systematic evaluation of the effectiveness of materials and technology. 2 seminars, 1 activity. Prerequisite: Graduate standing.

ED 510  Educational Finance and Resource Allocation (3)
Financing public schools in America: historical and current sources and types of funding. District level and site level funding and budgeting including priorities and purchasing procedures. Financial implications of personnel contracts and obligations. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

ED 511  Educational Law and Governance (3)
Legal aspects of school administration including unions, collective bargaining, and contract administration. Governing roles of federal, state, and local agencies including boards and district administrators. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

ED 512  Educational Organization and Management (4)
Organization and management of schools to maximize educational effectiveness. Principles of organization and their influence on productivity, principles of personnel management including staff motivation. Activity experience in the application of management theory in schools. 3 seminars, 1 activity. Prerequisite: Graduate standing or consent of instructor.

ED 513  Educational Leadership and Decision Making (4)
Concepts of leadership and decision making in educational administration including administrators' responsibilities associated with roles in public schools. 3 seminars, 1 activity. Prerequisite: Graduate standing or consent of instructor.

ED 514  School Site Administration (4)
Principles and practices of effective building level administration in multicultural/multilingual environment. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

ED 515  Educational Program Management and Evaluation (3)
Supervision, management, and evaluation of educational curriculum and educational programs. Current trends in program management including mapping, monitoring, alignment. 2 seminars, 1 activity. Prerequisite: ED 501, graduate standing, or consent of instructor.
ED 516 Educational Personnel Management and Evaluation (4)
Principles and processes for the supervision and evaluation of certificated and classified staff including legal, research, and professional considerations. 3 seminars, 1 activity. Prerequisite: Graduate standing or consent of instructor.

ED 517 Organizational Development in Education (2)
Educator’s role in group processes, including fundamentals of human relations and working with formal and informal groups. 2 seminars. Prerequisite: Graduate standing or consent of instructor.

ED 518 Administrative Services Fieldwork (3) (CR/NC)
Supervised fieldwork in school administration for supervision at the elementary and secondary level. Assignments must encompass an entire school year and must involve some multicultural experience. Total credit limited to 18 units, only 9 of which may applied toward master’s degree. Credit/No Credit grading only. Prerequisite: Admittance to the Administrative Services Credential program or consent of instructor.

ED 525 Reading Processes, Programs and Technology (4)
Physiological, psychological and psycholinguistic components of the reading process. Applications of research findings of teaching reading, including innovative programs and the use of reading technology. 3 seminars, 1 activity. Prerequisite: Graduate standing.

ED 526 Diagnosing and Remediating Reading Problems (4)
Formal and informal methods of diagnosing and remediating reading problems in classrooms and reading clinics. 3 seminars, 1 activity. Prerequisite: Graduate standing.

ED 529 Bilingual Special Education and Reading Instruction (4)
Principles, procedures and materials for teaching reading to bilingual students coupled with diagnostic and prescriptive methods for understanding reading problems of the bilingual and bilingual special education student. 2 seminars, 2 activities. Prerequisite: Graduate standing.

ED 530 Secondary, College, and Adult Reading Practices (4)
Principles, procedures, and materials for improving reading in the subject matter areas with students of different backgrounds and abilities in grades 7 through college. Field experiences in teaching reading to adults, college, or secondary students. 3 seminars, 1 activity. Prerequisite: Graduate standing.

ED 531 Supervision of Reading Programs (4)
Acquisition and application of the principles of supervision in a field setting by organizing, equipping and staffing classes; communicating with individuals and others employed in teaching reading; provide inservice programs and develop reading curriculum. Assessment of school reading programs. Prerequisite: Graduate standing.

ED 532 Advanced Field Experiences in Education (3-12) (CR/NC)
Supervised advanced field experience and practical application of specialty for classroom teachers, reading and special education specialists, administrators and school support personnel. Total credit limited to 18 units for specialist credentials. Total credit limited to 6 units for the master’s degree. 30 hours work experience per unit of credit. Credit/No Credit grading only. Prerequisite: Graduate standing, completion of basic teaching or administrative credential, or consent of instructor.

ED 540 Counseling and Career Guidance of Exceptional Students (4)
Basic guidance techniques for teachers working with exceptional individuals and their families. Career selection, preparation, and counseling. Transition from school to work, and community resource utilization. 3 seminars, 1 activity. Prerequisite: Graduate standing.

ED 542 Administration of Special Programs and Services (3)
Principles and practices of organizing and administering special education, reading, counseling, and other support programs. Assessment and placement procedures, middle management’s role, overview of specially funded programs, historical precedents and future trends. 3 seminars. Prerequisite: Graduate standing.
ED 545  The Learning Handicapped: Characteristics and Teaching Strategies (4)
Characteristics of, and instructional strategies for students with learning handicaps. Organization and management of the special classroom. Evaluation of the instructional system. Individualization of instruction, and interaction in the total school environment. 3 seminars, 1 activity. Prerequisite: ED 440.

ED 546  Teaching Strategies for the Severely Handicapped (3)
Instructional strategies; current methodology and techniques of curriculum modification necessary to individualize instructional activities for the severely handicapped student. 3 seminars. Prerequisite: ED 551.

ED 547  Atypical Learning Patterns (4)
Theoretical considerations of learning patterns deviating from normal development. Educational implications of current theories of cognitive development and brain function as applied to disabled individuals. Development and application of a remedial therapy with appropriate individuals. 3 seminars, 1 activity. Prerequisite: ED 440.

ED 550  Assessment of the Exceptional Individual (4)
Using norm referenced, criterion referenced, and curriculum based testing for assessing academic, behavioral, and physical status of exceptional individuals for referral purposes. Instructional and evaluation decisions regarding exceptional students in school settings. 3 seminars, 1 activity. Prerequisite: Graduate standing.

ED 551  Characteristics of the Severely Handicapped (3)
Characteristics, identification procedures, causation, needs, legal issues, community attitudes, educational and social programs for severely handicapped person. 3 seminars. Prerequisite: ED 440.

ED 553  Current Issues in Special Education (3)
Consideration of assumptions and techniques of educational research regarding the educational, personal, social and vocational difficulties affecting the development of individuals with exceptional needs; emphasizing their applicability to general and specific educational programs. 3 seminars. Prerequisite: Admission to Special Education Program or consent of instructor.

ED 555  Counseling and Communication (4)
Overview of the counseling profession, history, philosophy, theory and ethics. Emphasis on developing interviewing, assessment and communication skills. Required practicum. 3 seminars, 1 activity. Prerequisite: Graduate standing.

ED 556  Ethnic Counseling (4)
Socio-psychological and psycho-historical analysis of the visible ethnic and ethnic experience. Effects of poverty, history and the significance of oppression. Counseling techniques, assessment, community relations and required activities. 3 seminars, 1 activity. Prerequisite: Graduate standing.

ED 557  Career Development (4)
Counselor role in career decision making to include career choice theory, appraisal instruments, community referral resources, occupational information, computerized retrieval systems, and personal and social data and required activities. 3 seminars, 1 activity. Prerequisite: Graduate standing.

ED 559  Academic Counseling (4)
Effective procedures in teaching and counseling to increase the academic and test taking performance of students. To include study skills, career planning and decision making, and application of computer software. 3 seminars, 1 activity. Prerequisite: Graduate standing or consent of instructor.

ED 560  Counseling Theories and Assessment (4)
Counseling theories and concepts applied to individuals. Develop skills in interviewing, assessment intervention selection, termination and crisis intervention. Ethics and law included. 3 seminars, 1 activity. Prerequisite: ED 555. PSY 452 or consent of instructor.
ED 515

ED 561 Group Counseling (3)
Theory and practice of group counseling, client selection, group structure, process and termination, and application of theories to specific developmental groups. Communication and facilitation skills emphasized with relevant ethics and law. 2 seminars, 1 activity. Prerequisite: ED 555 or consent of instructor.

ED 562 Student Development–Higher Education (4)
Exploration of the roles and competencies of the student development specialist in higher education. Review of relevant developmental theory with emphasis on practical implementation. Explore current issues and trends in higher education, and organizational framework. 4 seminars. Prerequisite: Graduate standing.

ED 564 Ethics and the Law: MFC Counseling (3) (Also listed as PSY 564)
Ethics, client rights, and laws related to individual, child, family and group therapy counseling. 3 seminars. Prerequisite: ED 560, ED 561, HD 450 or consent of instructor.

ED 565 Diagnosis and Treatment: Psychopathology (4) (Also listed as PSY 565)
Assessment of mental status. Diagnostic and Statistical Manual of Mental Disorders. Treatment planning, treatment, case documentation and research applied to client psychopathology. 3 seminars, 1 activity. Prerequisite: ED 560, PSY 307, PSY 432 or consent of instructor.

ED 566 Group Therapy (3)
Group therapy theory, leadership and research applied to client assessment, screening, treatment selection, evaluation and termination. Ethics, law included. 2 seminars, 1 activity. Prerequisite: ED 560, ED 561 or consent of instructor.

ED 567 Counseling the Elderly and Their Families (3) (Also listed as PSY 567)
Dynamics of aging and family transitions as applied to counseling. Application of medical, psychological, DSM III, physiological, crisis and ethnic concerns with a required practicum. 2 seminars, 1 activity. Prerequisite: ED 555, HD 421 or PSY 459 or consent of instructor.

ED 568 Cognitive Behavioral Counseling (3)
Theory and application of cognitive restructuring approaches in counseling and therapy. Includes social and cognitive learning approaches, coping, problem solving and decision making skills. 3 seminars. Prerequisite: ED 560 or consent of instructor.

ED 569 Counseling Clinic Practicum: MFCC (3–9)
Applied experience and instruction in assessment, diagnosis, treatment planning and treatment of individuals, couples, families and children under direct supervision of faculty in Cal Poly's Counseling Clinic. Ethical and legal practices included. Weekly meetings. Total credit limited to 9 units. A maximum of 6 units may be applied to the Master of Science in Counseling. Prerequisite: ED 560, HD 450, PSY 307, PSY 459.

ED 571 Advanced Marital and Family Therapy (4) (Also listed as PSY 571)
Theory and application of process, structural and systems approaches to family and couple therapy. Assessment, diagnosis, treatment and follow-up of family and couple therapy with required supervised activities. Ethics and law related to family therapy. 3 seminars, 1 activity. Prerequisite: HD 450, ED 555 or consent of instructor.

ED 572 Child Therapy (4) (Also listed as PSY 572)
Assessment, diagnosis, treatment planning and therapeutic modalities appropriate for children and adolescents. Seven hours of instruction in abuse and neglect of children with relevant ethics and law. Effective parenting approaches and integration of family treatment. 3 seminars, 1 activity. Prerequisite: ED 560, ED 561, PSY 307, PSY 456 or consent of instructor.

ED 573 Field Experience, Counseling (3–12)
Practical application of guidance services and counseling in public schools, colleges and community settings. Weekly seminars with university staff included. Total credit limited to 24 units. Maximum of 12 units may be applied toward Master of Science in Counseling. Maximum of 6 units may be applied toward Master of Arts in Education. Prerequisite: ED 555, ED 557 and consent of Counseling Coordination Committee.
ED 574 Field Experience: Marital and Family Counseling (3–12)
Supervised practicum in applied psychotherapeutic techniques, assessment, diagnosis, prognosis and treatment of pre-marital, marital, family and child relationships dysfunctions with licensed supervisor. Total credit limited to 24 units. Maximum of 12 units may be applied toward Master of Science in Counseling; maximum of 6 units may be applied toward the Master of Arts in Education. Weekly seminar with on-site and university supervisors. 30 hours work experience per unit of credit. Prerequisite: ED 569, consent of instructor and Counseling Coordinating Committee.

ED 575 Sexual Dysfunction Therapy (3) (Also listed as PSY 575)
Analysis of physiological, social, psychological antecedents to sex role identity. Sexual behavior, disease, sexual dysfunction. Assessment, diagnosis, and treatment of sexual dysfunction. Ethics. 3 seminars. Prerequisite: ED 560 and HD 450.

ED 581 Graduate Seminar in Education (1–3)
Contemporary problems in education. Trends, developments, and issues. Total credit limited to 9 units. Prerequisite: Graduate standing.

ED 582 Seminar in Educational Administration (4)
Review of current management practice, research, and literature related to school site and central office administration. 4 seminars. Prerequisite: Graduate standing and completion of the Preliminary Administrative Services Credential or master’s degree in administration.

ED 583 Advanced Educational Personnel Management and Evaluation (4)
Theory, practice, and skill development in the management and evaluation of educational personnel. Practice and skill development in the implementation of effective evaluation strategies. 4 seminars. Prerequisite: Graduate standing and completion of the Preliminary Administrative Services Credential or master’s degree in administration.

ED 584 School Management, Communication and Organizational Effectiveness (2)
Application of principles of school management with emphasis on presentation, communications, and interpersonal relationships as they impact school effectiveness. 2 seminars. Prerequisite: Graduate standing, completion of the Preliminary Administrative Services Credential or master’s degree in administration.

ED 585 Research Methods in Education (4)
Compare and contrast a variety of educational research methods to develop a plan which demonstrates the student’s knowledge of research methodology. Statistics and use of computer technology in research. 3 seminars, 1 activity. Prerequisite: Graduate standing.

ED 587 Educational Foundations and Current Issues (4)
Historical, organizational, legal and philosophical characteristics of American education. Emphasis on the analysis of contemporary issues focusing on these characteristics. 4 seminars. Prerequisite: Graduate standing.

ED 588 Education, Culture, and Learning (4)
Cultural characteristics of educational institutions and practice. Review of theory and research relating to the social and organizational context in which learning and teaching takes place. 4 seminars. Prerequisite: Graduate standing.

ED 590 Research Applications in Education (4)
Application of research techniques to problems in education and human services. Students will be involved in applied research. 2 seminars, 2 activities. Prerequisite: Master’s degree candidate, ED 585, ED 587, ED 588 and a minimum of 15 units in a master’s degree curriculum.

ED 599 Thesis or Project (3) (3)
Completion of a thesis or project pertinent to the field of education. Students must enroll every quarter in which advisement is received. Prerequisite: Consent of graduate committee and supervising faculty member(s).
EDES—ENVIRONMENTAL DESIGN

EDES 101 Introduction to Architecture and Environmental Design (2) (CR/NC)
Familiarization with the professional fields of architecture, landscape architecture, structural engineering, construction, and city planning. Introduction to the school's programs as they relate to individual aptitudes. The design process. Visiting speakers. Credit/No Credit grading. 2 lectures.

EDES 110 Descriptive Drawing (1)
Exercises in drawing without mechanical aids. Total credit limited to 3 units. 1 activity.

EDES 301 Environmental Impact Reporting (3)
Systematic and interdisciplinary methodologies for information handling and transfer for decision making in environmental development. Public concerns, participation and legal implications. Problem areas. 3 lectures. Prerequisite: Third-year standing.

EDES 303 Human Factors for Environmental Designers (3)
Integrated approach to development of systematic design programs. Developing and interpreting human factors design criteria, performance and satisfaction as a function of environmental factors, determining and assessing user preferences, methods of field observation and analysis. 3 lectures. Prerequisite: Second-year standing in School of Architecture and Environmental Design or consent of instructor.

EE—ELECTRICAL ENGINEERING

EE 110 Orientation (1)
Familiarization with the field of electrical and electronic engineering. 1 lecture.

EE 112 Electric Circuit Analysis I (2)
Introduction to basic circuit analysis. Resistive circuits, voltage and current sources, network theorems, op-amp circuits. 2 lectures. Prerequisite: MATH 142 or equivalent.

EE 200 Special Problems for Undergraduates (1-2)
Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

EE 211 Electric Circuit Analysis II (3)
Continuation of basic circuit analysis. Energy storage elements, RC and RL circuits, and phasors. 3 lectures. Prerequisite: EE 112, MATH 143. Concurrent: EE 241.

EE 212 Electric Circuit Analysis III (3)
AC power, 3-phase circuits. Mutual inductance, series and parallel resonance and two-port networks. 3 lectures. Prerequisite: MATH 242 (or concurrent), EE 211. Concurrent: EE 242.

EE 241 Electric Circuit Analysis Laboratory II (1)
Use of electrical and electronic test equipment. Experimental verification of circuit analysis concepts including Kirchhoff's Laws, Thevenin's Theorem, maximum power transfer and superposition. 1 laboratory. Concurrent: EE 211.

EE 242 Electric Circuit Analysis Laboratory III (1)
Observation of transient and steady-state phenomena, phase-shift circuits, resonance. Use of phasor diagrams. 1 laboratory. Concurrent: EE 212.

EE 301 Linear Systems Analysis (3)

EE 302 Linear Control Systems (3)
Automatic feedback control systems. Analysis of linear dynamic systems. 3 lectures. Prerequisite: EE 301, EE 325.
EE 303  Power Transmission (3)
Electrical characteristics of three-phase overhead and underground power transmission lines. Development of models for different types of lines as well as interconnected power systems. Introduction of per unit calculations. Introduction of computer simulation methods. 3 lectures. Prerequisite: EE 301.

EE 311  Electric Circuit Theory (3)
Application of fundamental circuit laws and theorems to the analysis of DC, and steady-state single-phase and three-phase circuits. For engineering majors except electronic/electrical. 3 lectures. Prerequisite: MATH 242, PHYS 133.

EE 325  Energy Conversion Electromagnetics (3)
Fundamentals of electro-mechanical energy conversion. Magnetic circuits and electromagnetic devices. Theory of operation and operating characteristics of transformers, DC machines, AC induction machines, and synchronous machines. Stepper motors. 3 lectures. Prerequisite: EL 208 or EL 321.

EE 341  Linear Analysis Laboratory (1)
Fourier analysis. Two-port networks, frequency response and Bode plots. 1 laboratory. Concurrent: EE 301.

EE 342  Control Systems Laboratory (1)
Laboratory work in feedback control systems. 1 laboratory. Concurrent: EE 302.

EE 351  Electric Circuits Laboratory (1)
Techniques of measurement of DC and steady-state AC circuit parameters. Equivalent circuits, nonlinear elements, resonance. 1 laboratory. Concurrent or prerequisite: EE 311.

EE 365  Energy Conversion Laboratory (1)

EE 400  Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

EE 406  Power Systems Analysis I (4)
Introduction to electric power systems. Representation of power systems and components. One line diagrams and per unit calculations. Power limits and stability, system model representation of the synchronous machine, symmetrical faults, electrical insulation, grounding. Solution of power system problems by microcomputer techniques and time-share methods. 4 lectures. Prerequisite: EE 303.

EE 407  Power Systems Analysis II (4)
System protection, relays and relay systems, faults, load flow calculation, computer solutions, power system instrumentation and measurement techniques. Solution of power system problems by microcomputer techniques and time-share methods. 4 lectures. Prerequisite: EE 406.

EE 410  Power Control I (4)
Power semiconductor devices. Theory of power diodes, SCR, Triac, MOSFET, HEXFET, Diac, Unijunction transistor, etc., modeling of diode and SCR circuits, SCR trigger circuits, analysis of SCR circuit in rectifiers, choppers and dc motor control. 3 lectures, 1 laboratory. Prerequisite: EE 325, EL 309.

EE 411  Power Control II (4)
Analysis of SCR circuits in inverters and cycloconverters; modeling of inverter-induction motor drive system; regenerative braking; electric propulsion; digital computer study of motor control system. Line commutated inverters and HVDC converters, phase-locked loops and microprocessor based control systems. 3 lectures, 1 laboratory. Prerequisite: EE 410.

EE 414  Direct Energy Conversion (3)
Direct energy conversion, and storage, with consideration of resources, batteries, fuel cells, thermoelectricity, thermionic generators, solar energy, cells, MHD, power generation, and related topics. 3 lectures. Recommended as a complement to ME 415. Prerequisite: ME 302.
EE 417 Alternating Current Machines (4)
Alternating current machines. Generalized, operational and dynamic analysis. Steady-state and transient operation of synchronous machines and linear induction machines. 3 lectures, 1 laboratory. Prerequisite: EE 325, 365.

EE 432 Digital Control Systems (3)
Theory and applications of digital computers in linear control systems. Discrete time methods are used in analysis and design studies. Digital control systems are synthesized. 3 lectures. Prerequisite: EE 302 or consent of instructor.

EE 433 Computer-Aided Design in Magnetics (4)
Variational principles, integral and partial differential equation methods. Application of integral and partial differential equation methods to electromagnetic field problems. Computer-aided design of electrical devices. Use of commercially available software. 3 lectures, 1 laboratory. Prerequisite: EE 325, EL 334.

EE 444 Power Systems Laboratory (1)
Protective relaying, coordination, and relay calibration. Power control using transformers, parallel operation of generators, and computer simulation of power systems. 1 laboratory. Prerequisite: EE 406.

EE 461, 462 Senior Project (3) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Miscellaneous course fee required—see Class Schedule. Minimum 150 hours total time. Prerequisite: EE 325, EL 309, EL 334.

EE 463 Undergraduate Seminar (1) (CR/NC)
Discussion of new developments in the fields of power systems and control. Fields of employment and job considerations. Credit/No Credit grading only. 1 seminar. Prerequisite: Senior standing.

EE 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

EE 471 Selected Advanced Laboratory (1-3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

EE 500 Individual Study (1-3)
Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.

EE 511 Electric Machines Theory (3)
Advanced topics in electric machines theory. Introduction to Park’s transformation. Analysis of electric machines using Kron’s generalized concept. Excitation systems. 3 seminars. Prerequisite: EE 325 or equivalent, graduate standing or consent of instructor.

EE 513 Control Systems Theory (4)
State representation of dynamic systems. Mathematical models of physical devices, controllability and observability. Design of closed-loop systems. Optimal control theory. 4 seminars. Prerequisite: EE 302 or equivalent, graduate standing or consent of instructor.

EE 514 Digital and Nonlinear Control Systems Theory (4)
Nonlinear control systems analysis, discrete-time control. Finite-precision digital controllers. Microprocessor mechanizations of linear and non-linear controls. Efficient coding of control algorithms. Overflow characteristics and optimal saturating control structures. 4 seminars. Prerequisite: EE 432 or EL 328, graduate standing or consent of instructor.
EE 518 Advanced Power System Analysis (3)
Symmetrical components. Unbalanced faults. Analysis by digital computer simulation. Load flow studies. Elements of power system stability. 3 seminars. Prerequisite: EE 406 or equivalent, graduate standing or consent of instructor.

EE 519 Power System Design (4)
Design studies involving aspects of an electric power system. Current industrial designs. Computer simulation techniques used extensively. 4 seminars. Prerequisite: EE 518, graduate standing or consent of instructor.

EE 520 Solar-Photovoltaic Systems Design (3)
Solar cell and storage battery theory; examination of insolation variability and optimization techniques, principles of grounding protection and control, a survey of power conditioning equipment and system integration techniques. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

EE 525 Stochastic Processes for Engineers (4)
Probability and stochastic processes used in random signal analysis. Response of linear systems to random inputs. Auto-correlation and power spectral densities. Applications in signal processing using the discrete Kalman filter. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

EE 527 Advanced Topics in Power Electronics (4)
Static variable speed AC and DC drives. Phase-controlled rectifiers and choppers in DC motor control. PWM in three-phase inverters, sinusoidal modulation techniques, control strategies for AC three-phase variable speed motor control using voltage source inverters, current source inverters and speed control of AC motors. Torque and speed pulsations. HVDC converters and DC transmission. 4 seminars. Prerequisite: EE 410, EE 411 or equivalent, graduate standing or consent of instructor.

EE 563 Graduate Seminar (1)
Current developments in the fields of electrical and electronic engineering. Participation by students, faculty and guest lecturers. Open to graduate students with a background in electrical or electronic engineering. Total credit limited to 3 units. 1 seminar.

EE 570 Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to graduate students and selected seniors with electrical and electronic engineering background. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 seminars. Prerequisite: Graduate standing or consent of instructor.

EE 599 Design Project (Thesis) (2) (2) (5)
Each individual or group will select, with faculty guidance and approval, a topic for independent research or investigation resulting in a thesis or project to be used to satisfy the requirement for the degree. An appropriate experimental or analytical thesis or project may be accepted. Prerequisite: Graduate standing.

EL—ELECTRONIC ENGINEERING

EL 200 Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

EL 208 Electronic Devices (3)
Internal operation, terminal characteristics, and models of diodes, transistors (bipolar and field-effect), and optical devices (LED's and phototransistors). 3 lectures. Prerequisite: EE 212 and PHYS 211.

EL 219 Logic and Switching Circuits (3)
Modulo-N arithmetic and digital coding techniques. Fundamentals of Boolean Algebra and minimization techniques. Multiple function synthesis using ROM's and PLA's. Combinational circuit design as it applies to computers. Sequential circuit elements, flip-flops, counters and shift-registers. 3 lectures. Prerequisite: CSC 118 or CSC 204 or CSC 251.
**EL 248 Electronic Devices Laboratory (1)**
Experimental determination of device characteristics and models. 1 laboratory. Prerequisite: EE 242. Concurrent: EL 208.

**EL 303 Signal Transmission (3)**
Distributed-circuit concepts and traveling waves. Transmission line parameters. Lines with and without reflection. Standing waves. Smith Chart and its applications. Transmission line measurements and impedance matching techniques. 3 lectures. Prerequisite: EE 302, EL 308, EL 328.

**EL 307 Digital Integrated Electronics (3)**
Integrated logic circuits: RTL, DTL, TTL, pL, ECL, MOS, CMOS, interfacing different logic families. 3 lectures. Prerequisite: EE 302, EL 308, EL 328.

**EL 308 Electronic Circuits (3)**
Analysis and design of linear small-signal amplifiers. 3 lectures. Prerequisite: EE 301, EL 307.

**EL 309 Integrated Electronic Circuits (3)**
Analysis and design of feedback amplifiers; operational amplifier applications. Design of analog/digital and digital/analog converters. Power supply design. Emphasis on IC implementation. 3 lectures. Prerequisite: EE 302, EL 308, EL 328.

**EL 319 Digital System Design (3)**
Introduction to finite automata theory and the design of digital systems utilizing state-machines, analysis and synthesis of state-machines. Design of synchronous, asynchronous, and pulse mode sequential circuits. Role of the microprocessor in implementing state-machines. Trade-offs between system design utilizing hardware, firmware and microprocessors. 3 lectures. Prerequisite: EL 219, EL 307.

**EL 321 Electronics (3)**
Semiconductor devices and circuits. Instrumentation amplifiers, power control rectifiers, feedback, pulse circuits, digital logic circuits. Not for Electronic or Electrical Engineering majors. 3 lectures. Prerequisite: EE 311.

**EL 327 Electronic Instrumentation and Measurement (4)**
Principles and characteristics of instruments and instrumentation systems; analog and digital transducers; A/D conversion; data and signal transmission and amplification problems. Low level signal, high frequency signal, and high accuracy signal measurement problems. Automated instrumentation systems. 3 lectures, 1 laboratory. Prerequisite: EE 301, EL 308.

**EL 328 Discrete Time Systems (3)**

**EL 334 Electromagnetic Fields I (3)**
Advanced treatment of static vector electric and magnetic fields and their sources. Magnetic fields in ferromagnetic materials. Laplace’s equation and boundary value problems. 3 lectures. Prerequisite: EE 302, EL 308, EL 328.

**EL 343 Signal Transmission Laboratory (1)**

**EL 347 Digital Integrated Electronics Laboratory (1)**
Experimental investigation of the characteristics of different logic families. 1 laboratory. Concurrent: EL 307.

**EL 348 Electronic Circuits Laboratory (1)**
Design, construction and testing of solid state amplifier to meet stated specifications. 1 laboratory. Concurrent: EL 308.
EL 349 Integrated Electronic Circuits Laboratory (1)

EL 359 Digital System Design Laboratory (1)
Laboratory synthesis of combination and sequential logic circuits. Sequential subsystems analysis with the logic state analyzer. Fault testing and automated checkout procedures. Familiarization with the characteristics of SSI and MSI logic components. 1 laboratory. Concurrent or prerequisite: EL 319, EL 347.

EL 361 Electronics Laboratory (1)
Instrumentation amplifiers, feedback, rectifiers and power control, pulse and digital logic circuits. 1 laboratory. Concurrent or prerequisite: EL 319.

EL 400 Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

EL 401 Electromagnetic Fields I (3)
Time changing electric and magnetic fields. Maxwell's equations, with the relationship between field and circuit theory. Plane waves in dielectric and conducting media. Selected topics from wave polarization, reflection and refraction. 3 lectures. Prerequisite: EL 303, EL 334.

EL 402 Microwave Engineering (3)
Application of Maxwell's equations and boundary value problems to wave guide structures. Microwave equivalent circuit theorem. Passive microwave devices including treatment of attenuation, insertion loss power division, directional coupling, and the scattering parameters. Introduction to stripline and microstrip techniques. 3 lectures. Prerequisite: EL 401.

EL 403 Fiber Optic Communication (3)
Propagation of light in optical fibers, attenuation and bandwidth. LED and Laser Diode sources for use with optical fibers. Optical sources, detectors, and displays. Design of optical communication systems with applications in telecommunications and local area networks (LANs). 3 lectures. Prerequisite: EL 303, EL 309.

EL 404 Microprocessor System Design Methodologies (3)
Classification and functional configurations of existing microprocessors and analysis of hardware system designs and system economics. Interface design techniques utilizing programmable I/O interfaces, real-time clocks, interrupts, and DMA channels. Representative applications. 3 lectures. Prerequisite: EL 319, CSC 221, or consent of instructor. Concurrent: EL 446.

EL 405 High-frequency Amplifier Design (3)
Design of modern electronic amplifiers and amplifier systems with advanced techniques. Small signal wideband lowpass amplifier design utilizing both discrete and integrated devices. VHF, UHF amplifier design using S parameters. GaAs FET microwave distributed amplifier. Noise analysis. 3 lectures. Prerequisite: EL 303, EL 309.

EL 407 Digital Computer Subsystems (3)
Design of registers, counters, sequencers, accumulators, encoders, decoders, memories, and other computer subsystems. Use of modern techniques and devices in implementation. Consideration given to cost, speed, and dependability. 3 lectures. Prerequisite: EL 319.

EL 408 Digital Computer Systems (3)
Design of computer ALU's microprogram controllers, memory systems, and I/O controllers. Use of LSI components in CPU design. Microprogram and nanoprogram development. 3 lectures. Prerequisite: EL 407 or consent of instructor.

EL 409 Computer Peripheral Interfacing (3)
Design of the more common computer peripherals (paper devices, floppy disks, etc.) with the emphasis on the controller and interfacing aspects. Use of microprocessors and/or LSI controller chips in the design of intelligent peripherals. 3 lectures. Prerequisite: EL 404, or consent of instructor.
EL 411  **Network Synthesis and Filter Design Fundamentals (3)**

EL 412  **Advanced Analog Circuits (3)**
Application of linear integrated circuits to data acquisition problems: transducer interfacing, linear and nonlinear preprocessing, phase-locked loops, and high performance quantization and recovery (A/D, D/A conversion). 3 lectures. Prerequisite: EL 309, EL 414.

EL 413  **Electronic Circuit Design (4)**
Design of electronic circuits and sub-systems. Non-linear circuit applications, signal generators, voltage references, switched capacitor filters and noise in OP AMPS. 3 lectures, 1 laboratory. Prerequisite: EL 309.

EL 414  **Introduction to Communication Systems (3)**
Amplitude modulation. Frequency and phase modulation. Demodulation techniques. Bandwidth and power considerations. Noise in communication systems. 3 lectures. Prerequisite: EL 328 and EE 302.

EL 415  **Communication Systems Design (3)**
Design of modern electronic communication and telemetry systems. Emphasis: practical implementation and comparative evaluation of various modulation systems. 3 lectures. Prerequisite: EL 309, EL 414.

EL 416  **Digital Communication Systems (3)**
Baseband (PCM, PAM, DM) signals and transmission. Bandpass (PSK, FSK, ASK) modulation and demodulation techniques. Digital communication signals in the presence of noise and detection of signals in Gaussian noise. 3 lectures. Prerequisite: EL 414.

EL 418  **Electro-Optical Engineering (3)**
Modern optical design with an emphasizing the use of computers to design simple optical systems and to evaluate existing optical designs. Paraxial and exact ray tracing through thin and thick lenses, mirrors, and prisms. Radiometry and photometry. Electro-optic, acousto-optic, and magneto-optic modulators and their applications. Thermal detectors, semiconductor detectors, and charge coupled arrays. Miscellaneous course fee required—see Class Schedule. 3 lectures. Prerequisite: EL 401 or equivalent or PHYS 323.

EL 419  **Digital Filter Design (3)**

EL 421  **Solid-state Microelectronics (3)**
Physical basis of solid-state microelectronics. Passive and active integrated circuit components in Bipolar, MOS, thin and thick film systems. Diffusion, oxidation, ion implantation and other fabrication techniques. Microcircuit layout and design: system development, reliability and economic considerations. Future trends. 3 lectures. Prerequisite: Senior standing.

EL 423  **Microwave Electronics (3)**
Charge and field interactions in oscillators and amplifiers. Transferred electron devices, avalanche transit-time devices, microwave transistors. Circuits associated with oscillators and reflection type amplifiers. 3 lectures. Prerequisite: EL 401.

EL 424  **Antenna Theory and Application (3)**
Linear antenna theory. Antenna as a matching device. Antenna directivity, gain, efficiency, resistance, aperture, and reciprocity. Application of antenna theory to various types of antennas. 3 lectures. Prerequisite: EL 401.
EL 425  Analog Filter Design (3)

EL 430  Computer-Aided Circuit Design (3)
Analysis and design of active and passive electronic circuits using digital computers. Graphic terminal and time-sharing systems. Survey of available CAD programs and techniques. Applications of ECAP, SPICE and other programs for dc, ac and transient analysis, including tolerance, sensitivity, optimization and device modeling. 3 lectures. Prerequisite: EL 309, or consent of instructor.

EL 431  Computer-Aided Design of VLSI Devices (3)
Design of VLSI circuits, design of subsystems, PLA's and finite-state machines, patterning, hand layout, and CIF programming. 3 lectures. Prerequisite: EL 319, EL 309.

EL 441  Microwave Laboratory (1)
Experimental investigation of vacuum-tube and solid state microwave sources, crystal and power detectors, coaxial cables, directional couplers and n-port devices. Measurement of SWR by slotted line and reflectometer techniques. Techniques for measurement of attenuation, frequency and power. 1 laboratory. Prerequisite: EL 303, EL 343, EL 401.

EL 443  Fiber Optics Laboratory (1)
Experimental investigation of the properties of optical fibers, sources, and detectors. Measurement of fiber physical characteristics, attenuation, losses, and bandwidth. Evaluation of an analog and digital fiber optic data link. 1 laboratory. Prerequisite or concurrent: EL 403.

EL 444  Network Synthesis and Filter Design Lab (1)
Modern network synthesis; network driving point and transfer function synthesis; design, construction and testing filters of the Butterworth and/or Chebyshev kind—lowpass, bandpass, band elimination and highpass filters. 1 laboratory. Concurrent or prerequisite: EL 411.

EL 445  Advanced Amplifier Design Laboratory (1)
Experimental investigation employing advanced techniques. Design of electronic amplifiers and amplifier systems utilizing recently developed components. 1 laboratory. Concurrent or prerequisite: EL 405.

EL 446  Microprocessor Interfacing Laboratory (1)
Design and construction of selected digital systems. Utilization of superstrip boards to construct MSI, LSI based logic circuits. Interfacing of student built systems with several representative microprocessors. Hardware/software performance evaluation of microprocessor interfacing techniques. 1 laboratory. Prerequisite: EL 309 and consent of instructor. Concurrent: EL 404.

EL 448  Digital Computer Systems Laboratory (1)
Laboratory analysis and synthesis of digital computer subsystems. Microprogramming of a simple digital computer via computer simulation. Interfacing with digital systems. 1 laboratory. Prerequisite: EL 407, or EL 409 or consent of instructor.

EL 451  Solid State and Microelectronic Laboratory (1)
Laboratory investigation of electronic properties of semiconductor materials. Experimental projects in design, fabrication and evaluation of hybrid/monolithic microelectronic devices and circuits. 1 laboratory. Prerequisite: Senior standing or consent of instructor.

EL 453  Active Network Synthesis Laboratory (1)
Advanced laboratory study of sensitivity and stability of active networks prescribed for realization of transfer functions by active network synthesis techniques. Formal experiments and individual project work. 1 laboratory. Concurrent or prerequisite: EL 425.

EL 456  Communication Systems Laboratory (1)
Methods of analog and digital modulation and demodulation. Emphasis on spectral analysis, bandwidth requirements and other practical considerations of modulation and demodulation. 1 laboratory. Prerequisite: EL 414.
EL 458  **Electro-Optical Engineering Laboratory (1)**
Experimental investigation of the techniques used in processing optical signals. Formal experiments on electro-optic modulation, acousto-optic modulation. Construction of an RF spectrum analyzer. Analog processing of optical signals, and charge-coupled array devices. 1 laboratory. Prerequisite or concurrent: EL 418.

EL 459  **Digital Signal Processing Laboratory (1)**
Experiments in digital filter design and digital signal processing emphasizing various areas of applications (communications, audio signals, speech processing). Formal experiments and individual project work. 1 laboratory. Prerequisite: Concurrent enrollment in EL 419 and knowledge of C or assembly language desirable.

EL 461, 462  **Senior Project (3) (2)**
Selection and completion of a project under faculty supervision. Project results are presented in a formal report. Miscellaneous course fee required—see Class Schedule. Minimum 150 hours total time. Prerequisite: EE 325, EL 309, EL 319, EL 334.

EL 463  **Undergraduate Seminar (1) (CR/NC)**
Discussion of new developments in the fields of communications, computers, and industrial electronics. Fields of employment and job considerations. Credit/No Credit grading. 1 seminar. Prerequisite: Senior standing.

EL 470  **Selected Advanced Topics (1–3)**
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

EL 471  **Selected Advanced Laboratory (1–3)**
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

EL 500  **Individual Study (1–3)**
Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.

EL 515  **Discrete Time Filters (4)**
Analysis and design of digital filters using time-domain and transform techniques. Frequency response, aliasing problems and sampling issues. Recursive and non-recursive filters, digital filtering in numerical analysis, image processing, prediction algorithms. 4 seminars. Prerequisite: EL 414, graduate standing or consent of instructor.

EL 517  **Information Theory (4)**
Introduction to information theory and coding self and mutual information. Discrete and continuous information sources and transmission channels. Additive white Gaussian noise channel. Channel capacity. The Source- and Channel-Coding Theorems. Data compression. Huffman code. Block codes, including Hamming and linear codes. Parity and syndrome decoding. Convolutional codes. 4 seminars. Prerequisite: EL 414, EE 525, graduate standing or consent of instructor.

EL 520  **Digital Systems Design (3)**
Design of asynchronous sequential machines and pulse mode logic circuits. Selected automata theory topics include state compatibility analysis, state partition analysis, threshold logic, fuzzy logic. Modern digital system design. Analysis of MOS-LSI multiphase logic structures. Comparison of digital subsystems. Microprocessor as a digital subsystem module. 3 seminars. Prerequisite: EL 319, graduate standing or consent of instructor.

EL 521  **Computer Systems (4)**
Organization of modern general purpose, high speed digital computer systems. Arithmetic units, control units, memories and memory subsystems. Peripheral equipment. Cost and speed trade-offs in the design of such systems. 3 seminars. Prerequisite: EL 407, or consent of instructor.
**EL 522** Microprocessor-Based Digital System Design (3)
Design and implementation of microprocessor-based digital systems. Their analysis and cost effective use in system design problems. Data acquisition and control systems. Role of microperipheral controllers. Laboratory problems associated with interfacing microprocessors to various systems. 2 seminars, 1 laboratory. Prerequisite: EL 404, or consent of instructor.

**EL 524** Solid State Electronics (3)
Physical theory of solid-state devices. Properties of metal-semiconductor junctions and p-n junctions. Derivation of properties of diodes, transistors, and four-layer devices from basic physical and mathematical considerations. 3 seminars. Prerequisite: PHYS 412 or equivalent, graduate standing or consent of instructor.

**EL 526** Digital Communications (4)
M-ary signals. Vector space representation of signals. Optimum receiver principles. Synchronization. Multiplexing and multiple access. Spread spectrum techniques. 4 seminars. Prerequisite: EE 525 and EL 416.

**EL 528** Digital Image Processing (4)
Two-dimensional spatial frequency transforms. Image enhancement, histogram equalization. Smoothing and sharpening. Image restoration, image encoding and segmentation. Descriptors. 4 seminars. Prerequisite: EL 414, EE 525, graduate standing or consent of instructor.

**EL 529** Advanced Topics in Microwave Device Electronics (3)
Emphasis on device and circuit principles of active microwave solid-state devices, their noise aspects and systems applications. 3 seminars. Prerequisite: EL 401, PHYS 412 or equivalent, graduate standing or consent of instructor.

**EL 530** Electro-Optics Systems (4)
Design of radiometric information optics and imaging systems. Remote sensing, guidance and tracking, fiber optic and laser communications. Component modeling and optimization of systems for detection of radiant flux with maximum signal to noise ratio. Modeling of source, intervening media, optical subsystem, focal plane, signal-conditioning electronics, and output and display. 4 seminars. Prerequisite: EL 401, PHYS 412 or equivalent, graduate standing or consent of instructor.

**EL 570** Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to graduate students and selected seniors with electrical and electronic engineering background. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 seminars. Prerequisite: Graduate standing or consent of instructor.

**ENGL—ENGLISH**

**ENGL 100** Fundamentals of Writing: English as a Second Language (2) (CR/NC)
Practice of written patterns of English, developing sentences that express meaning clearly. Structured writing assignments. Writing following reading and discussion of writing task. Credit/No Credit Grading only. Repeatable. 4 lectures.

**ENGL 101** Fundamentals of Writing: Sentence Construction (4) (CR/NC)
Practice in writing sentences in a larger context with attention paid to sentence variety, rules of grammar and mechanics. Substantial essay due at the end of the quarter. Directed readings of exemplary essays. Credit/No Credit grading only. Repeatable. 4 lectures.

**ENGL 102** Fundamentals of Writing: Logic and Organization (4) (CR/NC)
Practice in the strategies of organizing paragraphs in a larger context with attention paid to focus and support. Substantial essay due at the end of the quarter. Directed readings of exemplary essays. Credit/No Credit grading only. Repeatable. 4 lectures.
ENGL 106  **Controlled Composition (4) (CR/NC)**

For speakers of nonstandard English variations. Instruction aimed at mastering specific conventions of standard English: inflections, article usage, pronoun/antecedent agreement, subject/verb agreement, tense agreement and punctuation. Frequent copying and proofreading assignments requiring transformations of grammatical units. Prepares students for ENGL 107. Credit/No Credit grading only. Repeatable. 4 lectures. Prerequisite: Consent of instructor.

ENGL 107  **Controlled Composition (4) (CR/NC)**

For speakers of nonstandard English variations. Practice in composing and proofreading essays with focus on the specific features of standard English reviewed in ENGL 106. Additional drill and practice in progressive and perfect tenses, present and past participles, and negating and contradicting. Credit/No Credit grading only. Repeatable. 4 lectures. Prerequisite: ENGL 106 or consent of instructor.

ENGL 108  **Fundamentals of Standard English: Spelling and Vocabulary (4) (CR/NC)**

For speakers of non-standard English variations who need additional work with the conventions of standard English. Programmed instruction in vocabulary development with additional drill and practice in the English sound system as it relates to spelling. Credit/No Credit grading. Repeatable. 4 lectures. Prerequisite: ENGL 106 or consent of instructor.

ENGL 111  **English Sentence Structure for ESL/EFL Students (4) (CR/NC)**

Focus on the fundamentals of sentence patterns, sentence construction, and sentence combining within the context of the paragraph and story. Practice in writing a variety of effective sentences; practice in linking sentences in a unified paragraph controlled by a topic sentence. Credit/No Credit grading only. 4 lectures. Prerequisite: Non-native English speakers who need to develop skill in writing English sentences.

ENGL 112  **English Paragraph Development for ESL/EFL Students (4) (CR/NC)**

Focus on the fundamentals of paragraph development within the context of the essay and story. Writing paragraphs with strong topic sentences that control paragraph unity; linking paragraphs for a unified essay through transitions and the control of the thesis statement. Credit/No Credit grading only. 4 lectures.

ENGL 114  **Writing: Exposition (4)**

Writing and stylistic analysis of expository papers. Study and application of techniques of exposition. Critical reading of model essays. 4 lectures.

ENGL 125  **Critical Thinking (3) (Also listed as PHIL 125 and SPC 125)**

Nature of critical thinking. Analysis of inductive and deductive arguments. Practice in the composing of arguments in English. 3 lectures. Prerequisite: ENGL 114 or equivalent.

ENGL 215  **Writing: Argumentation (4)**

Writing and critical evaluation of argumentative papers. Techniques of research and evaluation of research sources. Discussion of elements of argumentation, inductive and deductive reasoning and use of supporting documentation in written discourse. Examination of special problems in invention, form, style and evaluation. Not open to students with credit in ENGL 218. 4 lectures. Prerequisite: ENGL 114 and ENGL 125 or PHIL 125 or SPC 125.

ENGL 218  **Writing: Argumentation and Reports (4)**

Argumentation in writing. Composing and conveying technical information. Methods of research. Analysis of writing situations. Analysis and criticism of student reports and technical reports. Extensive writing practice in professional formats: reports, proposals, letters, memoranda. Not open to students with credit in ENGL 215. 4 lectures. Prerequisite: ENGL 114 and ENGL 125 or PHIL 125 or SPC 125.

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

Selected readings in British literature from its beginnings through the Eighteenth Century. Early and middle English works read in translation. Includes works by such authors as Chaucer, Shakespeare, Milton, Swift, Pope and Johnson. 4 lectures. Prerequisite: ENGL 114 or equivalent.
ENGL 231 Masterworks of British Literature: Romantic Period to the Present (4)  GEB C.1.  
Selected readings in British literature from the Romantic period to the present. Includes works by such Romantic, Victorian, Edwardian and Twentieth Century writers as Wordsworth, Byron, Tennyson, Shaw, Yeats and Eliot. 4 lectures. Prerequisite: ENGL 114 or equivalent, or consent of instructor.

ENGL 240 American Tradition in Literature (4)  GEB C.1.  
Selected readings from major authors that show the American literary tradition from the Colonial period into the Twentieth Century. Literary expression of movements that shaped the American character, including Puritanism, Deism, Transcendentalism and Naturalism. Includes works by such authors as Franklin, Emerson, Poe, Whitman, Dickinson, Twain, Frost, Hemingway and Faulkner. 4 lectures. Prerequisite: ENGL 114 or equivalent, or consent of instructor.

ENGL 251 Great Books of World Literature: Classical and Ancient World (3)  GEB C.1.  
Selected readings from world writings, beginning with the earliest epics through the literature of Greece and Rome. Includes such authors as Homer, Aeschylus, Sophocles, Euripides, Plato and Ovid. 3 lectures. Prerequisite: ENGL 114 or equivalent, or consent of instructor.

ENGL 252 Great Books of World Literature: Middle Ages, Renaissance and Enlightenment (3)  GEB C.1.  
Selected masterpieces from the fall of the Roman Empire up to the Eighteenth Century. Includes such authors as Dante, Cervantes, Shakespeare, Molière, Voltaire and Swift. 3 lectures. Prerequisite: ENGL 114 or equivalent, or consent of instructor.

Selected works from the beginning of Romanticism up to the present. Includes material from literary movements such as Realism, Naturalism, Symbolism and Existentialism, with works by such authors as Goethe, Hugo, Keats, Wordsworth, Flaubert, Balzac, Dostoevsky, Woolf, joyce and Beckett. 3 lectures. Prerequisite: ENGL 114 or equivalent, or consent of instructor.

ENGL 260 Children's Literature (3)  
Analysis and evaluation of realism, traditional fantasy, modern fantasy, and poetry for children in multiple subject classroom grades K–8. 3 lectures. Prerequisite: ENGL 114 or equivalent, or consent of instructor.

ENGL 290 Introduction to Linguistics (4)  
Overview of linguistics from its origin to present forms and practices. 4 lectures. Prerequisite: ENGL 114 or equivalent, or consent of instructor.

ENGL 302 Writing: Advanced Composition (4)  
Writing and analysis of expository and argumentative papers at an advanced level. Discussion and application of rhetorical, stylistic and grammatical principles through writing and critical reading of essays. Practice in revising and editing papers. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

ENGL 310 Corporate Communication (4)  
Instruction and practice in forms of communication characteristic of business and industry. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

ENGL 311 Advanced Technical Writing (4)  
Technical writing as produced in industry and government. Analytic reports, manuals, instructions, specifications. Trade journal articles. Editing skills. Orientation to technical communication careers. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

ENGL 318 Writing for Scientific Journals (4)  
Practice of the skills necessary in the preparation of articles for scientific journals. Extensive writing and copy-editing, and study of the forms and styles required by the professional societies in each field. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

ENGL 325 Creative Writing (4)  
Instruction and practice in the writing, revising, and evaluating of fiction, poetry, or drama. Total credit limited to 8 units. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.
ENGL 326  Literary Criticism (4)
Instruction and practice in writing, revising, and evaluating various kinds of critical writing. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

ENGL 330  British Literature: Medieval Period (4)  GEB C.3.
Major works of the Old and Middle English periods in modern translation, including epic and lyric poetry, early religious writings, romance cycles and mystery and morality plays. Representative works include Beowulf, the Arthurian legends, Everyman and Chaucer’s Canterbury Tales. 4 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

ENGL 331  British Literature: The Renaissance (4)  GEB C.3.
Major works of Elizabethan and Jacobean prose, poetry and drama. Literary responses to the foundations of humanism, individualism, nationalism and other forces of change leading from the medieval to the modern world. Representative writers include Spenser, Sidney, Donne, Jonson, Bacon and Milton. 4 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

ENGL 332  British Literature: The Enlightenment (4)  GEB C.3.
Major prose, poetry, and drama from 1660 to 1800, emphasizing the period’s interest in order, reason, rules and decorum in both life and literature. Representative writers include Dryden, Swift, Pope, Johnson, Boswell and Defoe. 4 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

ENGL 333  British Literature: Romanticism (4)  GEB C.3.
Major works of the Romantic period. Romantic concepts of imagination, individualism, nature and the organic qualities of art. Representative writers include Blake, Wordsworth, Coleridge, Byron, Shelley and Keats. 4 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

ENGL 334  British Literature: The Victorians (4)  GEB C.3.
Major prose and poetry of the Nineteenth Century. Victorian concerns such as progress, belief, alienation and threats to the sense of personal identity in a technological age. Representative writers include Carlyle, Ruskin, Tennyson, Browning and Arnold. 4 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

ENGL 335  British Literature: Twentieth Century (4)  GEB C.3.
Selected prose, poetry, and drama reflecting major movements of British literature from Modernism through Postmodernism, including Conrad, Joyce, Woolf, Waugh, Amis, Drabble, Yeats, Eliot, Smith, Stoppard. 4 lectures. Prerequisite: ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

ENGL 339  Introduction to Shakespeare (3)  GEB C.3.
Readings from such works as Hamlet, King Lear, A Midsummer-Night’s Dream and the sonnets. 3 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

ENGL 340  American Literature to 1860 (4)  GEB C.3.
Selected prose and poetry by American writers to 1860, showing the Colonial foundation of our national literature, developments of the Enlightenment and achievements of the Romantic age. Representative writers include Bradstreet, Edwards, Franklin, Paine, Emerson, Poe, Hawthorne, Thoreau and Melville. 4 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

Selected prose and poetry by American writers from the Civil War to World War I with the focus on local-color fiction and on literary Realism and Naturalism. Representative writers include Whitman, Dickinson, Twain, James, Howell, Chopin and Crane. 4 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.
ENGL 342  American Literature: 1914 to the Present (4)  
Selected prose, poetry and drama by American writers from World War I to the present, depicting the social and psychological complexities of the Twentieth Century. Representative authors include Frost, Eliot, Stevens, Fitzgerald, Hemingway, Faulkner and O’Neill. 4 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

ENGL 345  Women Writers (4)  
Literature by women with attention to the woman artist and the creative process. Women writers and the dominant literary tradition with consideration of the existence of a women’s literary tradition. 4 lectures. Prerequisite: ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253, or consent of instructor.

ENGL 346  Ethnic American Literature (4)  
Literature written in English by Black, Latino, Asian American, and Native American writers. Historical contexts which affected these writers and the effect of marginalization on the creative process. Relationship of such writers to the American canon and a revised canon. 4 lectures. Prerequisite: ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253, or consent of instructor.

ENGL 350  Modern Novel (3)  
Readings in representative Twentieth Century novels with special emphasis on form and ideas. 3 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

ENGL 351  Modern Poetry (3)  
Readings in representative Twentieth Century poetry with special emphasis on form and ideas. 3 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

ENGL 352  Modern Drama (3)  
Readings in representative Twentieth Century drama with special emphasis on form and ideas. 3 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

ENGL 355  The Bible as Literature (3)  
Old and New Testaments with historical background. Literary forms and characteristics of Hebraic writing. Appreciation of the far-reaching use of Biblical narrative and reference in literature, speeches, art, drama, and modern film. 3 lectures. Prerequisite: ENGL 114 or equivalent or consent of instructor.

ENGL 360  Literature for Adolescents (3)  
Readings in literature suitable for use in secondary schools. 3 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

ENGL 362  Classics for Children and Youth (4)  
Classic works of children’s literature from the Eighteenth Century to the present. 4 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

ENGL 370  World Cinema (4)  
Major works of international cinema with emphasis on critical interpretation, on the ways film communicates visually and verbally, and on the historical and cultural contexts in which films are created. Contains films by directors such as Howard Hawks, Orson Welles, Ingmar Bergman and Akira Kurosawa. 3 lectures, 1 activity. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

ENGL 372  Film Directors (4)  
Significant film directors from the Western world and non-Western world, and their cinematic and technical achievements. Demonstrates relationships of Twentieth Century modes of thought. Class Schedule will list topic selected. Total credit limited to 12 units. 3 lectures, 1 activity. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253, or consent of instructor.
ENGL 380 Contemporary Literary Ideas (4)
Literature of the modern period. Significant writers, both from the Western world and the non-Western world, and their literary achievements. Demonstrates relationships of prevailing Twentieth Century modes of thought. Class Schedule will list topic selected. Total credit limited to 12 units. 4 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

ENGL 385 Mass Media Criticism (4) (Also listed as JOUR 385 and SPC 385)
Examines mass media (especially broadcasting) from a rhetorical/critical perspective. Aims to expand students' understanding of media issues, media's role as critic, and the role of criticism. 4 lectures. Prerequisite: SPC 201 or SPC 202.

ENGL 390 Modern English Grammar (4)
Linguistic analysis of the English language. Phonology, morphology, and syntax. Traditional, descriptive-structural, and transformational-generative grammars. 4 lectures. Prerequisite: ENGL 114 or equivalent.

ENGL 392 Contemporary Grammar and Composition (4)
Instruction and practice in writing and revising essays. Emphasis on rhetorical principles for clear composition, using the English language and grammar systems as subjects. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

ENGL 395 History of the English Language (4)
development of the English language from its origins to its present forms and practices. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

ENGL 400 Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

ENGL 415 Advanced Creative Writing (4)
Instruction and practice in advanced writing, revising and evaluating of fiction or poetry. Total credit limited to 8 units. 4 lectures. Prerequisite: ENGL 325 or consent of instructor. ENGL 325 (Fiction) must be taken as prerequisite to ENGL 415 (Fiction).

ENGL 418 Technical Communication Practicum (2-4) (CR/NC)
Supervised work experience in government, corporate, or volunteer setting, as approved by department head. Placement may be student or employer initiated, or through Cooperative Education. Proposal, progress reports, and final report. Total credit limited to 8 units, with a maximum of 4 units per quarter. Credit/No Credit grading only. Prerequisite: Senior standing, two technical writing courses.

ENGL 421 Writing in Secondary Schools (4)
Approaches to writing in secondary schools. Overview of composition theory and examination of current research on the teaching of writing. Exploration of classroom techniques appropriate to student needs and program goals. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

ENGL 424 Organizing and Teaching English (4)
Introduction to the organization, selection, presentation, application, and interpretation of subject matter in English in secondary schools. 4 lectures. Prerequisite: Admission to teacher education program or valid teaching credential.

ENGL 430 Chaucer (4)
Selected readings from Canterbury Tales and Chaucer's other major poems. 4 seminars. Prerequisite: ENGL 330, or ENGL 331, or ENGL 332, or ENGL 333, or ENGL 334.

ENGL 431 Shakespeare (4)
Representative comedies, tragedies, and histories. 4 seminars. Prerequisite: ENGL 330, or ENGL 331, or ENGL 332, or ENGL 333, or ENGL 334, or ENGL 339.

ENGL 432 Milton (4)
Paradise Lost, Paradise Regained, and Samson Agonistes, with some attention to the minor poems. 4 seminars. Prerequisite: ENGL 330, or ENGL 331, or ENGL 332, or ENGL 333, or ENGL 334.
ENGL 439 Significant British Writers (4)
Selected British writers, as individual writers or in groups. Each course will have a subtitle descriptive of the content. Total credit limited to 8 units. 4 seminars. Prerequisite: ENGL 330, or ENGL 331, or ENGL 332, or ENGL 333, or ENGL 334.

ENGL 449 Significant American Writers (4)
Selected American writers, as individual writers or in groups. Each course will have a subtitle descriptive of the content. Total credit limited to 8 units. 4 seminars. Prerequisite: ENGL 340, or ENGL 341, or ENGL 342.

ENGL 459 Significant World Writers (4)
Selected world writers, as individual writers or in groups. Each course will have a subtitle descriptive of the content. Total credit limited to 8 units. 4 seminars. Prerequisite: 8 units of literature or consent of instructor.

ENGL 461 Senior Project (3)
Selection and completion of a project under faculty supervision. Projects typify problems which a graduate may face in his field of employment. Project results are presented in a formal written report. Minimum of 90 hours total time. Prerequisite: Prior consent of instructor.

ENGL 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

ENGL 495 Applied Language Study (4)
Linguistic theory applied to human communications, human relations, and literature. Each course will have a subtitle descriptive of the content. Total credit limited to 8 units. 4 seminars. Prerequisite: ENGL 390 or consent of instructor.

ENGL 496 Introduction to Teaching English as a Second Language/Dialect (4)
Language analysis and assessment; methods and materials for testing and teaching nonnative English speakers; phonemic analysis, oral-aural testing; oral-aural practice; vocabulary acquisition; oral and written patterns of organization, structure, grammar; acquiring English for special purposes; evaluating curriculum materials; observing and tutoring ESL students. 4 seminars. Prerequisite: 8 units of linguistics or consent of instructor.

ENGL 501 Techniques of Literary Research (4)
Purposes and methods of literary research in literature. Acquaintance with printed materials of research and practical experience in collecting material, weighing evidence, reaching conclusions, and writing scholarly articles. Analysis of dissemination of scholarly information. Discussion of ethics of scholarship. 4 seminars. Prerequisite: Graduate standing.

ENGL 502 Seminar in Critical Analysis (4)
Basic approaches used by critics. Multiple points of view. Application to literary works. Class Schedule will list topic selected. Total credit limited to 8 units. 4 seminars. Prerequisite: Graduate standing.

ENGL 503 Seminar in English Linguistics (4)
Review of current modes of linguistic study and introduction to linguistic research and its application. 4 seminars. Prerequisite: ENGL 290, ENGL 390 or consent of instructor.

ENGL 504 Seminar in Applied English Linguistics (4)
Development of English. Consideration of problems of grammar and uses of language. Total credit limited to 12 units. 4 seminars. Prerequisite: ENGL 503 or consent of instructor.

ENGL 505 Seminar in Composition Theory (4)
Special problems in composition. Direct application of new language information to composition or detailed analysis of relationship between rhetorical principles and writing. Total credit limited to 12 units. 4 seminars. Prerequisite: Graduate standing in English.
ENGL 506 Pedagogical Approaches to Composition (4) (CR/NC)
Practical problems in the teaching of English composition. Application and study of practical approaches. Discussion of day to day experiences in the classroom. Discussion of and research into the nature and solution of student writing problems. Required of all new teaching assistants in English. Total credit limited to 8 units. Credit/No Credit grading only. 4 seminars. Prerequisite: Graduate standing in English.

ENGL 510 Seminar in Authors (4)
Intensive study of major British and American literary figures, singly, doubly or in small groups. Written and oral reports of individual investigation. Class Schedule will list topic selected. Total credit limited to 8 units. 4 seminars. Prerequisite: Graduate standing, completion of or concurrent enrollment in ENGL 501.

ENGL 511 Seminar in American Literary Periods (4)
American periods. Written and oral reports of individual investigation. Class Schedule will list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: Graduate standing in English, completion of or concurrent enrollment in ENGL 501.

ENGL 512 Seminar in British Literary Periods (4)
British periods. Written and oral reports of individual investigation. Class Schedule will list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: Graduate standing, completion of or concurrent enrollment in ENGL 501.

ENGL 513 Seminar in Special Topics (4)
Themes and ideas in language and literature not ordinarily covered in the routine graduate course offerings. Written and oral reports of individual investigation. Class Schedule will list topic selected. Total credit limited to 8 units. 4 seminars. Prerequisite: Graduate standing, completion of or concurrent enrollment in ENGL 501.

ENGL 515 Apprenticeship in Teaching Literature or Linguistics at College Level (2) (CR/NC)
Supervised experience in planning, teaching, and evaluating a 200- or 300-level linguistics or literature class taught by English faculty member. Planning, selecting texts, conferring with students, discussing and constructing assignments, lecturing, leading small group discussions, Credit/No Credit grading only. Prerequisite: ENGL 506 and successful teaching experience in ENGL 114 or ENGL 215.

ENGL 518 Technical Communication Theory (4)
Theory of technical communication for teachers, managers, advanced writers, and editors. Applications to science, agriculture, engineering. Evolving concepts and uses of literacy in a technological age: e.g., readability, information retrieval, document design. 4 seminars. Prerequisite: ENGL 318 or equivalent or consent of instructor.

ENGL 520 Problems in Secondary English (3)
Topical issues in teaching secondary school English. Designed especially for credentialed teachers in the field. Alternate topics like the following: writing instruction workshop, teaching masterworks and young adult literature, implications of rhetorical and discourse theories, computer technology in English, literary criticism and teaching, research in reading and writing. Written reports of topic investigations. Total credit limited to 9 units. 3 seminars. Prerequisite: Graduate standing in English.

ENGL 590 Directed Study (4)
Independent or group study of special problems in selected areas of language, composition, or literature. Total credit limited to 12 units. 4 seminars. Prerequisite: Graduate standing in English.

ENGR ENGINEERING

ENGR 141 Engineering Orientation (2) (CR/NC)
Study skills for the technical student, including time management, test-taking and note-taking skills for both technical and non-technical courses. Utilization of campus resources. Academic, career and personal assessment as it relates to the educational process. Specifically for students enrolled through Student Academic Services and the Minority Engineering Program. Credit/No Credit grading only. 1 lecture, 1 activity.

ENGR 142 Engineering Careers (2) (CR/NC)
Career investigation, resume writing, job search and interview skills, speakers from industry and time management. Specifically for students enrolled through Student Academic Services and the Minority Engineering Program. Credit/No Credit grading only. 1 lecture, 1 activity.
ENGR 301 Technology in the 20th Century (3)
Role of science, engineering and technology in the Twentieth Century. Effects of technological change, the function of the scientist-engineer in society. Computer as a tool, case studies of systems to compare alternative approaches to problem solving. 3 lectures. Prerequisite: Junior standing or consent of instructor.

ENGR 303 Professional Development (2) (CR/NC)
Integration of principles of Engineering with industrial realities via professional problem solving modules. Research and field investigation at cooperating industry sites. Advanced learning systems. Specifically designed for transfer students. Credit/No Credit grading only. 2 lectures. Prerequisite: Junior standing or consent of instructor.

ENGR 599 Design Project (Thesis) (2) (2) (5)
Each individual or group will select, with faculty guidance and approval, a topic for independent research or investigation resulting in a thesis or project to be used to satisfy the degree requirement. An appropriate experimental or analytical thesis or project may be accepted. Prerequisite: Graduate standing.

ENT–ENTOMOLOGY

ENT 220 Agricultural Entomology (4)
Major insect orders and families of agricultural importance. Taxonomy, identification, life cycles, histories, and natural controls of insects. 2 lectures, 2 laboratories.

ENT 326 General Entomology (4)
Introduction to the study of insects. Structure, major orders and families of insects, life histories, economic importance and control. Insect collection required. 3 lectures, 1 laboratory.

ENT 332 Economic Entomology (4)
Identification, life histories and control of insects beneficial or injurious to various crops, fruits, stored products, domestic animals and man; important invertebrates such as mites, ticks and spiders. 3 lectures, 1 laboratory. Prerequisite: ENT 220 or ENT 326 or consent of instructor.

ENT 421 Immature Stages of Insects (4)
Identification, biology, and economic importance of preimaginal insect forms. 2 lectures, 2 laboratories. Prerequisite: ENT 220, ENT 326 or consent of instructor.

ENVE–ENVIRONMENTAL ENGINEERING

ENVE 200 Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

ENVE 304 Thermodynamics of Processes (3)
Material balances, energy balances, liquids and mixtures, vapor-liquid equilibria, solubility and absorption, equilibrium in chemical reactions. 3 lectures. Prerequisite: ME 302, CHEM 125.

ENVE 309 Noise and Vibration Control (3)
Behavior of sound waves, selection of instrumentation, practical measurements, criteria for noise and vibration control. Assessment of noise produced by transportation and other engineering facilities. 2 lectures, 1 laboratory. Prerequisite: MATH 241, PHYS 133.

ENVE 316 Automatic Process Control (2)
Introduction to automatic control instrumentation. Methods of analysis of control systems. Analytical determination of control response. 2 lectures. Prerequisite: MATH 242, ME 302, ME 313.

ENVE 324 Introduction to Air Pollution (3)
Causes and effects of air pollution on the individual, the community and industry. Legal and economic aspects. For non-majors. 3 lectures. Prerequisite: Junior standing.
ENVE 325 Environmental Air Quality (3)
Consideration of ambient air contamination inside and outside. Factors included in establishing, monitoring and maintaining air quality standards. 3 lectures. Prerequisite: CHEM 125.

ENVE 326 Air Pollution Measurements (3)
Planning and conducting of atmospheric surveys. Collection, evaluation, and interpretation of data as they pertain to the concentration of pollutants sampled. 2 lectures, 1 laboratory. Prerequisite: ENVE 325, CHEM 129.

ENVE 330 Environmental Quality Control (3)
Application of scientific and engineering principles to control the development and use of air, water and land resources. Control of pollution of the environment. Disposal of wastes. Administrative and legal aspects. For non-Engineering majors. 3 lectures. Prerequisite: Junior standing.

ENVE 331 Introduction to Environmental Engineering (3)

ENVE 400 Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

ENVE 411 Air Pollution Control (3)
Theory, principles and practices related to the control of particulate emissions. Mechanical separations, Cost and design of control systems. 3 lectures. Prerequisite: ENVE 325 or ENVE 331.

ENVE 421 Mass Transfer Operations (3)
Theory and practices related to using mass transfer principles to solve environmental problems. Design principles dealing with air and water pollution control and hazardous waste management. Computer simulation. 2 lectures, 1 laboratory. Prerequisite: ENVE 325 or ENVE 331.

ENVE 434 Water Quality Measurements (2)
Methods employed in the qualitative and quantitative determination of water and waste water constituents. Physical, chemical and biological procedures used in determining water quality. Testing of effluents from industrial and municipal treatment plants. 1 lecture, 1 laboratory. Prerequisites: CHEM 129, CHEM 326.

ENVE 435 Principles of Water and Wastewater Engineering (3)
In depth coverage of water and wastewater characteristics. Theory of various physical unit operations and biological unit processes encountered in water and wastewater treatment. 2 lectures, 1 laboratory. Prerequisite: CHEM 125.

ENVE 436 Introduction to Hazardous Waste Management (3)
Overview of industrial processes which produce hazardous wastes. Principles of toxicology and review of state federal regulations for hazardous wastes, including RCRA, TSCA, and superfund laws. Storage, handling, and transport of hazardous wastes. Unit operations and processes treatment and reduction. Ultimate disposal including incineration and secure landfills. 3 lectures. Prerequisite: ENVE 325 or ENVE 331.

ENVE 438 Water and Waste Water Treatment Design (3)
Design facilities for physical and chemical treatment, biological treatment of wastewater, treatment and disposal of sludge. Design of land treatment systems, septic tanks. Use of microprocessors for design problems. 2 lectures, 1 laboratory. Prerequisite: ENVE 331 or ENVE 435.

ENVE 439 Solid Waste Management (3)
Chemical and physical properties of municipal and industrial refuse. Landfill disposal, incineration, composting. Industrial and commercial solid waste disposal problems and treatment methods. Pyrolysis. Salvage and recycle operations. Economics of disposal methods. Interrelationship between water quality and landfill operations. 2 lectures, 1 laboratory. Prerequisite: Senior standing.
ENVE 441, 442 Advanced System Design (3) (3)
Individual and team project work in designing systems for industrial ventilation, air and water pollution control, solid waste disposal and heating, ventilating and air conditioning. 1 lecture, 2 laboratories. Prerequisite: ME 313, ME 341, ENVE 304.

ENVE 461, 462 Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum of 120 hours total time. Prerequisite: Senior standing.

ENVE 465 Environmental Management and Urban Systems (2)
Interdisciplinary study of urban pollution sources and control. Political, economic, and technological interrelationships. Participation in METRO-APEX, assuming roles of several urban decision makers. 1 lecture, 1 activity. Prerequisite: Senior standing.

ENVE 470 Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

ENVE 471 Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

ENVE 500 Individual Study (1–3)
Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Total credit limited to 4 units. Prerequisite: Graduate standing and consent of department head.

ENVE 534 Advanced Design of Pollution Control Systems (3)
Comprehensive problems in pollution control. Methods of analysis, design of unit operations and processes for environmental engineering facilities. 1 seminar, 2 laboratories. Prerequisite: ENVE 411 or graduate standing.

ENVE 535 Advanced Wastewater Treatment (3)
Operations and processes used in tertiary treatment. Chemical coagulation, flocculation, sedimentation, filtration, absorption. Methods for removal of phosphorous, nitrogen, solids and organics. Integration of advanced wastewater treatment processes. 3 seminars. Prerequisite: Graduate standing.

ENVE 536 Biological Wastewater Treatment Processes Engineering (3)
Fundamentals of reactor engineering. Biochemical and microbiological background. Modeling and design of biochemical reactors. 3 lectures. Prerequisite: Graduate standing.

ENVE 541 Resource and Energy Recovery (3)
In-depth evaluation of physical and biological processes for the recovery of resources and energy from solid waste. Preparation of an engineering design report. Use of computer models for process engineering and cost estimation of resource recovery facilities. 2 lectures, 1 laboratory. Prerequisite: Graduate standing.

ENVE 551 Environmental Unit Operations (4)
In-depth laboratory study of unit operations and processes used in environmental engineering. Performance tests on laboratory scale equipment. Computer simulations. 2 lectures, 2 laboratories. Prerequisite: Graduate standing.

ENVE 570 Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 seminars. Prerequisite: Graduate standing or consent of instructor.
ENVE 571  Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

ENVE 599  Design Project (Thesis) (2) (2) (5)
Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master’s degree, culminating in a written report/thesis. Prerequisite: Graduate standing.

ET—ENGINEERING TECHNOLOGY

ET 200  Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

ET 400  Special Problems for Advanced Undergraduates (1–2)
Individual investigation of techniques, studies or laboratory application of selected problems. Total credit limited to 4 units, with maximum of 2 units per quarter. Prerequisite: Consent of department head.

ET 441  Technical Supervision in Industry (1)
Principles and practices of supervising technical employees. Application of fundamental concepts and techniques of supervision provided by assignment in manufacturing laboratories. 1 laboratory. Prerequisite: Junior standing.

ET 461, 462  Senior Project (2) (3)
Selection and completion of a project under faculty supervision. Projects are typical of problems graduates must solve in their fields of employment. Project results are presented in a formal report. Miscellaneous course fee required—see Class Schedule. Minimum 150 hours total time. Prerequisite: Senior standing and consent of instructor.

ET 463  Undergraduate Seminar (2)
Special studies and technical developments in the field. Individual reports on important technology in the engineering technology field. 2 seminars. Prerequisite: SPC 201 or SPC 202 and senior standing.

ET 470  Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

ET 471  Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

ETAC—ENGINEERING TECHNOLOGY—AIR CONDITIONING

ETAC 121  Air Conditioning and Refrigeration Principles (4)
Principles of commercial and industrial air conditioning and refrigeration systems. Installation, service maintenance, and cost estimating. 3 lectures, 1 laboratory. Prerequisite: PHYS 121.

ETAC 201  Air Conditioning and Refrigeration Codes (4)
Introduction to current federal, state, and local codes for equipment, sanitation, water and fuel supplies, fire protection and human safety as applied to building plumbing, heating, ventilating, refrigeration, and air conditioning systems. 3 lectures, 1 laboratory.

ETAC 301  Computer Aided HVAC (3)
Programming techniques, estimating and design problems peculiar to heating, ventilating and air conditioning industry. 1 lecture, 2 laboratories. Prerequisite: Any computer programming course and ENGL 218.
ETAC 321  Air Distribution Systems (3)
Materials and techniques in fabrication and installation of air ducts for heating, ventilating, refrigerating, and air conditioning. Introduction to noise control of air handling equipment and related accessories for high and low velocity systems. Field trip required. 1 lecture, 2 laboratories. Prerequisite: ETAC 123, ETMP 246, ENGL 218.

ETAC 322  Mechanical Equipment of Buildings (3)
Application of engineering analysis comfort control. Design includes forced air circulation systems, fluid flow fundamentals, piping systems, psychrometrics, load calculations and comfort air-conditioning. 2 lectures, 1 laboratories. Prerequisite: ETME 301, ETME 302, ENGL 218, MATH 132, PHYS 123.

ETAC 323  HVAC System Design (4)
System design and layout of environmental control systems for heating, ventilating, and air conditioning (HVAC) applications, including piping and air distribution concepts. Computer solutions of HVAC problems including CAD. Industrial clean room technology. 2 lecture, 2 laboratories. Prerequisite: ETAC 322, ETME 143, ENGL 218.

ETAC 331, 332  Refrigeration Systems I, II (4) (4)
Operation, installation, and supervision of medium and low temperature refrigeration systems for food and product processing and storage using various staging systems. Cold storage and building requirements for efficient operation. Low temperature testing and cryogenic refrigeration. Transport refrigeration system. Field trips required. 2 lectures, 2 laboratories. Prerequisite: ETAC 121, ENGL 218.

ETAC 339  Heat Exchanger Technology (3)
Heat exchanger applications for the heating, ventilating, air conditioning and refrigeration industries. 2 lectures, 1 laboratory. Prerequisite: ETAC 331, PHYS 122, ENGL 218.

ETAC 425, 426  Air Conditioning Systems I, II (4) (4)
Application of complete air conditioning consisting of heating, ventilating, humidification, dehumidification, refrigeration, air pollution, water treatment and control equipment for commercial and industrial applications. Field trips required. 2 lectures, 2 laboratories. Prerequisite: ETAC 332.

ETAC 445  HVAC Controls Technology (3)
Electrical, electronic, and pneumatic systems used to control heating, ventilating, and air conditioning installations. 2 lectures, 1 laboratory. Prerequisite: ETME 337 or consent of instructor.

ETEL-ENGINEERING TECHNOLOGY-ELECTRONIC

ETEL 124  Introduction to Electronic Circuits (4)
Application of DC and AC circuit concepts to the solution of electronic circuit problems. 3 lectures, 1 laboratory. Prerequisite: MATH 120.

ETEL 125  Introduction to Electronic Devices (4)
Application of AC/DC principles to the understanding of basic electronic devices. 3 lectures, 1 laboratory. Prerequisite: ETEL 124.

ETEL 218  Digital Circuits I (3)
Mathematical and logic foundations of digital systems. Number systems, Boolean algebra, logic symbology, implementation of combinational networks, flip-flops, registers. 3 lectures. Prerequisite: MATH 120. Prerequisite or concurrent: ETEL 125.

ETEL 226  Electrical Practices (4)
Fundamentals of industrial power distribution systems. Introduction to theory and practice of polyphase circuits. Electrical safety, industrial wiring practices, and practical trouble shooting. 3 lectures, 1 laboratory. Prerequisite: ETEL 124, PHYS 123.
ETEL 231 Passive Network Analysis (4)
Application of Thevenin and Norton theorems to steady state AC networks. Complex numbers in circuit analysis. AC passive circuit transfer functions with gain-phase versus frequency analysis (Bode plots). Series-parallel equivalent circuits of RLC circuits and transformers. RC and RL transients analysis. 3 lectures, 1 laboratory. Prerequisite: ETEL 125, MATH 131, CSC 110, or consent of instructor.

ETEL 232 Electronic Circuits and Devices I (4)
Semiconductor devices and circuits. \( H \) and \( R \)-parameters and load line techniques in analyzing amplifiers. Computation of current, voltage, and power gains, input and output impedances. Bias stability and leakage current considerations. 3 lectures, 1 laboratory. Prerequisite: ETEL 231.

ETEL 233 Electronic Circuits and Devices II (4)
Active discrete and integrated devices. Use of device parameters and specifications to analyze simple linear circuits. Use of pulse and timing circuits, active filters, power amplifier circuits, and active regulated DC power supplies. 3 lectures, 1 laboratory. Prerequisite: ETEL 232.

ETEL 310 System and Circuit Analysis (4)
Laplace transform applications in circuit and system analysis. Singular forcing functions, transient analysis, transfer function, pole-zero locations and system response. Bode plots development and application. Computer-aided circuit analysis (applications of Spice/Pspice for circuit analysis). 3 lectures, 1 laboratory. Prerequisite: ENGL 218, ETEL 231, MATH 133.

ETEL 311 Transmission Lines and Antennas (4)
Application of transmission lines and antennas. Smith charts and the propagation of the radio signal from various antennas. 3 lectures, 1 laboratory. Prerequisite: ETEL 231. Prerequisite or concurrent: ENGL 218, MATH 132.

ETEL 312 Active Linear Circuits (4)
Analysis and design of multistage transistor amplifiers with emphasis on the operational amplifier and its applications. Low-frequency and high-frequency limitations, pulse testing, Bode plots, stability criteria, oscillators. Construction of op amp circuits. 3 lectures, 1 laboratory. Prerequisite: ETEL 233, ENGL 218, MATH 133.

ETEL 330 Electric Machine Technology (3)
DC and AC motors and generators, their construction, selection and application, and the use of electric and electronic control of these devices. 2 lectures, 1 laboratory. Prerequisite: ETEL 226, ENGL 218, MATH 132.

ETEL 334 Digital Circuits II (4)
Analysis of electronic digital circuits. Topics include: Bipolar and MOS logic gates, loading and interfacing, counters, adders, memories, encoders, decoders, digital displays, A/D and D/A converters. 3 lectures, 1 laboratory. Prerequisite: ETEL 218, ETEL 233, ENGL 218.

ETEL 335 Communications I (4)
Communication signal spectrum investigation including time domain to frequency domain conversions using Fourier analysis. Evaluation of various modulation techniques including amplitude, angle, frequency, and pulse forms. Noise, its use and effects in communications. 3 lectures, 1 laboratory. Prerequisite: ETEL 311, ETEL 312, ENGL 218.

ETEL 338 Fundamentals of Computer Technology (4)
Selected computer components, circuits and systems and their influence on programming in machine language. Problem solving using a digital computer. 3 lectures, 1 laboratory. Prerequisite: ETEL 334, CSC 110, ENGL 218.

ETEL 411 Radio Frequency and Microwave Technology (4)
Fundamentals of high frequency components commonly used in communication systems. Application of analysis methods, physical realization and testing techniques related to the RF and microwave frequency spectrum. 3 lectures, 1 laboratory. Prerequisite: ETEL 311.
ETEL 432  Automatic Control (4)
Electronic and electromechanical systems used in servomechanisms. Stability criteria. Nichols chart utilization. Compensation networks and control system testing. 3 lectures, 1 laboratory. Prerequisite: ETEL 312.

ETEL 435  Communications II (4)
Analysis and application of communication systems, receivers, transmitters, analog and digital techniques. Equipment specifications, measurement techniques, application of modems. 3 lectures, 1 laboratory. Prerequisite: ETEL 335.

ETEL 438  Computer Technology I (4)
Analysis of computer circuits and components in a specific digital computer. Effects of computer architecture on machine and assembly language programming. Use of hardware and software aids for troubleshooting and development. 3 lectures, 1 laboratory. Prerequisite: ETEL 338.

ETEL 440  Audio Technology (4)
Fundamentals of specifications, standards, devices, circuits, and systems used in audio. Operational analysis of hi-fi and professional audio circuits. Circuit responses observed in laboratory. Field trip to local audio manufacturing facility. 3 lectures, 1 laboratory. Prerequisite: ETEL 338.

ETEL 441  Video Technology (4)
Fundamental principles of colorimetry. Review of television system synchronization and compatibility requirements. Analysis of the operation of circuits in a solid state television. Circuit responses observed in laboratory. Field trip to a major network television facility. 3 lectures, 1 laboratory. Prerequisite: ETEL 335.

ETEL 449  Computer Technology II (4)
Computer controlled testing and instrumentation using a particular computer and the associated operating system. Test instruments and techniques for interfacing. Locating system malfunctions using lab equipment, maintenance manuals, and diagnostic programs. 3 lectures, 1 laboratory. Prerequisite: ETEL 338.

ETEL 452  Filter Networks (4)
Theory and application of filter networks. Butterworth, Chebyshev, Bessel and elliptic passive filters and use of IC operational amplifiers in active filters. Special filters such as ceramic, crystal, mechanical, SAW and digital. 3 lectures, 1 laboratory. Prerequisite: ETEL 312.

ETEL 455  Electro-Optics Technology (4)
Fundamentals of electro-optics devices and circuits. Parameters, units, sources and systems found in electro-optics. Solving problems encountered in electronics and optics. Laboratory study of devices, circuits and systems. 3 lectures, 1 laboratory. Prerequisite: ETEL 335.

ETHS—ETHNIC STUDIES

ETHS 114  Racism in American Culture (3)
Survey and analysis of racism in the development of American institutions and its effect upon minority ethnic groups and society. 3 lectures.

ETHS 210  Cultural Heritage (3)
History and culture of selected ethnic groups, their role in and contributions to the American cultural heritage. 3 lectures.

ETME—ENGINEERING TECHNOLOGY—MECHANICAL

ETME 131  Introduction to Engineering Drawing (2)
Basic instruction in drafting methods, techniques and use of equipment. Geometric constructions. Principles and practices of isometric, oblique, and multiview drawing systems. 1 lecture, 1 laboratory.
ETME 141  Applied Descriptive Geometry (2)
Computer aided solutions of problems involving geometry in three-dimensional space by method of multiview projection. View structure in CAD. Intersections and development of geometric solids. Application to engineering design. 1 lecture, 1 laboratory. Prerequisite: High school drafting or ETME 131.

ETME 142  Engineering Drawing I (1)

ETME 143  Engineering Drawing II (1)
Drawings of mechanical components; layout, details, and assemblies. Selection of views, scales, dimensions, symbols and notes. Engineering change systems. Introductory geometric tolerancing. Computer aided drafting utilizing the CRT, keyboard, and light pen/digitizer. Introduction to view structure. 1 laboratory. Prerequisite: ETME 142.

ETME 205  Statics for Engineering Technology (3)
Statics by scalar methods. Includes forces, couples, resultants, equilibrium, trusses, cables, friction, centroids, and moments of inertia. 3 lectures. Prerequisite: CSC 110, MATH 132, PHYS 121.

ETME 206  Dynamics for Engineering Technology (4)
Dynamics by scalar methods. Includes kinematics (both absolute and relative motion of particles and bodies) and kinetics, force, mass, acceleration, work and energy, impulse and momentum, and fundamentals of vibrations. 4 lectures. Prerequisite: ETME 205.

ETME 240  CAD Project Laboratory (1) (CR/NC)
Computer aided design methods and applications utilizing a CAD system on individual or group investigation of selected projects. Total credit limited to 4 units, with a maximum of 1 unit per quarter. Credit/No Credit grading only. 1 laboratory. Prerequisite: ETME 143 or consent of instructor.

ETME 301  Thermodynamics for Engineering Technology (3)
Fundamental concepts of work, heat, and energy. First and second laws of thermodynamics. Properties of ideal gases and vapors, combustion, vapor and gas power cycles. 3 lectures. Prerequisite: PHYS 122, CHEM 121, MATH 132.

ETME 302  Heat Transfer for Engineering Technology (3)
Modes of heat transfer. Fluid mechanics principles for heat transfer. Steady state conduction, radiation, convection. Applications in heat absorption and heat exchangers. 3 lectures. Prerequisite: CHEM 121, MATH 132, PHYS 122.

ETME 303  Applied Mechanics Laboratory (1)
Experimental studies in statics, dynamics, and fluid mechanics with applications involving friction, conservation of energy and momentum, vibrations, pipe flow and flow measurement. 1 laboratory. Prerequisite: ETME 141, ETME 206, ETME 311, ENGL 218.

ETME 311  Fluid Mechanics for Engineering Technology (3)
Principles that underlie the flow of various fluids. Fluid statics, kinematics of fluid flow, viscosity and fluid friction. Incompressible flow in pipes and open channels, flow measurement, fluid machinery and lubrication. 3 lectures. Prerequisite: PHYS 122, ETME 206.

ETME 320  Mechanisms (3)
Motion of machine parts. Graphical methods for determining displacements, velocities, and accelerations in linkages, cams, gears, and other mechanical assemblies. 1 lecture, 2 laboratories. Prerequisite: ETME 142, ETME 206, ENGL 218.
ETME 333  Industrial Hydraulics and Pneumatics (4)
Basic principles of hydraulics and pneumatics. Characteristics and performance of various hydraulic and pneumatic components such as pumps, compressors, cylinders, motors, valves, accumulators, lines, fittings, filters, etc. Hydraulic fluids. Component selection and circuit layout using American National Standard graphic symbols. 3 lectures, 1 laboratory. Prerequisite: ETME 311 or consent of instructor, ENGL 218.

ETME 335  Selection of Engineering Materials (2)
Concepts and properties of materials and their relevance to industrial applications. Selection of metals, plastics, ceramics, composites, etc. 2 lectures. Prerequisite: ETMP 144, ETWT 144, IE 141, MET 235.

ETME 337  Instrumentation of Mechanical Systems (3)
Principles of process instrumentation and control. Temperature, pressure, flow and level measurement. Analytical instrumentation. Pneumatic and electric transmission devices and controllers. Signal conditioning. Recorders and indicators. 2 lectures, 1 laboratory. Prerequisite: ETEL 125, ETME 311, ENGL 218.

ETME 338  Industrial Engines (4)
Types of power plants and their application to vehicles and stationary plant generators, compressors, and other industrial equipment. Includes various types of engines, turbines, boilers and some of the newer developments being applied in industry. Fuel conservation and pollution control. 3 lectures, 1 laboratory. Prerequisite: ETME 301, ETME 337, ENGL 218.

ETME 344  Design Systems and Practices (2)
Preparation of detail and assembly drawings from design layouts. Tolerances on linear dimensions and geometric form. Surface finish symbols, production notes and parts lists. Piping, electrical and tooling drawings. Computer aided drafting. 2 laboratories. Prerequisite: ETME 143, ENGL 218.

ETME 406  Vibrations for Technology (2)
Free and forced vibration in damped and undamped systems. Rotating balance, critical speeds, measuring and monitoring techniques, vibration and acoustical noise isolation and reduction. 2 lectures. Prerequisite: ETME 206, CE 202.

ETME 421, 422  Applied Machine Design I, II (4) (4)
Machine design emphasizing properties of materials relative to structural loading and design; layout of machine elements. Calculations for selecting hardware such as gears, bearings, fasteners, etc. Laboratory includes solution of realistic design projects both with and without computers. 2 lectures, 2 laboratories. Prerequisite: ETME 320, ETME 344, CE 202, CE 203, MATH 133.

ETME 437  Applied Fluid Power Systems (4)
Application of hydraulic and pneumatic equipment. Design, selection and layout of devices and systems including electrical and pneumatic control logic. 2 lectures, 2 laboratories. Prerequisite: ETME 333.

ETME 443  Mechanical Systems (4)
Application of technical principles incorporating various components into an integrated system. Project design oriented activities so that the student becomes familiar with component selection and layout of mechanical systems, emphasizing industrial handbook and catalog material. 4 laboratories. Prerequisite: ETME 333, ETME 335, ETME 422.

ETMP—ENGINEERING TECHNOLOGY—PROCESSES

ETMP 121  Manufacturing Survey (1)
Overview of manufacturing processes relating to metals and plastics. Includes study of materials, thermal cutting systems, welding, forming, machining, and foundry processes. Open to all majors. 1 lecture.
ETMP 144  Manufacturing Processes: Machining I (2)
Uses, capabilities, and theoretical and operational characteristics of lathe and milling machine tools, including conventional, automatic and numerical control. Study of cutting tool characteristics, machining parameters, quality control, and production methods. Design considerations for manufacturing. Introduction to robotics and automation. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 laboratory.

ETMP 145  Manufacturing Processes: Machining II (1)
Relationship between engineering design and production fabrication. Hole forming by drilling, boring, broaching, punching, piercing and nontraditional methods. Forming and assembling of gage metal components. Engineering and economic significance of various production techniques. Miscellaneous course fee required—see Class Schedule. 1 laboratory. Prerequisite: ETMP 144 or consent of instructor.

ETMP 157  Electronic Manufacturing (3)
Design, documentation and fabrication of electronic units with emphasis on CAD/CAM. Prototyping techniques, project planning, and production methods. Student completes working unit from start to finish in 60 hours of project-oriented laboratory. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories.

ETMP 158  Introduction to Robotics (2)
Introduction to applied industrial robotics. Concepts in programming, tooling and general application of robots in industry. Opportunity to program and operate full-size industrial robots. Open to all majors. 1 lecture, 1 laboratory.

ETMP 240  Additional Engineering Laboratory (1)
Advanced production and toolroom problems. Design and construction of laboratory tooling and instrumentation. Individual and group investigation of selected problems. Total credit limited to 4 units, with a maximum of 1 unit per quarter. Miscellaneous course fee required—see Class Schedule. 1 laboratory. Prerequisite: ETMP 144 or consent of instructor.

ETMP 244  Machining Technology I (3)
Principles of metal cutting. Theory and operational problems of turning and milling machines. Investigation of machine operating parameters, tool materials, surface texture and cutting fluids, machinability of materials. 1 lecture, 2 laboratories. Prerequisite: ETMP 144.

ETMP 245  Machining Technology II (3)
Advanced applications of manual and automatic machine tools. Use of machine accessories, workholding fixtures and attachments. Fundamentals of surface and cylindrical machine grinding, emphasizing productivity, attainment of surface finish and comparison to other processes. Material planning and routing techniques. 1 lecture, 2 laboratories. Prerequisite: ETMP 244 or consent of instructor.

ETMP 246  Machining Technology III (2)
Productivity testing relating tool life to various machining variables. Instrumentation, analysis, and test report writing of results. Quality control and inspection methods for manufacturing. Nontraditional machining processes. Gear cutting and other specialty manufacturing processes. 1 lecture, 1 laboratory. Prerequisite: ETMP 245 or consent of instructor.

ETMP 247  Duct Design and Fabrication (2)
Relationships between engineering design and production fabrication and installation. Air distribution systems, duct work, materials, commercial fabrication methods. Installation techniques and cost estimating. 1 lecture, 1 laboratory. Prerequisite: ETME 141.

ETMP 321, 322  Tool Design I, II (3) (3)
Design of manufacturing tools such as jigs, fixtures, and dies. Material selection, tolerance stacking, and quality control requirements as economic design factors. Field trips to manufacturing centers. 2 lectures, 1 laboratory. Prerequisite or concurrent: ETMP 244, ETME 344, ENGL 218, or consent of instructor.
ETMP 336  Numerical Control Programming (3)
In-depth study of numerical control (NC) machine tool programming. Computer-aided, manual, and conversational NC methods. Use of NC to produce and inspect parts. Role of NC in CAD/CAM. 2 lectures, 1 laboratory. Prerequisite: IE 233 or consent of instructor, ENGL 218.

ETMP 337  Computer Aided Manufacturing Technology (3)
Advanced APT programming concepts. Design and implementation of computer driven manufacturing cells and flexible manufacturing systems. Integration of CAD/CAM systems to machine tool and robot motion. 2 lectures, 1 laboratory. Prerequisite: ETMP 336, ENGL 218.

ETMP 357  Electronic Fabrication Technology (4)
Electronic manufacturing engineering overview with emphasis on new technologies, planning, producibility, product assurance, packaging and testing. Advanced fabrication techniques and advanced use of electronic CAD/CAM. 2 lectures, 2 laboratories. Prerequisite: ETEL 233, ETMP 157, ENGL 218, IE 222.

ETMP 434  Advanced Manufacturing Technology I (3)
Construction and use of jigs and fixtures in a production environment. Economic application of conventional, computer aided and specialized manufacturing processes. Application of management, communication, and quality control techniques to inhouse and industrial sponsored manufacturing projects. Field trips to manufacturing centers. 3 lectures. Prerequisite: ETMP 322 or consent of instructor.

ETMP 435  Advanced Manufacturing Technology II (3)
Continuation of ETMP 434 in laboratory mode. 3 laboratories. Prerequisite: ETMP 434 or consent of instructor.

ETMP 475  Advanced Manufacturing Laboratory (1)
Extension of projects from ETMP 322 and/or ETMP 435. Directed individual and/or group study of selected topics in current manufacturing technology. Support of inhouse and industry sponsored projects. 1 laboratory. Prerequisite: ETMP 435 or consent of instructor.

ETWT–ENGINEERING TECHNOLOGY–WELDING TECHNOLOGY

ETWT 144  Manufacturing Processes: Welding (2)
Theory and application of metal cutting and welding processes. Includes shielded metal arc, flux cored arc, submerged arc, gas metal arc, gas tungsten arc, brazing, resistance, and oxy-acetylene processes. Bonding theory, joint design, codes and testing. 1 lecture, 1 laboratory.

ETWT 155  Industrial Welding Technology (1)
Application of various electric welding processes to joining of steel sheet and plate. Includes short circuiting arc, flux cored electrode, gas metal arc, and shielded metal arc processes. Gas welding of steel pipe and hard surfacing. 1 laboratory. Prerequisite: ETWT 144.

ETWT 156  Welder Qualification Technology (1)
Out of position fillet and groove welds in carbon steel plate. Welder qualification tests according to code requirements. 1 laboratory. Prerequisite: ETWT 144.

ETWT 240  Additional Welding Laboratory (1)
Individual investigation of current methods and applications. Studies of laboratory procedures and selected problems. Total credit limited to 4 units, with a maximum of 1 unit per quarter. 1 laboratory. Prerequisite: ETWT 144 or consent of instructor.

ETWT 324  High Energy-Non Conventional Welding Processes (4)
ETWT 325  Metallurgy and Mechanical Testing of Carbon Steel Welds (4)
Investigation of the micro structure of carbon steel welds. Heat flow effects, residual stresses and distortion. Weld discontinuities and weldability tests. Metallography and mechanical testing. 2 lectures, 2 laboratories. Prerequisite: ETWT 324, ENGL 218.

ETWT 326  Weldability of Low Alloy Steels-Structural Welding Code (4)
Detailed study of AWS Structural Welding Code D1.1 with emphasis on low alloy steel. Welding, evaluation, mechanical and nondestructive testing of procedure qualification test joints. 2 lectures, 2 laboratories. Prerequisite: ETWT 325, ETWT 335, ENGL 218.

ETWT 335  Nondestructive Evaluation (3)
Theory and application of nondestructive evaluation systems for quality control. Includes radiography, ultrasonic, magnetic particle, penetrants, eddy current and holography. 2 lectures, 1 laboratory. Prerequisite: ENGL 218, PHYS 123, junior standing.

ETWT 336  Welding Power Sources (3)
Design, selection, and application of welding power sources. Physics of the welding arc as related to power sources. 2 lectures, 1 laboratory. Prerequisite: PHYS 123, ETEL 126, ENGL 218.

ETWT 337  Nondestructive Testing of Weldments (2)
Application of nondestructive test methods for quality control of weldments. Includes visual, radiography, ultrasonic, magnetic particle, liquid penetrant, eddy current and acoustic emission. 2 laboratories. Prerequisite: ETWT 335, ETWT 359, ENGL 218.

ETWT 359  Gas Shielded Arc Welding (2)
Theory and application of gas tungsten arc, gas metal arc, plasma arc and flux cored arc welding processes to the welding of aluminum, carbon steel and stainless steel. 1 lecture, 1 laboratory. Prerequisite: ETWT 144 or consent of instructor, ENGL 218.

ETWT 434  Weldability of Stainless Steels and Nickel Alloys (4)
Welding metallurgy of stainless steels, nickel alloys and dissimilar metals. Welding qualification in accordance with ASME Sect. IX Pressure Vessel Code. 2 lectures, 2 laboratories. Prerequisite: ETWT 326 or consent of instructor.

ETWT 435  Weldability of Nonferrous Alloys (4)
Welding metallurgy and weldability of aluminum, copper, titanium, and their alloys. 2 lectures, 2 laboratories. Prerequisite: ETWT 434.

ETWT 436  Performance of Welded and Brazed Joints (4)
Welding and brazing design, symbols, corrosion problems and cost estimating. 2 lecture, 2 laboratories. Prerequisite: ETWT 435, CHEM 121.

ETWT 444  Robotic Arc Welding (2)
Programming of arc welding robots. Robot manipulator configurations, drive and control systems. Software specifically for arc welding. Accessory equipment, such as positioners and power sources. Typical applications and economic justification. New developments in seam finding and tracking. 1 lecture, 1 laboratory. Prerequisite: ETMP 158, ETWT 359.

FIN–FINANCIAL MANAGEMENT

FIN 330  Real Estate Principles (4)
Introduction to the field of real estate providing a basic background for further study. Includes legal aspects, financing, valuation, economics, public control, title insurance and escrow, closing, safeguards for the buyer. Investment and leasing. 4 lectures. Prerequisite: BUS 201 or BUS 207. Junior standing required.

FIN 342  Financial Management (4)
Theory and applications of financing business operations. Financial management of current and fixed assets from internal and external sources. Analysis, planning, control, and problem solving. 4 lectures. Prerequisite: ECON 222, MATH 221, STAT 252. ACTG 301 recommended. Junior standing required.
FIN 388, 389  Financial Management II, III (4) (4)
Development of analytical and decision-making techniques in applying financial theory to business management problems. FIN 388 emphasizes valuation, cost of capital, capital structure, capital budgeting and leasing. FIN 389 emphasizes working capital management, financial analysis and forecasting, mergers and acquisitions, and other current topics in finance. Both courses use cases to emphasize practical problems and microcomputer-based software to analyze cases. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 activity. Prerequisite: FIN 388: Junior standing, FIN 342. FIN 389: ACCTG 321 and FIN 388.

FIN 411  Security Analysis and Portfolio Management (4)
Analysis of securities, markets, and valuation. Security price movements related to money and capital market factors and corporate events. Portfolio planning, risk, media, and objectives of individual and institutional investors. 4 lectures. Prerequisite: ECON 337, FIN 342, STAT 252.

FIN 412  Law of Real Property (4)
Legal problems of acquisition, ownership and transfer of real property. Contracts, agency, estates, and co-ownership, mortgages and deeds, covenants, conventions, and restrictions, easements, landlord-tenant, and zoning. 4 lectures.

FIN 430  International Business Finance (4)
Financial management of international business. International capital and money markets, international financial institutions, special problems in evaluating direct foreign investment, and financial techniques used in international business operations. 4 lectures. Prerequisite: FIN 342.

FIN 432  Real Estate Finance (4)
Analysis of the relationship between national and local money markets. Real estate financing techniques, sources of funds, government participation, legal instruments of finance. 4 lectures. Prerequisite: FIN 330. FIN 342 strongly recommended.

FIN 434  Real Estate Investment (4)
Effects of federal, state and local taxes on investment transactions. Intensive investigation and computer analysis of urban investment opportunities. Problems in exchanging and property management. 4 lectures. Prerequisite: FIN 330. Recommended: FIN 342, FIN 432.

FIN 440  Commercial Bank Management (4)
Analysis of the management of a commercial bank as a profit-making entity. Emphasis put on cases in bank management, especially those which deal with the management of a bank's asset and liability structure. 4 lectures. Prerequisite: Senior standing, FIN 342, FIN 411, and ECON 337.

FIN 480  Advanced Seminar in Investment (4)
Current topics in investments. An in-depth analysis of the efficient markets hypothesis and capital market theory. 4 seminars. Prerequisite: FIN 411.

FOR—FOREST RESOURCES

FOR 100  Forest Resources Enterprise Project (1-4) (CR/NC)
Selection and completion of a forest management/production project under faculty supervision. Project participation is voluntary and subject to approval by the department head and the Cal Poly Foundation. Degree credit limited to 12 units. Credit/No Credit grading only.

FOR 120  Fisheries and Wildlife Management (3) (Also listed as CONS 120)  GEB F.2.
Survey of fisheries and wildlife resources and management practices. Relationships to recreational values, land management, food production, and preservation. 3 lectures.

FOR 201  Forest Resources (3)  GEB F.2.
Fundamentals of forestry including basic silviculture, forest protection, measurement and policy. Multiple use of forest lands for water production, forage, recreation, wildlife, and timber. 3 lectures.
FOR 204  Resource Fire Control (2)
Basic fire control techniques used on various wildland fuels. Elementary fire physics, fuels, weather, fire behavior, line construction, mop-up, fire line safety, and fire organization. Meets basic fire fighter certification requirements for U.S. Forest Service and California Department of Forestry and Fire Protection. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 laboratory.

FOR 208  Dendrology (4)
Identification, classification, silvical characteristics, distribution, environmental requirements and economic importance of trees and shrubs in parks, forest and wildlife areas of the United States. Emphasis on Pacific Coast species. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: BOT 123.

FOR 250  Survey and Management of Mediterranean Ecosystems (2)
Shrubby vegetation found in worldwide Mediterranean ecosystems. Distribution, historical development and use of these ecosystems. Fire influences and fire management problems. Animal use and other management problems. 2 lectures.

FOR 290  Intercollegiate Forestry Activities (2) (CR-NC)
Beginning through advanced skills in the event areas of college forestry activities. Instruction in use of specialized equipment and safety. Minimum of 8 hours of laboratory per week. Total credit limited to 8 units. Credit/No Credit grading only. Prerequisite: Enrollment limited to those qualified to compete in intercollegiate forestry activities and consent of instructor.

FOR 300  Computer Applications in Resource Management (2) (Also listed as NRM 300)
Resource Management applications of microcomputers. Software programs include forest and natural resource management planning, forecasting, analysis of systems, and resource data base management for multiple use objectives. Forestry and Natural Resource examples will be used. 1 lecture, 1 laboratory. Prerequisite: CSC 110, junior standing or consent of instructor.

FOR 303  Forest Protection (5)
Impact and losses to forested areas caused by physical and biotic agents (such as insects and diseases) other than fire; relation of direct and indirect control practices to forest management. Saturday field trips required. 4 lectures, 1 laboratory. Prerequisite: NRM 304 or consent of instructor.

FOR 305  Forest Harvesting (4)
Relationships between forest production and harvesting methods, preparation of timber harvest plans, site preparation, harvesting effects, and cost analysis of harvesting methods. Overnight field trips are required to visit timber operations. Miscellaneous course fee required—see Class Schedule. 3 lectures and required field trip. Prerequisite: Junior standing in Forest Resources Management concentration or consent of instructor.

FOR 314  Forest Mensuration (5)
Methods and principles of measurement for contents of trees, stands and felled timber. Construction and use of volume tables. Use of statistical measures, sampling and inventory techniques. Miscellaneous course fee required—see Class Schedule. 3 lectures, 2 laboratories. Weekend field trips required. Prerequisite: MATH 117, STAT 212, and AE 237.

FOR 316  Growth and Yield (3)
Site, growth and yield mensuration and prediction; techniques of growth determination for plantations, even-aged and all-aged forests. Use of models such as CACTOS, CRYPTOS and STAG. Volume from logs. Thinnings and growth response. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Saturday field trips required. Prerequisite: FOR 314.

FOR 318  GIS Application of Natural Resource Information (2) (Also listed as LA 318 and NRM 318)
ARC/INFO Geographic Information System (GIS) computer software to explore relevant environmental issues utilizing natural resources data such as vegetation, soils, habitats, topography and geology. Develop data base, use software and apply to relevant, natural systems. Miscellaneous course fee required—see Class Schedule. 2 laboratories. Prerequisite: CSC 110 or consent of instructor.
FOR 325 Woodlot and Christmas Tree Management (3)
Farm and small forest holdings. Measurement, care and improvement of existing woodlots. Fuel and product uses. Establishment of new woodlands. Woodland management design and plans for fuel and other products, including Christmas tree operations. Integration with range, wildlife and recreation values. 2 lectures, 1 laboratory. Prerequisite: FOR 201 or consent of instructor.

FOR 332 Forest Products (3)
Manufacturing and marketing of wood products, wood identification, study of wood structure and mechanical properties. Weekend field trip required. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: FOR 201. PHYS 104 or PHYS 121 recommended.

FOR 333 Hardwood Management (3)
Hardwood forest types, their historical development, management, protection, measurement, and utilization. Discussion of land use conflicts among public resource agencies, private companies, landowners, and governments representing views of ranchers, wildlife managers, foresters, environmental groups, recreation, etc. 2 lectures, 1 laboratory. Saturday field trips required. Prerequisite: FOR 208 or consent of instructor.

FOR 339 Internship in Forest and Natural Resources (1–12) (CR/NC)
Selected students will spend up to 12 weeks with an approved forest or natural resources firm engaged in production management or related business. Applying and developing production management and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Credit/No Credit grading. Prerequisite: Consent of instructor.

FOR 340 Resource Fire Management (2)
Advanced study of wildland fuels, fire weather, fire behavior, and fire danger ratings in the chaparral, grassland, and wooded areas of forests, parks, and wildlands. Management implications. Saturday field trips may be required. 2 lectures. Prerequisite: FOR 204 or consent of instructor.

FOR 342 Fire Ecology (3)
Fire effects on the environment; prescribed use of fire in management; policy and objectives of fire management organizations. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: NRM 304 or ecology course, and FOR 204 or consent of instructor.

FOR 345 Chaparral Management (3)
Chaparral community management techniques, management alternatives and the effects of management on fire, water production, erosion and potential utilization of the biomass. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: NRM 304 or consent of instructor.

FOR 350 Urban Forestry (3)
Establishment and management of city forests, wood lots, small forest holdings, shelter belts, and plantings for erosion control, wildlife enhancement, and pollution abatement. Management of forest areas requiring special attention because of heavy recreational use, fire hazard, watershed, and societal values. 2 lectures, 1 laboratory. Prerequisite: FOR 201.

FOR 400 Special Problems for Advanced Undergraduates (2–4)
Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units. Prerequisite: Consent of department head.

FOR 407 Silviculture and Vegetation Management (4)
Interaction of forest and chaparral plant communities within the environment; influence of external factors upon wildlands, particularly those suited to forestry practices; growth and development of individual plants; origin, development, cultural practices and tolerance of forest and chaparral plant communities. Impacts of intermediate and harvest treatments on wildlife, watershed, recreation, and range resources. Miscellaneous course fee required—see Class Schedule. Overnight and/or weekend field trips required. 3 lectures, 1 laboratory. Prerequisite: FOR 208, FOR 314.

FOR 415 Forest Valuation (3)
Wildland and timber appraisal, wildland taxation. Financial and business aspects of forestry. Economic alternatives in addition to timber production. 2 lectures, 1 laboratory. Prerequisite: NRM 401, FOR 407.
FOR 417 Forest Management and Multiple-Use Planning (4)
Methods of organizing forest resources for sustained yield management; regulation of annual cut, determination or rotation and cutting cycles, and preparation of management plans. Discussion of Forestry Practices Act; Impact of timber management decisions on wildlife, recreation, range, and watershed resources; importance of human relations and communication. Miscellaneous course fee required—see Class Schedule. Saturday field trips required. 3 lectures, 1 laboratory. Prerequisite: FOR 314, FOR 407.

FOR 425 Impacts of Forest Practices (3)
Impacts of forestry practices on riparian zones and meadows and their vegetation. Discussion includes snag, log management and habitat analysis. 3 lectures. Prerequisite: NRM 304, SS 121 or consent of instructor.

FOR 434 Tree Growth and Wood Properties (3)
Physiology of wood formation, effects of hereditary and environmental factors on the structure, properties and uses of wood. 2 lectures, 1 laboratory. Prerequisite: FOR 201, FOR 208, and FOR 332.

FOR 438 Wood Energy and Residue Utilization (3)
Present and potential uses, including wood energy, of 1) residue produced by forest and industrial utilization, and 2) biomass plantations. Technologies available for increasing utilization. Miscellaneous course fee required—see Class Schedule. Overnight field trips required. 2 lectures, 1 laboratory. Prerequisite: FOR 305 or FOR 332 or consent of instructor.

FOR 440 Watershed Management (3)
Concepts of the hydrologic cycle and measurement of its components. Streamflow with emphasis on surface water behavior as affected by land management practices. Saturday field trips required. 2 lectures, 1 laboratory. Prerequisite: NRM 304 and SS 121.

FOR 441 Forest and Range Hydrology (3)
Influence of forest and range vegetation on wildland water resources for optimum production and regulation of water yields. Hydrograph analysis. Techniques for managing wildlands for increases in usable water yields and predicting impacts of land management practices. Analytical evaluation and prediction of watershed disturbances. Overnight field trips required. 2 lectures, 1 laboratory. Prerequisite: FOR 440.

FOR 442 Watershed Protection (2)
Watershed protection and rehabilitation, erosion, sedimentation and other water quality aspects of land use. Sampling techniques, landslide evaluation, cumulative watershed impacts. 1 lecture, 1 laboratory. Overnight field trips required. Prerequisite or concurrent enrollment in: FOR 440.

FOR 450 Community Forestry (3)
Development and management of the urban/wildland interface. Socio-economic problems related to forest tree establishment, care, and harvest utilization. Weekend field trips required. 2 seminars, 1 laboratory. Prerequisite: FOR 201 or consent of instructor.

FOR 461, 462 Senior Project (3) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time.

FOR 463 Undergraduate Seminar (1)
Study and oral presentation of current developments and problems in the subject field. Discussion of recent findings and research and their application. 1 seminar.

FOR 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.
FOR 471 Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

FOR 500 Individual Study (1–3)
Advanced independent study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Total credit limited to 4 units. Prerequisite: Graduate standing and consent of department head.

FOR 504 Agroforestry Systems (3)
Principles and practical applications of tree crop systems which are managed to provide fuel, fiber, fodder, and food. Tree crop identification and tree product uses. Plantation design, establishment, and cultural practices. Soil management. Integration of forest and range management practices and values. Prerequisite: Graduate standing or consent of instructor.

FOR 506 World Forestry in Social Context (3)
Problems in design and implementation of technical assistance projects. How social elements impact technical aspects of development programs. Social forestry, community development and extension techniques to coordinate social and technical aspects of development. 3 lectures. Prerequisite: FOR 504 or consent of instructor.

FOR 570 Selected Topics in Forest Resources (1–3)
Directed group study of selected topics for advanced students. Class Schedule will list topic selected. Total credit limited to 9 units. 1–3 lectures. Prerequisite: Graduate standing or consent of instructor.

FOR 571 Selected Topics in Forest Resources Laboratory (3)
Directed group laboratory of selected topics for advanced students. Class Schedule will list topic selected. Total credit limited to 9 units. 1–3 laboratories. Prerequisite: Graduate standing and consent of instructor.

FOR 581 Graduate Seminar in Forest Resources (3)
Group study of selected developments, trends and problems in the field of forest and natural resources. 3 seminars. Prerequisite: Graduate standing.

FOR 599 Thesis (1–9)
Individual research in forest or natural resources management under the general supervision of faculty, leading to a graduate thesis. Prerequisite: Graduate standing and consent of instructor.

FORL–FOREIGN LANGUAGE

FORL 101, 102, 103 Foreign Language (4) (4) (4)
Organized group instruction arranged for students who wish to acquire basic skill in a foreign language indicated by subtitle. Laboratory drill required. Language taught in its cultural context. To be taken in numerical sequence. 3 lectures, 1 activity.

FORL 303 Culture (3)
Aspects of cultures of the French-, German-, or Spanish-speaking peoples. History, society, political movements, art, music and literature are discussed. Topic and language of instruction vary to provide specific focus. 3 lectures. Prerequisite: FR, GER or SPAN 202, depending on language offered, equivalent, or consent of instructor.

FORL 400 Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units. Prerequisite: Consent of department head.

FORL 401 Translation (4)
Practice in translating from English to the foreign language indicated by subtitle, and from the foreign language to English. Vocabulary development including focus on idioms, analysis of style, and grammatical analysis as a function of the techniques of translation. 4 lectures. Prerequisite: FR 301, GER 301, SPAN 301 depending on language, or consent of instructor.
FORL 470  Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

FR–FRENCH

FR 101, 102, 103  Elementary French (4) (4) (4)
For beginners. Class practice and assigned outside work in pronunciation, sentence structure, reading, writing, and basic conversation. Laboratory drill required. Language taught in its cultural context. Credit not available for students who have completed FR 104. To be taken in numerical sequence. 3 lectures, 1 activity.

FR 104  Intensive Elementary French (12)
Class practice in pronunciation, syntax, reading, writing and conversation including appropriate cultural information. Offered in summer only. Laboratory drill required. 9 lectures, 3 activities.

FR 201, 202  Intermediate French (4) (4)
Review of French grammar and practice in writing and oral expression based on social and cultural values. 3 lectures, 1 activity. Prerequisite: FR 103 or consent of instructor.

FR 233  Critical Reading in French Literature (4)  GEB C.1.
Selected readings in French from major Francophone authors that show the French literary tradition from the Middle Ages to the present in both France and other French-speaking countries. Includes such works by Medieval, Renaissance, Classical, Romantic, post-Romantic, and 20th Century writers as Créti en de Troyes, Rabelais, Molière, Voltaire, Flaubert, Proust, Gide, Sartre, Camus. 4 lectures. Prerequisite: FR 202.

FR 301  Advanced French Composition and Grammar (4)
Oral and written development of structural grammar, syntax and complex components of French. Expansion of vocabulary and idiomatic expressions through text study. Translation from English to French and written composition. 4 lectures. Prerequisite: FR 202 or equivalent, or consent of instructor.

FR 302  Advanced French Conversation and Grammar (4)
Topics based on student interest. Outlines and/or abstracts constitute written assignments. Individual presentations to elicit spontaneous response. Group presentations to allow cooperative research and preparation. 4 lectures. Prerequisite: FR 202, or consent of instructor.

FR 305  Significant Writers in French (4)  GEB C.3.
Critical analysis and oral discussion of poetry, essays, novels, plays. Each course will have a subtitle descriptive of the content. May be repeated to 12 units. 4 lectures. Prerequisite: FR 233 or equivalent.

FR 405  French Literature in English Translation (4)  GEB C.3.
Selected works to be read by students in the original or in English translation. Critical analysis, interpretation, and comparison of individual works by outstanding French writers. Lecture in English. Class Schedule will list topics selected. Total credit limited to 8 units. 4 lectures. Prerequisite: One literature course or consent of instructor.

FR 470  Selected Advanced Topics (1–4)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

FRSC–FRUIT SCIENCE

FRSC 100  Enterprise Project (1–4) (CR/NC)
Selection and completion of a management/production project under faculty supervision. Project participation is subject to approval by the department head and the Cal Poly Foundation. Degree credit limited to 12 units. Credit/No Credit grading only.
FRSC 123 Beekeeping (3)
Practical studies and exercises in the handling of honey bees with special reference to pollination of commercial crops. Honey processing and marketing. Bee inspection and disease detection. 2 lectures, 1 laboratory.

FRSC 131 Pomology (4)
History and outlook for California fruit growing. General principles of fruit production. Field laboratories in orchard management practices, tree and fruit identification, harvesting, grading and packing of university orchard products. Field trip required. Miscellaneous course fee may be required—see Class Schedule. Not open to students with credit in FRSC 230. 3 lectures, 1 laboratory.

FRSC 132 Pomology (4)
Training and pruning of deciduous fruits. Culture of pome, stone and miscellaneous fruit species. Saturday lab may be required. 3 lectures, 1 laboratory. Prerequisite: FRSC 131.

FRSC 133 Pomology (4)
Production practices common to deciduous nut crops produced in California. Normal spring cultural problems including thinning and spraying. Small fruit culture. 3 lectures, 1 laboratory. Prerequisite: FRSC 132.

FRSC 230 California Fruit Growing (4)
Production practices, areas of production, suitable varieties, harvest and processing of important deciduous and subtropical fruit crops. Methods of propagation and training. Field trip required. Miscellaneous course fee may be required—see Class Schedule. Not open to students with credit in FRSC 131. 3 lectures, 1 laboratory.

FRSC 231 Viticulture (4)
Growing wine, raisin and table varieties of grapes. Techniques in harvesting and handling, utilizing the university planting. 3 lectures, 1 laboratory.

FRSC 331 Advanced Viticulture (4)
Commercial production practices, mechanization and processing. Utilization of university vineyards for propagation, planting, training and pruning of grape vines. 3 lectures, 1 laboratory. Prerequisite: FRSC 231.

FRSC 332 Fruit Plant Propagation (4)
Propagation by seed, cuttings, layering, grafting, and budding. Rootstocks for deciduous fruits, commercial nursery practices. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: FRSC 100- or 200-level course or consent of instructor.

FRSC 342 Citrus and Avocado Fruit Production (4)
Growing and marketing oranges, lemons, grapefruit, tangerines, limes and avocados. Minor citrus species, rootstocks and ornamental types included. Orchard practice. Field trip to a major California production area required. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: FRSC 131 or FRSC 230, or consent of instructor.

FRSC 421 Advanced Pomology (4)
Organization and management of labor and equipment in field and processing operations. Production problem analysis. Advanced work in production management. Job instruction training. 3 lectures, 1 laboratory. Prerequisite: FRSC 421.
FRSC 521  Advanced Fruit and Nut Crop Production (4)
Advanced commercial production and management techniques. Use of mechanical aids and harvesters as related to size of crops, harvesting, and post-harvest handling. 3 seminars, 1 laboratory. Prerequisite: Graduate standing and consent of instructor.

FRSC 581  Graduate Seminar in Fruit Production (3)
Group study of current problems of fruit production; current experimental and research findings as applied to production and marketing. 3 seminars. Prerequisite: Graduate standing.

FSN—FOOD SCIENCE AND NUTRITION

FSN 100  Enterprise Project (1–4) (CR/NC)
Selection and completion of a management/production project under faculty supervision. Project participation is voluntary and subject to approval by the department head and the Cal Poly Foundation. Degree credit limited to 12 units. Credit/No Credit grading only.

FSN 101  Orientation to Food Science and Nutrition (1) (CR/NC)
Understanding the depth and breadth of the Food Science and Nutrition Department, the major programs and the university. Emphasis on curriculum and career planning. Food Science and Nutritional Science students are required to complete this course within their first year in the major. Credit/No Credit grading only. 1 lecture.

FSN 150  Food Quality Inspection (3)
Food laws and safety regulations concerning the food industry and consumer protection. Fundamental principles and procedures for inspecting foods based upon federal, state and industry standards. Credit not allowed for Food Science majors. 3 lectures.

FSN 170  Introductory Food Science (4)
Principles and practices of food science and technology. Ingredient properties, methods of preservation, handling and processing of foods representing the major food groups. 3 lectures, 1 laboratory.

FSN 200  Special Problems for Undergraduates (2–3) (CR/NC)
Individual investigation, research studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Credit/No Credit grading only. Prerequisite: Consent of department head.

FSN 209  Meat Procurement and Use (3)
Selection, identification and cutting of meat. Physical and chemical composition of meat and its relationship to flavor, tenderness, nutritional value and related subjects. Meat inspection and grading. Credit not allowed for students having completed in FSN 211. 2 lectures, 1 laboratory.

FSN 210  Nutrition (3) (Also listed as HE 210)
Nutrition as it relates to health throughout the life cycle, with emphasis on the young adult. 3 lectures.

FSN 211  Meats (3)
Meat industry processing methods and operations. Practice in slaughtering and cutting beef, pork and lamb. Meat inspection, grading, composition, curing, preservation and related topics. Credit not allowed for students having completed FSN 209. 2 lectures, 1 laboratory.

FSN 212  Meat Grading and Evaluation (2)
Factors related to carcass quality and yield. USDA meat grading principles and practices. Judging of carcass and wholesale cuts. Field trip to meat packing plants required. 1 lecture, 1 laboratory. Prerequisite: FSN 211.

FSN 217  Fundamentals of Food Processing Operations (4)
Introduction to the processing aspects of food plant operations and equipment. Relationship between unit operations and processes as well as equipment operations, adjustment, and maintenance. Calculations dealing with basic fundamentals of food processing operations. 3 lectures, 1 laboratory. Prerequisite: FSN 170.
FSN 230  Elements of Food Processing (4)
Principles of unit operations in food processing covering canning, freezing, dehydration, fermentation and concentration. Food quality and spoilage. For non-Food Science majors only. 3 lectures, 1 laboratory.

FSN 301  Unit Processing Operations I (4)
Applied food manufacturing and processing technology emphasizing thermal process operations. Major processes discussed are retort operation, osmotic preservation, extraction and filtration. Product formulation and material balances. Students produce processed foods in a pilot plant. Field trip may be required. 3 lectures, 1 laboratory. Prerequisite: FSN 217.

FSN 302  Unit Processing Operations II (4)
Continuation of FSN 301. Application of various processing operations to different product systems. Water removal in foods (evaporation, vacuum concentration, dehydration), heat removal (refrigeration and freezing), freeze drying and freeze concentration. Small scale food processing and group projects. Field trip may be required. 3 lectures, 1 laboratory. Prerequisite: FSN 301.

FSN 310  Maternal and Child Nutrition (3)
Nutritional requirements from conception to adolescence; role of nutrition in normal development. 3 lectures. Prerequisite: FSN 210, sophomore standing.

FSN 315  Nutrition in Aging (3)
Nutrition as it relates to the middle and later years, with emphasis on the elderly. 3 lectures. Prerequisite: FSN 210, junior standing.

FSN 328  Advanced Nutrition I (3)
Metabolism of carbohydrates, fats and proteins as it applies to human nutrition. Evaluation of nutritional status. 3 lectures. Prerequisite: FSN 210, CHEM 328, ZOO 332.

FSN 329  Advanced Nutrition II (3)
Continuation of FSN 328. Biochemical and physiological functions of vitamins and minerals and their interactions with other nutrients. Current topics in nutrition research. 3 lectures. Prerequisite: FSN 328.

FSN 331  Principles of Food Plant Sanitation (3)
Organization, management and operation of a food plant sanitation and waste disposal program. Field trips required. 3 lectures. Prerequisite: FSN 170 or FSN 230 and consent of instructor.

FSN 332  Statistical Quality Control (3)
Application of statistical methods in quality control programs and evaluation of operations in food industry. Calculator required. 3 lectures. Prerequisite: STAT 211, junior standing or consent of instructor.

FSN 333  Food Quality Control (3)
Chemical, microbiological and physical methods of analyses of foods used in the food plant quality control and product development laboratory. Organization of the laboratory. 2 lectures, 1 laboratory. Prerequisite: FSN 302, CHEM 326, or consent of instructor.

FSN 336  Food Packaging (3)
Packaging materials, packages and packaging methods applicable to a variety of processed and prepared foods. Field trip may be required. 3 lectures. Prerequisite: FSN 170 or FSN 230 and consent of instructor.

FSN 338  Meat Processing (3)
Manufacturing of further processed meats including curing, fermenting, restructuring, smoking and cooking. Product formulation, use of equipment and product evaluation. Field trip required. 2 lectures, 1 laboratory. Prerequisite: FSN 209 or FSN 211.

FSN 339  Cereal, Bakery and Snack Food Technology (3)
Applied technology of producing cereal, bakery items, sheeted and extruded snack food products. Milling of various flours. Functional properties of ingredients used and their effect on product quality. Comparative nutritional properties also discussed. Field trips may be required. 3 lectures. Prerequisite: FSN 170 or FSN 230 and consent of instructor.
FSN 341  Wines and Fermented Foods (3)
Processing, manufacturing and bio-technical applications of fermentation technology for the production of food products. Wine, beer, pickles, olives and other fermented food products important to the post-harvest economy of California. Field trip may be required. 3 lectures. Prerequisite: Junior standing.

FSN 361  Meat Packing By-Products (2)
Value, origin, classification and uses of meat by-products. Investigation of scientific principles and manufacturing processes. Field trips required. 1 lecture, 1 activity. Prerequisite: Junior standing. FSN 209 or FSN 211.

FSN 400  Special Problems for Advanced Undergraduates (2-4) (CR/NC)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 4 units per quarter. Credit/No Credit grading. Prerequisite: Consent of department head.

FSN 407  Food Composition Science (4)
Chemical and physical properties of food ingredients. Function and properties of carbohydrates, proteins, fats, pigments and other food ingredients used in the formulation and processing of foods. 3 lectures, 1 laboratory. Prerequisite: FSN 302, CHEM 328, senior standing or consent of instructor.

FSN 409  Sensory Evaluation of Food (3)
Characteristics of food color, consistency, texture and flavor. Sensory evaluation and grading, food acceptance testing and statistical analysis of data. 2 lectures, 1 laboratory. Prerequisite: FSN 230, FSN 302, STAT 211 and consent of instructor.

FSN 410  Nutritional Aspects of Food Processing (3)
Effects of food manufacturing practices on the nutritional quality of food products. Kinetics of nutrient losses. New developments in research and technology in the field. 3 seminars. Prerequisite: Senior standing, one course in Food Processing, FSN 329, or consent of instructor.

FSN 412  Experimental Nutrition (2)
Nutrient requirements and their evaluation. Quantitative laboratory techniques used in nutrition research. 2 laboratories. Prerequisite: FSN 329.

FSN 415  Methods of Teaching Nutrition (3)
Selection of valid content and learning activities for a variety of teaching situations and strategies in the classroom, community, or clinic setting. Writing of measurable objectives and the utilization of appropriate motivational and evaluation techniques. Activity designed to prepare students to teach nutrition at all stages of the life cycle. 2 lectures, 1 activity. Prerequisite: FSN 329, ED 305, and senior standing.

FSN 416  Community Nutrition (3)
Focus on community nutrition problems and methods of solving these problems. Government and private programs involved in the solutions. Development of skills in communication, assessment, and planning needed by the community nutritionist. 2 lectures, 1 activity. Prerequisite: FSN 415.

FSN 425  Quantity Food Preparation (3)
Economic principles and problems involved in planning and preparing food using institutional equipment to meet specific product standards for large groups. 1 lecture, 2 activities. Prerequisite: HE 321, MGT 206 and senior standing.

FSN 426  Food Systems Management (3)
Principles of successful organization and management with their application to the effective operation of food service. Administrative responsibilities of the food service manager. Advance reservation with instructor required. 3 lectures. Prerequisite: HE 321, MGT 312, MGT 314 and senior standing.

FSN 427  Equipment and Layout (3)
Selection, maintenance, and arrangement of equipment and furnishings for food service departments with emphasis on materials, construction, and specifications. Designated field trips required. 2 lectures, 1 laboratory. Prerequisite: FSN 426, HE 321, and senior standing.
FSN 429  Diet Therapy (5)
Modification of normal food intake and dietary patterns, with emphasis on dietary adjustments necessitated by certain disease processes and conditions. 4 lectures, 1 laboratory. Prerequisite: FSN 412 and senior standing.

FSN 431  Advanced Meats (3)
Physical and chemical properties of meats and meat products. Quality control and special problems associated with the processing and distribution of meats. 2 lectures, 1 laboratory. Prerequisite: Junior standing, FSN 209 or FSN 211.

FSN 433  Food Processing Management (3)
Food plant layout and flow lines, evolutionary operations technique, unit cost accounting, work simplification and scheduling. Economic justification and feasibility in selection of food processing equipment and systems. 3 lectures. Prerequisite: FSN 230 or FSN 302.

FSN 435  Food Engineering (3)
Principles of material and energy balance as applied to food processing systems. Calculations regarding energy requirements, heat transfer, refrigeration and freezing systems, and pumping heads. Food processing control points, methods of control, computers and microprocessors. 3 lectures. Prerequisite: FSN 230 and consent of instructor or FSN 302, MATH 118, PHYS 104.

FSN 436  Food Laws and Regulations (3)
Federal, state, and local laws and regulations to include case law history affecting the production, processing, packaging, marketing, and distribution of food and food products. 3 lectures. Prerequisite: FSN 302, senior standing.

FSN 437  Advanced Food Processing (4)
Advanced treatment of processing operations with emphasis in heat transfer, physical and chemical changes in foods as a function of processing conditions. Field trip may be required. 3 lectures, 1 laboratory. Prerequisite: FSN 230 and consent of instructor or FSN 435.

FSN 440  Internship (1-12)
Career experience with private or public agencies. For Nutritional Science majors only. Total credit limited to 12 units. Maximum of 8 units may be applied toward degree requirements. Prerequisite: FSN 329, FSN 415 (or concurrent) and junior standing and consent of instructor.

FSN 461, 462  Senior Project (3) (3)
Selection and completion of research related to the student’s area of interest. Project requires a formal report which must follow departmental guidelines. Minimum of 180 hours required. Prerequisite: ENGL 215 or ENGL 218 and senior standing.

FSN 463  Undergraduate Seminar (2) (CR/NC)
Exploration of students' career opportunities and factors to be considered in career decisions. Each student is responsible for the development and presentation of a short topic in the chosen field. Recommended enrollment not more than 3 quarters prior to graduation. Credit/No Credit grading only. 2 seminars. Prerequisite: Senior standing.

FSN 470  Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1-3 lectures. Prerequisite: Senior standing.

FSN 471  Selected Advanced Laboratory (1-3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Senior standing.

FSN 501  Lipid Metabolism and Nutrition (3)
Normal and abnormal lipid metabolism in relation to human nutrition at physiological and biochemical levels. 3 seminars. Prerequisite: Graduate standing or consent of instructor.
FSN 581  Graduate Seminar in Food Science and Nutrition (3)
Current findings and research problems in the field and their application to food science and nutrition. *Class Schedule* will list topic selected. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**GEOG—GEOGRAPHY**

**GEOG 150  Human Geography (3)**
Introduction to the basic concepts and content of human geography. Survey of the field with emphasis on the cultural universals of language, religion, systems of government, and economic activities. 3 lectures.

**GEOG 215  Human Impact on the Earth (3)**
Global assessment of human impact upon vegetation, animals, soils, water and atmosphere. Emphasis on problems stemming from the interactions of technology, population growth and natural resources. 3 lectures.

**GEOG 250  Physical Geography (3)**
Emphasizes the origins of the earth’s physical diversity. Seeks to account for the distribution and interrelationships of the earth’s diverse patterns of climate, landforms, vegetation and soils. 3 lectures.

**GEOG 305  Political Geography (3)**
Spatial influences on man’s political behavior. Geopolitics, boundaries, significance of resources on power politics, internal spatial structure of the nation-state, relationships between nation-states. 3 lectures. Prerequisite: Junior standing.

**GEOG 308  Global Geography (3)**
Survey of principal elements of global geography. Interrelations of human activities and natural elements as related to international developments and trends. Focus on selected regional examples. 3 lectures. Prerequisite: Junior standing.

**GEOG 310  Urban Geography (3)**
Presentation of geographic concepts, principles, and generalizations related to urban functions, forms, distribution, and growth. Location, areal extent, and interaction among the various urban functions. 3 lectures. Prerequisite: Junior standing.

**GEOG 315  Geography of Resource Utilization (3)**
World view of the interconnections of the following resource systems: food, energy, water and nonfuel minerals. Pervading theme: causes and characteristics of the great disparities in global living standards. 3 lectures. Prerequisite: Junior standing.

**GEOG 320  Geography of Hunger (3)**
Geographic analysis of the world problem of hunger that considers the factors of environmental deterioration, energy deficiencies, the Green Revolution, and rapid population growth. Underdeveloped world and the cultural and physical restraints it must overcome to adequately feed a growing population. 3 lectures. Prerequisite: Junior standing.

**GEOG 325  Climate and Humanity (3)**
Geographic perspective on the interrelationships between climate and humanity. Effects of people on climate and the influence of climate and weather upon human activities and behavior. Focus on global human conditions which are responsible for the alteration of climate and in turn are vulnerable to climate change. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**GEOG 340  Geography of California (3)**
Physical environment of California; patterns of settlement and economic development; current problems. 3 lectures. Prerequisite: Junior standing.

**GEOG 350  Geography of the United States (3)**
People, land utilization, and economic development viewed against the background of the physical environment. Topically and regionally organized. Pervading themes include current problems and regional cultural distinctiveness. 3 lectures. Prerequisite: Junior standing.
GEOG 401  Area Geography (3)
Detailed study of geographic characteristics of a selected world area. *Class Schedule* will list topic descriptive of the particular world area to be studied. Total credit limited to 12 units. 3 lectures. Prerequisite: Junior standing.

GEOG 470  Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

GEOL—GEOLOGY

GEOL 201  Physical Geology (3)  GEB B.1.a.

GEOL 203  Fossils and the History of Life (3)  GEB B.1.a.
Fossil record. Mechanisms and patterns of evolution. Adaptation of ancient organisms to their environments. Fossils in the interpretation of earth history. Important events in the history of life. Historical development of the major groups of invertebrates, vertebrates, and plants. 3 lectures.

GEOL 204  Geologic History of California (3)  GEB B.1.a.
Development of California through geologic time. Where and why the rocks appeared. Movement on faults, and mountain building. Geologic processes at work today and yesterday. Relationship of California geology to the rest of the world. 3 lectures. Prerequisite: GEOL 201 recommended.

GEOL 205  Earthquakes and Earth Hazards (3)  GEB B.1.a.

GEOL 206  Geologic Excursions (1) (CR/NC)  GEB B.1.a.
Field trips to places of geologic interest. *Class Schedule* will indicate destinations. Students must provide their own transportation, food, and camping equipment. May be repeated for a maximum of 3 units provided field trips are taken to different locations. Credit/No Credit grading only. 1 laboratory. Recommended prerequisite or concurrent: GEOL 201 or GEOL 204.

GEOL 211  Cities and Geology (3)

GEOL 241  Physical Geology Laboratory (1)  GEB B.1.a.
Properties and identification of minerals and rocks. Topographic maps and landform analysis. Geologic maps and interpretation of rock structure. 1 laboratory. Prerequisite or concurrent: GEOL 201.

GER—GERMAN

GER 101, 102, 103  Elementary German (4) (4) (4)
For beginners. Class practice in pronunciation, sentence structure, reading, writing and basic conversation. Laboratory drill required. Language taught in its cultural context. To be taken in numerical sequence. 3 lectures, 1 activity.

GER 201, 202  Intermediate German (4) (4)
Review of German grammar and practice in writing and oral expression based on social and cultural values. 3 lectures, 1 activity. Prerequisite: GER 103 or consent of instructor.
GER 233  Critical Reading in German Literature (4)
Selected readings in German from major German-speaking authors that show the German literary tradition from the Middle Ages to the present in Germany and other German-speaking countries. Includes works by such Medieval, Renaissance, Classical, Romantic, post-Romantic, and 20th Century writers as Wolfram von Eschenbach, Luther, Schiller, Goethe, Rilke, Mann, Böll and Brecht. 4 lectures. Prerequisite: GER 202.

GER 301  Advanced German Composition and Grammar (4)
Oral and written development of structural grammar, syntax and complex components of German. Vocabulary expansion and idiomatic construction. Written compositions. Translations to examine linguistic and semantic differences. 4 lectures. Prerequisite: GER 202, or equivalent, or consent of instructor.

GER 302  Advanced German Conversation and Grammar (4)
Topics based on student interest. Outlines and/or abstracts constitute written assignments. Individual presentations to elicit spontaneous response. Group presentations to allow cooperative research and preparation. 4 lectures. Prerequisite: GER 202 or consent of instructor.

GER 305  Significant Writers in German (4)
Critical analysis and oral discussion of poetry, essays, novels, and plays. Class Schedule will list topic selected. Total credit limited to 12 units. 4 lectures. Prerequisite: GER 233 or equivalent.

GER 405  German Literature in English Translation (4)
Selected works to be read by students in the original or in English translation. Critical analysis, interpretation, and comparison of individual works by outstanding German writers. Lecture in English. Class Schedule will list topics selected. Total credit limited to 8 units. 4 lectures. Prerequisite: One literature course or consent of instructor.

GER 470  Selected Advanced Topics (1-4)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

GRC–GRAPHIC COMMUNICATION

GRC 101  Introduction to Graphic Communication (3)
Graphic communication history, theory, processes, and industry segments. Reproduction technology from a systems concept showing fundamental relationships between art and copy preparation and reproduction of print media. 3 lectures.

GRC 122  Typography (4)
Introduction to computerized typesetting. Type classification, identification and selection. Copyfitting, mark-up systems, and proofreading. Fundamentals of typographic layout and design for mass print media. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories.

GRC 200  Special Problems for Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

GRC 204  Introduction to Printing Management (3)

GRC 223  Copy Preparation (3)
Preparation of line and tone copy for the reproduction processes. Designing roughs and visuals and preparation of single- and multi-color mechanicals. Production planning. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory.
GRC 227 Graphic Arts Photography (4)
Introduction to optical and electronic methods of graphic arts photography. Photographic materials and equipment for the graphic arts. Imaging requirements for different printing processes. Densitometry and sensitometry. Line halftone, and color separation theory and practice. Color and monochrome scanning systems. 3 lectures, 1 laboratory.

GRC 301 Electronic Composition Systems (3)
Electronic composition and typesetting systems, with emphasis on equipment generations. Computer principles as applied to graphic communication: formatting, interfacing word processing, pagination systems, quality control, and systems evaluation. Miscellaneous course fee required see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: GRC 122.

GRC 302 New Technologies in Graphic Communication (3)
New graphic communication technologies that are impacting the methods and procedures of producing and distributing print media. Application of computers and electronics, laser beams, telecommunication, photo-optics integrated systems, robotics, and related technologies. Prerequisite: Junior standing.

GRC 307 Color: Theories and Applications (3)
Application of color theories from the sciences and arts to the color producing industries of printing, photography, television, textiles, paints, and plastics. Color technology for communication through images, products, and the environment. 3 lectures. Prerequisite: Junior standing.

GRC 311 Substrates and Ink (3)
Introduction to technical aspects of paper, other substrates, and ink used in the printing industry. Manufacture, computerized densitometric and performance testing, and interaction of these materials are examined in relation to particular processes and end use requirements. 2 lectures, 1 laboratory.

GRC 322 Advanced Typography (2)
Typographic principles, practice and design of complex text, display and tabular composition for mass print media. Copy markup and layout procedures for electronic composition, with consideration of printing process requirements. Miscellaneous course fee required see Class Schedule. 1 lecture, 1 laboratory. Prerequisite: GRC 122.

GRC 323 Pre-Separated Art for Camera (3)
Manual preparation and separation of line and continuous tone images for multicolor reproduction. Preparation of complex full-color mechanical layouts. Programmable, computer driven cameras, for half-tone and line copy manipulation. Miscellaneous course fee required see Class Schedule. 1 lecture, 2 laboratories. Prerequisite: GRC 223.

GRC 324 Finishing Processes (4)
Imposition techniques, cutting, folding, and use of computers in determining complex impositions for finishing processes. Stitch, case and perfect binding techniques and applications. Operational and aesthetic uses of die cutting, scoring, creasing, foil stamping and embossing techniques. Miscellaneous course fee required see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: GRC 101.

GRC 326 Printing Equipment Management (3)
Procedures in designing, maintaining and decision making for printing equipment including pneumatics, hydraulics, mechanical and electrical systems. Pollution, safety and training in the graphic communication industry. 2 lectures, 1 laboratory. Prerequisite: GRC 204 and junior standing.

GRC 328 Image Assembly and Platemaking (3)
GRC 331  Color Reproduction Control (3)
Color sciences and quality control techniques as they relate to the printing and allied industries. Application of color theory to color reproduction, color control, print inspections, process control and quality measurement. Use of instruments and computers to quantify color properties. 2 lectures, 1 laboratory. Prerequisite: Junior standing.

GRC 333  Plant Layout Analysis (3)
Elements of printing plant site selections, equipment planning, inventory planning, and workflow optimization. Design and layout of printing plants for effective space utilization. Organization of plant services. 2 lectures, 1 activity. Prerequisite: Junior standing, GRC 204 and MATH 117, or MATH 118, or MATH 120.

GRC 335  Line and Halftone Media (4)
Preparation and evaluation of original art copy for commercial use. Laboratory problems in drawing and layout for single and multiple color runs. Various approaches to registration through computer generated images and conversions. Use of color and texture in art copy. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: GRC 323 or consent of instructor.

GRC 336  Modern Copy Technology (4)
Preparation and evaluation of current and experimental typographic images for the major printing processes; pagination and typographic modification by electronic means. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: GRC 301, GRC 335.

GRC 337  Screen Printing Technology (2)
Flexibility and directness of screen printing technology; frame, ink, fabric and stencil technology as they relate to printing characteristics. Mechanical art-registration tolerances; commercial production practices; screen printing presses and their applications. Safety and environmental consideration. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 laboratory. Prerequisite: GRC 328 or consent of instructor.

GRC 400  Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

GRC 401  Printing Marketing and Sales (3)
Introduction to printing marketing and sales management. Graphic communication market determination, market strategy, and implementation. Salesmanship, sales forecasting techniques for printed products. 2 lectures, 1 laboratory. Prerequisite: GRC 204.

GRC 403  Estimating (4)
Estimating the cost of various kinds of printed products. Analysis of material, labor and other cost factors. Use of budgeted hour costs and production standards. Computer assisted estimating. 3 lectures, 1 laboratory. Prerequisite: GRC 204, GRC 311 or consent of instructor.

GRC 408  Newspaper and Publications Management (3)
Analysis of newspaper and publications production systems. Organization of the production function. Personnel and industrial problems peculiar to the industry. 3 lectures. Prerequisite: Senior standing or consent of instructor.

GRC 411  Printing Management I (3)
Coordination of customer service, sales and estimating functions to printing industry market trends. Estimating for web processes including color impositions. Evaluating printing company profitability using ratio analysis, effective data collection systems and innovative management practices. 3 lectures. Prerequisite: GRC 403 and GRC 416 or consent of instructor.

GRC 414  Color Image Assembly (2)
Materials, equipment and facilities required for color image assembly. Registration, masking, chokes, spreads, film duplication and contacting. Use of screen tints in process color, composite film, color proofing, and color electronic pre-press systems. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 laboratory. Prerequisite: GRC 328 or consent of instructor.
GRC 415  Sheetfed Lithographic Technology (5)
Theory, practice and applications of sheetfed lithographic technology to the printing industry segments of commercial, books, advertising, catalogs, packaging, reprographics. Computerized press controls, scanning densitometers. 3 lectures, 2 laboratories. Prerequisite: Junior standing.

GRC 416  Web Printing Technology (5)
Web press for lithography, rotogravure, flexographic and letterpress printing. Applications for newspapers, packaging, business forms, magazines, books, catalogs and advertising materials. Applications of computers to the management and technical function of web technology. Miscellaneous course fee required—see Class Schedule. 3 lectures, 2 laboratories. Prerequisite: GRC 415.

GRC 417  Advanced Web Printing Technology (2)
Advanced theory and applications of web printing technology to include copy and design reproduction and management decisions as they pertain to the graphic communication field. 2 lectures. Prerequisite: GRC 223, GRC 416.

GRC 421  Printing Management II (4)
Production planning control for printing. Manufacturing strategy, quality control, and optimization techniques as applied to the production of printed products. Recording and analyzing production data. 3 lectures, 1 activity. Prerequisite: GRC 204, and MATH 117, MATH 118, or MATH 120.

GRC 422  Printing Management III (3)
Applied techniques of printing plant personnel management. Investigation and determination of job descriptions, testing for staff and line employees. Setup of graphic arts in-plant training programs. Evaluation procedures for personnel working in the printing facility. Printing industry association relationships. 2 lectures, 1 laboratory. Prerequisite: GRC 204.

GRC 423  Printing Management (4)
Trends in the graphic arts labor movement. Graphic arts labor unions. Collective bargaining and grievance procedures practiced in the printing industry. Administration of the labor contract by printing plant supervisor. Industry-specific case problems. 3 lectures, 1 activity. Prerequisite: GRC 204.

GRC 427  Desktop Publishing (2)
Primarily for non-Graphic Communication majors. Personal computers, page make-up, software, laser printers, and other output devices for desktop publishing. Publishing process, terminology, and design basics. Creating, editing, transferring and merging text and graphics. GRC majors may enroll for elective credit only. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 laboratory. Prerequisite: Any course in computer applications.

GRC 429  Computer Imaging (3)
Computer imaging systems in graphic communication. Digital typesetting, CAD systems, integrated pre-press systems, page makeup devices, scanners, monochrome and color terminals, interfacing, and electronic publishing systems. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: GRC 301.

GRC 432  Imaging Systems Management (4)
Management issues associated with the introduction and use of computerized electronic prepress systems. Strategic, technical, marketing, financial, production, operational, and personnel aspects of color prepress work in a capital-intensive environment. 4 lectures. Prerequisite: GRC 204, GRC 227, and GRC 328.

GRC 437  Consumer Packaging (3)
Problem-solving strategies for package printing which integrate concepts from management, design and technology. Package manufacturing, function, quality, visual appeal, and economics are addressed. Consumer packaging industry. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: Junior standing.
GRC 439  Advanced Line and Halftone Media (4)
Complex and experimental copy and art preparation and their limitations for use in line and halftone reproduction by gravure and offset lithography in book quality paperback and journal reproduction. Mechanical requirements and production procedures, implemented through computer-controlled production equipment. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: GRC 336, GRC 417.

GRC 440  Advanced Copy Technology (4)
Complex copy preparation in line, tone and color for reproduction by offset, gravure, flexography and letterpress (relief) printing. Print production requirements for high-speed computer controlled reproduction presses. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: GRC 439.

GRC 460  Research Methods in Graphic Communication (1)
Introduction to research methods for preparing scholarly and defensible papers and senior projects, and in conducting qualitative and quantitative evaluations, testing, and research in graphic communication. Methods covered include statistical, historical, descriptive, questionnaires, interviewing, and sampling. 1 lecture. Prerequisite: Senior standing and STAT 211.

GRC 461  Senior Project (3)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in formal report. Minimum 90 hours total time. Prerequisite: Senior standing.

GRC 470  Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

GRC 471  Applied Graphic Communication Management Practices (2)
Management theories and practices in the graphic communication industry. Application of theories and practices to the University Graphic Systems as they apply to commercial printing, publication printing, and newspaper industries. Total credit limited to 6 units. 2 seminars. Prerequisite: Consent of instructor.

GRC 474  Applied Graphic Communication Practices (2) (CR/NC)
Application of theories and practices to the University Graphic Systems as they apply to commercial printing, publication printing, and newspaper industries. Total credit limited to 18 units, with a maximum of 2 units per quarter. Credit/No Credit grading only. 2 activities. Prerequisite: Consent of instructor.

GSB—GRADUATE STUDIES—BUSINESS

GSB 511  Financial Accounting (4)

GSB 512  Foundations for Quantitative Analysis (4)
Basic quantitative concepts used in the MBA program. Matrices, linear systems of equations, introduction to calculus. Probability, basic statistical concepts and regression. Use of computer software to solve problems. 4 seminars.

GSB 513  Organizations and Management (4)
Examination of major theories and conceptual constructs relating to the operating requirements of complex organizations, including manufacturing, service, and nonprofit organizations; historical development of theory and practice; managerial behavior functions and processes. Current issues and actual cases. 4 seminars.
Managerial approach to important legal issues affecting business and the market system. Focus on those aspects of law which affect managers directly including contracts, products liability and corporations in perspective; principles of partnership authority, liability, and control; managerial duty and liability to the corporation; public control of managerial activity. 4 seminars.

Managerial accounting with emphasis on communication and information to assist management in planning and control. Development of an operational understanding of cost systems, budgeting concepts, performance evaluation and other quantitative accounting techniques to assist management in planning and control. Accounting data in computer modeling applications. 3 seminars, 1 laboratory.

Introduction to the concepts of statistical analysis. Probability distributions, point and interval estimation of population means, proportions, and variances. Analysis of variance, regression, correlation, multiple regression, time series, and forecasting. 4 seminars.

Microeconomic analysis and its application to business decisions. Topics covered include market structures, pricing strategies, cost analysis and input selection. Examination of the economic impact of various governmental policies on the business firm. 4 seminars.

Introduction to marketing management. Concepts and principles necessary to plan, direct and control the product, promotion, distribution and pricing strategies of the firm. 4 seminars.

Theories, practices and tools of financial decision making. Topics include financial statement analysis, financial forecasting, valuation, capital budgeting, capital structure, dividends, and an overview of financial markets and institutions. 4 seminars.

Theoretical framework and empirical dimensions of the aggregate economic environment in which business enterprise must operate. Understanding of national income accounting, monetary and fiscal policies, inflation, unemployment and balance of payments issues in static and dynamic contexts. Develops an ability to understand macroeconomic events in an evolving and interconnected world economy. Miscellaneous course fee required—see Class Schedule. 3 seminars, 1 laboratory.

Production function and its interaction with other functional areas in an organization. Application of quantitative and statistical methods to planning, control and decision making in operations management. Topics include economics of plant location, logistics, material management, and quality control. 4 seminars.

Examination of major micro-organizational behavior (individual, interpersonal and group) concepts, theories and constructs. Presented from an applied perspective with the purpose of increasing one’s effectiveness and skill in understanding, analyzing, and managing organizational processes. 4 seminars. Prerequisite: GSB 513.

Makes the student a knowledgeable user of marketing research information to develop and implement marketing plans. Emphasis on development of ability for using research information to formulate marketing objectives and strategies and to analyze marketing problems in depth. 4 seminars.
GSB 543 Information Systems for Decision Support (4)
Overviews of management information systems and decision support systems. Structure of organizational information systems. Process of information systems development. File processing and integrated data base concept. Data communication and on line distributed systems. Management decision making using computer software packages. Report generation using word processing system. Interactive financial planning systems and the decision support systems. 3 seminars, 1 laboratory.

GSB 551 Management in an International Environment (4)
Impact of international factors on management. Organizational behavioral strategies in the context of differential economic, technological, political and cultural environments. 4 seminars.

GSB 552 Financial Analysis and Planning (4)
Application of financial theory and models to a variety of financial problems. Analysis and formulation of financial plans developed primarily through the use of cases and other real world examples. Working capital management, investment decision under conditions of risk, and financing and capital structure decisions. 3 seminars, 1 laboratory.

GSB 561 Business, Government and Society (4)
Analysis from social, economic, political, legal and ethical perspectives of the changing domestic and international environment within which the American business enterprise operates. 4 seminars.

GSB 562 Business Strategy and Policy (4)
Integration of total organization imperatives. Case studies and analysis of problems faced by top management. Strategy and policy formulation as affected by environmental factors, competition, technological development, growth objectives and organizational capabilities. Appraisal of total performance and alternative strategies. 4 seminars.

GSB 570 Entrepreneurship and Small Business Management (4)
Exploration in entrepreneurship with emphasis on the formation and management of new business ventures. Analysis of typical operating problems of these firms and application of appropriate techniques for their solution. 4 seminars.

GSB 571 Seminar in Organization Design (4)
Organization design approaches, configurations, principles, and processes. Diagnosis and redesign of a wide variety of complex organizations in the public, private, and international sectors. Organization design as an organization development technology. 4 seminars. Prerequisite: Completion of first year MBA coursework or the equivalent.

GSB 574 Seminar in Labor-Management Relations (4)
Exploration of models of labor-management relationships from adversarial to cooperative, in both non-union and union, private and public sectors. Emphasis on labor-management relationships maximizing commitment and performance. Analysis of employee influence. Work organization, reward systems, conflict resolution. 4 seminars.

GSB 576 Organizational Analysis, Planning and Decision Making (4)
Organizational strategy analysis and constructs; environmental, technological and behavioral factors influencing organizational objectives, structures and design; strategic and tactical planning concepts and decision making criteria relating to business, governmental and nonprofit organizations. 4 seminars.

GSB 577 Quantitative Business Analysis III (4)
Case studies using the concepts of Quantitative Business Analysis I and II applied to selected problems in business and industry. These involve concepts of linear programming, quadratic programming, goal programming and advanced forecasting concepts. Solutions of these models obtained using the resident computer system. 4 seminars.

GSB 579 Manufacturing Strategy (4)
Strategic role of manufacturing in the overall corporate competitive strategy. Matching manufacturing capabilities and marketing needs, capacity planning, matching process technology with product requirements. The experience curve, vertical integration, managing change, CIM, robotics, and managing international production. 4 seminars. Prerequisite: GSB 534.
GBS 580 Industrial Marketing (4)
Marketing of business goods and services to other businesses, governmental agencies and social institutions by the manufacturer. Market analysis, sales forecasting, product strategy, effective use of sales force and industrial advertising media. 4 seminars.

GBS 581 Marketing Management Seminar (4)
Practice in the application of analytical tools and techniques to current and potential marketing problems. 4 seminars.

GBS 582 High-Technology Marketing (4)
Emphasis on marketing of high-technology products, processes, systems, and services. Strategic high-tech product planning and high-tech new product development in the context of marketing management. Market forecast for a non-existing new high-tech product. 4 seminars. Prerequisite: Graduate standing.

GBS 585 Seminar in Investments (4)
Stock, bond and options market. Emphasis on operations of markets, the efficient market hypothesis and portfolio theory. Setting investment objectives and managing portfolios given efficient capital markets. 4 seminars.

GBS 586 Financial Institutions and Markets (4)
Structure of money and capital markets and the financial institutions that operate in these markets. Evaluation of contemporary thought on the evolving market and institutional arrangements. Emphasis on the management policies of the institution. 4 seminars.

GBS 587 Seminar in Financial Management (4)
Two or three current issues in financial management, including a review of the analytical and theoretical literature, empirical studies and ramifications for the discipline. 4 seminars. Prerequisite: GSB 531.

GBS 589 Accounting Policy (4)
Role of management in establishing and directing accounting policy. Coverage includes the impact of management decisions on external reporting and taxes and the establishment and maintenance of appropriate internal systems for planning, reporting and control. 4 seminars.

GBS 590 Seminar in Sociotechnical Systems (4)
Systems theory. Manager's role and functions in managing technology. Organizations as sociotechnical systems. Sociotechnical system theory. Sociotechnical system analysis and design. Managing sociotechnical systems. Design experiments that foster the innovative process. 4 seminars. Prerequisite: GSB 513, GSB 541.

GBS 591 Industry Analysis (4)
In-depth study of major industry using analytical tools developed in prerequisite courses. Intensive investigation of the dynamic environment, markets, technology, financial and economic structures, history and other key factors. Further prospects for the industry explored through preparation of a comprehensive forecast. 4 seminars.

GBS 593 Management and Control of Information Systems (4)
Overviews of information technology trends and implications. Information systems (IS) functions and organization. Strategic planning for information systems. Integration of IS plan with corporate strategy. IS administration and control. Management of IS development and computer operations. IS issues in a multinational environment. 4 seminars. Prerequisite: GSB 543.

GBS 594 Future of Business (4)
Examination of the techniques and conclusions of representative future studies by research institutions such as the Rand Corporation, Hudson Institute and The Club of Rome. Analysis of the implications of those conclusions for the operations and role of business in society. 4 seminars.
GSB 595  Organization Development and Change (4)
Planned change within complex organizations. Organization development models and interventions, including action research, team development, intergroup conflict, structural, and comprehensive approaches. Design and use of action programs to improve organizational effectiveness. 4 seminars. Prerequisite: Completion of first year MBA coursework or the equivalent.

GSB 596  Economic Forecasting (4)
Applications to business planning of selected economic forecasting techniques. Classical time series analysis, Box-Jenkins (ARIMA) models, adaptive (Kalman) filtering models, leading indicators and input-output analysis. 3 seminars, 1 laboratory.

GSB 597  Seminar in Selected Economic Problems (4)
Selected problems analyzed at an advanced level in a particular field, such as international trade, public finance, urban, industrial organization or transportation. 4 seminars.

GSB 598  Graduate Internship in Business (2–8) (CR/NC)
To permit students to correlate experience and academic knowledge. Placement in a supervised work program in a business or public organization as approved by the MBA Director. Sixty hours of work experience per two units of credit. Total credit limited to 8 units. Credit/No Credit grading only. Prerequisite: Second-year MBA students.

GSB 599  Individual Research (1–4)
Advanced individual research planned and completed under the direction of a member of the school faculty. Designed to meet the needs of qualified students who wish to pursue investigations which they cannot follow effectively in regularly offered elective courses.

HD–HUMAN DEVELOPMENT

HD 101  Orientation to Psychology and Human Development (1) (CR/NC)
Introduction to curricula and programs designed to prepare students for careers in psychology, child and adult development, early childhood education, and family studies. Credit/No Credit grading only. 1 lecture.

HD 103  Pairing and Marriage (3)
Functional approach to contemporary dating and pairing patterns with emphasis on developing communication during the early developmental stages of the paired relationship. 3 lectures.

HD 108  Introduction to Human Development (3)
Introduction to individual development and socialization processes from life span and human ecology perspectives with emphasis on interactions among the child, the family and community. 3 lectures.

HD 109  Parenting (2)
Philosophies and techniques explored out of which an individual can devise an effective parenting style. Basic skills for parent effectiveness. 2 lectures.

HD 129  Program Planning for Young Children (2)
Curriculum development and analysis of programs for young children with emphasis on activities, environment and communication. 2 activities. Recommended for Early Childhood Education Concentration students prior to enrollment in HD 130, HD 140, or HD 150.

HD 130  Supervised Study of Children: Infant–Toddlers (4)
Faculty supervised experience with infant–toddlers in on-campus laboratory program. Participant observation, planning and conducting activities for individuals and groups. 1 activity, supervision.

HD 140  Supervised Study of Children: Early Childhood (4)
Faculty supervised experience with children from age 3 to 6 in on-campus laboratory program. Participant observation, planning and conducting activities for individuals and groups. 1 activity, supervision.
HD 150 Supervised Study of Children: Middle Childhood (4)
Faculty supervised experience with children from age 6 to 12 in on-campus laboratory program. Participant observation, planning and conducting activities for individuals and groups. 1 activity, supervision.

HD 200 Special Problems for Undergraduates (1–3)
Supervised investigation, including a written report, of a topic chosen with prior approval of instructor. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Consent of department head.

HD 203 Family Development (3)
Survey of family living at each stage of the life cycle. Emphasis on developmental approach to understanding families, family subsystems, and family developmental tasks, socio-economic and cultural influences, and family differences. 3 lectures.

HD 296 Infancy (3)
Development and behavior from conception to age three. Characteristic social, physical and sensorimotor behavior patterns of infants and toddlers in relation to the environment. 3 lectures. Prerequisite: HD 108, PSY 201 or PSY 202.

HD 298 Early and Middle Childhood (3)
Development and behavior of children from age three through age ten. Intellectual, physical, emotional, social, and moral development of the growing child. 3 lectures. Prerequisite: HD 296 or consent of instructor.

HD 303 Family Interaction (3)
Examination of the building blocks of family interaction that produce a distinctive family style or set. 3 lectures. Prerequisite: HD 203 and junior standing.

HD 306 Adolescence (3)
Analysis of the years from prepubescence to young adulthood. Current research on individual development and behavior including interaction patterns with peers, family, and others. Multidisciplinary perspective on the interaction among physical, affective, cognitive, social, and historical aspects of the youth culture. 3 lectures. Prerequisite: HD 108, PSY 201 or PSY 202 or consent of instructor.

HD 308 Adulthood (3)
Analysis of the stages of adulthood. Current research on adulthood including interaction patterns with the family, peers, and others, as well as interrelations among physical, cognitive, and social development of the individual. 3 lectures. Prerequisite: HD 306 or consent of instructor.

HD 330 Supervised Internship (6) (CR/NC)
Faculty-supervised internship in a career-related setting for early childhood education students. Role of professional apprentice is experienced and analyzed by each student. Credit/No Credit grading only. Prerequisite: HD or Liberal Studies major, HD 101, PSY 323, PE 280, junior standing and consent of instructor.

HD 351 American Families: Past, Present, Future (3)
American families from the perspective of understanding how historical change led to the evolution of present day families. 3 lectures. Prerequisite: HIST 204, PSY 201 or PSY 202, SOC 105.

HD 400 Special Problems for Advanced Undergraduates (1–3)
Supervised investigation, including a written report, of a topic chosen with prior approval of instructor. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Consent of department head.

HD 401 Foundations of Child Development (3)
Past, present and future perspectives in theory and research on child development and on programs for young children. 3 seminars. Prerequisite: HD 330 or consent of instructor.
HD 404 Administration of Child Development Centers (3)
Organization and administration of programs for young children, preschool and child care centers. Staffing, finance, equipment, records, program evaluations, regulations, public policy and community relations. 3 lectures. Prerequisite: HD 330, HD 401.

HD 405 Advanced Administration of Child Development Centers (3)

HD 413 Parent-Child Relationships (3)
Application of major theories to understanding of parent-child relations. Examination of primary prevention strategies and programs. Review of current research and evaluation of literature on parent-child interactions. 3 lectures. Prerequisite: HD 203, HD 298 or consent of instructor.

HD 421 Developmental Processes (3)
Critical examination of developmental processes in the three major domains of development: psychomotor-physiological, social-affective, and cognitive. Particular attention to the identification, assessment and relevance of specific processes, and to factors that influence and facilitate their development. Class Schedule will list topic selected. Total credit limited to 9 units. 3 seminars. Prerequisite: HD 306 or HD 296 or HD 298 or consent of instructor.

HD 430 Advanced Internship (6) (CR/NC)
Faculty-supervised preprofessional experience in a career-related setting which complements the HD 330 internship. Such roles as master teacher, caseworker, therapeutic intern, administrative aide or program specialist are experienced and analyzed by each student. Total credit limited to 12 units. Credit/No credit grading only. Prerequisite: HD or Liberal Studies major, HD 330, and consent of instructor.

HD 444 The Atypical Infant (4) (Also listed as ED 444)
Exploration of issues pertinent to the development of atypical infants. Relationship of theory and research to intervention efforts with handicapped, developmentally delayed infants, and other at-risk infants. 3 seminars, 1 activity. Prerequisite: Junior standing, HD 296 and ED 440 or consent of instructor.

HD 450 Family Therapy (3)
Basic elements of marriage and family therapy. Emphasis on concepts, goals, and techniques of various family therapy approaches. 3 lectures. Prerequisite: Junior standing.

HD 451 Family Crises (3)
Analysis of causes and effects of crises on the family. Methods for prediction, control, and solution of family crises. 3 seminars. Prerequisite: HD 203, PSY 201 or PSY 202, junior standing.

HD 453, 454 Supervised Fieldwork (6) (6) (Also listed as PSY 453, PSY 454) (CR/NC)
Supervised fieldwork experience in various community, governmental, and educational settings. Applied psychological, developmental, or educational experiences determined by the participating institution, supervising faculty member, and the student. Maximum of 6 units per quarter. Credit/No Credit grading only. Prerequisite: HD 101, PSY 323, HD majors, junior standing and consent of instructor.

HD 461, 462 Senior Project (2) (3)
Selection and completion of a project under faculty supervision. Project must be related to psychology, human or family development fields. Results of the project must be presented in a formal, written report. Minimum of 150 hours total time. Prerequisite: PSY 329, HD 330 or HD/PSY 453, HD major, completion of Graduation Writing Requirement, and consent of instructor.

HD 463 Senior Seminar (2)
Presentation of student investigations of career and graduate school options. Definition of personal goals. Career and life planning. Student presentations of current issues. 2 seminars. Prerequisite: HD major and senior standing.
HD 464 Issues in Family Life Education (3)
Examination of the role of family life specialists in relation to the teaching profession, public agencies, and the community. Analysis of issues that impact on the family life educator. 3 lectures. Prerequisite: HD 453, HD 454.

HD 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1-3 lectures. Prerequisite: Consent of instructor.

HD 481 Family Theory (3)
Critical analysis and discussion of the current theories used to explain family behavior including their application in the helping professions and family research. 3 seminars. Prerequisite: Senior standing.

HE-HOME ECONOMICS

HE 101 Home Economics as a Profession (1) (CR/NC)
Definition, history, career opportunities and future directions for professional home economists. Introduction to the department and the campus. Credit/No Credit grading only. 1 lecture.

HE 121 Fundamentals of Food (4)
Theoretical aspects and practical applications of the principles of food science and food preparation. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: CHEM 121.

HE 122 Design Analysis (3)
Design elements and principles as they apply to specific areas of home economics: interior design, textiles and clothing, and food presentation. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 activity.

HE 131 Apparel Construction (3)
Basic techniques in apparel construction. Emphasis on pattern and fabric selection, fit, and quality construction. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories.

HE 200 Special Problems for Undergraduates (1-3)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Consent of department head.

HE 210 Nutrition (3) (Also listed as FSN 210) GEB E.2.
Nutrition as it relates to health throughout the life cycle, with emphasis on the young adult. 3 lectures.

HE 220 Textile End-Products (3)
Trends, selection, use and care of textile end-products. Carpets, draperies, upholstery, other interior textiles, and apparel. Legislation as it affects consumers and the industry. Resources for current information. 3 lectures.

HE 224 Creative Textiles (3)
Exploration and development of a variety of creative textile projects through demonstrations and laboratory experiences. Course content will vary each quarter. Total credit limited to 6 units. Miscellaneous course fee required—see Class Schedule. 3 laboratories. Prerequisite: HE 122 or consent of instructor.

HE 226 Methods of Home Food Preservation (2)
Preservation techniques to obtain maximum food quality. Emphasis on palatability, appearance, safety, and efficient use of resources. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 activity. Prerequisite: HE 121.

HE 237 Fashion Analysis (3)
Application of aesthetic principles to apparel design. Fashion theory, personal color analysis, figure analysis, and wardrobe planning. 3 lectures. Prerequisite: HE 122.
HE 241 Flat Pattern (3)
Principles of designing by drafting and flat pattern methods. Development of production patterns for selected designs. Advanced fitting techniques. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: HE 131 or consent of instructor.

HE 242 Interior Design (3)
Basic interior design: visual, functional, and economic aspects of planning interior space. 3 lectures. Concurrent enrollment in HE 343 recommended. Prerequisite: HE 122 or consent of instructor.

HE 305 Family Housing and Consumer Resources (5)
Family as consumers in the marketplace and the importance of housing in that role. Analysis of the changing processes of producing, purchasing and regulating family housing. Sources of consumer protection, information, and recourse. 5 lectures. Prerequisite: GEB D.3. and GEB D.4.a. recommended. (See page 114 for GEB requirements.)

HE 309 History of Interior Design I (3)
Development of furniture styles and their environments from Antiquity to the Victorian Era. 3 lectures. Prerequisite: HE 242.

HE 311 History of Interior Design II (3)
Development of furniture styles and their environments from the Victorian Era through the 20th Century. 3 lectures. Prerequisite: HE 309.

HE 315 Textiles and Clothing Industries (3)
Commercial aspects of design, production, and distribution of textiles and clothing. External influences which affect the fashion industry. 3 lectures. Prerequisite: HE 220 or consent of instructor.

HE 321 Meal Management (3)
Factors and principles involved in the choice, purchase, and preparation of foods for a meal. Application of management principles in the use of time, energy and money in relation to feeding diverse groups. Planning, preparing, and serving of meals with emphasis on nutritional, aesthetic, economic, and cultural aspects of foods. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories. Prerequisite: HE 121, HE 210, or consent of instructor.

HE 322 Textiles (3)
Physical and chemical characteristics of natural and synthetic fibers. Laboratory application of theory in understanding properties of fibers, yarns, fabrics, and finishes as related to the selection, use and care of textiles. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: CHEM 121, HE 220.

HE 323 Individual Residential Design (4)
Developmental and sequencing processes for single-family residences as they relate to the professional practice of interior design. Emphasis on specifications as developed by interior designers and working drawings. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: HD 203, HE 305, HE 331, HE 344.

HE 324 Management of Family Resources (3)
Application of an ecosystem framework as it relates to contemporary aspects of personal, family, and group living management. Analysis of selected resource management areas such as goal setting, budgeting, and time management. 3 lectures. Prerequisite: HE 305, or consent of instructor.

HE 326 Presentation Methods (3)
Development and evaluation of effective means of communication by use of a variety of presentation methods including demonstration. 3 activities. Prerequisite: HE 331, SPC 201.

HE 331 Residential Equipment (3)
Technological principles involved in construction, operation, energy consumption, selection, safety, and space utilization of residential equipment. 2 lectures, 1 laboratory.

HE 333 Apparel Design by Draping (3)
Techniques of draping as one method of apparel design production. Construction of an individual dress form and creation of original designs in fabric. Miscellaneous course fee required—see Class Schedule. 3 activities. Prerequisite: HE 241 or consent of instructor.
HE 334 Special Fabrics (3)
Interrelationships of appropriate designs, equipment, and construction techniques to special fabrics. Care and storage of apparel constructed from special fabrics. Evaluation of ready-to-wear. Miscellaneous course fee required—see Class Schedule. 3 lectures. Prerequisite: HE 131, HE 322.

HE 341 Clothing and Human Behavior (3)
Socio-cultural, psychological, economic and aesthetic aspects of clothing as related to human behavior. 3 lectures. Prerequisite: GEB D.4.a. and GEB E.1. (See page 114 for GEB requirements.)

HE 343 Interior Design Laboratory (1)
Basic interior design. Laboratory experience in solving realistic design problems. Miscellaneous course fee required—see Class Schedule. 1 laboratory. Concurrent enrollment in HE 242 recommended. Prerequisite: HE 122.

HE 344 Interior Design Materials and Techniques (4)
Survey of materials used for interior surfaces. Practical experiences in specification writing and custom design. Basic interior design business procedures. Total credit limited to 8 units. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: HE 220, HE 343, or consent of instructor.

HE 400 Special Problems for Advanced Undergraduates (1-3)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Junior standing and consent of department head.

HE 401 Occupational Training Seminar (3)
Current developments in the teaching of vocational, home economics-related occupations at the secondary level. 3 seminars. Prerequisite: Senior standing.

HE 404 Seminar in Financial Responsibilities of the Family (3)
Individual and group study of the economic role of the family: factors affecting use of income, and cost of goods and services within the U.S. economic system. Opportunity to analyze and make decisions concerning families' financial situations and understand how their specific socio-economic levels relate to other families. 3 seminars. Prerequisite: HE 324 or consent of instructor.

HE 407 Interior Lighting (3)
Introduction to artificial lighting for commercial and residential use. Basic definitions and fundamental applications through problem solving. 2 lectures, 1 laboratory. Prerequisite: HE 344.

HE 410 Food Styling and Presentation (2)
Food styling and presentation as it applies to working with food professionally in a commercial setting. 2 activities. Prerequisite: HE 122, HE 421, or consent of instructor.

HE 411 Teaching Methods in Home Economics (3)
Selection of valid content and learning activities for a variety of teaching situations and strategies in the classroom, community, or clinic setting. 2 lectures, 1 activity. Prerequisite: HE 326.

HE 412 Home Economics Student Teaching Seminar (3)
Practices and problems of student teaching in home economics. Synthesis of professional study and experience to develop teaching competence. Total credit limited to 6 units. 3 seminars. To be taken concurrently with student teaching.

HE 420 Fashion Merchandising (3)
Planning, buying, and selling of fashion merchandise through various distribution channels. Retail management, organization, operations, and image. Pricing and retail math. Miscellaneous course fee required—see Class Schedule. 3 lectures. Prerequisite: HE 315 or consent of instructor.

HE 421 Cultural and Aesthetic Aspects of Food (3)
Psychological, sociological, and economic factors that influence the formation of food habits and attitudes. Lab illustrates application of basic principles of food science to food consumption patterns of cultural groups. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: HE 321 or consent of instructor.
HE 423  Clothing for Disabled People (3)
Analysis and discussion of designs and functions of clothing as related to special needs of people with physical differences. 3 seminars. Prerequisite: HE 241, HE 322 or consent of instructor.

HE 430  Advanced Textiles (2)
Seminar in advanced textiles including fiber structure, fabrics, and finishes as related to textile performance. Review and reporting of student independent investigations. 2 seminars. Prerequisite: HE 322.

HE 431  Advanced Textiles Laboratory (1)
Advanced study of fiber structure, fabrics and finishes through laboratory experimentation. Individual and group research on fabric performance. Taken concurrently with HE 430. Miscellaneous course fee required—see Class Schedule. 1 laboratory. Prerequisite: HE 322.

HE 432  Advanced Interior Design (3)
Individual research and creative experiences in interior design with emphasis on real client projects. Total credit limited to 9 units. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories. Prerequisite: HE 323, HE 344, ARCH 111.

HE 433  Historic Costume (3)
Chronological study of costume designs as related to cultural influences. 3 lectures. Prerequisite: Junior standing.

HE 435  Seminar in Interior Design Trends and Developments (3)
Effects of mass marketing and construction of facilities relative to interior design. Comparison of social and economic factors affecting 20th Century design trends. 3 seminars. Prerequisite: HE 344.

HE 440  Internship (1–12) (CR/NC)
Career experience with private or public agencies. Total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: Consent of department head.

HE 442  Comparative Tailoring (3)
Traditional and contemporary tailoring techniques. Garment construction and selection. Investigation of and reporting on tailoring types, methods, fabrics, and garment qualities. Miscellaneous course fee required—see Class Schedule. 1 seminar, 2 activities. Prerequisite: HE 241 or consent of instructor.

HE 451, 452, 453, 454  Professional Study Tours (1) (2) (3) (4) (CR/NC)
Study tours of selected facilities related to home economics emphasis areas. Varying resources studied on different tours. Classroom and tour hours variable depending on course units. Total credit limited to 8 units for any combination of HE 451, HE 452, HE 453, HE 454. Miscellaneous course fee required—see Class Schedule. Class Schedule will list subtitle indicating tour location and emphasis area. Credit/No Credit grading only. HE 451: 1 laboratory. HE 452: 1 seminar, 1 laboratory. HE 453: 1 seminar, 2 laboratories. HE 454: 1 seminar, 3 laboratories. Prerequisite: Consent of instructor.

HE 460  Fashion Promotion (3)
Fashion illustration, presentation, events, and visual merchandising. Promotion through personal techniques and the media. Controls on fashion promotion. 3 lectures. Prerequisite: HE 420 or consent of instructor.

HE 461, 462  Senior Project (3) (3)
Selection and completion of research related to the student’s area of interest. Project requires a formal report which must follow department guidelines. Minimum of 180 hours required. Prerequisite: HE 463 and completion of 135 units including all freshman, sophomore, and junior classes in the area of study.

HE 463  Undergraduate Seminar (2) (CR/NC)
Discussion of individual capabilities, values, and academic preparation as they relate to the career process. Implications of current social issues for the profession. Introduction to the research process applied to home economics. 2 seminars. Credit/No Credit grading only. Prerequisite: GEB A.4.
HE 470  Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. Miscellaneous course fee may be required—see Class Schedule. 1–3 lectures. Prerequisite: Consent of instructor.

HE 471  Selected Advanced Laboratory (1-3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topics selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

HE 500  Individual Study (1-3)
Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Only 6 units may be applied to degree requirements. Prerequisite: Consent of department head, graduate program coordinator, and supervising faculty member.

HE 580  Seminar (1-3)
Advanced study of current issues and topics significant for professional home economists. Class Schedule will list topics selected. 1–3 seminars. Prerequisite: Graduate standing.

HE 599  Thesis (3) (3) (3)
Individual research under the general supervision of the staff, leading to a graduate thesis of suitable quality. Only 9 units may be applied to degree requirements. Students must enroll every quarter in which advisement is received. Prerequisite: Graduate standing.

HIST–HISTORY

HIST 101, 102, 103  History of Western Civilization (3) (3) (3)
Development of western civilization from earliest times to the present. Political, economic, social, intellectual, and religious contributions of the various peoples to contemporary life. 3 lectures.

HIST 200  Special Problems for Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

HIST 201, 202, 203  United States History (3) (3) (3)  GEB D.1.
Comprehensive survey of the development of the United States from the 15th century to the present. HIST 201 satisfies the general education requirement of HIST 204 for History majors. 3 lectures.

HIST 204  History of American Ideals and Institutions (3)  GEB D.1.
Comprehensive thematic study of the historical development of industry, corporations, racial relations, foreign policy and political and constitutional issues since the foundation of the Republic. Such an historical analysis will enable students to better understand contemporary America. Not open to students with credit in HIST 201, HIST 202, HIST 203. 3 lectures.

HIST 221  Historical Craft (3)
Introduction to research and writing methods in history. Seminar approach to the craft of history. Nature of historical research, research methods, library facilities, basic bibliography and organization skills, writing techniques. 3 seminars.

HIST 222  Writing and Research Seminar in History (3)
Development of research and bibliographic skills in the process of composing a major research paper. Emphasis will be upon thesis formation, the development of the synoptic skills of historical analysis and the preparation of written and oral critiques of the papers presented in the seminar. 3 seminars. Prerequisite: HIST 221, ENGL 114, and ENGL 125 or PHIL 125 or SPC 125.

HIST 270  History through Film (3)
Various historical themes examined through the medium of film. Influence and overall relationship of films to the societies that produced them examined. Total credit limited to 6 units. 2 lectures, 1 laboratory.
HIST 285  Vietnam War at Home and Abroad (3)
Role of U.S. foreign policy in the transformation of the Vietnamese revolution from a colonial insurrection into a multinational conflict. Interaction of public opinion, electoral politics with foreign policy formulation and military strategy analyzed. 3 lectures.

HIST 301  Historiography (3)
Theory, interpretation and philosophies of history. 3 seminars. Prerequisite: HIST 221, HIST 222 and junior standing.

HIST 305  History of American Agriculture (3)
Agricultural development with emphasis upon economic, political and social implications. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 306  History of American Technology (3)
Development of industrial, transportation, and agricultural technologies in America. Miscellaneous course fee required—see Class Schedule. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 307  History of Science (3)
Historical impact of science on human and physical environments from ancient to modern times. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 308  American Warfare (3)
Inception, induction and impact of American warfare from 1775 to the present within the context of changing ideas and major political, social and economic developments. 3 lectures. Prerequisite: Junior standing.

HIST 311  Early Britain (3)
History of the British Isles from the reconstruction of Celtic history to the end of the Medieval epoch. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 312  Early Modern Britain (3)
History of the British Isles from the end of the Medieval epoch to the era of the American revolution—from Richard III to George III. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 313  Modern Britain: Industry, Empire and War (3)
History of the British Isles from the loss of the American colonies through the era of the World Wars and the dissolution of the British Empire. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 314  The Middle East (3)
Islamic civilization, the Ottoman Empire, origins of Pan-Islamism, Arab, Turkish, Iranian nationalism, impact of World Wars I and II, and the background of contemporary problems. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 315  Modern World History (3)
Analysis of the interaction of selected traditional and modernizing non-Western cultures with Western industrial imperialism and its attendant forces. Within this context, evaluation of both the nature of industrial imperialism and the way in which it influenced or interfered with the host culture. 3 lectures. Prerequisite: Junior standing.

HIST 325  Comparative History of American Minorities (3)
Analyzes the political, economic and social status of various racial and ethnic groups in the United States, focusing on the history of Asians, Blacks, Chicanos and Native Americans, emphasizing both the general and particular forces that influenced their experience in America and the varying degrees to which each was able to maintain its cultural identity. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 328  American Indian History (3)
Historical examination of Native American culture; topics of conflict and contributions emphasized. 3 lectures. Prerequisite: Native American culture; topics of conflict and contributions emphasized.
HIST 329 American Indian Thought (3)
Cultural, spiritual, and philosophical concepts of several Native American societies; the intellectual and religious influences of Indians upon American society; their adaptation to White domination. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 331 Afro-American History (3)
Political and social history of Afro-Americans from the early 17th century to the present; emphasizes the Afro-American contribution to American cultural and political life. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 339 History of Colonial Latin American (3)
Survey of Latin American history in the colonial period from 1492 to the early Nineteenth Century. Special attention to the indigenous cultures, the Iberian civilization, and the evolving relationship between them. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 340 History of Modern Latin America (3)
Social and political history of South America, Mexico, and Cuba during the Nineteenth and Twentieth Centuries. Historical development of economic structure and socio-political and cultural institutions in the region. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 341 History of Modern Central America (3)
Political, social, and economic development of Central American countries in the context of regional history and international politics during the Nineteenth and Twentieth Centuries. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 343 Greece and Rome (3)
Foundations of western civilization; origins and development of the science, technology, philosophy, religion, art, and sociopolitical institutions which produced the modern world; continuity between ancient times and the present. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 346 Medieval Europe (3)
Medieval society from the emergence of feudalism to the beginning of the Renaissance. Triumph of the papacy, development of feudal monarchies and institutions. The Crusades. Recovery of commerce. Rediscovery of Greek thought, and rise of universities. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 347 Renaissance and Reformation (3)
Decline of medieval universalism. Rise of commercial capitalism and dynastic nation-states. Flowering of the Renaissance. Protestant reformation. Economic, political, social, intellectual, and cultural influences. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 348 Religious Wars and Absolutism (3)
Era of the Counter-Reformation and Divine Right absolutism, religious and dynastic wars and their impact on the political, economic, social, religious and cultural fabric of European civilization. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 349 The Age of Revolution and Napoleon (3)
Europe from the death of Louis XIV (1715) to the settlement at Vienna of 1815. International rivalries, continental and global warfare, the philosophy of the Enlightenment. Enlightened Despotism, the French Revolution, and Napoleon. Political, intellectual, economic, and social developments and upheavals during the Eighteenth Century. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 351 Europe in the Age of Reaction and Revolution, 1815-1871 (3)
Reaction to the French Revolution. Industrialization. Liberal socialist and nationalist revolts against the conservative order of 1815. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 352 Europe in the Age of Imperialism and War, 1871-1919 (3)
Maturation of industrialization, socialism and nationalism. Imperialist competition of nation states for world hegemony. Explosion of the First World War. 3 lectures. Prerequisite: Junior standing or consent of instructor.
HIST 353  Europe in the Age of Fascism (3)
Democracy in crisis and the fascist alternatives. Second World War and the recovery of Europe in a bipolar world. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 375  Urban History of America (3)
Growth and development of American cities from the Colonial period through the 1970s. Includes a comparative analysis of American urban areas with city development in Europe, Asia and Africa. Evolution of urban culture, assimilation of European ethnic groups, clash of city and rural values, rise of racial ghettos. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 381, 382  African History (3) (3)
Survey of African history from earliest times. Ancient African civilizations, Moslem penetration, indigenous kingdoms. European colonialism, rise of African nationalism. Development of independent Africa as illustrated by the history of selected countries. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 383  History of American Thought (3)
Thought and culture in America since the Puritans. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 384  Labor and Work in American History (3)
Labor and work from the colonial period to the present. Analysis of the organization and division of the labor process, formation of classes, rise of unions and the shift from an industrial to a service and high technology workforce. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 385  Topics in California History (3)
In-depth analysis of selected political, economic, and social issues involved in the development of California from the earliest times to the present. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 386  Frontiers in American History (3)
Development and evolution of the frontier experience in chronological and geographic context. Consideration given to the various political, economic, social, cultural and religious factors which helped to bring about the end of the so-called frontier. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 387  From Colony to Empire: A History of U.S. Foreign Relations (3)
Analysis of the evolution of this culture from an insecure appendage of European colonialism to a global power implementing a foreign policy based on hegemonic assumptions. Analysis of the impact of internal developments on foreign relations. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 400  Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Miscellaneous course fee may be required—see Class Schedule. Prerequisite: Consent of department head.

HIST 401  Colonial America (3)
Age of exploration. European powers in eastern North America. English settlements, development of the English colonies, with emphasis on Virginia and Massachusetts. Proprietary interests, growth of internal control, and colonial conflicts. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 402  American Revolution (3)
Background of the Anglo-American imperial problem. The War for Independence and internal democratic upheaval of the era. Establishment of the new nation, origins of the Constitution, the party system, American foreign policy, the national economy. 3 lectures. Prerequisite: Junior standing or consent of instructor.
HIST 403 Jacksonian America (3)
Growing nationalism and simultaneous development of sectional rivalries. Emerging two-party system. The transportation revolution, early industrialization, and a changing social order. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 404 Civil War and Reconstruction (3)
Interaction of political, social and economic forces with personalities and ideas in a period in which the political process failed to function. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 405 Rise of Industrial America (3)
Interaction between rising industrialism and traditional agrarian democracy. Relationship between the industrial system and the values of democratic institutions. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 406 Progressive Era (3)
Economic, social, intellectual, and political history, and foreign policy. Progressive response to problems of industrialization, agriculture, and urbanization. Development of the American corporate business system. Era of normalcy and onset of the Depression. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 407 Modern America (3)
Major developments of the mid-Twentieth Century. Change and growth in domestic and foreign policies. The Depression, New Deal, World War II, Cold War. Problems of world leadership and contemporary domestic problems. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 415 East Asian Civilization (3)
Central ideas and institutions which have shaped Chinese, Japanese and Korean civilization since ancient times. Emphasis on cultural themes rather than a political continuum. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 416 Modern Japan (3)
Japan's development as a modern state in the 19th and 20th centuries. Emphasized themes include the conflict of modernity and cultural continuity, the persistence of traditional values and postwar reconstruction of Japanese society. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 417 Modern China (3)
Analysis of Chinese history in the twentieth century, the conflict between modernity and cultural continuity. Chinese Communist Party and People's Republic of China since 1949. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 424 Organizing and Teaching History (3)
Organization, selection, presentation, application, and interpretation of subject matter in history in secondary schools. 3 seminars. Prerequisite: Admission to teacher education program or valid teaching credential.

HIST 426 Imperial Russia (3)
Evolution of Russian autocratic society from the foundation of tsarist absolutism in the Fifteenth Century to 1917. Reaction, reform and revolutionism. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 427 Soviet Russia (3)
Transformation of Russian autocracy from tsarist to Bolshevik under the impact of World War I and the Revolution of 1917. The formative force of Marxism-Leninism, forced collectivization and industrialization, the social engineering of the New Soviet Man. World War II, the Cold War and peaceful coexistence. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 429 History of Communism (3)
Theory and practice of Marxian Communism since 1848. 3 lectures. Prerequisite: HIST 315 and junior standing or consent of instructor.
HIST 435  Women in History (3)
Traditional roles and attitudes about women. Contributions of individual women. Changing conditions and their implications for today's woman. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 437  Nazi Germany (3)
Intellectual, social and cultural roots of National Socialist ideology and how they combined under the influence of Adolph Hitler to produce the Nazi Revolution. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 460, 461  Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Results presented in a formal report. Minimum of 60 hours time per quarter. Student must enroll in second quarter. Prerequisite: HIST 221 and HIST 301.

HIST 463  Undergraduate Seminar (2)
Historical analysis of selected problems and topics for undergraduates. 2 seminars. Prerequisite: HIST 301.

HIST 468  Internship in State and National Park History (3) (3)
Work experience program in interpreting state and national park history. Weekly three-hour seminar and regularly scheduled work experience training at Hearst–San Simeon State Historical Monument. 90 hours of work experience per 3 units of credit. Miscellaneous course fee required—see Class Schedule. Recommended preparation: Western Civilization Survey, U.S. and California History, History of Art.

HIST 470  Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 590  Seminar in History (3)
Historical analysis of selected problems and topics. Class Schedule will list topic selected. Total credit limited to 6 units. 3 seminars. Prerequisite: Graduate standing.

HUM–HUMANITIES

HUM 302  Human Values in Agriculture (3)  GEB C.3.
Nature of values at issue in agriculture which impact on the wider community. Technical-factual foundation of needs of agriculture which contribute to value conflicts, discrimination between resolvable and unresolvable conflicts, ethical principles and devices yielding resolutions. Interdisciplinary team taught, with guest lecturers and possible field trips. Literary materials, novels, short stories, and expository history giving dramatic expression to values. 3 seminars. Prerequisite: Junior standing and ENGL 215 or ENGL 218.

HUM 310  Humanities in World Cultures (3)  GEB C.3.
An interdisciplinary examination of the humanities in a selected culture. Special focus on the arts, literature, philosophy and foreign language in that culture. Class Schedule will list topic selected. Repeatable to 9 units with different course titles. 3 lectures. Prerequisite: Junior standing and ENGL 215 or ENGL 218.

HUM 400  Independent Study Project (1–2)
Independent study project focusing more than one discipline on a problem in the Humanities. May involve travel and/or independent research. Bibliography and study plan submitted in advance. 1–2 activities. Prerequisite: Junior or senior standing and consent of instructor.

HUM 402  Values and Technology (3)  GEB C.3.
Humanistic investigation into the theoretical and practical applications of technology with specific reference to the social effects of technological change. For all majors. Nontechnical. 3 lectures. Prerequisite: Junior standing and ENGL 215 or ENGL 218.
HUM 470 Selected Advanced Topics (2-4)
Focused interdisciplinary study of a problem in the Humanities combining the insight and expertise of more than one discipline, such as history, literature, religious studies, philosophy, fine arts and the sciences. Class Schedule will list topic selected. 2-4 lectures. Prerequisite: Junior standing and ENGL 215 or ENGL 218.

IE-INDUSTRIAL ENGINEERING

IE 101 Introduction to Industrial Engineering (2)
Development of the industrial economy and the profession of industrial engineering. Concepts and principles of industrial organization and management. Survey of industrial engineering techniques and areas of application in manufacturing and service systems. Career opportunities review. 1 lecture, 1 laboratory.

IE 121 Industrial Systems Analysis (2)
Systems, subsystems, and relationships (interfaces) of industrial systems. Productivity concepts and measurements. Trends in techniques for data gathering, analysis, including spread sheet analysis, and presentation for management decisions. 1 lecture, 1 laboratory.

IE 131 Work Design and Measurement (3)
Principles of work simplification, methods flow charting and micro-motion analysis. Quantitative analysis of work measurement methods including time study, synthetic data and work sampling. Review of allowances and performance ratings. Integration of these techniques in human-machine systems. 2 lectures, 1 laboratory. Prerequisite: MATH 141.

IE 141 Manufacturing Processes (1)
Metal casting as a process in manufacturing. Properties of molding materials and methods of casting. Sand, shell and investment molding and casting, core making, and sand testing. Pattern and casting design principles. Miscellaneous course fee required—see Class Schedule. 1 laboratory.

IE 200 Special Problems for Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

IE 201 Production Costs Estimating (3)
Estimating costs of manufactured products and services based on detailed estimates of labor, materials, overhead and general and administrative expenses. Break even points, price breaks, industrial learning, network cost analysis, multiple regression derived formulas, labor efficiency and cost indices. 3 lectures. Prerequisite: Sophomore standing.

IE 214 Production Control (2)
Coordination of production facilities to meet objectives of customer service, minimum inventory investment, and maximum manufacturing efficiency. Forecasting, statistical determination of order requirements, group technology concepts, input-scheduling and machine loading control techniques. Production systems computer modeling. 2 lectures. Prerequisite: Sophomore standing.

IE 222 Engineering Analysis (3)
Mathematical and statistical methods of evaluating and control of variability of engineering design parameters, predicting deviations from expected averages, counting, grouping data for computations. Computer applications. Expected fit within engineering tolerances and allowable signal fluctuations. 2 lectures, 1 activity. Prerequisite: MATH 131.

IE 233 Computer Aided Manufacturing (2)
Introduction to CAM. Manual and computer part programming. Basic concepts of part design, process planning, manufacturing operations. Tool path definition/verification to production phase. Use of commercially available software. 1 lecture, 1 laboratory. Prerequisite: ETME 142, ETMP 144, CSC 251 or consent of instructor.
IE 234 Robotic Assembly (2)
Product design and planning for robotic assembly. Robot characteristics required for product assembly. Off-line programming environment for robots. Selection of sensors, end-of-arm tooling and control arrangements for robotic assembly. Practical applications using a robot programming language for assembly. 1 lecture, 1 laboratory. Prerequisite: Computer literacy course (F.1.)

IE 239 Industrial Costs and Controls (3)
Estimation of manufacturing costs for production planning, cost analysis, and cost control. Planning, budgeting and control processes. Costs, accounting data and analysis of variances for managerial control, inventory valuation and decision making. Techniques of forecasting, pricing, cost estimating and cost reduction. 2 lectures, 1 laboratory. Prerequisite: IE 121.

IE 240 Additional Engineering Laboratory (1-2)
Total credit limited to 4 units, with a maximum of 2 units per quarter. 1 or 2 laboratories.

IE 251 Manufacturing Engineering (3)
State of the art methods and processes in manufacturing and assembly. Metrology. Product design and manufacturability. Value engineering, parts codification. Instrumented analysis of cutting tool forces and machine alignment. 2 lectures, 1 laboratory. Prerequisite: ETMP 144, MATH 142.

IE 303 Project Management (3)
Design, analysis and implementation of a major industrial/business systems problem. Emphasis on periodic impacting situations requiring resolutions and management decisions by groups representing various elements of an enterprise. Resource leveling and management under constraints. 3 lectures. Prerequisite: Junior standing.

IE 304 Operations Research (3)
Introduction to operations research. Matrix theory, linear programming formulations and solution. Simplex method, sensitivity analysis, transportation and assignment algorithms. Introduction to goal programming. Existing computer programs and algorithms utilized. 3 lectures. Prerequisite: MATH 242.

IE 305 Operations Research II (4)
Theory and applications of network flow analysis, queuing models, dynamic programming and inventory models, computer programming in solution of problems. 3 lectures, 1 laboratory. Prerequisite: IE 304, STAT 321.

IE 312 Data Management and System Design (3)
Design and management of industrial data bases and reporting systems. Relationships of financial accounting and production control systems, efficient data entry routines, report formats, data base managers and system benefit cost analysis. 2 lectures, 1 laboratory. Prerequisite: CSC 251.

IE 314 Engineering Economics (3)
Economic analysis of engineering decisions. Determining rates of return on investments. Effects of inflation, depreciation and income taxes. Application of basic principles and tools of analysis using case studies. 3 lectures. Prerequisite: ECON 201 or equivalent, junior standing.

IE 316 Manufacturing Automation (3)
Survey of the use of computers in the factory automation environment. Basic control theory including feedback and process synchronization. Programming and use of intelligent devices, programmable controllers, robotic arms, and industrial control systems. 2 lectures, 1 laboratory. Prerequisite: IE 233, MATH 143.

IE 319 Human Factors Engineering (3)
Analysis of factors influencing the efficiency of human work. Data on the physical and mental capacities of persons, the physical environment, work organization, and the problem of aging. Human reactions and capabilities related to specific tasks and systems. Design of machines, operations, human computer interface and work environment to match human capacities and limitations, including the handicapped. 3 lectures. Prerequisite: PSY 201 or PSY 202 and junior standing.
IE 334 CAD/CAM (3)
Identification and study of the individual techniques of CAD/CAM as being practiced in modern industry. 2 lectures, 1 laboratory. Prerequisite: IE 233, ETME 143, CSC 251 or a course in a high level computer language.

IE 400 Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limit to 4 units, with a maximum of 2 units per quarter.

IE 401 Sales Engineering (2)
Concepts and principles of engineering in sales. Role of the professional engineer in the analysis, design, development, production, and final application of a product or system required by the buyer. 2 seminars. Prerequisite: Senior standing in engineering, or consent of instructor.

IE 403 Principles of Engineering Economics (3)
Development of methods to assess economic merits of engineering proposals through mathematical models. Time value concepts and computations. Evaluating economic factors in the making of individual or industrial decisions. Effects of depreciation and income taxes on the analysis. 3 lectures. Prerequisite: Senior standing or consent of instructor.

IE 404 Engineering Economic Decision Management (3)
Quantitative approaches to engineering and management problems. Time value concepts, breakeven and replacement analysis, optimization techniques for scheduling. Project cost estimation, resource management and risk analysis. Use of computer software packages. For non-majors only. 3 lectures. Prerequisite: Junior standing.

IE 407 Algorithmic Systems Analysis (4)
Advanced linear programming as applied to problems in industrial systems. Integer programming using branch-and-bound. Application of nonlinear, quadratic, dynamic programming concepts. Case studies of current topics in industrial engineering. 3 lectures, 1 laboratory. Prerequisite: MATH 242, IE 305, or consent of instructor.

IE 409 Economic Decision Systems (3)

IE 410 Inventory Control Systems (4)
Inventory planning and control systems in modern manufacturing. Implementation of manufacturing resource planning (MRP II) including demand forecasting, production plan, master scheduling, bill-of-material, and inventory master file. Capacity requirements planning and shop floor control. Zero inventory management, just-in-time and Kanban systems of inventory management. 3 lectures, 1 laboratory. Prerequisite: IE 407.

IE 411 Production Systems Analysis (3)
Systems analysis for production control. Design of computer integrated planning and control systems for scheduling manufacturing orders, monitoring operating costs and control system performance evaluation. Development of computer-aided decision making framework. Interactive decision making using computer-based factory simulator. 2 lectures, 1 laboratory. Prerequisite: IE 410, or consent of instructor.

IE 413 Flexible Manufacturing Systems (3)
IE 416  Automation of Industrial Systems (3)
Automation in manufacturing and warehousing. Selection of automation systems. Low cost automation in manufacturing and warehousing. Types of systems. Projects in low cost automation systems. Applicability of pneumatic systems towards low cost automation. 2 lectures, 1 laboratory. Prerequisite: IE 233, IE 251, IE 334, IE 316.

IE 420  Simulation for Design Analysis (4)
Design and analysis of manufacturing and service systems by simulation. Basic concepts of simulation type models, functions of random variables by random number and function generators, basic programming concepts, characteristics of simulation languages. 3 lectures, 1 laboratory. Prerequisite: CSC 251, IE 305, IE 312.

IE 421  Manufacturing Organization (3)
Theory and principles of manufacturing organizations. History of industrial organization. Engineering management concepts and practice. Use of case discussion method. Planning and operations in terms of human and other resources and factors within and external to the firm. 3 seminars. Prerequisite: PSY 201/PSY 202.

IE 426  Engineering Test Design and Analysis (4)
Data gathering and statistical testing applied to industrial engineering and manufacturing fields. Experimental methods for evaluation and comparisons; interpretation of interference, fatigue, and field data. Engineering experiments including linear and nonlinear regression, ANOVA, and multifactor ANOVA. Utilization of existing computer software. 3 lectures, 1 laboratory. Prerequisite: STAT 321.

IE 430  Quality Assurance (4)
Introduction to assurance sciences: QC, reliability, maintainability, and integrated logistic support. Statistical theory of process control and sampling inspection. Risks associated with decisions based on operating characteristics of control charts and sampling plans. Reliability and life testing methods. Economics of statistical QC. 3 lectures, 1 laboratory. Prerequisite: IE 426 or consent of instructor.

IE 433  Advanced Work Measurement (3)
Predetermined time systems. Time formulas. Standard data systems. Use of statistical methods. Standard data systems applied to clerical, manufacturing, and micro assembly. Developing and maintaining computerized systems. Course will be administered with project orientation. 2 lectures, 1 laboratory. Prerequisite: IE 131, IE 312, IE 426.

IE 435  Reliability Assurance (3)
Reliability concepts and mathematical models, mechanical device reliability, electrical device reliability, systems reliability and maintainability, reliability data, assurance program elements. 3 lectures. Prerequisite: IE 305, IE 430, MATH 242.

IE 437  Advanced Human Factors Engineering (3)
Principles, concepts and models used in maximizing human performance capabilities at the workplace. Experimental methods for generating rational data relative to man-machine interface. Data and multi-variate analysis. 2 lectures, 1 laboratory. Prerequisite: IE 319, IE 426.

IE 440  Quality Process Management (3)
Quantitative approaches to engineering and management of quality. Statistical process control, quality assurance concepts. Variability loss and off-line QC. Tolerance design and experimental design. Human factors and managerial dimensions influencing quality. For non-majors only. 3 lectures. Prerequisite: Junior standing.

IE 441, 442  Fundamentals of Supervision (2) (1)
Theory and principles of supervision. Application of fundamental concepts and techniques of supervision provided by assignment in engineering laboratories. 2 laboratories, 1 laboratory. Prerequisite: IE 141, IE 233 and senior standing.
IE 443 Facilities Planning and Design (4)
Design concepts and input requirements in planning and design of new, or renovation of existing, manufacturing systems. Product, process, and flow and activity analysis techniques. Flow lines and buffering techniques. Computer-aided layout design and evaluation. Design of handling systems. Math models of location problems. 2 lectures, 2 laboratories. Prerequisite: IE 305, IE 334, IE 420, or consent of instructor.

IE 461, 462 Senior Project (2) (3)
Faculty supervised projects typical of problems which graduates encounter in their profession and which involve costs, planning, scheduling and research. Formal written report, suitable for reference library, discussing methods, results and conclusions. Minimum 150 hours total time, Prerequisite: Senior standing, IE 314, IE 334, IE 443.

IE 463 Undergraduate Seminar (2)
Preparation, oral presentation, and discussion by students of technical papers on recent engineering developments and/or subject matter pertinent to industrial engineering. 2 seminars. Prerequisite: Senior standing.

IE 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

IE 471 Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

IE 500 Individual Study (1–3)
Advanced study planned and completed under the direction of a member of the department faculty. Open only to students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.

IE 541 Advanced Operations Research (3)
Models for mathematical programming and operations research. Topics in linear programming, network analysis, and dynamic programming. Operations research models including queuing, inventory, simulation, and Monte Carlo. Special problems in nonlinear programming and integer programming. 3 seminars. Prerequisite: IE 305, IE 426, graduate standing or consent of instructor.

IE 542 Reliability Engineering (3)
Theory and techniques for determining the reliability of systems and system elements. Influence of failures in series, parallel, and redundant designs. Failure modes and effects. Frequency distributions of failures and failure rates. Methods of estimating, predicting, measuring, and testing for reliability and maintainability. 3 seminars. Prerequisite: IE 426, IE 430, graduate standing or consent of instructor.

IE 543 Advanced Human Factors (4)
Theory and application of man-machine relations and system design. Concepts of mathematical models, human information input channels, decision making based on capability of human operator. 3 seminars, 1 laboratory. Prerequisite: IE 319 or equivalent, IE 426, graduate standing or consent of instructor.

IE 544 Advanced Topics in Engineering Economy (3)
Advanced topics in engineering economy. Replacement analysis, capital budgeting and allocation theory, risk and uncertainty, and benefit-cost analysis. Impacts of governmental and industrial policy. 3 seminars. Prerequisite: IE 314, graduate standing or consent of instructor.
IE 545  Advanced Topics in Simulation (3)
Validation of simulation models. Statistical techniques for variance reduction. Experimental design and optimization. Comparison of attributes of simulation language. Review of current manufacturing and service industry applications. 2 seminars, 1 laboratory. Prerequisite: IE 420, graduate standing or consent of instructor.

IE 555  Computer-Integrated Manufacturing (4)
CIM concepts and system architecture. Systems analysis methodologies and functional specifications. Technological and managerial strategies for system integration. Analysis of contemporary CIM frameworks. Information networks and protocols for integrated manufacturing systems. Implementation strategies for CIM and organizational impacts. 3 seminars, 1 laboratory. Prerequisite: IE 334, IE 411 or equivalents, graduate standing or consent of instructor.

IE 556  Technological Project Management (4)
Projects in industrial organizations and enterprises. Emerging technologies and project management. Relationship to strategic plans. Formulating, selecting, structuring, and planning projects. Project organization and control. Overcoming barriers. Role of computers. 4 seminars. Prerequisite: Graduate standing and experience using computers.

IE 557  Technological Assessment and Planning (4)
Assessing likely future technological environments, speed of industrial change, relationship to business plans of firms. Past and present technological evolution. Forecasting quantitative and qualitative approaches. Technological impact assessment and business strategy development. Use of case studies. 4 seminars. Prerequisite: STAT 321, IE 426 or equivalent and graduate standing.

IE 558  Engineering Decision Making (4)
Principles, concepts, models, and case studies of decision making, both quantitative and non-quantitative. Emphasizes commonly used techniques when quantitative models do not exist, do not cover all key factors, or when sufficient data are not available. 3 lectures, 1 laboratory. Prerequisite: IE 304, STAT 321 or equivalent and graduate standing.

IE 559  Engineering Research and Development (4)
Principles, approaches and practices for effective engineering innovation, design, research and development (R&D) in business and industry. Relationship of R&D with corporate strategy and technology base. R&D objectives through implementation. Integration of creativity, evaluation, design, and ongoing operations. Case studies. 4 seminars. Prerequisite: IE 314 or equivalent and graduate standing.

IE 599  Design Project (Thesis) (2) (2) (5)
Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis. Prerequisite: Graduate standing or consent of instructor.

IT–INDUSTRIAL TECHNOLOGY

IT 101  Technical Problem Solving (3)
Intensive investigation of the three major steps in technical problem solving. Defining the problem; planning and implementing the process for determining the solution; effective communication of the solution. Modern information processing systems, including computer usage. 3 lectures.

IT 111  Principles of Technology (3)
Technology from a systems perspective. Emphasis on the interrelationships of CAD/CAM/CIM. Evaluation, utilization and significance of technology and its impact on society. 3 lectures.

IT 125  Industrial Wood Processes (3)
Theory and practice of woodworking processes, materials and equipment used in cabinetmaking and furniture industries. Impact of technology. Cultural and social implications of technology. Practical applications include the construction of a project. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories.
IT 130 Automotive Fundamentals (2) GEB F.2.
Principles and components of the automobile for consumer understanding. How automobile technology impacts cultures and societies. The automobile throughout history. Economics of selection, operation, and preventive maintenance. Practical experience. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 laboratory.

IT 141 Plastics Processes and Applications (2) GEB F.2.
Global, cultural and social implications and applications of plastics. Uses, capabilities, and operational characteristics of plastics machinery and processes. Properties and classes of molds and tools. Injection molding, extrusion, compression molding, rotational molding, foaming, casting, and plastic fabrication. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 laboratory.

IT 233 Metal Technology (3) GEB F.2.
Practical applications of hand and machine tools. How metal technology impacts cultures and societies. Welding, forging, foundry, sheet metal, ornamental metal and applications of CIM. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories.

IT 235 Industrial Drawing (2)
Methods, policies and practices, including CAD, used in preparing, reading and applying industrial and construction drawings, their techniques and language to the industrial and construction projects. Presentations and proposals common to the management and construction industries. 1 lecture, 1 laboratory.

IT 237, 238 Industrial Electricity (3) (3)
Theory and application of basic AC and DC circuits as they pertain to industry and teaching applications. Principles of motors and generators, instruments, control and control circuits, transformers and circuitry. 2 lectures, 1 laboratory.

IT 245 Technical Sketching (2)
Freehand sketching of industrial products using perspective, isometric oblique and orthographic projection. Shading. Basic design. 2 activities.

IT 250 Transportation Power (3)
Introduction to world transportation and transportation power: land, sea, air and space transport systems, regulation, operational theory; piston, rotary and turbine engines; ignition, fuel, charging, cooling and lubrication systems. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory.

IT 301 Current Technological Issues (3) GEB F.2.
Technological issues, benefits and risks of technological decisions. The dynamics of technology and its impact on energy resources, the environment and quality of life. The effects of technological innovation on productivity, travel, communication, leisure and personal expression. Demonstrations of industrial processes will be conducted. 3 seminars. Prerequisite: IT 101.

IT 302 Plastics Design (2)
Properties of plastics as a class of materials. Interpretation of plastic design data. Principles underlying the properties of plastics. Design problems. Laboratory applications of plastics processes and their effects on design. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 laboratory. Prerequisite: IT 101.

IT 304 Product Quality Control (3)
Applications at the supervisory level of the overall quality plan for manufacturing. Quality assurance, testing, shop and field inspection techniques, material review, source inspection, vendor surveillance, and quality audits. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

IT 305 Technical and Management Presentations (3)
Methods, techniques and evaluation of presenting technical and management information to groups. Individual-group presentations utilizing self-produced aids including transparencies, slides, charts, models, other media. Integration of commercial visual aids. Use of projectors and video-cassette recorder, camera and monitor. 1 lecture, 2 activities. Prerequisite: Junior standing, IT 101, SPC 201 or SPC 202.
IT 311 Industrial Safety and Health Management (3)
Fundamentals of safety and health management. Background liabilities and safety legislation, hazards and their control in industry and industrial education. Falls, falling objects, impacts, mechanical injuries, pressure, electrical, fires, explosions, toxic materials, radiation, vibration, noise. 2 lectures, 1 activity. Prerequisite: IT 101 or consent of instructor.

IT 322 Energy and Power (4)
Introduction to energy sources, energy conversion and power. Fossil, atomic and solar resources. Conversion by current power technology including reactors, internal and external combustion and direct conversion. Power transmission systems and system maintenance including electrical, mechanical, pneumatic and hydraulic systems. Automobile used as one exemplary system. 4 lectures. Prerequisite: IT 101 or consent of instructor.

IT 323 Energy Management (3)
Energy sources, traditional and alternative. Energy management including system selection and energy auditing. Energy conservation including heat loss, gain and corrective measures for residential, commercial and industrial facilities. 3 lectures. Prerequisite: IT 322 or consent of instructor.

IT 326 Product Evaluation (3)
Practical application of value engineering. The systematic application of recognized techniques which identify the function of a product or service, establish the monetary value for that function, and provide the necessary function reliability at the lowest overall cost. 2 lectures, 1 activity. Prerequisite: IT 101 or consent of instructor.

IT 327 Plastics Technology (3)
Materials, processes and applications of industrial polymers. Basic operations in processing, fabricating and finishing of thermal plastic and thermal setting resins, product and materials testing. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 activity. Prerequisite: CHEM 121.

IT 329 Industrial Materials (3)
Investigation of the characteristics, applications and limitations of materials of industry including organics, ceramics and metallics. 2 lectures, 1 activity. Prerequisite: IT 101.

IT 330 Fundamentals of Packaging (3)
Overview of packaging. Historical development, functions, and materials. Processes and technology employed to protect goods during manufacture, handling, shipment and storage. Container types, package design, development, research and testing. Economic importance and perspective as an industrial activity. 3 lectures. Prerequisite: CHEM 121, PHYS 104 or PHYS 121.

IT 331 Advanced Industrial Electrical Systems (4)
Industrial applications of electrical power distribution systems, industrial wiring, illumination, motors and controllers. Field trips. 3 lectures, 1 activity. Prerequisite: IT 238, MATH 131.

IT 332 Electronic Control Systems (4)
Automated control devices from an operational and servicing viewpoint. Modular approach to the study of electronic control systems. Field trips. 3 lectures, 1 laboratory. Prerequisite: PHYS 122, IT 238.

IT 333 Electronic Computer Applications (4)
Fundamentals of analog and digital computers and numerical control machines. Number systems, logical and sequential circuits and devices, basic and A.P.T. languages. Computer aided design and manufacturing. Word processing, simulation, documentation, personal computers and process control. 3 lectures, 1 laboratory. Prerequisite: IT 101, or consent of instructor.

IT 334 Materials Handling and Packaging (3)
Technical interrelationships between materials handling and packaging. Design, materials, quality control, packaging and product manufacturing. Storage, transportation and marketing. 2 lectures, 1 activity. Prerequisite: IT 330 or consent of instructor.
IT 350  Quality Systems Applications (3)
Philosophy and principles of quality system administration. Relationship to total systems program administration; impact on management information and data requirements. Quality system administration techniques applied to control performance, cost and schedule data, traceability, and retrievability. 3 lectures. Prerequisite: IT 305.

IT 354  Industrial Machine Tool Service Systems (3)
Theory and practice in normal service or repair to common technological systems. Equipment maintenance, testing and repair of mechanical, electrical, pneumatic, hydraulic and other systems. Maintenance includes lubrication systems, sharpening, precision measurement and maintenance scheduling. 1 lecture, 2 activities. Prerequisite: IT 125, IT 250, IT 327.

IT 355  Cabinetmaking (3)
Examination of modern materials and construction techniques as related to cabinetmaking. Fieldwork in comprehensive projects stressing decision making and design solutions to the problems of cabinetmaking. Team projects with emphasis on job organization, scheduling and construction. 1 lecture, 2 activities. Prerequisite: IT 125.

IT 356  Building Construction (3)
Examination of modern materials and methods of construction as related to residential construction. Team fieldwork on actual construction projects, including decision making and design solutions, job organization, scheduling, bidding procedures and building codes. 1 lecture, 2 laboratories. Prerequisite: IT 125.

IT 400  Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of instructor.

IT 404  Customer Relations (3)
Customer contacts. Personal relationships, ethics, legal relationships. Service contracts, communication channels. 3 lectures. Prerequisite: MKTG 301 or equivalent, or consent of instructor.

IT 405  Industrial Marketing (3)
Investigation of the institutions and channels involved in industrial marketing. Analysis of industrial products, competitors, and consumers. Problems in marketing research, personnel, and management. Individual reports on industrial products, companies or training programs. 3 lectures. Prerequisite: MKTG 301 or equivalent, or consent of instructor.

IT 406  Industrial Management and Supervision (3)
Application of cost control techniques, CIM, and processes for the industrial manager. Techniques and procedures of cost reduction. Investigate methods of reducing waste and inefficiency in business and industry considering labor processes, products, materials and systems. 3 lectures. Prerequisite: IT 101.

IT 407  Industrial Product Development (3)
Organization for new industrial product development, linking marketing, operations and technology functions. Sources and screening of new product ideas, sizing and evaluation of market prospects. Budgeting, pricing, timing, advertising and distribution factors as they relate to new industrial products. Internal coordination during product development phases. 3 lectures. Prerequisite: IT 404, IT 405 or consent of instructor.

IT 408  Protective Packaging (3)
Principles of protective packaging development. Packaging of different classes of products. Materials and test methods for cushioning, blocking, barriers, packing. Development of cushion design, problem solving. Analysis of package configurations, closing features, locking devices and labels. Examination of permeability of materials to gases, vapors and liquids, considerations of biological protection of packages and packaging materials. 2 lectures, 1 laboratory. Prerequisite: IT 330, PHYS 121, CHEM 121, or consent of instructor.
IT 409 Machinery For Packaging (3)
Analysis of major types of packaging machinery from a practical, operational and marketing viewpoint. Basic processes utilizing packaging machinery. Specialized operations, contract specifications, selection, operation and maintenance. Required field trips to packaging operations. 2 lectures, 1 laboratory. Prerequisite: IT 330, PHYS 104 or PHYS 121, or consent of instructor.

IT 410 Drafting: Industrial Education (2)
Teaching applications of drafting principles, home planning, sketching, rendering and industrial working drawings. For high school industrial arts drafting teachers. Field trips to industrial drafting offices. 2 activities. Prerequisite: IT 235 or consent of instructor.

IT 412 Industrial Illustration (3)
Fundamental theories and techniques involved in the preparation of industrial technical illustrations and industrial drawings and photographs for duplication processes and presentation purposes. Experiences in delineation, use of pastels, brush and air brush. Miscellaneous course fee required—see Class Schedule. 3 activities. Prerequisite: IT 245 or consent of instructor.

IT 418 Technical Management Problems (4)
Familiarization with production and operational management including organizational positions of key personnel in corporate and technical management structure. Use of decision-making aids; solution and analysis of problems including use of computer programs and applications of CIM. 3 lectures, 1 activity. Prerequisite: Senior standing, GEB F.1. computer literacy.

IT 419 Industrial Internship (2-6) (CR/NC)
Part-time industrial experience or early field experience in an approved school, with or without pay. Conducted under company or school personnel supervision, and University faculty supervision. Guided observations related to technical management or education. Report of experiences required at end of quarter. 30 hours work experience per unit of credit. Credit/No Credit grading only. Prerequisite: Consent of instructor.

IT 420 Industrial Curriculum Management (3)
Developing and managing curriculum for an industrial learning setting. Assessing resources. Developing a philosophy, sequencing objectives, and properly using materials in training, evaluating and reporting effectiveness. Managing people within this process in an industrial setting. 3 lectures. Prerequisite: Junior standing.

IT 424 Curriculum and Methods of Industrial and Technical Education (3)
Industrial and technical education curriculum and instructional processes. Organization, selection, presentation, application, interpretation and evaluation for teaching automotives, drafting, electronics, graphic arts, metals, plastics, power mechanics, woodworking. Preparation for student teaching. Field trips. 2 lectures, 1 activity. Prerequisite: Senior standing.

IT 425 Automotive Technology, Fuel Systems (3)
Fuel systems and fuels used in internal combustion engines. Fuel injection, computer controlled systems, turbo-chargers, manifolds, pumps, and storage tanks. Emission control systems. Types of fuels and their compounding. 2 lectures, 1 laboratory. Prerequisite: IT 250.

IT 427 Automotive Technology, Electricity and Electronics (3)
Applications of electronics and electrical systems in automotive type equipment including computer controls, ignition, lighting, starting, charging, and auxiliary systems. 2 lectures, 1 laboratory. Prerequisite: IT 250.

IT 431, 432 Mechanical Systems (3) (3)
Application of laws of physics and thermodynamics to various systems. Engines, pumps, heat exchange, piping, hydraulics, pneumatics, refrigeration, air conditioning, nuclear energy. 3 lectures, Prerequisite: MATH 131, PHYS 122, IT 322.

IT 433 Production and Process Management (3)
Production equipment and systems, measurement, tooling and finishes. Production management and computer applications in management of production and processes (CIM). Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: IT 101.
IT 435 Package Development Management (3)
Managing the development of industrial and consumer goods packaging from concept to market place. Interplay of marketing, economic, technical, production and distribution considerations in developing a package. Organizing the package function for best results. Case studies of package and product successes and failures. Class project for analysis and solution. 3 lectures. Prerequisite: IT 330, IT 408, IT 409.

IT 437 Reinforced Plastics (3)
Mold preparation and production of reinforced plastic products. Standard specifications for reinforced materials and resin systems. 1 lecture, 2 laboratories. Prerequisite: Junior standing.

IT 438 Plastics Mold Construction (3)
Properties and characteristics of thermosetting and thermoplastic materials. CAD/CAM tool production and simulation. Analysis and construction of molds and dies for use with reinforced plastics, injection molding, thermoforming processes. Extrusion, compression and transfer molding and polymer castings. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories. Prerequisite: Junior standing.

IT 443 General Metals (3)
Theory and application of various metal processes. Problem solving in joining, casting, machining and forming as applied in industrial education and industrial fabrication. Maintenance of metalworking equipment, application and techniques of CIM. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 activities. Prerequisite: IT 233.

IT 444 Technical Drawing: Industrial Education (3)
Application of current drafting procedures in preparing complete graphic descriptions of industrial components. Sketching, lettering, instrument drawing. Preparation of work drawings and specifications. Analysis of drafting materials, equipment and processes. 1 lecture, 2 activities, Prerequisite: IT 235, IT 245, or consent of instructor.

IT 451 Industrial Equipment and Systems (4)
Major mechanical equipment and systems making up the utility and production support systems of a modern industrial facility. Field trips to industrial facilities. 3 lectures, 1 activity. Prerequisite: IT 431.

IT 452 Industrial Power and Lighting (3)
Major power systems in a modern industrial plant, including electrical distribution systems and industrial and commercial illumination. Planning and budgeting of industrial power and lighting systems. 3 lectures. Prerequisite: IT 331, IT 451.

IT 453 Plant Maintenance Management (4)
Maintenance function. Maintenance repair, and operations of industrial plant facilities including utility and mechanical systems, preventive maintenance, job control systems, CIM, work estimating, budgeting, other essential services. Field trips to industrial facilities. 3 lectures, 1 activity. Prerequisite: IT 451.

IT 454 Plant Facilities Management (3)
Management of the modern industrial facility, including capital and operating budgeting, forecasting, organization. 3 lectures. Prerequisite: IT 452, IT 453, ECON 201.

IT 461 Senior Project (3)
Selection and completion of a project under faculty supervision. Projects are typical of problems graduates must solve in their field of employment. Project results are presented in a formal report and must be completed during one quarter. Minimum 90 hours total time. Prerequisite: Consent of instructor.

IT 463 Industrial Technology Seminar (2)
Functions, philosophies and current trends of industry, including CAD, CAM and CIM. Content will be presented using such methods as lectures, guest lecturers, panel discussions and debates. 2 seminars. Prerequisite: Senior standing.
IT 470 Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

IT 471 Selected Advanced Activity (1–3)
Directed group study for advanced undergraduate and graduate students. Class Schedule will list topic selected. May be required with IT 470. Total credit limited to 6 units. 1 to 3 activities. Prerequisite: Consent of department head or graduate adviser and supervising faculty member.

IT 500 Individual Study (1–6)
Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Maximum of 6 units may be applied to degree requirements. Prerequisite: Consent of department head or graduate adviser and supervising faculty member.

IT 505 Graduate Seminar (3)
Organize, build, and conduct experimental projects using research techniques. Physical problem solving initiated through research by the student. Prerequisite: Graduate standing.

IT 515 History and Philosophy of Industrial Education (3)
Development of industrial education from its initial conception to the present time. Current philosophical concepts of the field. 3 seminars. Prerequisite: Graduate standing.

IT 520 Organization and Administration of Industrial and Technical Studies (3)
Current factors in the administration and organization of industrial and educational environments. 3 seminars. Prerequisite: Graduate standing.

IT 521 Curriculum in Industrial and Technical Studies (3)
Basic principles and practices in the preparation of course guides, courses of instruction and related materials for industrial instruction. 3 seminars. Prerequisite: Graduate standing.

IT 522 Facility Planning (3)
Analysis of major factors in planning and designing industrial and educational facilities. 3 seminars. Prerequisite: Graduate standing.

IT 527 Technical Trends and Issues (3)
Current and innovative practices in technology. Social impact, changing values and tradition. 3 seminars. Prerequisite: Graduate standing.

IT 580 Graduate Research in Industrial and Technical Studies (3)
Advanced study and analysis of selected topics and problems in industrial and technical studies. 3 seminars. Prerequisite: Graduate standing.

IT 599 Industrial and Technical Studies Thesis or Project (5)
Each student will propose, develop and complete a thesis or project involving individual research that is significant to the field of industrial and technical studies. Prerequisite: Acceptable academic standing in the master’s degree program in Industrial and Technical Education and consent of instructor.

ITAL–ITALIAN
ITAL 101, 102, 103 Elementary Italian (4) (4) (4)
Italian for beginners. Class practice in pronunciation, sentence structure, reading, writing, and basic conversation. Laboratory drill required. Language taught in its cultural context. To be taken in numerical sequence. 3 lectures, 1 activity.

JOUR–JOURNALISM
JOUR 201 Journalism History (3)
Survey of historical influences in the development of today’s journalism. 3 lectures.
JOUR 203 Reporting I (4)
Introduction to the techniques of reporting and writing news for the news media. Intensive laboratory and field practice in gathering and evaluating information. Writing basic news stories under close supervision. 3 lectures, 1 laboratory. Prerequisite: ENGL 114 and typing proficiency.

JOUR 205 Agricultural Communications (3)
Survey of the media of agricultural communication. Newspaper farm pages and sections, general and specialized agricultural magazines. Radio and TV farm broadcasts. Public and private agencies involved in agricultural communication. 3 lectures.

JOUR 218 Mass Media in Society (4)
Traditional mass media and the emerging technologies, their methods, functions and dysfunctions. Responsibilities of journalists. Importance of media in society. 4 lectures.

JOUR 233 Copy Editing (4)
Introduction to the techniques of newspaper and magazine copy desk work. Rewriting, editing, and writing headlines for news and feature copy. Selecting, cropping, and writing cutlines for photographs and line art. Practical laboratory experience in editing. 3 lectures, 1 laboratory. Prerequisite: JOUR 203 or equivalent.

JOUR 302 Mass Media Law (4)
Legal basis for freedom of expression. Court decisions resolving conflicts between First Amendment and right to fair trial, privacy, reputation. Source confidentiality, freedom of information, contempt, copyright. Federal and state laws and regulations affecting mass media reporters, editors, publishers. 4 lectures. Prerequisite: JOUR 203.

JOUR 304 Reporting II (4)
Intermediate experience in reporting and writing news and short feature stories for the news media. Intensive field and laboratory experience in interviewing, beat reporting, covering speeches and meetings and using library and other information sources. 3 lectures, 1 laboratory. Prerequisite: JOUR 203 and JOUR 233.

JOUR 312 Introduction to Public Relations (4)
Growth and development of public relations as a practice in business and industry, government, volunteer agencies and other public institutions. Communications and activities utilized to gain public interest and support. 4 lectures. Prerequisite: Sophomore standing.

JOUR 323 Photojournalism (3)
Application of photographic techniques to journalism. Use of lighting, particularly electronic flash. Use of 35mm camera and other cameras in journalism. Introduction to the principles of news photography for television. Application of darkroom techniques suitable for news media deadline requirements. Projects using still cameras and black and white and color film. Integration of photographic and writing skills. 2 lectures, 1 laboratory. Prerequisite: JOUR 203, ART 221.

JOUR 331 Advertising (3)
Principles of advertising, advertising psychology, salesmanship, copy, layout, and production for print and broadcast media. 3 lectures.

JOUR 333 Broadcast News I (4)
Beginning broadcast news writing, reporting and editing emphasis on radio. Gathering and producing audio and video materials for news and public affairs programming. Newsroom and studio equipment operation and procedures. 3 lectures, 1 laboratory. Prerequisite: JOUR 203 and JOUR 233.

JOUR 342 Public Relations Media (4)
Application of public relations techniques with emphasis on writing for media and working with media editors. Preparing news releases, newsletters and other communications. Analysis of the use of broadcast media. Utilization of case studies. 4 lectures. Prerequisite: JOUR 203 and JOUR 312 or consent of instructor.
JOUR 346 Broadcast Announcing (4)
Radio and television announcing of news, public affairs, sports, special events, commentary, features, commercials, and talk and discussion. 3 lectures, 1 laboratory. Prerequisite: JOUR 333, SPC 201 or SPC 202.

JOUR 351 Broadcast Practice (3)
Practicum for students holding broadcast news positions on radio station KCPR, or other similar supervised experience as determined by the department. Total credit limited to 6 units. 1 lecture, 2 laboratories. Prerequisite: JOUR 233 and JOUR 304 or consent of instructor.

JOUR 352 Reporting Practice (3)
Practicum for students holding editorial or photographic positions on Mustang Daily or other similar supervised experience as determined by the department. Total credit limited to 6 units. 1 lecture, 2 laboratories. Prerequisite: JOUR 233 and JOUR 304.

JOUR 353 Mass Media Criticism (4) (Also listed as ENGL 385 and SPC 385)
Examines mass media (especially broadcasting) from a rhetorical/critical perspective. Aims to expand students' understanding of media issues, media's role as critic, and the role of criticism. 4 lectures. Prerequisite: SPC 201 or SPC 202.

JOUR 400 Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of instructor.

JOUR 401 International Communication (4)
Global communications facilities and operations; world transmission of information; survey of world wire services and international print and electronic media. Analysis of press operations under varying government ideologies, including third world countries. 4 seminars. Prerequisite: Junior standing.

JOUR 402 Social Responsibility of Mass Media (4)
Current issues revolving around the social responsibility of the mass media. Role of the public, government, and media in considerations of media accountability. Professional behavior in media organizations. 4 seminars. Prerequisite: Senior standing, JOUR 218.

JOUR 403 Reporting III (4)
Advanced experience in specialized public affairs reporting and writing of investigative and interpretative stories for the news media. Frequent field assignments, with focus on municipal, county, state and federal government affairs. 3 lectures, 1 laboratory. Prerequisite: JOUR 304.

JOUR 404 Feature Writing (3)
Practice in researching, interviewing, and data gathering for nonfiction newspaper and magazine articles. Analysis of articles printed in current publications. 3 lectures. Prerequisite: JOUR 203 or consent of instructor.

JOUR 405 Advanced Public Relations (4)
Methods employed in dissemination of public information by organizations, institutions and governments. Interaction of media and PR practitioners, case histories, formation and measurement of public opinion. Public opinion survey projects. 4 lectures. Prerequisite: JOUR 203, JOUR 312, JOUR 351 or consent of instructor.

JOUR 406 Advertising Layout and Copywriting (2)
Advertising typography and illustration, application of production processes in making of layouts and writing of copy. 1 lecture, 1 activity. Prerequisite: JOUR 331 or consent of instructor.

JOUR 407 Broadcast News II (4)
Intermediate broadcast news writing, reporting, editing and producing television news and public affairs programming. Electronic news gathering techniques. Television studio and control room equipment and procedures. Discussion and evaluation of electronic news organizations and policies. 3 lectures, 1 laboratory. Prerequisite: JOUR 333 and ART 221 or consent of instructor.
JOUR 434 Advanced Editing (4)
Advanced experience in rewriting and editing news and feature stories, designing and laying out pages for the print media. Experience in writing simple editorials and opinion columns. 3 lectures, 1 laboratory. Prerequisite: JOUR 233, JOUR 304.

JOUR 444 Media Internship (4)
Application of techniques on daily basis with media under supervision of department faculty. Prerequisite: Junior standing in Journalism.

JOUR 460 Senior Project (3)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 90 hours total time.

JOUR 470 Selected Advanced Topics (2-4)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 2-4 lectures. Prerequisite: Consent of instructor.

LA–LANDSCAPE ARCHITECTURE

LA 110 Graphic Communication for Landscape Architects (3)
Communication through descriptive drawing and professional plan graphics, including theories of perspective. 3 laboratories.

LA 111 Three Dimensional Graphics for Landscape Architects (3)
Elements of three dimensional perception/visualization with emphasis on freehand and mechanical perspective drawing methods. 3 laboratories. Prerequisite: LA 110 or consent of instructor.

LA 112 Graphic Communication Techniques for Landscape Architects II (3)
Exploration of two and three dimensional graphic techniques including presentation and rendering methods. Miscellaneous course fee required—see Class Schedule. 3 laboratories. Prerequisite: LA 111 or equivalent.

LA 152 Fundamentals of Design and Planning in Landscape Architecture (4)
Exploration of design and planning projects on different scales and in different environmental settings: site, community, city, region. Introduction to the principles of environmental design including basic design elements and composition. Contextual understanding of landscape architecture and other environmental design disciplines. Identification of natural and cultural elements in the environment. 4 laboratories. Prerequisite: LA 110.

LA 153 Fundamentals of Design and Planning in Landscape Architecture (3)
Exploration of landscape architectural design and planning projects in various scaled environmental settings including site, neighborhood, urban, regional. Contextual relationships of natural and cultural elements in the environment and the landscape architect’s role in environmental design. Basic principles of design, composition, design process and the creation of spatial settings for human use. Miscellaneous course fee required—see Class Schedule. 3 laboratories. Prerequisite: LA 152.

LA 201 Survey of Landscape Architecture (2) GEB F.2.
Survey of the profession of landscape architecture from small space design to regional planning. Relationships between landscape architecture and society and professionals in related fields. 2 lectures.

LA 202 Fundamentals of Design and Planning in Landscape Architecture (3)
Elements of environmental and visual perception including three dimensional site planning and design principles. Spatial design and sequencing of spaces with concern for human behavior and social implications. Behavioral, environmental and natural site factors for program concept and design development. Design process and development of verbal and graphic communication skills. Miscellaneous course fee required—see Class Schedule. 3 laboratories. Prerequisite: LA 152 and LA 153.
LA 203 Applied Design and Planning Fundamentals (3) (Also listed as CRP 203)
Focus on the application of basic design fundamentals and design of environments through a series of design exercises. 3 laboratories. Prerequisite: LA 202.

LA 213 Site and Terrain Analysis (3-4)
Introduction and application of selected inventory and analysis techniques through interpretation, reading and evaluation of land and terrain descriptions including maps, air photos, soil survey, hydrologic studies, contour and landform models. Projects range in size and scope from limited sites to regional areas. 2 lectures, 1–2 laboratories.

LA 214 Landscape Analysis and Planning (4)
Research and analysis techniques of primary natural components of a landscape. Contour maps, aerial photographs, soil reports, climate and hydrologic studies, vegetation surveys, visual and sensory assessments, program analysis, suitability/sensitivity analyses, and ethics. Mapping, case study reviews, individual and team field studies, research and project analysis and land use planning. Miscellaneous course fee required—see Class Schedule. 4 laboratories. Prerequisite: LA 153, SS 121.

LA 231 Landscape Architecture Construction I (3)

LA 240 Additional Landscape Architecture Laboratory (1–3)
Total credit limited to 6 units, with a maximum of 3 units per quarter. 1–3 laboratories.

LA 247 Landscape Plant Composition (3)
Plant characteristics and ecological conditions as constraints and opportunities for the landscape architect. Investigation of plant material forms and composition for design effect. Miscellaneous course fee required—see Class Schedule. 3 laboratories. Prerequisite: LA 214, BOT 238. Concurrent: LA 202.

LA 300 Internship (3) (CR/NC)
Involvement in a work setting related to landscape architecture. Thirty hours work experience per unit of credit. Credit/No Credit grading only. Prerequisite: Third year standing.

LA 310 Introduction to Computing in Planning and Design (2)
Introduction to computing for planning and design students. Familiarization with micro and mainframe computer hardware currently being utilized by the profession and programming concepts germane to application programs used in the Department of Landscape Architecture. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 laboratory. Prerequisite: CSC 110 and second year standing or consent of instructor.

LA 311 History of Landscape Architecture (3) GEB F.2.
Historical evaluation of man's interaction with outdoor space. Analysis of influences that direct, perpetuate, and form the landscape. 3 lectures.

LA 313 Architectural Design for Landscape Architects (3)
Exposure to architectural design concepts and theories with attention given to historical and contemporary case studies. Discussions and field trips emphasize architectural implications of materials and methods of construction. 2 seminars, 1 activity. Prerequisite: Third-year standing.

LA 314 Site Planning (3)
Identifies the elements of a site and influences methods and examples of site planning for environmental design projects. Emphasis on interdisciplinary nature of site planning. Regulatory and technical requirements. Creation and evaluation of prototypical site planning projects. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: Upper division standing in ARCH, LA, CRP or related discipline.
LA 318 GIS Application of Natural Resource Information (2) (Also listed as FOR 318 and NRM 318)
ARC/INFO Geographic Information System (GIS) computer software to explore relevant environmental issues utilizing natural resources data such as vegetation, soils, habitats, topography and geology. Development of data base, use of software for application to relevant, natural systems. Miscellaneous course fee required—see Class Schedule. 2 laboratories. Prerequisite: CSC 110 or consent of instructor.

LA 321 Concepts in Environmental Decision Making (3) GEB F.2.
Investigation of theoretical and attitudinal bases of environmentally concerned disciplines. Ecology, perception, behavior and design studies as organizational principles and theories in developing understanding of interface between built and natural environments. 3 lectures.

LA 323 History of Twentieth Century Landscape Architecture (3)
Work, philosophies and design theory of important personalities in the environmental design disciplines of the twentieth century. 3 lectures. Prerequisite: At least one course in either architecture, landscape architecture or planning history.

LA 341 Landscape Architecture Construction II (3)
Application of formulas, principles, and criteria in the development of methods for solving problems of grading and drainage and developing skills for landform manipulation. Miscellaneous course fee required—see Class Schedule. 3 laboratories. Prerequisite: LA 231. Concurrent: LA 203.

LA 342 Landscape Architecture Construction III (3)
Information and application of materials, connections, and details for landscape architecture construction. Miscellaneous course fee required—see Class Schedule. 3 laboratories. Prerequisite: LA 341, ARCE 311. Concurrent: LA 352.

LA 343 Landscape Architecture Construction IV (3)
Development of landscape architecture construction working drawings for the testing, refinement, and implementation of site design. Miscellaneous course fee required—see Class Schedule. 3 laboratories. Prerequisite: LA 342. Concurrent: LA 353.

LA 348 Advanced Landscape Plant Composition (3)
Preparation of landscape planting contract documents. Emphasis on understanding installation, maintenance, and irrigation of planted areas as related to design and composition. Miscellaneous course fee required—see Class Schedule. 3 laboratories. Prerequisite: LA 247, LA 341, LA 351, AE 337, OH 237, OH 238.

LA 351, 352 Design for Landscape Architects (4) (4)
Process oriented site designs with emphasis on spatial design site analysis, landform, plantform, builtform, circulation, detail design and graphic communication. Miscellaneous course fee required—see Class Schedule. 4 laboratories. Prerequisite for LA 351: LA 203. For LA 352: LA 351. Concurrent for LA 352: LA 342.

LA 353 Design for Landscape Architects (4)
Completion of design project, selected by instructor, of sufficient scale and complexity to encompass most fundamental design and technical decisions common to landscape architectural construction projects. Conceptual, design development, and working drawings prepared as a complete set. Miscellaneous course fee required—see Class Schedule. 4 laboratories. Prerequisite: LA 348, LA 352. Concurrent: LA 343.

LA 363 Recreation and Open Space Planning and Design (3)
Planning and design methods for meeting leisure requirements. Issues of recreation and society. Relationship of recreation and open spaces, assessment of needs and supply of resources. 3 lectures. Prerequisite: Must have completed minimum of one 200-level course in planning, design or recreation and third-year standing or consent of instructor.

LA 400 Special Problems for Advanced Undergraduates (1–3)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter.
LA 410  Information Systems for Landscape Architecture (2)
Introduction and hands-on experience with computerized spatial information systems utilized in design and planning. Emphasis on existing computer programs for use on both micro computers and the campus computing facilities. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 laboratory. Prerequisite: CSC 110 and third-year standing or consent of instructor.

LA 411  Regional Landscape History (3)
Developmental history of the landscape in the western region with specific focus on the Basin and Range regions. 3 lectures. Prerequisite: Fourth year standing or consent of instructor.

LA 441  Professional Practice I (2)
Theoretical and practical aspects of professional practice. Addressing professional, human, and business skills. Practice diversity and inter-professional relationships. Professionalism and ethics. Licensure, communication skills, office management and marketing. Construction documentation. 2 lectures. Prerequisite: Fourth year standing, LA 353.

LA 442  Professional Practice II (2)
Practical aspects of professional practice. Addressing methods of contracting professional services. Project management procedures, office practice and conditions. Goal setting, resume and portfolio preparation. Job procurement and licensure requirements. 2 lectures. Prerequisite: Fourth year standing, LA 441.

LA 451  Regional Landscape Assessment (5)
Emphasis in regional landscape assessment and design techniques. Large scale environments. Issues in land use planning and design. Miscellaneous course fee required—see Class Schedule. 5 laboratories. Prerequisite: LA 410, LA 353.

LA 452  Urban Design for Landscape Architects (5)
Emphasis in urban and community design issues related to landscape architecture; scales of investigation and application; community involvement techniques. Miscellaneous course fee required—see Class Schedule. 5 laboratories. Prerequisite: LA 353.

LA 454, LA 455, LA 456  Design for Landscape Architects (4) (4) (4)
Advanced design studio. Emphasis is on complex design problems and special environmental situations or interdisciplinary work and involvement in current design issues. At least one course in the series must be self-directed. 4 laboratories. Prerequisite: Completion of fourth-year design sequence (LA 451, LA 452, LA 461).

LA 461  Senior Design Project (5)
Student selection and completion of approved design or research project sufficient in scale and complexity to encompass issues common to landscape architecture. Time management, documentation, and communication skills emphasized. Miscellaneous course fee required—see Class Schedule. 5 laboratories. Prerequisite: LA 441, LA 451, LA 452, LA 463.

LA 463  Undergraduate Seminar (2) (CR/NC)
Exploration of issues and problems in the environmental design field. Research methods; preparation of a proposal for senior project. Credit/No Credit grading. 2 seminars. Prerequisite: Fourth-year standing.

LA 470  Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1-3 lectures. Prerequisite: Consent of instructor.

LA 471  Selected Advanced Laboratory (1-3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Consent of instructor.
LA 481 Visual Resource Management Methods (3)
Investigation and application of the major visual resource management methods relevant to landscape architecture. Theoretical basis for visual resource assessment, the different assessment techniques, and the process of translating assessment results into visual resource management techniques. 2 lectures, 1 laboratory. Prerequisite: Fourth year or graduate standing.

LA 482 Evaluating Social and Behavioral Factors for Open Space Design (3)
User oriented approach to open space design. Interview and survey techniques, behavioral trace mapping and systematic observation, post occupancy evaluation and similar methods are used to generate user input and feedback in the design process. Understanding the behavioral implications of designed environments. 2 lectures, 1 laboratory. Prerequisite: Fourth-year or graduate standing or consent of instructor.

LA 483 Special Studies in Landscape Architecture (1-12)
Special issues and problems through research, field trips, seminars and other forms of investigation and involvement. Course requirements are determined prior to each individual project through a contractual agreement between students and department. Departmental Off Campus Study Program guidelines apply. 1-12 seminars. Prerequisite: Fourth or fifth year standing.

LA 551 Regional Landscape Assessment I (4)
Definition, research and filing of data covering the biological, cultural and physical resources of a specific region. Concepts of regionalism, land planning, reclamation and preservation are integral to the course. Utilization of mainframe and microcomputer facilities and software. 4 laboratories. Prerequisite: LA 410, LA 411, graduate standing or consent of instructor.

LA 552 Regional Landscape Assessment II (4)
Application of data manipulation techniques in order to model both impacts on natural systems and land development potentials. Use of planning strategies to predict outcomes resulting from the land use decision process. Utilization of mainframe and microcomputer facilities and software. 4 laboratories. Prerequisite: LA 551 and graduate standing.

LIB—LIBRARY

LIB 101 Library Instruction (1)
Instruction and practice in the use of the on-line catalog, reference books, periodical indexes, government documents, and other library materials. Development of student independence and initiative in using the library as a source of information. 1 lecture.

LIB 301 Library Resources in Biology and Agriculture (1)
Sources of information pertaining to biology and agriculture and closely related disciplines. Use of abstracts and indexes for journal articles, reviews, proceedings, dissertations, and government documents. Bibliographic database searching. Search strategy, reference books introduced, bibliographic techniques. 1 lecture. Prerequisite: Junior standing or consent of instructor.

LIB 302 Library Resources and Literature Searches (1)
Sources of information in major subject fields. Reference materials, bibliographic aids, indexing and abstracting tools, periodicals, serials, and other sources. Techniques used in literature searches and preparation of bibliographies. Class Schedule will list major subject area covered. Total credit limited to 3 units. 1 lecture. Prerequisite: Junior standing or consent of instructor.

LIB 303 Library Computer Searching (1)
Instruction and practice in use of computerized information retrieval systems including CD-ROM, local and remote on-line catalogs, and vendor services. Emphasis on efficient searching skills utilizing controlled and/or keyword searching, limiters, Boolean logic, and truncation. 1 lecture.

LS—LIBERAL STUDIES

LS 101 Orientation to Liberal Studies (1) (CR/NC)
Exploration of the Liberal Studies Program as preparation for the Multiple Subjects Credential and for alternate career objectives. To be taken during the first quarter in attendance at Cal Poly as a Liberal Studies major. Credit/No Credit grading only. 1 lecture.
LS 461, LS 462 Senior Project (3) (3)
Selection and completion of a project or report under faculty supervision. Topic must be chosen with departmental approval. Results must be presented in a formal, written report. Prerequisite: Senior standing and consent of Liberal Studies Coordinator.

MATH–MATHEMATICS

Satisfactory completion of the Entry Level Mathematics (ELM) requirement is a prerequisite for enrollment in all mathematics courses.

MATH 102 Agricultural Mathematics (3) (CR/NC)
Percentage problems in soils, dairy, horticulture, poultry, feeds, discount and interest, Pearson’s square, equations, formulas, dimensional analysis, linear measurements, areas, volumes and proportions. Concrete and lumber problems. Not for baccalaureate credit. Credit/No Credit grading only. 3 lectures.

MATH 103 Agricultural Mathematics (3) (CR/NC)
Use of exponents, logarithms and trigonometric functions. Basic land descriptions and measurement. Mathematics of finance. Basic statistics. Work, horsepower and efficiency, pressure. Not for baccalaureate credit. Credit/No Credit grading only. 3 lectures. Prerequisite: Two years of high school algebra or equivalent.

MATH 104 Intermediate Algebra (3) (CR/NC)
Review of basic algebra skills at the intermediate algebra level. Not for baccalaureate credit. Credit/No Credit grading only. 3 lectures. Prerequisite: Two years high school algebra and successful completion of ELM requirement.

MATH 105 Hand-Held Calculators (1)
Operation of multi-function programmable calculators including all operations and memory and stack registers. Applications of the calculator to problems in mathematics and engineering. 1 lecture.

MATH 112 The Nature of Modern Mathematics (3) GEB B.2.
Contemporary mathematics and the relationship between mathematics and our cultural heritage. Intended to develop an appreciation for the role that mathematics plays in society, both past and present. 3 lectures. Prerequisite: ELM Requirement, passing score on Mathematics Placement Examination and 3 years high school math, including 2 years high school algebra, or equivalent.

1 MATH 116, 117 Pre-Calculus Algebra I, II (3) (3)
117: GEB B.2.
Precalculus college algebra without trigonometry. Topics in algebra and coordinate geometry. Functions and applications, polynomial and rational functions, exponential and logarithmic functions, systems of equations and analytic geometry. Additional topics. MATH 116 and MATH 117 are equivalent to MATH 118. Not open to students with credit in MATH 118 or MATH 120. 3 lectures. Prerequisite for MATH 116: ELM requirement, passing score on Mathematics Placement Examination and 3 years high school math including 2 years of high school algebra, or equivalent. Prerequisite for MATH 117: MATH 116.

MATH 118 Pre-Calculus Algebra (4) GEB B.2.
Pre-calculus college algebra without trigonometry. Special products and factoring, exponents and radicals, partial fractions. Fractional and quadratic equations, determinants, systems of equations. Graphing, inequalities and absolute value, mathematical induction. Binomial theorem, logarithms, complex numbers. Not open to students with credit in MATH 117 or MATH 120. 4 lectures. Prerequisite: ELM requirement and passing score on Mathematics Placement Examination and 3 years high school math including 2 years high school algebra, or equivalent.

1 Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.
MATH 119 Pre-Calculus Trigonometry (3)  
Rectangular and polar coordinates. Trigonometric functions, fundamental identities. Inverse trigonometric functions and relations. Complex numbers. Not open to students with credit in MATH 120. 3 lectures. Prerequisite: ELM requirement, passing score on Mathematics Placement Examination and MATH 117 or MATH 118, or equivalent.

MATH 120 Pre-Calculus Algebra and Trigonometry (5)  
An integrated review course in college algebra and trigonometry covering function concepts and symbols, rectangular coordinates, trigonometric functions, linear and quadratic functions, inequalities, analysis of trigonometric functions, inverse trigonometric functions, exponential and logarithmic functions, systems of equations and complex numbers. Not open to students with credit in MATH 117, MATH 118, or MATH 119. 5 lectures. Prerequisite: ELM requirement, passing score on Mathematics Placement Examination and 3 years high school math including 2 years high school algebra, and trigonometry, or equivalent.

MATH 124 Finite Mathematics (3)  

1 MATH 131, 132, 133 Technical Calculus (4) (4) (4)  
Functions, their graphs and limits; techniques and applications of differential and integral calculus; introduction to applied differential equations. Designed principally for technology students and others interested in an applied three-quarter calculus sequence. Not open to students with credit in MATH 142, MATH 143, MATH 318 (respectively) or equivalents. 4 lectures. Prerequisite: ELM requirement and passing score on Mathematics Placement Examination, MATH 118 and MATH 119 or equivalent.

1 MATH 141, 142, 143 Calculus I, II, III (4) (4) (4)  
Limits, continuity, differentiation, integration. Techniques of integration, applications to physics, transcendental functions. Infinite sequences and series, vector algebra, curves. 4 lectures. Prerequisite: ELM requirement and passing score on Mathematics Placement Examination, MATH 118 and MATH 119 or equivalent.

MATH 170 Theory of Equations (2)  
Properties of polynomials, rational solutions, partial fractions, complex roots, symmetric functions, numerical solutions. 2 lectures.

MATH 202 Orientation to the Mathematics Major (1) (CR/NC)  
Career opportunities in the field of mathematics, preparing a field of study, and a survey of departmental facilities and procedures related to research, study and graduation. Credit/No Credit grading only. 1 lecture. Prerequisite: Sophomore standing or consent of instructor.

MATH 206 Linear Algebra I (4)  
Matrices, inverses, linear systems, determinants, eigenvalues, eigenvectors, vector spaces, linear transformations, applications. 4 lectures. Prerequisite: MATH 142 or consent of instructor.

MATH 221 Calculus for Business and Economics (4)  
Polynomial calculus for optimization and marginal analysis. Partial derivatives and elementary integration. Not open to students with credit in MATH 143, MATH 133 or equivalent. 4 lectures. Prerequisite: MATH 118 or equivalent.

MATH 222 Mathematical Analysis for Economics and Business (4)  
Multivariate calculus. Lagrange multipliers, linear algebra and determinants. Differential and difference equations. 4 lectures. Prerequisite: MATH 221 or equivalent.

1 Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.
MATH 241 Calculus IV (4)  GEB B.2.
Partial derivatives, multiple integrals, introduction to vector analysis. 4 lectures. Prerequisite: MATH 143.

MATH 242 Differential Equations (4)  GEB B.2.
Ordinary differential equations: introduction with applications in engineering and science; classification of equations and their analytic solutions; study of interrelationships between differential systems, graphs, and physical problems. 4 lectures. Prerequisite: MATH 241.

MATH 248 Methods of Proof in Mathematics (4)  GEB B.2.
Methods of proof (direct, contradiction, conditional, contraposition); valid and invalid arguments. Examples from set theory. Quantified statements and their negations. Functions, indexed sets, set functions. Proofs in number theory, algebra, geometry and analysis. Proof by induction. Equivalence and well-defined operations and functions. The axiomatic method. 4 lectures. Prerequisite: MATH 143 and MATH 170, or consent of instructor.

MATH 300 Microcomputers in Mathematics Education (3)
Examination of existing hardware and software designed for educational uses. Mathematical topics appropriate for computer enhancement. Special methods and techniques for educational uses of computers. Emphasis on activity learning and applications. Computer as a classroom management device. 2 lectures, 1 activity. Prerequisite: MATH 118 and CSC 110 or CSC 410.

MATH 304 Vector Analysis (4)  GEB B.2.

MATH 306 Linear Algebra II (4)  GEB B.2.
Inner product spaces, bilinear and quadratic forms, diagonalization of symmetric operators, applications. 4 lectures. Prerequisite: MATH 206 and MATH 248, or consent of instructor.

Properties of linear discrete-time systems. Theory and application of z-transforms to problems found in electronic, mechanical, and industrial engineering, population dynamics, inventory control and finance. Transfer functions, stability theory, Fourier analysis, and digital filters. Not open to students with credit in EL 328. 4 lectures. Prerequisite: MATH 242.

MATH 317 Topics in Engineering Mathematics (4)  GEB B.2.
Fourier series, Fourier transforms and their properties. Introduction to generalized functions. Introductory probabilistic concepts encountered in data analysis and engineering. 4 lectures. Prerequisite: MATH 242.

MATH 318 Advanced Engineering Mathematics (4)  GEB B.2.
Power series solutions of differential equations and Bessel functions. Fourier series and transform; matrices. 4 lectures. Prerequisite: MATH 242.

MATH 327, 328 Introduction to Modern Mathematics (4)  328: GEB B.2.
Introduction to set theory, logic and proof, number theory, real numbers, geometry and trigonometry, probability and statistics. 4 lectures. Prerequisite: MATH 118.

MATH 329 Mathematical Applications to Elementary Teaching (3)
Mathematical concept development in elementary school mathematics. Emphasis on activity learning and problem solving. Computer applications. 2 lectures, 1 activity. Prerequisite: MATH 328.

MATH 335 Graph Theory (3)
Finite graphs, digraphs, Eulerian and Hamiltonian paths, matrix representation of graphs, connectedness, isomorphism, planarity, matching theory, network flow, trees, applications. 3 lectures. Prerequisite: Junior standing or consent of instructor.

Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.
MATH 336  Combinatorial Mathematics (3)
Selected topics from the field of enumerative combinatorics: permutations, combinations, generating functions, recurrence relations, inclusion and exclusion, Polya theory, block design. 3 lectures. Prerequisite: Junior standing or consent of instructor.

MATH 341  Theory of Numbers (4)
Properties of numbers. Euclid's Algorithm, greatest common divisors, diophantine equations, prime numbers, congruences, number theoretic functions, the quadratic reciprocity laws, primitive roots and indices. 4 lectures. Prerequisite: MATH 248 or consent of instructor.

MATH 370  Putnam Exam Seminar (2)
Directed group study of mathematical problem solving techniques. Open to undergraduate students only. Class members are expected to participate in the annual William Lowell Putnam Mathematical Competition. Course may be repeated up to eight units. 2 seminars. Prerequisite: Consent of instructor.

MATH 371  Math Modeling Seminar (2)
Directed group study of mathematical modeling techniques. Open to undergraduate students only. Class members are expected to participate in the annual Mathematical Competition in Modeling. Total credit limited to 8 units. 2 seminars. Prerequisite: Consent of instructor.

MATH 400  Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

MATH 404  Introduction to Differential Geometry and Topology (4)
Theory of curves and surfaces in space. Topics such as curvature, geodesics, Gauss map, Gauss-Bonnet Theorem, combinatorial topology, point set topology. 4 lectures. Prerequisite: MATH 206 and MATH 304.

MATH 406  Linear Algebra III (4)
Spectral Theorem, Cayley-Hamilton Theorem and minimal polynomial, Jordan and rational canonical forms, applications. 4 lectures. Prerequisite: MATH 306.

MATH 408  Functions of a Complex Variable (4)
Elementary analytic functions and mapping; Cauchy's Integral Theorem; Power series; theory of residues and evaluation of integrals; harmonic functions. 4 lectures. Prerequisite: MATH 242.

MATH 409  Complex Analysis (4)
Further development of analytic function theory. Additional topics in calculus of residues, conformal mapping and the Poisson Integral. 4 lectures. Prerequisite: MATH 408.

MATH 412, 413, 414  Advanced Calculus I, II, III (4) (3) (3)
Introduction to concepts and methods basic to real analysis. Topics such as real number system, continuity, uniform continuity, differentiation, the integral, uniform convergence, partial differentiation, multiple integration, implicit and inverse function theorems. MATH 412, 4 lectures; MATH 413, 414, 3 lectures. Prerequisite: MATH 248.

MATH 417  Introduction to Dynamical Systems (4)
Theory of dynamical systems in one and two dimensions. Topics such as bifurcation theory, chaos, attractors, limit cycles, nonlinear dynamics. 4 lectures. Prerequisite: MATH 242.

MATH 418  Partial Differential Equations (4)

1 Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.
MATH 419 Introduction to History of Mathematics (3)
Evolution of mathematics from earliest to modern times. Contributions of prominent mathematicians. Development of mathematical concepts and techniques. Appropriate for prospective and in-service teachers. 3 lectures. Prerequisite: Junior standing or consent of instructor.

MATH 424 Organizing and Teaching Mathematics (4)
Organization, selection, presentation, application and interpretation of subject matter in mathematics. Introduction to current issues in mathematics education. For students who will be teaching in secondary schools. 4 lectures. Prerequisite: Senior standing or consent of instructor.

1 MATH 431, 432 Mathematical Optimization I, II (3) (3)
Classical optimization. Maximum/minimum of functions, linear and nonlinear optimization problems, duality, constrained optimization. Model building and applications to various fields. 3 lectures. Prerequisite: CSC 219 and MATH 206 or consent of instructor.

MATH 437 Game Theory (3)
Development of the mathematical concepts, techniques, and models used to investigate optimal strategies in competitive situations; games in extensive, normal, and characteristic form. 3 lectures. Prerequisite: MATH 206 or consent of instructor.

MATH 442 Euclidean Geometry (4)
Foundations of Euclidean geometry, finite geometries, congruence, similarities, polygonal regions, circles and spheres. Constructions, mensuration, the parallel postulate. Appropriate for prospective and in-service mathematics teachers. 4 lectures. Prerequisite: MATH 248.

MATH 443 Modern Geometries (4)
Non-Euclidean and projective geometries. Properties of parallels, biangles, Saccheri and Lambert quadrilaterals, angle-sum and area. Limiting curves, hyperbolic trigonometry, duality, perspective, quadrangles, fundamental theorems of projective geometry, conics. 4 lectures. Prerequisite: MATH 442.

MATH 459 Undergraduate Seminar (2)
Written and oral analysis and presentations by students on topics from mathematical modeling. 2 seminars. Prerequisite: MATH 206 and MATH 242.

1 MATH 461, 462 Senior Project (3) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: MATH 459.

MATH 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

1 MATH 481, 482 Modern Algebra I, II (4) (4)
Fundamental algebraic structures and types of algebras, including operations within them and relations among them. Groups, rings and fields. 4 lectures. Prerequisite: MATH 248.

MATH 501, 502 Methods of Applied Mathematics I, II (4) (4)
Introduction to advanced methods of mathematics useful in the analysis of engineering problems. Theory of vector fields, Fourier analysis, Sturm-Liouville theory, functions of a complex variable. Selected topics in asymptotic analysis, special functions, perturbation theory. Not open to students in major or master's degree program in mathematics. 4 lectures. Prerequisite: MATH 318 or equivalent, and graduate standing or consent of instructor. MATH 502: MATH 501.

1 Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.
MATH 505 Foundations of Mathematics (4)
Development of the primitive materials and concepts necessary to an understanding of the axiomatic method dealing with sets and logic. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

MATH 506 Topics in Modern Algebra (4)
Topics selected from group theory, ring theory, unique factorization, group representation, module theory and linear algebra. 4 seminars. Prerequisite: MATH 306 and MATH 482 or equivalent.

MATH 507 Structure of Geometry (4)
Transformations and geometries; affine, topological and analytic. Appropriate for the prospective or in-service teacher. 4 seminars. Prerequisite: Graduate standing or consent of instructor; MATH 442 recommended.

MATH 508 Introduction to Topology (4)
Basic ideas of general topology, metric spaces, homeomorphisms and the separation axioms. 4 seminars. Prerequisite: MATH 412 and graduate standing or consent of instructor.

MATH 510 Survey of Modern Mathematics (4)
Selected topics from the field of modern mathematics. Projective, and synthetic geometry, topology, logic, matrices, vectors. Theory of games, probability, linear and modern algebra and convex sets. Boolean algebras, graph theory, Lattice theory, geometry of complex numbers. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

MATH 512, 513 Partial Differential Equations of Physical Systems (4) (4)
Partial differential equations of first and second order. Laplace's equation, wave equation, diffusion equation and others. Methods for analytical solution. 4 seminars. Prerequisite: MATH 418 and graduate standing or consent of instructor.

MATH 515 Real Analysis (4)
Introduction to Lebesgue measure and integration, convergence theorems, $L_1$ spaces, Radon-Nikodym theorem and Fubini's theorem. 4 seminars. Prerequisite: MATH 413 and MATH 508 or consent of instructor.

MATH 516 Linear Operators (4)
Linear spaces, operator theory and operational calculus. Applications to differential equations, integral equations, transforms and Fourier analysis. 4 seminars. Prerequisite: MATH 515 and graduate standing or consent of instructor.

MATH 518 Advanced Ordinary Differential Equations (4)
Existence, continuation and dependence on parameters of solutions. Linear systems, initial and boundary value problems. Self-adjoint eigenvalue problems. 4 seminars. Prerequisite: MATH 318 and graduate standing or consent of instructor.

MATH 580 Seminar (1-4)
Built around topics in advanced mathematics chosen according to the common interests and needs of the students enrolled. Each seminar will have a subtitle according to the nature of the content. Total credit limited to 12 units. 1-4 seminars. Prerequisite: Graduate standing and consent of instructor.

MATH 596 Thesis (3) (3)
Serious research endeavor devoted to the development, pedagogy or learning of mathematics. Prerequisite: Graduate standing and consent of instructor.

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1 Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.
ME-MECHANICAL ENGINEERING

ME 134 Mechanical Systems (3)
An introduction to analysis, synthesis, and testing of mechanical systems, their components and instruments. 2 lectures, 1 laboratory.

ME 211 Engineering Statics (3)
Analysis of forces on engineering structures in equilibrium. Properties of forces, moments, couples, and resultants. Equilibrium conditions, friction, centroids, area moments of inertia. Introduction to mathematical modeling and problem solving. Vector mathematics where appropriate. 3 lectures. Prerequisite: MATH 241 (or concurrently), PHYS 131.

ME 212 Engineering Dynamics (3)
Analysis of motions of particles and rigid bodies encountered in engineering. Velocity, acceleration, relative motion, work, energy, impulse, and momentum. Further development of mathematical modeling and problem solving. Vector mathematics where appropriate. 3 lectures. Prerequisite: MATH 241, ME 211.

ME 221 Solar Energy (3)
Methods of utilizing solar energy. Energy concepts, collection and storage systems; greenhouse effect. Commercial and residential building applications. Solar power generation and recent technical developments. International achievements in solar energy with emphasis on solar energy application in developing countries for water purification and other life support functions. 3 lectures. Prerequisite: PHYS 121, PHYS 122, PHYS 123 or equivalent.

ME 234 Philosophy of Design (3)
General approach to the meaning of engineering design. Conceptual blocks, creativity, design process, design considerations and elements. Intended for transfer students as a substitution for ME 134. 3 lectures.

ME 236 Thermal Systems (3)
Fundamentals associated with the analysis of thermal systems and the measurement of physical quantities important to thermal systems. Theory and practice of writing lab reports. 2 lectures, 1 laboratory. Prerequisite: CHEM 125, ENGL 114, PHYS 132.

ME 240 Additional Engineering Laboratory (1) (CR/NC)
Special assignments undertaken by students who need or wish to acquire abilities supplementary to their standard pattern of courses. Assignments must be primarily of shop or laboratory nature. Work is done by the student with a minimum of faculty supervision. Credit/No Credit grading only. 1 laboratory. Prerequisite: Consent of department head.

ME 302 Thermodynamics I (3)
Properties and fundamental relations for processes involving substances and the transfer of energy. First and second laws of thermodynamics, irreversibility and availability. 3 lectures. Prerequisite: PHYS 132, ME 212, CSC 251.

ME 303 Thermodynamics II (3)
Power and refrigeration cycles. Ideal gas mixtures, psychrometry, combustion. 3 lectures. Prerequisite: ME 302, CHEM 122 or CHEM 125.

ME 313 Heat Transfer (3)
Basic principles of heat transfer. Conduction, radiation and forced and natural convection. 3 lectures. Prerequisite: ME 302 or CHEM 305, MATH 242, CSC 251.

ME 318 Mechanical Vibrations (4)
Free vibration, damping, transient and steady state response to forced vibrations. Engineering methods, single and multiple degrees of freedom. Experimental studies of the dynamic behavior of structures and machines. Instrumentation methods utilized in field and laboratory. 3 lectures, 1 laboratory. Prerequisite: MATH 318, ME 326, EE 201.
ME 326 Intermediate Dynamics (4)
Continuation of ME 214. Additional analysis of planar motion of rigid bodies with particular attention to the kinematics of mechanisms. Rotating reference frames. Introduction to three dimensional dynamics. 4 lectures. Prerequisite: MATH 242 (or concurrent), ME 212, CSC 251.

ME 328 Introduction to Design (4)
Design of machine parts by stress and deflection. Effects of fluctuating stresses and stress concentration. Design of threaded fasteners, power screws, springs, shafts and other machine parts. Modern industrial design practice using standard components and design layout drawings. 3 lectures, 1 laboratory. Prerequisite: CE 204, CE 205 (or concurrent), ETME 143, MET 306, CSC 251, ME 212.

ME 329 Intermediate Design (4)
Design of mechanical equipment and systems using various machine elements and components such as shafts, gears, bearings, clutches, etc. Decision modeling based on technical and economic feasibility. 3 lectures, 1 laboratory. Prerequisite: ECON 201, ME 318 (or concurrent), ME 326, ME 328.

ME 341, 342 Fluid Mechanics (3) (4)
Fluid statics. Conservation equations of fluid dynamics. Viscous flow, boundary layer concepts, lift and drag, compressible flow, turbomachinery. ME 341: 3 lectures. Prerequisite: ME 212. ME 342: 4 lectures. Prerequisite: ME 341, CSC 251.

ME 343 Thermal Science Laboratory (1)
Heat transfer and thermodynamic experiments covering combined convection and radiation, cooling fin, heat exchanger, polytropic blowdown, steam turbine, and refrigeration system. 1 laboratory. Prerequisite: ME 236, ME 303, ME 313, ME 341.

ME 345 Fluid Mechanics Laboratory (1)
Fluid mechanics experiments in pipe flow, flow measurement, turbomachinery, lift and drag, nozzle flow, and applications of the conservation equations of fluid mechanics. 1 laboratory. Prerequisite: ME 236, ME 342.

ME 350 Thermal Environmental Engineering (4)
An introduction to environmental control including physiological aspects of the thermal environment, moist air properties, heat transmission in buildings, pumps, fans, and fluid distribution systems. 4 lectures. Prerequisite: ME 302.

ME 351 Active Solar System Analysis and Design (4)

ME 400 Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

ME 401 Stress Analysis (4)
Advanced strength of materials: behavior of disks, plates, and shells. Theory of elasticity. Energy methods. 3 lectures, 1 laboratory. Prerequisite: CE 205, CE 206, CSC 251, MATH 318.

ME 410 Experimental Methods in Mechanical Design I (4)
Bonded resistance strain gauges for static and dynamic measurements. Strain, rosettes, bridge circuits, calibration, lead-wire effects, special gauges. Brittle coatings. Theory of photoelasticity with emphasis on birefringent coatings. Applications in mechanical design. 3 lectures, 1 laboratory. Prerequisite: ME 328.

ME 412 Composite Materials Analysis and Design (4)
Behavior of unidirectional fiber composites. Properties of short-fiber composites, and orthotropic lamina. Analysis of laminated composites. Strength and hygrothermal behavior of composite materials. Structural optimization. 3 lectures, 1 laboratory. Prerequisite: AERO 324 or ME 328.
ME 415  Energy Conversion (4)
Engineering aspects of energy source, conversion and storage. Topics selected from fossil fuel systems, nuclear power, thermoelectric systems, thermionic converters, fuel cells, magnetohydrodynamic generators, and geothermal, tidal, wind and ocean temperature energy conversion systems. 4 lectures. Prerequisite: ME 302.

ME 416  Ground Vehicle Dynamics and Design (4)
Design of ground vehicles for directional stability and control. Tire mechanics and their effects on vehicle performance. Simulation of vehicle dynamics using digital computer. Synthesis of steering mechanism and suspension system. 3 lectures, 1 laboratory. Prerequisite: ME 318, ME 326, ME 328.

ME 420  Kinematics Analysis and Design (3)
Kinematic and kinetic analysis and design of two and three dimensional mechanisms including open chain types. Analysis techniques include Tensor methods, application of Newtonian and Lagrangian dynamics. Approximate techniques and utilization of large scale commercial mechanism analysis programs. 3 lectures. Prerequisite: ME 318.

ME 422  Mechanical Control Systems (4)
Modeling and analysis of mechanical control systems. Design of mechanical, hydraulic and fluid systems using block diagrams, root locus, Bode diagrams, and the digital computer. 3 lectures, 1 laboratory. Prerequisite: ME 318.

ME 423  Robotics: Fundamentals and Applications (4)

ME 424, 425  Design of Piping Systems (4) (4)
Functions, requirements, and design of piping systems, including safety and economic considerations for power, chemical, and process plants. Welding and other forms of joint construction, materials specifications, sizing, layout, flexibility, support, insulation, and cost estimation of water, steam, air, gas, and corrosive and viscous fluid systems. Philosophy, background, and requirements of principal governing National Codes. 3 lectures, 1 laboratory. Prerequisite: CE 205, CE 206, ME 342, CSC 251.

ME 428  Design (4)
Component and system design from global integration point of view of various design parameters, using real life problems. Techniques of brainstorming, decision making, PERT, feasibility studies. Industrial participation design program. Subsystem design involving gears, bearings, etc. 2 lectures, 2 laboratories. Prerequisite: ME 329, CSC 251.

ME 431  Mechanical Design Techniques (4)
Comprehensive study of various design methods and techniques. Techniques used to explore various structural concepts such as prestressing, shaping, sizing, etc. Simulation of systems using digital computer. Design criteria identification of design parameters and constraints. 3 lectures, 1 laboratory. Prerequisite: ME 318, ME 329.

ME 432  Petroleum Reservoir Engineering (4)
Types of reservoirs and reservoir rocks. Measurement and interpretation of physical properties of reservoir rocks and fluids porosity, permeability, compressibility, electrical resistivity, fluid saturation, viscosity, solution gas. Introduction to flow in porous media, reserve calculations and computer applications. 3 lectures, 1 laboratory. Prerequisite: ME 318, ME 329.

ME 434  Enhanced Oil Recovery (4)
Primary, secondary, and tertiary (enhanced) oil recovery methods. Waterflooding, gas injection, steam injection, in-situ combustion, chemical flooding, miscible flooding. Performance calculations and computer applications in EOR. 4 lectures. Prerequisite: ME 313, ME 342.

ME 435  Drilling Engineering (4)
Theory and practice of oilwell planning, drilling, well logging, and completion applied to the development of new oil production. Planning and operation of offshore deep water drilling systems. 4 lectures. Prerequisite: ME 329, ME 342.
ME 436 Petroleum Production Surface Operation (4)
Design, operation and maintenance of surface equipment required in oil production. Processes and systems involved are well pumping, acidizing, hydraulic fracturing, fluid gathering and storage, separation of oil, gas, water and sediment from produced fluid. Includes equipment used in processes of water flood, steam stimulation and in-situ combustion. 4 lectures. Prerequisite: ME 303, ME 313, ME 342.

ME 438 Heat Exchanger Design (4)
Theory and application of numerical, analytical, and experimental methods to selected heat transfer problems. Application of principles of conduction, convection, condensation, and boiling heat transfer, stress, and vibrations to design of heat exchange equipment. 4 lectures. Prerequisite: ME 303, ME 313, ME 342, CSC 251.

ME 440 Thermal System Design (4)
Techniques used to design thermal systems. Engineering economics, preliminary cost estimation, mathematical modeling, and simple optimization techniques in performance analysis of thermal designs. 3 lectures, 1 laboratory. Prerequisite: ME 303, ME 313, ME 342, CSC 251.

ME 443 Turbomachinery (4)

ME 444 Combustion Engine Design (4)
Application of design parameters to the various engine cycles. Aspects of the combustion processes. Energy conversion including losses and cooling. Static and dynamic loading. 3 lectures, 1 laboratory. Prerequisite: ME 303.

ME 445 Convective Heat and Mass Transfer (4)
Forced convection in laminar and turbulent flow, free convection, diffusion, combined heat and mass transfer. 4 lectures. Prerequisite: ME 313, ME 341.

ME 448 Cooling of Electronic Equipment (3)
Concepts involved with designing for heat removal from electronic equipment. Thermal network method as a tool for modeling the heat transfer in electronic systems. Computer modeling of thermal networks. 3 lectures. Prerequisite: ME 313, ME 342.

ME 450 Solar Power Systems (4)
High and intermediate temperature systems for conversion of solar energy to mechanical power and heat. Thermal energy storage and total thermal energy system design. Recommended as a complement to ME 415. 3 lectures, 1 laboratory. Prerequisite: ME 302, ME 313.

ME 451 Passive Solar System Analysis and Design (3)
Performance analysis of passive systems applied to building environmental control. Dynamics of massive thermal systems. Simulation and correlation techniques in system design. Use of packaged CAD programs. 3 lectures. Prerequisite: ME 351.

ME 452 Solar Engineering Design (2)
Project work in designing active and passive heating and cooling systems. Use of simulation and correlation tools, case studies. 1 lecture, 1 laboratory. Prerequisite: ME 451.

ME 455 Thermal Environmental Experimentation (2)
Experimental determination of the performance of various thermal and solar devices. Conducting experiments, analyzing experimental data, and preparation of reports. 1 lecture, 1 laboratory. Prerequisite: ME 351, ME 459.
ME 456, 457, 458 HVAC System Design (3) (3) (3)
Individual and team project work (including computer simulation) in designing systems, selecting equipment, estimating energy consumption and operating cost for applications in: ME 456, industrial ventilation, exhaust and pollution control; ME 457, commercial and industrial refrigeration; ME 458, commercial and industrial heating and air conditioning. 1 lecture, 2 laboratories. Prerequisite: ME 341, ME 350, EE 201.

ME 459 Advanced Thermal Environmental Engineering (4)
Advanced topics in environmental control including psychrometric chart construction, direct contact transfer processes, heat exchangers, and refrigeration fundamentals. 4 lectures. Prerequisite: CSC 251, ME 313, ME 350, or consent of instructor.

ME 461, 462 Senior Project (2) (3)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: Senior standing and ME 328.

ME 463 Undergraduate Seminar (1)
New developments, policies, practices, and procedures discussed through seminar mode. Codes of ethics and case studies interpretations through panel discussions by students. 1 seminar. Prerequisite: Senior standing.

ME 470 Selected Advanced Topics (1–4)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 9 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

ME 471 Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

ME 500 Individual Study (1–3)
Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.

ME 502 Stress Analysis (4)
Approximate methods of stress analysis. Energy methods, applications to one- and two-dimensional stress fields. 3 lectures, 1 laboratory. Prerequisite: ME 401, graduate standing or consent of instructor.

ME 517 Advanced Vibrations (4)
Vibration of complex engineering systems. Inertia and stiffness matrices. Natural frequencies and normal modes. Approximate solutions and computer techniques. Response to transient and periodic inputs. 3 lectures, 1 laboratory. Prerequisite: ME 318, CSC 251, graduate standing or consent of instructor.

ME 531 Acoustics and Noise Control (3)
Description of sound using normal modes and waves. Interaction between vibrating solids and sound fields. Sound absorption in enclosed spaces. Sound transmission through barriers. Applications in acoustic enclosures, room enclosures, room acoustics. Design of quiet machinery and transducers. 3 seminars. Prerequisite: ME 318, MATH 318.

ME 541 Advanced Thermodynamics (4)
Selected modern applications of thermodynamics. Equilibrium and kinetics as applied to combustion and air pollution. Analysis and evaluation of techniques used to predict properties of gases and liquids. Energy reduction techniques for industrial and commercial operations. Improvement of modern thermodynamic cycles by second law analysis. 4 lectures. Prerequisite: ME 303, ME 342, and graduate standing or consent of instructor.
ME 542  Dynamics and Thermodynamics of Compressible Flow (4)
Control volume analysis of fluid-thermo equations for one-dimensional, compressible flow involving
area change, normal shocks, friction, and heat transfer. Two-dimensional supersonic flow including
linearization, method of characteristics, and oblique shocks. One-dimensional constant area, un-
steady flow, 4 lectures. Prerequisite: ME 303, ME 342, MATH 242, and graduate standing or consent
of instructor.

ME 551  Mechanical Systems Analysis (4)
Various system modeling methods applied to mechanical systems. System stability studies and
system optimization methods. 3 seminars, 1 laboratory. Prerequisite: Graduate standing or consent
of instructor.

ME 552  Conductive Heat Transfer (3)
Theory of steady-state and transient conduction in isotropic and anisotropic media. Development
of differential equations, solutions by series, conformal mapping, transforms, finite differences.
Concentrated and distributed heat sources. 3 seminars. Prerequisite: ME 303, ME 313, ME 342,
MATH 318, and graduate standing or consent of instructor.

ME 553  Convective Heat Transfer (3)
Conservation of mass, momentum, and energy applied to laminar forced and free convection and
turbulent flows. Differential, integral, and scale analysis solutions. 3 seminars. Prerequisite ME 313,
ME 342, MATH 318, and graduate standing or consent of instructor.

ME 554  Computational Heat Transfer (3)
Numerical solutions of classical, industrial, and experimental problems in conduction, convection,
and radiation heat transfer. 3 seminars. Prerequisite ME 552, ME 553, graduate standing or consent
of instructor.

ME 599  Design Project (Thesis) (2) (2) (5)
Each individual or group will be assigned a project for solution under faculty supervision as a
requirement for the master’s degree, culminating in a written report/thesis. Prerequisite: Graduate
standing.

MET–METALLURGICAL AND MATERIALS ENGINEERING

MET 121  Introduction to Materials Engineering (1)
A lecture series involving materials engineers from industry as well as Cal Poly faculty. 1 lecture.

MET 122  Introduction to Materials Engineering Analysis (1)
Introduction to materials engineering laboratory practices through demonstrations of laboratory
equipment for evaluation of material properties. 1 activity.

MET 200  Special Problems for Undergraduates (1-4)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8
units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

MET 222  Ferrous Metals (4)
Introduction to the physical metallurgy of major ferrous alloy systems. Crystal structure and bonding,
equilibrium diagrams, phase transformations, TTT diagrams, hardenability and heat treatment. Steel
mill, foundry and welding metallurgy. Metallurgical laboratory practices, mechanical testing, mettal-
urgical calculations and engineering reports. Miscellaneous course fee required–see Class Schedule.
3 lectures, 1 laboratory. Prerequisite: MET 235 or MET 306.

MET 223  Nonferrous Metals (3)
Introduction to the physical metallurgy of major nonferrous alloy systems. Copper, aluminum, nickel,
cobalt and titanium. Extractive and refining metallurgy. Casting, joining metallurgy, strengthening
mechanisms, mechanical properties, mechanical working and recrystallization. Corrosion resistance.
Miscellaneous course fee required–see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: MET
235 or MET 306 and MET 341.
MET 224, 225  Metallography (2) (2)
Interpretation of microstructures in metals and alloys and laboratory methods for revealing and documenting such microstructures. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 laboratory. Prerequisite: MET 235 or MET 306 and MET 341.

MET 235  Materials Technology (4)
Introductory physical metallurgy of the common ferrous and nonferrous alloys including mechanical, electrical and magnetic properties, corrosion behavior and fracture and failure characteristics. Mechanical properties and applications of polymers. Electronic behavior and applications of semiconductors. Materials selection. 3 lectures, 1 laboratory. Prerequisite: MET 306, PHYS 133.

MET 301  Physical Properties of Materials (4)
Solid state theory of materials as pertaining to crystallography, X-ray diffraction, scanning electron microscopy, internal energy, interatomic bonding, specific heat, thermal expansion, thermal conductivity, electrical conductivity, semiconductors, magnetism, temperature effects and diffusion. 3 lectures, 1 laboratory. Prerequisite: MET 306, CE 205, CE 206.

MET 302, 303  Mechanical Metallurgy (4) (4)
Uniaxial and complex static stress, stress strain elastic and plastic relationships. Mechanical property tests, mechanisms of plastic deformation, dislocation theory, strengthening mechanisms. Brittle, ductile and high temperature fracture. Fatigue, creep, stress-rupture. Strain rate and environmental effects. Miscellaneous course fee required for 302—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: MET 306, MET 324.

MET 306  Materials Engineering (3)
Structure of matter. Physical and mechanical properties of materials including metals, alloys, ceramics, insulating materials, semiconductors and polymers. Equilibrium diagrams. Heat treatments, material selection and corrosion phenomena. 3 lectures. Prerequisite: CHEM 125.

MET 324  Materials Inspection (3)
Special physical and mechanical techniques for non-destructive and destructive examination of materials, photomacrophotography, microhardness, energy-dispersive X-ray analysis. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories. Prerequisite: MET 225.

MET 326  Failure Analysis (3)
Procedures for analyzing failed materials. Actual failure analysis of a failed component by each student. Involves fracture, fatigue, corrosion, overload, using metallography, electron microscopy, chemical analysis and heat treatments. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories. Prerequisite: MET 302, MET 324.

MET 341  Materials Engineering Laboratory (1)
Laboratory experiments on the heat treatment and resulting properties of steel and aluminum alloys. Effects of cold deformation of metals. Brittle-ductile fracture behavior, equilibrium phase relationships, corrosion. Mechanical behavior of polymers. Construction and behavior of semiconductor devices. 1 laboratory. Prerequisite or concurrent: MET 306.

MET 400  Special Problems for Advanced Undergraduates (1–4)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

MET 421, 422  Materials Thermodynamics I, II (4) (4)

MET 423  Rate Processes (2)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
<th>Description</th>
<th>Prerequisites</th>
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</thead>
<tbody>
<tr>
<td>MET 425</td>
<td>Corrosion Engineering (4)</td>
<td>4</td>
<td>Galvanic corrosion, thermodynamics of corrosion, polarization curves, corrosion testing, corrosion control, cathodic protection systems. 3 lectures, 1 laboratory. Prerequisite: CHEM 125 or CHEM 128.</td>
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<tr>
<td>MET 426</td>
<td>Fracture of Materials (3)</td>
<td>3</td>
<td>Stress analysis of cracks, energy analysis of fracture process, fracture toughness testing, fail safe design. Use of fracture mechanics in describing fatigue and stress corrosion cracking. 2 lectures, 1 laboratory. Prerequisite: CE 205.</td>
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<tr>
<td>MET 427</td>
<td>Polymers and Composites (3)</td>
<td>3</td>
<td>Molecular structures of polymers. Properties, processing techniques and fabrication methods of polymers and composites, structure and property relationships. 3 lectures. Prerequisite: MET 306.</td>
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<tr>
<td>MET 434</td>
<td>Welding Engineering I (3)</td>
<td>3</td>
<td>Principles, primary variables, and metallurgical changes associated with the welding process, concentrating on the heat affected zone. Physics of heat transfer involved in welding and welding processes. Relation between joint design, weld microstructure, and weld properties. Description of weld processes. Miscellaneous course fee required–see Class Schedule. 1 lecture, 2 laboratories. Prerequisite: MET 306.</td>
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<tr>
<td>MET 435</td>
<td>Welding Engineering II (3)</td>
<td>3</td>
<td>Principles, primary variables, and metallurgical changes associated with the welding process, concentrating on the weld fusion zone. Thermodynamics of welding, solidification kinetics of the weld pool. Heat and mass transfer during solidification. Fusion zone structure and morphology. Hot ductility testing, weldability. Miscellaneous course fee required–see Class Schedule. 1 lecture, 2 laboratories. Prerequisite: MET 306.</td>
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<tr>
<td>MET 441, 442, 443</td>
<td>Advanced Materials Laboratory I, II, III (1) (1) (1)</td>
<td>1 (1) (1)</td>
<td>Laboratory examination of properties and microstructure–optical and SEM, of superalloys, stainless steels, titanium alloys, dual phase steels, Al-Li alloys and recently developed composite materials. MET 441: Miscellaneous course fee required–see Class Schedule. 1 laboratory. Prerequisite: MET 326.</td>
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<tr>
<td>MET 446</td>
<td>Surface Chemistry of Materials (3)</td>
<td>3</td>
<td>(Also listed as CHEM 446). Surface energy, capillarity, solid and liquid interface. Adsorption, surface areas of solids, contact angles and wetting. Friction, lubrication and adhesion. Relationship of surface to bulk properties of materials. Applications. 3 lectures. Prerequisite: CHEM 306.</td>
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<tr>
<td>MET 461, 462</td>
<td>Senior Project (1) (4)</td>
<td>1 (4)</td>
<td>Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time.</td>
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<tr>
<td>MET 463</td>
<td>Undergraduate Seminar (1)</td>
<td>1</td>
<td>Developments, policies, practices and procedures discussed through regular seminar. 1 seminar. Prerequisite: Senior standing.</td>
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MET 500 Individual Study (1–4)
Advanced study planned and completed under the direction of a member of department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Total credit limited to 12 units. Prerequisite: Consent of department head, graduate adviser, or supervising faculty member.

MET 562 Mechanical Behavior of Materials (4)
Complex stress analysis, dislocation theory, fracture mechanisms, introductory fracture mechanics. Fatigue, creep, brittle-ductile transition, environmental embrittlement. Special project assignment. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: Graduate standing.

MET 564 Fracture Mechanics (3)
Stress analysis of cracks, energy analysis of fracture process, fracture toughness testing. Fail safe design. Use of fracture mechanics in describing fatigue and stress corrosion cracking. 2 seminars, 1 laboratory. Prerequisite: Graduate standing.

MET 599 Design Project (Thesis) (2) (2) (5)
Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis. Prerequisite: Graduate standing.

MGT—MANAGEMENT

MGT 118 Introduction to Human Relations in Business (3)
Small group dynamics, leadership, communication, motivation, and perception. The individual in the business organization. For non-Business majors. 3 lectures.

MGT 200 Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

MGT 201 Principles of Management (3)
Management process involving organization, decision-making, and managerial activities fundamental to all management levels and functional areas. Application to business firms, governmental agencies, hospitals, benevolent groups, and colleges. For non-Business majors. 3 lectures.

MGT 206 Principles of Purchasing (3)
Purchasing function applied to manufacturing, retailing, and food-service institutions. Its interdependence with other functional areas of the organization. For non-Business majors. 3 lectures.

MGT 301 Production and Operations Management (4)
Introduction to operations management and production systems; production models. Planning and control in manufacturing. Quantitative methods and statistical techniques used in production systems management. 3 lectures, 1 activity. Prerequisite: MATH 221, STAT 252 and junior standing.

MGT 310 History of Management, Labor and Capitalism in the U.S. (4)
Historical development of labor-management systems and human resource management practices including case studies. Evolution of union and non-union, private and public sector workplaces. 4 lectures. Prerequisite: Junior standing.

MGT 311 Industrial Management (4)
Organization and functioning of management in industry. Planning, direction, and control of the business enterprise in terms of policy formation, organizational structure, finance, sales, procurement, plant location, facilities and production processes. 4 lectures. Prerequisite: Junior standing.

MGT 312 Organization and Management Theory (4)
Examination of the structural and configurational components of formal organizations. Analysis of management theory development, concepts of organizational processes and managerial strategies. Application of organizational and management imperatives to formal organizational structures and functions. 4 lectures. Prerequisite: Junior standing. Recommended: STAT 252.
MGT 313  **Industrial Relations (3)**
Functions of personnel and labor relations as they relate to the management of the human resources in the organization. Industrial relations theory and practice. For non-Business majors only. 3 lectures. Prerequisite: Junior standing.

MGT 314  **Human Resources Management (4)**
Personnel function as it relates to the management of the human resources of the organization. Survey of employee/employer relations, the work environment, employee development and labor relations. 4 lectures. Prerequisite: Junior standing.

MGT 316  **Labor Contract Negotiation and Administration (4)**
Collective bargaining and resolution of disputes between employees, unions, and employers. Simulation of bargaining and grievance processes. Contract development and arbitration. 4 lectures. Prerequisite: Junior standing.

MGT 317  **Organizational Behavior (4)**
Application of behavioral science concepts to management. Motivation, perception, communications, leadership style, group dynamics. Effectiveness: individual, interpersonal, team, intergroup and organizational. 4 lectures. Prerequisite: Junior standing. Recommended: STAT 252.

MGT 331  **Organization Design and Analysis (4)**
Organizational design strategies and constructs, environmental, technological, and behavioral imperatives influencing organizational objectives and structures; design modifications to accommodate industrial, governmental, and nonprofit organizational requirements. Diagnostic analysis approaches; causation analysis; alternative formulation and analysis; design optimization criteria and techniques. 4 lectures. Prerequisite: MGT 312 or consent of instructor.

MGT 332  **International and Cross Cultural Management (4)**
Impact of culture on multinational businesses. Problem-solving framework and managerial skills for dealing with cultural differences. Case studies, simulation, and fieldwork. 4 lectures. Prerequisite: MGT 312, MGT 317 and junior standing.

MGT 400  **Special Problems for Advanced Undergraduates (1-4)**
Individual investigation, research studies, or surveys of selected problems. Total credit limited to 4 units. Prerequisite: Senior standing and consent of instructor.

MGT 406  **Multinational Business Operations (4)**
International dimensions of managerial decision-making for multinational business operations. Environmental factors which shape international business strategy. Economic, technological, functional areas of management, accounting, finance, and marketing within the business enterprise. Complexities of global management strategy. Case studies and simulation. 4 lectures. Prerequisite: Senior standing and completion of all 300-level Business core courses.

MGT 410  **Compensation (4)**
Management of compensation systems. Wage, salary, and benefit administration. Job analysis, description, and evaluation. Incentive, insurance, leave, pensions, and sharing plans. Wage, hour, and benefit legislation. 4 lectures. Prerequisite: MGT 314 or consent of instructor.

MGT 413  **Labor Law (4)**
Federal and state labor policy as expressed in common law, relevant statutes, and executive orders. Effects upon labor, management, minorities, and the public. Current rules analyzed in a contemporary and historical context. Understanding important industrial relations and manpower problems. 4 lectures. Prerequisite: MGT 310 or consent of instructor.

MGT 414  **Business Strategy and Policy Seminar (4)**
Application of interdisciplinary skills to comprehensive short and long range strategy and policy formulation. Analysis of the interdependence between external environments and internal systems. Case studies from a general management point of view. Industry and company simulations. Group problem solving. Integrating course of the core curriculum. 4 seminars. Prerequisite: All 300-level Business core courses and senior standing.
MGT 415 Advanced Personnel Management (4)
Managerial functions related to the procurement, development, maintenance, and utilization of people in the work environment. 4 lectures. Prerequisite: MGT 314, or consent of instructor.

MGT 417 Organization Development (4)
Analysis of development and trends in the field of organization development. Application of behavioral science knowledge and social technology to growth and change of organizations for the purpose of improving effectiveness. Problem diagnosis and facilitation skills. 4 seminars. Prerequisite: MGT 317 or consent of instructor.

MGT 430 Internship (2-8) (CR/NC)
Business internship to permit student to correlate experience and academic knowledge. Placemen in a part-time, supervised work experience program in a government agency or private organization (entrepreneurship, partnership or corporation) as approved by the department head. The intern will function as an employee subject to all the duties and responsibilities of employees engaged in comparable work. 16 hours of work experience per quarter per two units of credit. Maximum of 8 units per quarter. Credit/No Credit grading only. Prerequisite: Junior standing.

MGT 440 Service Operations Management (4)
Principles and techniques of operations management applied to the management of service operations. Producing organizational success through offering reliable, dependable, readily available, and flexible customer service. 4 lectures. Prerequisite: MGT 301.

MGT 441 Operations Planning and Control (4)
Framework for operations planning and control. Management problems associated with controlling flows of material and inventory levels in manufacturing and distribution systems. 4 lectures. Prerequisite: MGT 301.

MGT 442 Purchasing and Materials Management (4)
Role and scope of the procurement function and concept of an integrated materials management process. Relations with functional departments. Purchasing structure and processes in business and service organizations. Global concept of international purchasing. Measuring purchasing performance. 4 lectures. Prerequisite: Junior standing.

MGT 445 Advanced Operations Management (4)
Advanced principles in operations management as applied to both manufacturing and service organizations. Product-service conversion systems, capacity planning and utilization, aggregate planning, scheduling and control, inventory management, and operations subsystem coordination with the organization's strategy. 4 lectures. Prerequisite: MIS 318, MIS 422, MGT 301, and senior standing.

MGT 461, 462 Senior Project (2) (2)
Selection and analysis of a problem under faculty supervision. Problems typical of those which graduates must solve in their fields of employment. Formal report is required. Minimum 120 hours total time. Prerequisite: MGT 461 for MGT 462.

MGT 470 Selected Advanced Topics (1-4)
Directed group study of selected topics for advanced undergraduate and graduate students. Class Schedule will list topics selected. Total credit limited to 6 units. 1-4 lectures. Prerequisite: Consent of instructor.

MGT 475 Seminar in Managerial Consultation (4)
Management consulting in the private and public sectors. Analysis of substantive and process skills required to provide independent and objective advice to clients. Application of consulting knowledge and skills to real client problems and facilitation of change. 4 seminars. Prerequisite: MGT 312, MGT 314, MGT 317 or consent of instructor.

MGT 480 Employee Ownership, Profit Sharing and Leveraged Buyouts (4)
Applications in large and small, public and private, union and nonunion businesses. Study of ESOPs (Employee Stock Ownership Plans). Review of related theory and research including tax and financial implications and role in corporate takeovers. Impact on management, labor relations, and economic performance. 4 seminars. Prerequisite: Junior standing, MGT 314 or equivalent.
MGT 488  Small Business Management (4)
Application of management knowledge and skills to the specific managerial problems involved in planning and operating the smaller company; growth strategies; the art of securing performance; changing the organization structure to match growth; recruiting and compensating new personnel. 4 seminars. Prerequisite: Senior standing.

MGT 489  Advanced Seminar in International Management (4)
Discussion and case analysis of integration of theoretical and applied managerial concepts, strategies, and organizational practices in: international and multinational organizations; administration of foreign operations; conflicts between domestic and international policies and practices; integration of cultural, technological, and organizational management imperatives in multinational and international operations. 4 seminars. Prerequisite: MGT 332 or consent of instructor.

MGT 500  Independent Study (1-4)
Advanced study planned and completed under the direction of a departmental faculty member. Open only to graduate students demonstrating ability to do independent work. Prerequisite: Formal petition with approval.

MIS–MANAGEMENT INFORMATION SYSTEMS

MIS 318  Modeling Systems (4)

MIS 321  Management Information Systems (4)
Applications of computers in business and industry. Management information systems and integrated systems concepts. Data organizations, file processing, and data bases. Data communication and distributed data processing. System development process and information resource management. Decision support systems and the relationship of the computer to the management decision-making process. 3 lectures, 1 activity. Prerequisite: CSC 120, MGT 301 and junior standing.

MIS 403  Simulation of Management Decision Making (4)
Simulation of business problems for management decision making. Types of business simulators. Computer simulation. Interaction of the information system and the simulation concept. Business applications and solutions of cases. 3 lectures, 1 activity. Prerequisite: MIS 321, MGT 301, or consent of instructor.

MIS 412  Information Management and Database Systems (4)
Overview of database management and modeling. Focuses on business applications. Treats flatfile, CODASYL network, relational, object oriented and semantic model designs. Provides analysis, design and implementation experience for flatfile, network and relational systems. 4 lectures. Prerequisite: CSC 203, CSC 345, MIS 321.

MIS 418  Advanced Quantitative Methods and Controls in Business (4)
Quantitative controls as applied to the operations of business. For the senior student who needs operational knowledge for application in business analysis and decision. 4 lectures. Prerequisite: MGT 301, MIS 318, and senior standing or consent of instructor.

MIS 419  Expert Systems Applications in Business (4)
Impact of expert systems on society. Concepts and methods of logical inference using a computer. Knowledge engineering and fuzzy systems. Structure and functions of an expert system. Development of business expert systems. 3 lectures, 1 activity. Prerequisite: MIS 321 and MGT 301 or consent of instructor.
MIS 422 Information Systems Analysis and Design (4)
System development methodology and logical database design. Determination of management information requirements. Cost and benefit analysis. Hardware and software selection. Modern development tools and application prototyping. Management decision process and decision support systems. 3 lectures, 1 activity. Prerequisite: MGT 301, MIS 321, MIS 412, or consent of instructor.

MIS 432 Information Systems Design and Implementation (4)
Structured design techniques and database implementation. Input, process, and output controls. Database administration and information security. Project management and control. Design and implementation of information systems. Automated development tools and software quality assurance. 3 lectures, 1 activity. Prerequisite: MIS 412, MIS 422 and senior standing.

MKTG–MARKETING

MKTG 204 Elements of Marketing (4)
Overview of the marketing institutions and function of marketing in the economic, socio-cultural and political-legal environments. Not acceptable for credit toward Business Administration degree. 4 lectures. Prerequisite: ECON 201 or ECON 221 or equivalent, or consent of instructor.

MKTG 301 Principles of Marketing (4)
Basic course in marketing that examines marketing's role in society and management of the product, promotion, pricing and channel strategies of the firm. 4 lectures. Prerequisite: ECON 222, STAT 252, and junior standing.

MKTG 302 Marketing Research I (4)
Market planning and information systems. Bayesian decision analysis. Survey research design, secondary and primary data collection, measurement and scaling. Questionnaire design, attitude theory and measurement, statistical sampling theory and sampling design. Elementary data analysis, report writing. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 activity. Prerequisite: MKTG 301.

MKTG 303 Buyer Behavior (4)
Applied study of behavior that affects marketing decisions in both consumer and industrial markets. 4 lectures. Prerequisite: MKTG 302.

MKTG 304 Channels and Physical Distribution (4)
Selection, evaluation and control of channels of distribution and management of physical distribution. 4 lectures. Prerequisite: MKTG 302.

MKTG 305 Promotion Strategies (4)
Designing the promotion strategies of the firm, including advertising, personal selling, sales promotion, publicity and public relations. Communications media available; their uses and limitations. 4 lectures. Prerequisite: MKTG 302.

MKTG 401 International Marketing (4)
Marketing activities necessary to direct the flow of a company's goods and services to customers in global markets. 4 lectures. Prerequisite: MKTG 302 and senior standing.

MKTG 402 Marketing Research II (4)
Emphasizes market data analysis. Includes current marketing research techniques. Regression, conjoint, and multidimensional scaling analysis. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 activity. Prerequisite: MKTG 301 and MKTG 302 and junior standing.

MKTG 405 Sales Management (4)
Management of the field sales force, including staffing, training, directing, evaluating and control of sales personnel. 4 lectures. Prerequisite: MKTG 302 and senior standing.

MKTG 406 Marketing Management (4)
Policymaking and decisionmaking applications in the planning, organizing, operating, controlling and evaluating of individual products and brands. 4 lectures. Prerequisite: Senior standing.
MKTG 412  Marketing Law (4)
Law of marketing from a comprehensive management perspective: products, channels, pricing, promotion and credit. Information on patents, copyrights and trademarks. 4 lectures including case analysis. Prerequisite: Senior or graduate standing, BUS 207 and BUS 404 recommended.

MKTG 450  Direct Marketing (4)
Direct response marketing including the use of mail, space advertising, radio and television media in marketing products and services to consumer and industrial markets. 4 seminars. Prerequisite: MKTG 302 and senior standing.

MKTG 470  Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

MSC—MILITARY SCIENCE

MSC 111  Orienteering (2)
Principles of orienteering, basic map reading and compass skills; course running techniques applied in field orienteering events. Open to all students. 1 lecture, 1 activity.

MSC 112  Survival Training—Wilderness (2) (CR/NC)
Techniques of survival in a wilderness environment. Traps and snares, building fires, preparing plant and animal food, locating water, and first aid. Open to all students. Credit/No Credit grading only. 1 lecture, 1 activity.

MSC 116  Basic Military Skills (2)
Conducting and evaluating individual, squad, platoon, and company drill and ceremony skills. Conducting manual of arms, evaluating physical fitness principles. Conducting and evaluating physical fitness program. Techniques of rifle marksmanship. Open to all students. 1 lecture, 1 activity.

MSC 211  Current Military Affairs (2)
Organization and functions of the Department of Defense. Issues related to U.S. military affairs: selective service, arms control, nuclear weapons and alliances. Purpose of ROTC, military customs, the military as a profession. Open to all students. 2 lectures.

MSC 212  Basic Camp (1–7)
One to seven units of credit may be granted depending upon successful completion of training. Six weeks of training, Fort Knox, Kentucky. Travel pay and salary provided through the Military Science Department. No obligation. Camp graduates eligible to enroll in ROTC Advanced Program.

MSC 213  Survival Training—Mountain (2) (CR/NC)
Techniques of survival in a mountainous environment. Rappelling, hot and cold weather survival, basic mountaineering, and rope bridges. Open to all students. Credit/No Credit grading only. 1 lecture, 1 activity.

MSC 215  Leadership/Management Seminar (2)
Exploration of key, basic managerial and leadership concepts/techniques. Emphasis is on practical application with experiential learning situations demonstrating key leadership and management principles. Open to all students. 2 seminars.

MSC 225  Advanced Survival Techniques (2) (CR/NC)
Mastery of advanced survival skills including water survival, water crossings, expedient tools, weapons, and shelters. Signaling, weather forecasting and survival medicine. Credit/No Credit grading only. 2 lectures. Prerequisite: MSC 112, MSC 213 or consent of instructor. Must be able to swim.

MSC 229  Ranger Challenge (2) (CR/NC)
Selection and preparation of the Ranger Challenge Team which will represent Cal Poly in military tactical skills competition. Includes rope bridging, orienteering, weapons knowledge, hand grenade accuracy, 10K road march with equipment, first aid, marksmanship, physical fitness and tactics. Credit/No Credit grading only. 1 lecture, 1 activity.
MSC 311 Leadership and Management (3)
Descriptive model of platoon leadership including personnel within a platoon and tasks of platoon leaders; major theories of leadership; instruction and practice in communication, human relations, organizational structure, power and influence, and management. 3 lectures.

MSC 312 Leader Communication Skills (3)
Principles and usage of verbal, nonverbal, and symbolic communications. Preparing, conducting, and evaluating training. Principles and techniques of meeting management; leadership counseling techniques; proper radio procedures. 3 lectures.

MSC 313 Tactical Military Operations (3)
Organization of the United States and Soviet land combat forces including tactical doctrine and equipment; organization of the modern battlefield; fundamentals of small unit tactics; planning, organizing and conducting small unit operations; fundamentals of land navigation. 3 lectures.

MSC 314 ROTC Advanced Camp (6) (CR/NC)
Six week summer training program required to achieve an Army commission. Testing and training as functional Army officers and determination of potential for service. Travel pay, room and board, and salary are provided by the U.S. Army. Held at Fort Lewis, Washington. Credit/No Credit grading only. Prerequisite: MSC 311, MSC 312, MSC 313, and consent of instructor.

MSC 400 Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of instructor.

MSC 411 Military Professionalism and Ethics (3)
Professional knowledge subjects including command and staff functions, personnel, training and logistics management, military correspondence and leadership counseling. Discussion of moral philosophy and values essential to the military profession. 3 lectures.

MSC 412 Military Justice (2)
Uniform code of military justice, including the court martial system, disciplinary measures, military crimes, search and seizure, apprehension and safeguarding evidence. Overview of the laws of war. 2 lectures.

MSC 413 Military Organizations and Management (2)
Planning and organizing military functions. Managing staff positions of responsibility. Cadets will be responsible for all coordination and execution of assigned projects. 2 lectures. Prerequisite: MSC 411, MSC 412 and consent of instructor.

MSC 470 Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

MU-MUSIC

MU 100 Music Fundamentals (3)
Traditional music notation. Use of treble and bass staff for pitch and rhythm, harmonization using principal triads, major and minor, and common seventh chords. Performance of simple pieces individually and in groups using common classroom instruments. 2 lectures, 1 activity.

MU 101 Introduction to Music Theory (3)
For the non-music major. Introduction to the elements of music and their use by composers and performers. Intended for students with little or no prior musical experience in music theory. Notation of pitch and rhythm, scales, intervals and chords. 3 lectures.

MU 102 Acoustic Communication (3)
Exploring aspects of sound for communication, sound in our society. Effect and implications of technology on sound and contemporary music. Interrelationship of acoustic space and musical creation. 3 lectures. Prerequisite: Music major or consent of instructor.
MU 103  Music Theory I (3)
Structure of tonality in music of Western civilizations, four-part writing of root position and inverted triads, cadences and melodic structure, harmonic progressions, harmonization of a melody and nonharmonic tones, and seventh chords. To be taken concurrently with MU 104. 3 lectures. Prerequisite: Music major or minor.

MU 104  Musicianship I (1)
Systematic development of skills in sight-singing and rhythm. Ear training and dictation in one and two parts. Score reading in two parts. To be taken concurrently with MU 103. 1 activity.

MU 105  Music Theory II (3)
Continuation of MU 103. Includes secondary dominants, nondominant seventh chord, basic modulation, change of mode. Augmented sixth chord, and Neapolitan sixth chord. To be taken concurrently with MU 106. 3 lectures. Prerequisite: MU 103.

MU 106  Musicianship II (1)
Continuation of MU 104. Ear training in rhythm, seventh chords, augmented and Neopolitan sixth chords, dictation and score reading in two and three parts. To be taken concurrently with MU 105. 1 activity. Prerequisite: MU 104.

MU 120  Introduction to Music (4)
GEB C.2. Exploration of the world of music with emphasis on Western tradition. Language of music, the role of music in society. The works of major composers from the Renaissance to the present. 3 lectures, 1 activity.

MU 150  Applied Music (1)
Individual instruction in performance with emphasis on repertoire, technical skills, style, and interpretation. Total credit limited to 3 units. Prerequisite: Consent of instructor.

MU 151  Beginning Piano (2)
Beginning piano for student with no background in keyboard instruments. Includes fundamentals of notation, keyboard techniques, tone production, sightreading and facility. 1 lecture, 1 activity.

MU 152  Keyboard Skills I (1)
Continuation of MU 151. Piano for students with the ability to play a simple Bach or Mozart Minuet. Total credit limited to 3 units. 1 activity. Prerequisite: MU 151 or equivalent.

MU 153  Keyboard Skills II (1)
Continuation of MU 152. Students are expected to play at the level of the easier Clementi Sonatinas. Total credit limited to 3 units. 1 activity. Prerequisite: MU 152 or one year of piano instruction.

MU 154  Beginning Voice (1)
Beginning study of vocal and performance technique for the untrained singer. Total credit limited to 3 units. 1 activity.

MU 155  Guitar (1)
Fundamentals of guitar technique and performance including elements of both classical and folk guitar. Designed to meet the needs of the public school teacher. No previous experience necessary. 1 activity.

MU 170  University Jazz Band (1)
Limited to those who have had considerable experience playing musical instruments. Students have an opportunity to play for various university functions, dances, community programs, the annual Spring Tour and the Jazz Night concert. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

MU 171  Instrumental Ensembles (1)
Open to qualified musicians. Rehearsal and public performances in large and small ensembles. Total credit limited to 6 units. 1 activity. Prerequisite: Consent of instructor.
MU 621  Band (1)
Study and public performance of music written for large wind bands (woodwinds, brass, and percussion). Limited to those students who have had experience with wind and percussion instruments. The band performs concerts on campus and makes at least one tour annually. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

MU 172  Wind Ensemble (1)
Study and public performance of music written for wind ensembles (woodwinds, brass and percussion). Limited to those students who have had experience with wind and percussion instruments. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

MU 174  Orchestra (1)
Preparation and performance of orchestral music including both the standard repertoire and rarely performed works. Open to all students whose technique is adequate. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

MU 180  Men's Chorus (1)
Study and public performance of music composed for men's voices. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

MU 181  University Singers (1)
Study and public performance of music for mixed voices. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

MU 182  Women's Chorus (1)
Study and public performance of music composed for women's voices. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

MU 183  Vocal Ensemble (1)
Open to qualified singers. Rehearsal and performance of vocal music. Total credit limited to 6 units. 1 activity. Prerequisite: Consent of instructor.

MU 201  Music Theory III (3)
Compositional procedures employed by composers of the Classical and Romantic periods. Chromatic third-related harmony, nineth, eleventh and thirteenth chords. Chromatic modulation. To be taken concurrently with MU 202. 3 lectures. Prerequisite: MU 105.

MU 202  Musicianship III (1)
Continuation of MU 106. Dictation and score reading in three and four parts. Ear training in rhythm and chromaticism. To be taken concurrently with MU 201. 1 activity. Prerequisite: MU 106.

MU 203  Alternative Music Systems (3)
Exploration of innovative and non-Western techniques for structuring music. Compositional application of new and unusual systems of theory. 3 lectures. Prerequisite: MU 201.

MU 204  Introduction to Music Synthesis (3)
Survey of equipment and techniques for synthesizing music, and instrumental timbres. Development of basic skills in programming synthesis equipment and manipulating sonic material. 2 lectures, 1 activity. Prerequisite: MU 102 and MU 101 or MU 103.

MU 205  Music Recording Techniques I (3)
Equipment and basic techniques for recording music. Understanding recording technology. Analysis and projects in recording. 2 lectures, 1 activity. Prerequisite: MU 120 and MU 101 or MU 102 or MU 103.
MU 206 Jazz and Popular Music Arranging (3)
Beginning techniques for combo and big band arranging. Arrangement planning, sketch scores, full scores, transpositions, part preparation and copying included. Arrangements will be played by University groups. 3 lectures. Prerequisite: MU 105 or equivalent and consent of instructor.

MU 220 Music Research and Writing (3)
Methodology for researching, analyzing, and writing about music. Exploration of investigative tools including library resources, periodicals, bibliographic tools, computerized search methods. Computer software for writing text, music notation, and music printing. Editing and formatting for music publication. 3 lectures. Prerequisite: ENGL 114, MU 120.

MU 221 Jazz Styles (3)
Survey of Jazz as a significant American art form from 1917 to the present; its historical background and development in the United States. Big bands, combos, and soloists. Extensive use of recordings and live presentations. 3 lectures.

MU 222 History and Theory of Jazz (3)
Survey of Jazz styles. Emphasis on historical context and development of Jazz through study and analysis of scores. 3 lectures. Prerequisite: MU 201.

MU 225 America's Music (3)
Exploration of the many styles of America's music through readings, sound recordings, and musical scores. Includes 'fine art,' 'popular,' and 'folk' traditions. How American music reflects the different cultural heritages, social contexts, and philosophies of its creators. 3 lectures. Prerequisite: MU 103, MU 120.

MU 250 Applied Music (1)
Individual instruction in performance with emphasis on repertoire, technical skills, style, and interpretation. Total credit limited to 3 units. Prerequisite: 3 units of MU 150 and consent of instructor.

MU 252 Intermediate Voice (1)
Vocal and performance technique for experienced singers. Total credit limited to 3 units. 1 activity. Prerequisite: MU 154 or consent of instructor.

MU 253 Keyboard Skills III (1)
Intermediate level piano techniques with emphasis on style, interpretation, sightreading, basic performance practices and the solution to general musical problems. Total credit limited to 3 units. 1 activity. Prerequisite: MU 153 or consent of instructor.

MU 300 Contemporary Music Theory (3)
Harmonic, melodic, and rhythmic styles and trends of contemporary music. Includes modality, polytonality, quartal harmony, and serial techniques. 3 lectures. Prerequisite: MU 201.

MU 301 Counterpoint (3)
Counterpoint as a compositional technique. Modal, tonal, and post-tonal practices. 3 lectures. Prerequisite: MU 201.

MU 303 Music Form and Analysis (3)
Musical forms and processes employed by composers from the Baroque period to the present. 3 lectures. Prerequisite: MU 300.

MU 305 Music Recording Techniques II (4)
Advanced techniques for recording music, signal processing, and the relationship of sound spaces and the recording process. Development of practical recording methods. 2 lectures, 2 activities. Prerequisite: MU 205.

MU 306 Advanced Music Synthesis (3)
Compositional application of sound synthesis techniques. Exploration of current topics in music synthesis. Total credit limited to 6 units. 1 lecture, 2 activities. Prerequisite: MU 204, MU 305 and consent of instructor.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites/Notes</th>
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</thead>
<tbody>
<tr>
<td>MU 321</td>
<td>History of Music I (3)</td>
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<td>MU 120, MU 201.</td>
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<tr>
<td></td>
<td>Survey of the history of Western music from Antiquity through the Renaissance. 3 lectures. Prerequisite: MU 120, MU 201.</td>
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<tr>
<td>MU 322</td>
<td>History of Music II (4)</td>
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<td>MU 321.</td>
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<td></td>
<td>Music of the Baroque, Classic and Romantic periods. 4 lectures. Prerequisite: MU 321.</td>
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<tr>
<td>MU 323</td>
<td>History of Music III (3)</td>
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<td>MU 322.</td>
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<td></td>
<td>Music of the 20th Century. 3 lectures. Prerequisite: MU 322.</td>
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<tr>
<td>MU 324</td>
<td>Music and Society (3)</td>
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<td>GEB C.3.</td>
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<td>Designed for the non-music major. Exploration into the role of music in history and culture. Emphasis on appreciation and a deeper understanding of music and both its historical and cultural context. Class Schedule will list topics selected. Total credit limited to 9 units. 3 lectures. Prerequisite: Junior standing. MU 120 recommended.</td>
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<tr>
<td>MU 340</td>
<td>Conducting (3)</td>
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<td></td>
<td>Principles and techniques of conducting with experience in score reading. 2 lectures, 1 activity. Prerequisite: MU 201.</td>
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<tr>
<td>MU 341</td>
<td>Choral Conducting (3)</td>
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<td></td>
<td>Continuation of MU 340. Emphasis on choral literature. Score reading, rehearsal techniques, and musical details associated with vocal music. 2 lectures, 1 activity. Prerequisite: MU 340.</td>
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<tr>
<td>MU 342</td>
<td>Instrumental Conducting (3)</td>
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<td></td>
<td>Continuation of MU 340. Emphasis on band and orchestra literature. Score reading, rehearsal techniques, and musical details associated with instrumental music. 2 lectures, 1 activity. Prerequisite: MU 340.</td>
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<tr>
<td>MU 350</td>
<td>Applied Music (1)</td>
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<td></td>
<td>Individual instruction in performance with emphasis on repertoire, technical skills, style, and interpretation. Total credit limited to 3 units. Prerequisite: 3 units of MU 250 and consent of instructor.</td>
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<tr>
<td>MU 360</td>
<td>Music for Children (3)</td>
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<td>Development of skills basic to fostering creative music experiences in the classroom. Exploration of various approaches to motivating children musically. Study of folk songs for singing, playing instruments, and learning about music as well as for their ethnic and cultural significance. 3 lectures. Prerequisite: MU 100.</td>
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<tr>
<td>MU 361</td>
<td>Instruments (1)</td>
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<td></td>
<td>Fundamentals of playing and teaching woodwind, brass, string, and percussion instruments. Separate sections arranged with instructor. Total credit limited to 6 units. 1 activity. Prerequisite: Consent of instructor.</td>
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<tr>
<td>MU 365</td>
<td>Music in the Elementary School (3)</td>
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<td></td>
<td>Study and application of Orff and Kodaly. Philosophy and objectives for implementing an effective school music program. Includes fieldwork. 2 lectures, 1 activity. Prerequisite: Junior standing.</td>
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<tr>
<td>MU 370</td>
<td>University Jazz Band (1)</td>
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<td>Limited to those who have had considerable experience playing musical instruments. Students have an opportunity to play for various university functions, dances, community programs, the annual Spring Tour and the Jazz Night concert. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.</td>
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<tr>
<td>MU 371</td>
<td>Instrumental Ensemble (1)</td>
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<td></td>
<td>Open to qualified musicians. Rehearsal and public performance in large and small ensembles. Total credit limited to 6 units. 1 activity. Prerequisite: Consent of instructor.</td>
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<tr>
<td>MU 372</td>
<td>Band (1)</td>
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<td></td>
<td>Study and public performance of music written for large wind band (woodwinds, brass and percussion). Limited to those students who have had experience with wind and percussion instruments. The band performs concerts on campus and makes at least one tour annually. Total credit limited to 6 units. 1 laboratory. Prerequisite: 2 years of band participation, consent of instructor.</td>
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</table>
MU 373 Wind Ensemble (1)
Study and public performance of music written for wind ensemble (woodwinds, brass and percussion). Limited to those students who have had experience with wind and percussion instruments. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

MU 374 Orchestra (1)
Preparation and performance of orchestral music including both the standard repertoire and rarely performed works. Open to all students whose technique is adequate. Total credit limited to 6 units: 1 laboratory. Prerequisite: Consent of instructor.

MU 380 Men's Chorus (1)
Study and performance of music for men's voices. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

MU 381 University Singers (1)
Study and public performance of music for mixed voices. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

MU 382 Women's Chorus (1)
Study and public performance of music for women's voices. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

MU 383 Vocal Ensemble (1)
Open to qualified singers. Rehearsal and performance of vocal music. Total credit limited to 6 units. 1 activity. Prerequisite: Consent of instructor.

MU 384 Music Production Workshop (2)
Preparation of a musical theatre production for public presentation, including acting and stage management. Total credit limited to 6 units. 2 laboratories. Prerequisite: By audition, or consent of instructor.

MU 400 Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

MU 402 Orchestration (3)
Scoring and arranging for various combinations of instruments. Ranges, transposition, and technical capabilities of vocal ensembles, band, and orchestra instruments. 3 lectures. Prerequisite: MU 201.

MU 404 Composition (3)
Independent creative projects. Exercises in compositional methods designed to increase technical facility. Total credit limited to 9 units. 3 lectures. Prerequisite: MU 300.

MU 420 Music History: Selected Topics (3)
Intensive study of selected topics in music history through the use of readings, recordings, and scores. Class Schedule will list topics selected. Total credit limited to 9 units. 3 lectures. Prerequisite: MU 323.

MU 450 Applied Music (1)
Individual instruction in performance with emphasis on repertoire, technical skills, style, and interpretation. Total credit limited to 3 units. Prerequisite: 3 units of MU 350 and consent of instructor.

MU 461 Senior Project (3)
Selection and completion of a project under faculty supervision. Minimum of 90 hours total time. Results presented in a recital, creative work, formal report, or a combination of all three. Prerequisite: Consent of department head.

MU 465 Choral Literature and Rehearsal Techniques (3)
Survey of choral literature especially suited for secondary schools. Philosophy and strategy for developing a school program. Musical as well as non-musical techniques for effective rehearsal. 2 seminars, 1 activity. Prerequisite: MU 341.

MU 466 Instrumental Literature and Rehearsal Techniques (3)
Survey of instrumental literature especially suited for secondary schools. Philosophy and strategy for developing a school program. Musical as well as non-musical techniques for effective rehearsal. 2 seminars, 1 activity. Prerequisite: MU 342.
NRM–NATURAL RESOURCES MANAGEMENT

NRM 101 Natural Resources Management and Society (3) GEB F.2.
Integrated development, utilization and management of the nation's and world's natural resources for the continuous benefit of humankind and the conservation of the resources. Discussion of natural resources management practices and technologies which may provide a more flexible range of societal benefits for the wise use of our natural resources. 3 lectures.

NRM 112 Parks and Outdoor Recreation (3)
Introduction to national, state, county, city and private park systems. History, philosophy, policy and principles of the formation, administration and functioning of wildland recreational units at the park, district and regional levels. 3 lectures.

NRM 140 Career Development and Planning in Natural Resources Management (1)
(CR/NC)
Analysis and development of career goals in natural resources. Acquainting students with potential career options and assisting them in planning and implementation phases of an academic career program at Cal Poly. Credit/No Credit grading. 1 activity. Prerequisite: Consent of instructor.

NRM 201 Environmental Management (3) GEB F.2.
Environmental management as a process within a functioning society seeking a harmonious balance between man's activities and intrinsic behavior of the natural environment. Major components of the natural environment and man's political and social activities that impact that environment. 3 lectures.

NRM 203 Resource Law Enforcement (3)
Law enforcement applied to natural resource conservation on public and private lands. Examination of state and federal laws related to fish and wildlife management. Problems associated with implementation of resource laws examined. 3 lectures.

NRM 300 Computer Applications in Resource Management (2) (Also listed as FOR 300)
Resource management applications of microcomputers. Software programs include forest and natural resource management planning, forecasting, analysis of systems, and resource data base management for multiple use objectives. Forestry and Natural Resource examples will be used. 1 lecture, 1 laboratory. Prerequisite: CSC 110, junior standing or consent of instructor.

NRM 302 Natural Resources Policy (3)
Historical development and significance of natural resource policies. Policy process approach to understanding the efforts to resolve natural resource problems in the public and private sector. 2 lectures, 1 laboratory. Prerequisite: FOR 201; NRM 112 suggested.

NRM 304 Ecology of Resource Areas (4)
Resource ecology and management implications in the major ecosystems of North America. Importance of maintaining the natural dynamics of energy flow and nutrient cycles at the community and ecosystem level for the benefit of man. Humanity's role as a principal factor of change of the resources in natural systems. 3 lectures, 1 laboratory. Prerequisite: One course in biological sciences or consent of instructor.

NRM 309 Coastal Resource Management Users (3)
Natural resource identification and management techniques in coastal environments (land and water), including overview and integration of physical, biological and man-made systems (including regulating) as they influence resource management decisions. 2 seminars, 1 laboratory. Field trips with lab are mandatory. Prerequisite: NRM 304.

NRM 310 Management of Outdoor Recreation Users (3)
Examination of outdoor recreation user behavior through application of behavioral science principles and techniques. Behavioral information for the planning, management, and maintenance of outdoor recreation areas. 3 lectures. Prerequisite: NRM 112, PSY 201 or PSY 202.
NRM 311 Environmental Interpretation (4)
Interpretation of the biological, physical and aesthetic values of the natural elements of our environment; organization and presentation of interpretive materials by oral, written, and display methods of communication. 3 lectures, 1 laboratory. Prerequisite: SPC 201 or SPC 202.

NRM 318 GIS Application of Natural Resource Information (2) (Also listed as FOR 318 and LA 318)
ARC/INFO Geographic Information System (GIS) computer software to explore relevant environmental issues utilizing natural resources data such as vegetation, soils, habitats, topography and geology. Develop data base, use software and apply to relevant, natural systems. Miscellaneous course fee required—see Class Schedule. 2 laboratories. Prerequisite: CSC 110 or consent of instructor.

NRM 400 Special Problems for Advanced Undergraduates (2-4)
Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units. Prerequisite: Consent of department head.

NRM 401 Natural Resource Economics (3)
Principles of optimum use of renewable and nonrenewable natural resources, set in a framework of historical resource concerns and real world resource markets. Key resource sectors treated in detail: forestry, fisheries, water resources and natural environments. 2 lectures, 1 laboratory. Prerequisite: ECON 211, NRM 302.

NRM 403 Environmental Impact Analysis (3)
Environmental impact assessment process. Historical background, legislation and techniques currently in use in the preparation of environmental documents. Selected aspects of environmental law and regulations. Proposal preparation for environmental impact analysis. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: NRM 304 or equivalent.

NRM 405 Applied Resource Analysis (4)
Environmental impacts in responses to resource management programs and activities. Preparation, implementation, and coordination of environmental activities. Criteria for measurements, interpretation, and evaluation. Resource inventories, analysis, synthesis, evaluation, environmental assessment writing and preparation. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: NRM 403 or senior standing.

NRM 406 Natural Resources Administration (3)
Administration of private and public natural resource units, including planning, budgeting, organizing, directing, staffing and controlling units. Key resources administered include forests, water, fish and wildlife, grasslands. 2 lectures, 1 laboratory. Prerequisite: NRM 302.

NRM 407 Environmental Law (3) (Also listed as CRP 407)
Detailed examination of the law governing use and protection of natural resources with focus on the legal institutions entrusted with the public duty of protecting the environment. 3 lectures. Prerequisite: Senior standing, POLS 206, or consent of instructor.

NRM 408 Water Resource Law and Policy (3) (Also listed as CRP 408)
Detailed examination of the various legal systems of water use, regulation and management in California and the United States. Discussion on the key concepts and principles of state, federal and interstate water quantity and quality control; focusing on issues and problems, why conflicts occur and how solutions evolve. 3 lectures. Prerequisite: NRM 302 or instructor approval, senior standing.

NRM 410 Resource Recreation Management (4)
Practices of management of resource recreation on private and public lands. Consideration of the following management systems: biophysical, user/visitor, facilities, equipment, fiscal, personnel will be made in the provision of resource recreation services. Case studies in mass recreation and wilderness areas will be examined. 3 lectures, 1 laboratory. Some weekend labs necessary. Prerequisite: NRM 112, NRM 310, or consent of instructor.
NRM 417 Resource Recreation Planning (3)
Development and analysis of resource recreation plans. Planning theory, types of plans, scheduling techniques, projecting supply and demand, application of models, and economic evaluations. Examples emphasize planning for parks and recreation. 2 lectures, 1 laboratory. Prerequisite: NRM 112.

NRM 461, 462 Senior Project (3) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time.

NRM 463 Undergraduate Seminar (1)
Study and oral presentation of current developments and problems in the subject field. Discussion of recent findings and research and their application. 1 seminar.

NRM 470 Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

NRM 471 Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

NRM 502 Resource Conservation (3)
Conservation, planning and administration for broad treatment of land, water, mineral, forest, range, and wildlife resources. 3 seminars. Prerequisite: Graduate standing and consent of instructor.

NRM 521 Natural Resources Management for Educators (3)
Philosophy (theoretical and applied) of natural resource management strategies functioning in today’s environment. Ecological principles applicable to specific resource components as they relate to the present perception of today’s resource base, use demands and projected utilization. 3 seminars. Prerequisite: Graduate standing.

NRM 540 Water Resource Systems (3)
Regional water resource systems with three components: (1) biophysical, (2) socio-eco-political including legal and (3) planning and management. Interface between and among components for synthesis for practical implementation in existing environments. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

NRM 570 Selected Topics in Natural Resources Management (1–3)
Directed group study of selected topics for advanced students. Class Schedule will list topic selected. Total credit limited to 9 units. 1 to 3 seminars. Prerequisite: Graduate standing and consent of instructor.

OH–ORNAMENTAL HORTICULTURE

OH 100 Enterprise Project (1–4) (CR/NC)
Selection and completion of a management/production project under faculty supervision. Project participation is voluntary and subject to approval by the department head and the Cal Poly Foundation. Degree credit limited to 12 units. Credit/No Credit grading only.

OH 101 Principles of Landscape Drafting (3)
Introduction to basic drafting skills, standards, techniques; CAD applications for the landscape contractor/designer; practical use of drafting tools; application of lines, symbols, lettering to construct typical landscape drawings. Overview of landscape history. Drafting tools required. 1 lecture, 2 laboratories.

OH 110 Orientation to Ornamental Horticulture (1) (CR/NC)
Understanding the depth and breadth of the ornamental horticulture industry, the department, and the University. Student and professional organizations. Required of all students in the major. Credit/No Credit grading only. 1 activity.
**OH 125 Commercial Floral Design Practices (3)**
Theory, techniques, and skills currently practiced in the floral design industry. Construction of basic floral products for resale, cut flower processing, industry sales practices, merchandising and packaging. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories.

**OH 126 Ornamental Horticulture Construction (2)**
Design, construction and repair of structures and facilities using tools, equipment, power machinery, materials and methods unique to the horticulture industry. 1 lecture, 1 laboratory.

**OH 131 Fundamentals of Ornamental Horticulture I (4)**
Introduction to and career potentials in the field of ornamental horticulture: Growing operations and cultural practices, soils, media and diagnosis of plant problems. Miscellaneous course fee required—see Class Schedule. Field trip required. 3 lectures, 1 laboratory.

**OH 132 Fundamentals of Ornamental Horticulture II (3)**
Introduction to basic equipment and techniques in floriculture and floral design. Effects of environment on plant growth and relationships to commercial applications. Miscellaneous course fee required—see Class Schedule. Field trip required. 2 lectures, 1 laboratory. Prerequisite: OH 131.

**OH 133 Plant Propagation Fundamentals III (4)**
Introduction to commercial practices of plant propagation including seed, cuttings, grafting, layering, tissue culture. Discussion of the structures and environmental conditions utilized for plant propagation. Field trip may be required. 3 lectures, 1 laboratory. Prerequisite: OH 131, OH 132.

**OH 134 Landscape Maintenance Fundamentals IV (3)**
Maintenance of trees, shrubs. Cultural requirements, irrigation, pruning, fertilizing. Turf and ground cover renovation. Repair of irrigation systems, equipment. Landscape maintenance industry. Maintenance of tools and power equipment. 2 lectures, 1 laboratory. Prerequisite: OH 126, OH 131 or consent of instructor.

**OH 145 Bonsai Culture (2)**
Philosophy, history, training, culture, production, and care of the Japanese Bonsai. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 activity.

**OH 200 Special Problems for Undergraduates (2-4)**
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

**OH 230 Ornamental Gardening (3)**
Information and recommendations for the home gardener. Methods of propagation, pruning, planting, soils, fertilizers, lawn planting and maintenance, pest and weed control, home landscaping, and identification and care of house plants. For non-horticulture majors. 2 lectures, 1 laboratory.

**OH 231, 232, 233 Plant Materials (4) (4) (4)**
Identification, habits of growth, cultural requirements, and use of ornamental plants in landscape. 3 lectures, 1 laboratory. Prerequisite: BOT 123.

**OH 237, 238 Landscape Plants I, II (3) (3)**
Identification of woody and herbaceous ornamental plant materials selected and specified for the landscape. Landscape uses, cultural requirements and growth habits of plants used in North America. Field trips required. For non-horticulture majors. 2 lectures, 1 laboratory. Prerequisite: BOT 121.

**OH 243 Turf Management (4)**
Turf propagation, irrigation, fertilizer and pest control methods and procedures. Turf grass varieties and uses. Turf equipment. 3 lectures, 1 laboratory.

**OH 250 Principles of Landscape Design (3)**
Introduction to basic principles, elements of landscape design, design theory, plant composition; creative problem solving, functional and design uses of landscape materials, client and maintenance criteria, xeriscape concepts and perspective drawing. Expansion of OH 101 drafting and CAD skills. 1 lecture, 2 laboratories. Prerequisite: OH 101, OH 126, OH 132, OH 134, one plant materials course and AG 250 or CSC 110.
OH 251 Ikebana (3)
Techniques of the ancient art of Ikebana as it influences western floral design. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: OH 132.

OH 252 Continental Mass Design (3)
History, theory and application of techniques of mass flower arranging. Traditional influences on commercial floral design practices in Continental Europe and North America. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: OH 125 or OH 132 or consent of instructor.

OH 253 Stylized Western Design (3)
Techniques of western stylized line design as it is known currently. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: OH 132.

OH 302 Ornamental Horticulture Sales and Service (3)
Historical establishment of the retail horticulture centers. Relating basic marketing and management principles to the unique conditions found in typical ornamental horticulture sales and service establishments. Field trip required. 2 lectures, 1 activity. Prerequisite: OH 132.

OH 320 Horticultural Presentation Techniques (4)
Various media essential to horticultural presentations. Expanded applications of plan, elevation, perspective drawings. Duplication, color rendering, CAD applications for logo, letterhead, business card, brochures for horticultural business. Model construction, photography and slide-synchronization. Required field trip. 2 lectures, 2 laboratories. Prerequisite: Computer literacy course, OH 250.

OH 321 Residential Landscape Design (4)
Principles of landscape design for single-family residential properties. Project involvement includes actual client contact. Application of xeriscape concepts to the residence. Computer assisted design applications emphasized. Required field trip. 2 lectures, 2 laboratories. Prerequisite: OH 250 and two plant materials courses selected from OH 231, OH 232, OH 233. Recommended: OH 320, OH 381, AE 131 or AE 237.

OH 322 Advanced Landscape Design (4)
Practical design applications for various landscape situations. Design projects, both real and hypothetical, emphasize site and client analysis, interior plantscape design, xeriscape applications, plant composition and computer applications. Field trip required. 2 lectures, 2 laboratories. Prerequisite: OH 321 or consent of instructor. Recommended: OH 320, OH 381, OH 324.

OH 324 Foliage Plant Culture (4)
Identification, propagation, production, marketing, utilization and maintenance of plants intended for interior plantscaping. 3 lectures, 1 laboratory. Prerequisite: Junior standing and consent of instructor.

OH 325 Floriculture Grades and Standards (3)
Grades and standards for fresh flowers, and blooming and foliage plants. Score cards in evaluating florist crops. Comparative evaluation used to develop both verbal skills and appreciation of commercially grown floriculture crops. 1 lecture, 2 laboratories. Prerequisite: OH 131, OH 132, or consent of instructor.

OH 328 Advanced Floral Design (4)
Advanced styling of floral designs used in sympathy work. Party decorations, hospital arrangements, and solid work. Field trip required. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: OH 132.

OH 329 Advanced Floral Design (4)
Advanced styling of floral designs to wear and carry, as practiced specifically in wedding work. Field trip required. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: OH 328.
OH 330  Art of Flower Arrangement (2)
Theory and practice of use of plant materials as an art medium in creating floral design. Application of universal art principles to flower and foliage decorations. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 laboratory. Prerequisite: Any course in GEB area B.1.

OH 331  Landscape Contracting (4)
Practices in supervising personnel and applying standard techniques in landscape construction. Cost finding and estimating for landscape trades. 3 lectures, 1 laboratory. Prerequisite: OH 101, OH 126, OH 250.

OH 332  Landscape Contracting (4)
Practices in supervising personnel and applying standard techniques in landscape construction cost finding and estimating for landscape trades. Rules, regulations, and licensing laws, set forth by the State of California, governing landscape contractors. 3 lectures, 1 laboratory. Prerequisite: OH 331.

OH 333  Advanced Turf Management (4)
Maintenance and operation of large areas such as golf greens, athletic fields, and park areas. Systems of management and maintenance, business aspects, and turf industry. 3 lectures, 1 laboratory. Prerequisite: OH 243.

OH 337  Park Planning and Management (4)
Overview of the management and maintenance of private and public parks and recreational areas. Field trips required. 3 lectures, 1 laboratory. Prerequisite: Junior standing or consent of instructor.

OH 338  Advanced Plant Propagation (4)
Current propagation practices with emphasis on producing and scheduling the early nursery phases of ornamental crops. Seed harvesting, handling and treatments, cutting production, grafting and budding techniques. 3 lectures, 1 laboratory. Prerequisite: OH 133.

OH 340  Principles of Greenhouse Environment (5)
Problems and practices affecting the contemporary commercial horticulturist. Analysis and operation of greenhouses and related equipment stressing the effect of environment on plant growth. Field trip required. 4 lectures, 1 laboratory. Prerequisite: OH 131 and OH 132, or consent of instructor.

OH 341  Cut Flower Production (4)
Production of cut flowers and other fresh florists' commodities in greenhouses and outdoors. Preparation and scheduling of such commodities for major markets. Field trip required. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: OH 340, SS 221 and consent of instructor.

OH 342  Potted Plant Production (4)
Production of major commercial flowering potted plants in greenhouses and outdoors. Preparation and scheduling of potted flowering greenhouse crops for major markets. Field trip required. 3 lectures, 1 laboratory. Prerequisite: OH 341 or consent of instructor.

OH 381  Advanced Plant Materials (3)
Recognition, identification, ecological significance, propagation, uses and landscape potential, environmental impact, and cultural needs of California flora as they pertain to the horticultural field, and natural resource management. 2 lectures, 1 laboratory. Prerequisite: Junior standing and consent of instructor.

OH 400  Special Problems for Advanced Undergraduates (2-4)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

OH 401  Field Studies in Ornamental Horticulture (1)
Field trips to ornamental horticulture outlets and the industry businesses that supply them. Garden centers, flower shops and garden center flower shop combinations. Foundation and display gardens with retail outlets and public educational facilities. Required field trip includes wholesalers, jobbers, display houses, advertising agency and others working with the retailers. 1 activity. Prerequisite: OH 131, OH 132.
OH 402  Advanced Ornamental Horticulture Sales and Services (4)
Legal aspects and economics of operating a retail horticulture business. State and county regulations, quarantines, grades and standards of nursery stock and floral design materials. Purchasing, merchandising and record keeping. Trade associations and cooperative buying. 3 lectures, 1 laboratory. Field trip required. Prerequisite: OH 302, ECON 201 or ECON 211, junior standing or consent of instructor. Recommended: MGT 201.

OH 421  Arboriculture (4)
Care and management of large ornamental trees. Use of ropes and other safety equipment in tree climbing. Cavity work, bracing, cabling, and pruning. 3 lectures, 1 laboratory. Prerequisite: OH 134, OH 231, OH 232, OH 233.

OH 422  Advanced Arboriculture (2)
Theory and practices utilized in the management of ornamental trees found in landscaped urban settings. Scheduling of cultural practices and safe usage of hand and power equipment, as specified by professional arborists, and other safety regulations. 1 lecture, 1 laboratory. Prerequisite: OH 231, OH 421 and consent of instructor.

OH 423  Wholesale Nursery Management (4)
Commercial nursery operations including container plant handling, growing media, fertilization, weed control, container sizing, pruning and staking, systems analysis, production and inventory control and marketing. History and overview of the nursery industry. Field trip required. 3 lectures, 1 laboratory. Prerequisite: OH 133, SS 221, senior standing, or consent of instructor.

OH 424  Tissue Culture Propagation I (2)
Principles of tissue culture applied to the propagation of ornamental plants. Systems applicable to commercial crops, laboratory organization, media, and current research. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 laboratory. Prerequisite: OH 133 and BOT 322.

OH 425  Tissue Culture Propagation II (1)
Current tissue culture techniques used in horticulture industry. Continuation of experiments begun in OH 423. Total credit limited to 6 units. 1 laboratory. Prerequisite: OH 425.

OH 427  Disease and Pest Control Systems for Ornamental Plants (5)
Recognition, prevention and control of disease, weed, insect and mite pests that impact commercial ornamental plantings. Pesticides recommended for prevention and control. Training for safe and proper pesticide applications. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: ENT 220 and/or CRSC 311, BOT 324 and senior standing.

OH 434  Landscape Management (3)
Maintenance procedures and operations. Estimating scheduling, recordkeeping and implementation of landscape maintenance projects. Interior landscape maintenance. 2 lectures, 1 laboratory. Prerequisite: OH 126, OH 134 or permission of instructor.

OH 435  Interiorscaping (4)
Systematic presentation and critique of current aspects of interior landscaping. Elements of design, environmental influences and measurements, plant materials selection, specifications, procurement and installation, and subsequent maintenance of finished interiorscape. 3 lectures, 1 laboratory. Prerequisite: OH 250 and OH 324 or consent of instructor.

OH 443  Greenhouse Management (4)
Problems and practices in the management of greenhouses. Scheduling greenhouse crops, planning crop rotation, cost accounting for floricultural crops, management decisions in production costs and personnel matters. Field trips required. 3 lectures, 1 laboratory. Prerequisite: OH 342 or consent of instructor.

OH 445  Ornamental Horticulture Irrigation Systems (4)
Irrigation system design with emphasis on landscape, nursery and specialized systems, materials and installation. 2 lectures, 2 laboratories. Prerequisite: OH 250, AE 337 and senior standing.
OH 460 Senior Seminar (1)
Open forum for senior students presenting information and developing skills necessary for career planning in professional horticulture. Exposure to current employment trends in the OH industry. 1 seminar. Prerequisite: Completion of all lower division major courses and senior standing.

OH 461 Senior Project (2)
Selection of a project under faculty adviser approval. Initial research and data gathering period for project information. Projects typical of problems which graduates must solve in their fields of study or employment. Project results are presented in a formal written report completed in OH 462. Contract drawn up with approval of adviser. Minimum 60 hours. Prerequisite: All 100–200 level courses in OH curriculum; 135 units; ENGL 114, ENGL 215 or ENGL 218.

OH 462 Senior Project (2)
Continuation of Senior Project development. Write-up of rough draft and formal draft of project. Completion of formal written report under adviser supervision. Minimum 60 hours. Prerequisite: Completion of OH 461 with a grade of C or better.

OH 470 Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

OH 471 Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

OH 581 Graduate Seminar in Ornamental Horticulture (3)
Group study of current problems of the ornamental horticulture industry; current experimental and research findings as applied to production and to the teaching of horticulture. 3 seminars.

PE--PHYSICAL EDUCATION

Number Fields for Physical Education Courses

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Coed (PE)</th>
<th>Men (PEM)</th>
<th>Women (PEW)</th>
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<tbody>
<tr>
<td>Basic Instructional Program</td>
<td>100–165</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intramural activities</td>
<td>174</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Competitive athletics</td>
<td>181–199</td>
<td>181–199</td>
<td>181–199</td>
</tr>
<tr>
<td>Professional activities (PE majors or related concentration students only)</td>
<td>206–239</td>
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<tr>
<td>Academic courses</td>
<td>240 up</td>
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BASIC INSTRUCTIONAL PROGRAM
Enrollment is open to all students except for designated intramural courses. Courses carry 1 unit of credit, meet 2 hours per week, and are designed to develop skill, knowledge of rules, background and analysis of techniques, and desirable attitudes toward physical fitness and participation in sports.

The beginning course or its equivalent is prerequisite to the intermediate, and the intermediate to the advanced. Prerequisite may be waived by consent of the instructor.

No more than two different activity courses nor more than one section of an individual activity course may be taken for credit in any one quarter. A student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course. Any level of an activity course can be taken only once for credit.

Students not majoring in physical education may apply a maximum of 12 units of credit earned in general and intramural activity courses toward the bachelor's degree.

All basic instructional courses (PE 100–176) are evaluated on a Credit/No Credit basis. A miscellaneous course fee may be required—see Class Schedule.
Coed

PE 100 Adaptive Activity
PE 101 Gymnastics
PE 103 Archery
PE 104 Badminton, Beg.
PE 105 Badminton, Int.–Adv.
PE 108 Basketball
PE 109 Bowling
PE 110 Cycling
PE 111 Fencing
PE 116 Aerobic Exercise
PE 121 Golf, Beg.
PE 122 Golf, Int.–Adv.
PE 125 Jogging
PE 126 Judo
PE 129 Hatha Yoga
PE 131 Physical Conditioning
PE 132 Racquetball, Beg.
PE 133 Racquetball, Int.–Adv.
PE 135 Skin Diving
PE 136 Scuba Diving
PE 137 Self-Defense
PE 138 Karate
PE 139 Soccer
PE 140 Ultimate Disc
PE 142 Softball
PE 144 Swimming, Beg.
PE 145 Swimming, Int.
PE 146 Swimming, Adv.
PE 148 Tennis, Beg.
PE 149 Tennis, Int.–Adv.
PE 150 Tumbling-Vaulting
PE 151 Volleyball, Beg.
PE 152 Volleyball, Int.–Adv.
PE 154 Weight Training
PE 156 Aqua-Aerobics
PE 158 Synch. Swimming
PE 159 Wrestling
PE 161 Canoeing
PE 162 Windsurfing
PE 165 Skiing
PE 174 Intramurals
PE 176 Fitness Walking

COMPETITIVE ATHLETICS

Enrollment limited to those academically qualified to compete in intercollegiate athletic programs. Consent of coach required. Total credit limited to 8 units. Courses are each 2 units and meet for a minimum of 10 hours per week. All competitive athletics courses are evaluated on a Credit/No Credit basis.

Men

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
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<tbody>
<tr>
<td>PEM 182</td>
<td>Baseball</td>
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<tr>
<td>PEM 183</td>
<td>Basketball</td>
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<tr>
<td>PEM 184</td>
<td>Cross Country</td>
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<td>PEM 185</td>
<td>Football</td>
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<td>PEM 189</td>
<td>Soccer</td>
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<td>Swimming</td>
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<td>Track and Field</td>
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<tr>
<td>PEM 196</td>
<td>Wrestling</td>
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Women

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<td>Softball</td>
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<td>PEW 191</td>
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<td>Tennis</td>
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<td>PEW 193</td>
<td>Track and Field</td>
</tr>
<tr>
<td>PEW 194</td>
<td>Volleyball</td>
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</tbody>
</table>

PROFESSIONAL ACTIVITIES

Priority for enrollment given to those students pursuing a major in Physical Education. Physical Education majors may apply a maximum of 24 units of credit earned in PE 101-239 toward the bachelor's degree. When applicable, course selection should be determined by the student after consultation with his/her adviser. All courses are one or two units and meet for two or four hours per week. All professional activities are designed to attain intermediate skills in performance and analysis and knowledge of rules and strategy. Prerequisites in the PE 101-165 series activities will be required for those students who cannot demonstrate minimum skill levels.

Men

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
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<tbody>
<tr>
<td>PE 206</td>
<td>Tumbling-Vaulting (2)</td>
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<tr>
<td>PE 207</td>
<td>Apparatus (2)</td>
</tr>
<tr>
<td>PE 208</td>
<td>Golf (1)</td>
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<td>PE 210</td>
<td>Tennis (1)</td>
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<tr>
<td>PE 211</td>
<td>Softball-Baseball (1)</td>
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<tr>
<td>PE 212</td>
<td>Handball/Racquetball (1)</td>
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Women

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<tr>
<th>Course Code</th>
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<tr>
<td>PE 213</td>
<td>Basketball (1)</td>
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<td>PE 214</td>
<td>Volleyball (1)</td>
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<tr>
<td>PE 215</td>
<td>Field Sports (Soccer, Speedball, Speed-a-Way) (2)</td>
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<tr>
<td>PE 216</td>
<td>Wrestling (1)</td>
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<td>PE 217</td>
<td>Flag Football/Football (1)</td>
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PE 218 Aquatics (2)
PE 219 Progressive Strength Training (1)
PE 221 Combatives/Self Defense (1)
PE 222 Archery (1)
PE 223 Cross Country and Track Events (1)
PE 224 Field Events (1)
PE 225 Team Handball (1)
PE 227 Aerobic Dance/Fitness (1)
PE 229 Badminton (1)

ACADEMIC COURSES
Professional courses designed primarily for the student majoring in physical education. PE 250 may be used in partial satisfaction of the General Education-Breadth requirement in physical education.

PE 241 Understanding Fitness and Training (1)
Introduction to physiological principles and factors which provide the basis for the development and maintenance of optional physical fitness. 1 lecture. Prerequisite: Concurrent enrollment in PE 110, PE 116, PE 125, PE 131, PE 145, PE 146, PE 154 or PE 156.

PE 243 Lifeguard Training (2)
Lifeguarding knowledge, techniques and skills. Students completing course will be eligible for American Red Cross Lifeguard Training Certification exam. 1 lecture, 1 activity. Prerequisite: Successful completion of Red Cross swimming skills test, consent of instructor.

PE 245 Adaptive Aquatics in Physical Education and Recreation (2) (Also listed as REC 245)
Adaptive techniques in working with the disabled in aquatics; physical, mental, emotional, social, and recreational involvements utilizing aquatics as the treatment modality. 1 lecture, 1 activity.

PE 250 Health Education (2)
Introductory health course geared to bridge the gap between scientific health discoveries and one's application of these discoveries in the daily living pattern. 1 lecture, 1 recitation.

PE 252 Introduction to Athletic Training (2)
Modern principles and practices in the prevention, treatment, rehabilitation and follow-up care of athletic injuries. Functions and limitations of the athletic trainer as an athletic paramedic. Theory and practice of adhesive strapping as related to supporting major body joints for athletic participation. 2 activities. Prerequisite: ZOO 131.

PE 270 Introduction to Physical Education (2)
Designed to acquaint the student with the concept of physical education as a profession and to orient the student to the Cal Poly program. 2 lectures.

PE 275 Sports Officiating (2)
Designed to provide knowledge, understanding, appreciation of officiating in general, and the development of skills in officiating. 1 lecture, 1 activity.

PE 280 First Aid and CPR (3)
Standard American Red Cross first aid and CPR course. Instruction and practice in the immediate and temporary care of injuries and sudden illness. 2 lectures, 1 activity.

PE 296 Planning Techniques in Physical Education (3)
Practical skills and techniques of teaching physical education in schools. Unit and lesson planning, class management, teaching aids. Implementation and evaluation of lessons in a laboratory setting. 2 lectures, 1 activity. Prerequisite: 4 units of professional physical education activity courses (PE 206–229).

PE 302 Mechanical Kinesiology (4)
Fundamental biomechanical concepts and their application to human movement activities, and analyses of exercise mechanics and skill performance. 3 lectures, 1 laboratory. Prerequisite: ZOO 237 and ZOO 340.

PE 303 Physiology of Exercise (4)
Application of the knowledge of human physiology to exercise situations. 3 lectures, 1 laboratory. Prerequisite: ZOO 331 and ZOO 322. Recommended: FSN 210.
PE 305  Drug Education (2)  
Instruction on the nature and effect of the use of tobacco, alcohol, narcotics and restricted dangerous drugs. 2 lectures. Prerequisite: PE 250.

PE 307  Adaptive Physical Education (4)  
Major categories of handicapping conditions with implications for the development of physical activity programs for specific disabilities. 3 lectures, 1 laboratory. Prerequisite: ZOO 237, ZOO 331 and ZOO 332.

PE 310  Concepts in Physical Education (3)  
Historical, physiological, mechanical, psychological, and sociological foundations of physical education. Movement as it relates to physical fitness, wellness, social development, cross-cultural understanding, and self-image. 3 lectures. Prerequisite: GEB E.2. (See page 114 for GEB requirements.)

PE 312  Coaching Aquatics (2)  
Supervision of swimming pool activities. Coaching swimming and water polo. 1 lecture, 1 activity. Prerequisite: PE 218 or consent of instructor. Recommended: PE 296.

PE 318  Measurement and Evaluation in Physical Education I (3)  
Scientific basis of evaluating programs in physical education. Experimental, survey, and historical evaluative methods. Statistical design and analysis with packaged computer programs and data base management. 3 lectures. Prerequisite: STAT 211 and GEB F.1. (See page 114 for GEB requirements.)

PE 319  Measurement and Evaluation in Physical Education II (4)  
Principles of test selection and administration, measurement and evaluation of characteristics and data, library research, data analysis, experimental design, questionnaire construction and sampling techniques related to physical education. 3 lectures, 1 activity. Prerequisite: PE 318, STAT 211.

PE 321  Coaching Football (2)  
Fundamentals and systems of offensive and defensive football. Preparation for interscholastic coaching. Rules of the game. 1 lecture, 1 activity. Prerequisite: PE 217 or consent of instructor. Recommended: PE 296.

PE 322  Coaching Basketball (2)  
Theories of coaching, principles of organization of interscholastic basketball. 1 lecture, 1 activity. Prerequisite: PE 217 or consent of instructor. Recommended: PE 296.

PE 323  Coaching Baseball (2)  
Fundamentals of baseball with emphasis on strategy, selection of players, officiating, interpretation of rules, scoring, and administration of interschool games. 1 lecture, 1 activity. Prerequisite: PE 211 or consent of instructor. Recommended: PE 296.

PE 325  Coaching Softball (2)  
Fundamentals of softball with emphasis on strategy, selection of players, officiating, interpretation of rules, scoring, and administration of interschool games. Slow pitch as well as fast pitch techniques will be emphasized. 1 lecture, 1 activity. Recommended prerequisite: PE 296.

PE 327  Coaching Wrestling (2)  
Coaching techniques of wrestling. Theories of coaching principles and organization of interscholastic wrestling. 1 lecture, 1 activity. Prerequisite: PE 216 or consent of instructor. Recommended: PE 296.

PE 344  Coaching Volleyball (2)  
Techniques and theories of individual fundamentals, game strategies, and problems of coaching secondary and collegiate level athletes. 1 lecture, 1 activity. Prerequisite: PE 214 or consent of instructor. Recommended: PE 296.

PE 350  Computer Applications in Teaching Physical Education (3)  
Practical experience with educational applications of microcomputers and software designed to aid the physical education teacher. 1 lecture, 2 activities. Prerequisite: CSC 110, CSC 111, CSC 112, CSC 118, CSC 120, CSC 410, CSC 416 or consent of instructor.
PE 354  School Health Programs (2)
Introduction to school health services, environment, and instruction within the public and private school system. Health instruction and curriculum. Identification and control of children's communicable diseases and special problems within the classroom. 2 lectures. Prerequisite: PE 250.

PE 356  Teaching Gymnastics (2)
Techniques and problems in teaching gymnastics along with practical experience. Emphasis on teaching progressions, class organization, spotting, and safety. 2 activities. Prerequisite: PE 206, PE 207, PE 296, or consent of instructor.

PE 379  Coaching Track and Field and Cross Country (2)
Techniques and problems in teaching track and field and cross country. 1 lecture, 1 activity. Prerequisite: PE 223, PE 224, or consent of instructor. Recommended: PE 296.

PE 384  Water Safety Instructor (3)
Analyzing swimming strokes and techniques with emphasis on teaching methods for beginning, intermediate, and advanced skills. Teaching infant and pre-school children. Teaching basic water safety and emergency water safety skills. Curriculum requirements can be satisfied without WSI card requirements. 2 lectures, 1 activity. Prerequisite: Pass skill and written pre-test, possess a current ARC Emergency Water Safety or Lifeguard Training Certificate.

PE 400  Special Problems for Advanced Undergraduates (1-3)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Senior standing or consent of instructor.

PE 401  Administration of Physical Education and Health/Fitness Programs (3)
Underlying philosophy, principles, policies, and procedures of administration and management as applied to physical education and health/fitness in various settings such as schools and commercial and corporation fitness enterprises. 3 lectures. Prerequisite: Junior standing (preference given to PE majors).

PE 402  Motor Learning and Control (4)
Variables which control sensory-motor integration. Analysis of factors which affect the acquisition of motor skills as related to the learning process and the learning environment. 3 lectures, 1 activity. Prerequisite: PE 319, ZOO 331 and ZOO 332.

PE 404  Motor Development (3)
Motor development of individuals from birth to maturity. Emphasis on interrelationship between motor and cognitive characteristics and affective needs and interests. 3 lectures. Prerequisite: PE 270, and two physical education Basic Instructional Program courses.

PE 405  Administration of Health Education (2)
Current procedures and policies in the development and basic administration of public and school health education programs. 2 lectures.

PE 407  Programming and Adaptive Techniques in Therapeutic Recreation (4) (Also listed as REC 407)
Description, etiology, and nature of specific disabilities, with an emphasis on the development of individualized therapeutic recreation programs for the physically handicapped, the developmentally disabled, and the emotionally troubled individual. 3 lectures, 1 laboratory. Prerequisite: PE 307 or REC 252 or consent of instructor.

PE 408  Exercise and Health Promotion for Senior Adults (3)
Special fitness, exercise, and health needs of the senior population. Theories of aging and age-related changes. Health promotion, exercise needs and activity programs for senior adults. 3 lectures. Prerequisite: PE 250, senior standing or consent of instructor.

PE 410  Psychology of Coaching (3)
Psychological considerations of the coach-athlete relationship and mental preparation of teams and individuals for competition and practice. Special emphasis on the male and female adolescent with regard to the psychological implications of sports participation. 3 lectures.
PE 412 Contemporary Issues in Sport (3)
Selected topics dealing with sports as a social phenomenon in American life. Class Schedule will list topic selected. Total credit limited to 9 units. 3 lectures.

PE 416 Physical Education/Recreation Facilities (3) (Also listed as REC 416)
Management, clientele considerations, facilities and outdoor areas planning and operations, personnel, finance and equipment as related to physical education and recreation areas and facilities. Consideration of architectural and environmental barriers. Field visits required. Miscellaneous course fee required—see Class Schedule. 3 lectures. Prerequisite: Upper division standing and consent of instructor for non-PE/REC majors.

PE 422 Teaching Elementary Physical Education (4)
Content and process required to implement a developmental physical education program for elementary school children. 2 lectures, 2 activities. Prerequisite: PE 296. Recommended: PSY 201 or PSY 202, PE 206, and DANC 311.

PE 423 Teaching Secondary Physical Education (4)
Techniques of teaching physical education in junior and senior high school. Emphasis on class organization, lesson plan development and evaluation, class management and control and understanding the secondary school setting. 2 lectures, 2 activities. Prerequisite: PE 207, PE 296. Recommended: PE 422.

PE 424 Organizing and Teaching Physical Education (3)
Organization, selection, presentation, application, and interpretation of subject matter in physical education. 3 lectures. Prerequisite: PE 296 and PE 422 or PE 423.

PE 432 Athletic Training and Rehabilitation (2)
Modern principles and practices in conditioning and care of athletes. Theory and practice in the scientific manipulation of the muscles as related to therapeutic exercise. 2 activities. Prerequisite: PE 241 and PE 252 for PE majors; PE 252 and senior standing for non-majors.

PE 434 Design and Implementation of Health and Fitness Programs (3)
Application of training physiology to development of health and fitness programs. Role of exercise in health promotion. Evaluation of current practice in health and fitness program design and implementation in various commercial and corporate settings. Review of knowledge and skills of health and fitness professionals. 3 lectures. Prerequisite: PE 252, PE 302, PE 303.

PE 437 Directed Fieldwork (1-3)
Practical work experience in related phases of physical education under qualified supervision. Total credit limited to 9 units. Minimum of 2 laboratory hours per week per unit. Prerequisite: Senior standing or consent of adviser.

PE 438 Adaptive Physical Education Fieldwork (1-3)
Practical experience in physical education for special populations. Students plan and conduct physical activity programs for subjects who have special needs. Total credit limited to 6 units. Prerequisite: PE 307, consent of instructor.

PE 440 Physical Education Practicum (1)
Supervised experience involving organizational and instructional responsibilities in activity, lecture and/or laboratory classes as determined by curricular concentration or certificate program. Total credit limited to 3 units, 2 hours per week. Prerequisite: PE 423 or consent of instructor.

PE 445 Electrocardiography (3)
Basic principles of electrocardiography, including practical skills of the ECG technician. Recognition of normal ECG patterns and abnormal changes related to rhythm disturbances, conduction defects, and myocardial ischemia/infarction. 2 lectures, 1 laboratory. Prerequisite: CHEM 328, PE 303, ZOO 237, ZOO 331, ZOO 332, or consent of instructor.
PE 450  Lifestyle Management in a Physical Fitness Setting (3)
Designed to acquaint students with those events, situations and relationships leading to healthy lifestyles in fitness and occupational settings. Emphasis on stress and time management, exercise, nutrition and relaxation techniques. 2 lectures, 1 laboratory. Prerequisite: Senior standing. Non-majors: Consent of instructor.

PE 451  Nutrition for Fitness and Sport (3)
Application of nutritional facts to selected aspects of physical training, degenerative disease, obesity and weight control, diet manipulation and modification in sport, nutrition supplementation and special dietary considerations for the young and old, male and female athletes. 3 lectures. Prerequisite: HE 210 and PE 303.

PE 452  Testing and Exercise Prescription for Fitness Specialists (3)
Selected areas of health/fitness screening and evaluation. Application of components relevant to the development and administration of exercise programs for persons regardless of sex, age, functional capacity and presence or absence of CHD or CHD risk factors. 1 seminar, 2 laboratories. Prerequisite: HE 210, PE 303, PE 445 or consent of instructor.

PE 461, 462  Senior Project (3) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: Senior standing.

PE 470  Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

PE 471  Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

PE 474  History and Philosophy of Physical Education (3)
History of physical education including philosophical, institutional, and personal influences. Application of education principles to physical education. 3 lectures. Prerequisite: PE 270.

PE 500  Individual Study (1–3)
Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Only 6 units may be applied to degree requirements. Prerequisite: PE 517 and consent of department head, graduate adviser, and supervising faculty member.

PE 501  Administration of Adapted Physical Education Programs (3)
Principles, policies, and procedures of administration as applied to the adaptive physical education program for the elementary and secondary school levels. Legal aspects involving city, county, state and national agencies. Assessment of program effectiveness. 3 seminars. Prerequisites: PE 406, PE 407.

PE 502  Seminar in Problems of Physical Education (3)
Practical problems in physical education and their solution in terms of desired objectives in this field. 3 seminars. Prerequisite: Graduate standing.

PE 503  Seminar in Adult Wellness (3)
Advanced seminar investigating topics relating to wellness in adults. Cardiovascular, respiratory, and stress related diseases as well as health issues in the later years. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

PE 511  Administration of Physical Education and Athletics (3)
Principles and techniques of administration of physical education and athletics on the elementary and secondary school levels. 3 seminars. Prerequisite: Graduate standing.

PE 512  Critical Health Issues (3)
Selected topics dealing with health and wellness appraisal, planning and management. Class Schedule will list topics selected. Total credit limited to 9 units. 3 seminars. Prerequisite: Graduate standing.
PE 513 Evaluation of Current Studies (3)
Analysis and evaluation of published studies in physical education, health education and recreation. 3 seminars. Prerequisite: PE 517.

PE 517 Research Methods in Physical Education (3)
Experimental, descriptive, historical, philosophical, and action research in physical education. Selection of adequate problems for investigation; various sampling techniques and analyses; use of library facilities; manuscript requirements for the thesis. 3 seminars. Prerequisite: PE 319 or consent of instructor.

PE 522 Biomechanics (3)
Advanced biomechanical concepts applied to human movement, examination of research, and biomechanical analyses of movement activities. 3 seminars. Prerequisite: PE 302 or equivalent.

PE 525 Human Performance and Learning (3)
Analysis of research principles and concepts and variables related to human motor performance and learning with emphasis on the information processing approach for evaluating performance. 3 seminars. Prerequisite: Graduate standing.

PE 526 Sport in American Society (3)
Understanding the role of sport in American society as viewed from sociological and psychological perspectives. Effect of success and failure in competitive sport situations. 3 seminars. Prerequisite: Graduate standing.

PE 530 Advanced Physiology of Exercise (3)
Effects of exercise on human beings in relation to performance and physiological adjustment to activity. 3 seminars. Prerequisite: PE 303.

PE 536 Advanced Electrocardiography (3)
Development and application of advanced skills for reading and interpreting resting and exercise electrocardiograms including abnormalities associated with myocardial infarction, rhythm disturbances, conduction defects, electrolyte imbalance and drug treatment. 3 seminars. Prerequisite: PE 445 or equivalent.

PE 537 Internship (3–12) (CR/NC)
Supervised work experience in an approved wellness/fitness clinical facility, school, or other faculty approved setting. Total credit limited to 12 units. Maximum of 6 units may be applied toward Master of Science in Physical Education. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

PE 581 Graduate Seminar in Physical Education (1–3)
Directed group study of selected topics for advanced students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 seminars. Prerequisite: Graduate standing or consent of instructor.

PE 599 Thesis or Project (3) (3)
Completion of a thesis or project pertinent to the field of physical education. Independent research under the guidance of the faculty. Prerequisite: PE 517, consent of graduate committee and supervising faculty member.

**PHIL—PHILOSOPHY**

PHIL 125 Critical Thinking (3) (Also listed as ENGL 125 and SPC 125) GEB A.2.
Nature of critical thinking. Analysis of inductive and deductive arguments. Practice in the criticism and composing of arguments in English. 3 lectures. Prerequisite: ENGL 114.

PHIL 225 Symbolic Logic I (3)
Methods of proof in propositional and predicate logic including conditional and indirect proof procedures. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.
PHIL 230  Philosophical Classics (3)  
Readings of various philosophic classics with focus on the identification and evaluation of the central metaphysical and epistemological themes. Various major arguments through a case mode presentation. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

PHIL 231  Philosophical Classics (3)  
Readings with focus on the identification and evaluation of the central themes of ethics, social and political philosophy. Various major arguments through a case mode presentation. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

PHIL 305  Judeo-Christian Religions (3)  
Origins, beliefs, practices and philosophies of Judaism and Christianity, and of the ancient Middle Eastern Religions which led to their development. Influence of these religions and the logic of their religious claims. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

PHIL 306  Asian Religions (3)  
Origins, beliefs, practices and philosophies of the religions of the Hindu, Buddhist, Taoist, Confucian and Shinto and other faiths common to India and the Far East. Influence of these religions on the world and the logic of their religious claims. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

PHIL 308  Islamic Religion (3)  
Beliefs, ethics and religious practices of Islam. Historical development of the Islamic tradition from the Prophet Muhammad. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

PHIL 311  History of Greek Philosophy (3)  
Beginnings of Western science and philosophy. Pre-Socrates, Socrates, Plato, and Aristotle. Greek philosophies in the Roman world. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

PHIL 312  History of Medieval Philosophy (3)  
Developments of Western philosophy from Augustine to Ockham, especially the philosophies of Anselm, Abelard, Roger Bacon, Bonaventure, and Aquinas. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

PHIL 313  Continental Philosophy: Montaigne to Leibnitz (3)  
Developments of Western philosophy from the Renaissance through Leibnitz with special emphasis upon the philosophies of the Continental Rationalists. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

PHIL 314  British Philosophy: Bacon to Mill (3)  
Developments of Western philosophy from the Renaissance through Mill with special emphasis upon the philosophies of the British Empiricists. Prerequisite: PHIL 230 or PHIL 231.

PHIL 315  German Philosophy: Kant to Nietzsche (3)  
Primary issues and concepts found in German philosophy from 1780 to 1900, with emphasis on Kant, Hegel, Marx, Kierkegaard, and Nietzsche. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

PHIL 316  Contemporary European Philosophy (3)  
Recent movements within the Continental tradition, including French and German existentialism, phenomenology, and post-metaphysical philosophy. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

PHIL 317  Contemporary British and American Philosophy (3)  
Distinctly Anglo-American philosophical movements of the twentieth century including pragmatism, realism, relativism, positivism and various schools of analytic philosophy. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

PHIL 321  Philosophy of Science (3)  
Methods of physics, biology, psychology and other selected sciences, with reference to their presuppositions and general findings. Relations between the sciences and implications of scientific methods for other fields of inquiry. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.
PHIL 331 Ethics (3)  GEB C.3.
Inquiry into the problems of the principles of right action and justice, of moral character and motivation, and of the good life. Examination of traditional and contemporary answers to these problems and the implications of those answers. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

PHIL 333 Political Philosophy (3)  GEB C.3.
Philosophic foundation of political ideologies. Freedom, state, law, obligation, sanction, and their relation to metaphysics, theory of knowledge, and ethics. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

PHIL 334 Jurisprudence (3)  (Also listed as POLS 334)  GEB C.3.

PHIL 335 Social Ethics (3)  GEB C.3.
Ethical theory and critical analysis applied to the resolution of such public policy issues as abortion, euthanasia, children's rights, family law, racial and sexual discrimination, government regulation of business, technology and ecology. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

PHIL 337 Professional Ethics (3)  GEB C.3.
Critical examination of ethical problems arising in the professions. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

PHIL 341 Philosophy of Art (3)  GEB C.3.
Theories about the nature and evaluation of artistic and literary phenomena. Relationship of art and literature to ethics, metaphysics, religion, political philosophy and epistemology. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

PHIL 342 Philosophy of Religion (3)  GEB C.3.
Inquiry into the nature of religious experience and claims, naturalism and supernaturalism, arguments for the existence of God, the problem of evil, miracles, revelation, faith, human nature and destiny, verification and refutation of religious claims. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

PHIL 400 Special Problems for Advanced Undergraduates (1-2)
Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

PHIL 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Class Schedule will list topics selected. Total credit limited to 6 units. 1-3 lectures. Prerequisite: Consent of instructor.

PHYS 104 Introductory Physics (4)  GEB B.1.a.
Fundamental principles of mechanics, heat, light and electricity. Not to be taken by students who have taken a college course in physics. 4 lectures. Prerequisite: MATH 103, MATH 117, MATH 118 or MATH 120.

PHYS 121 College Physics (4)  GEB B.1.a.
An introductory course in mechanics emphasizing motion, force, and energy. Not open for credit to students having a grade of C- or better in PHYS 131. 3 lectures, 1 laboratory. Prerequisite: MATH 117 and high school trigonometry or, MATH 119, or MATH 120.

PHYS 122 College Physics (4)  GEB B.1.a.
Continuation of PHYS 121. Topics include properties of materials, fluids, waves and vibrations, sound, heat, light and optics. Not open for credit to students having a grade of C- or better in PHYS 132. 3 lectures, 1 laboratory. Prerequisite: PHYS 121.
PHYS 123 College Physics (4)  
Continuation of PHYS 121 and 122. Electrostatics, electric current, magnetic fields and induction. Elements of modern physics. Not open for credit to students having a grade of C- or better in PHYS 133. 3 lectures, 1 laboratory. Prerequisite: PHYS 121. Recommended: PHYS 122.

PHYS 131 General Physics (4)  
Fundamental principles of mechanics. Vectors, particle kinematics, statics and dynamics. Equilibrium of a rigid body. Work and energy, linear momentum, rotational kinematics and dynamics. Primarily for physical science, engineering, and architecture students. 3 lectures, 1 laboratory. Prerequisite: MATH 131 or concurrent enrollment in MATH 142. High school physics recommended.

PHYS 132 General Physics (4)  
Oscillations, waves in elastic media, sound waves. Temperature, heat and the first law of thermodynamics. Kinetic theory of matter, second law of thermodynamics. Geometrical and physical optics. 3 lectures, 1 laboratory. Prerequisite: PHYS 131.

PHYS 133 General Physics (4)  
Charge and matter, electric field, electric potential, dielectrics, capacitance, current and resistance, electromagnetic force and circuits, magnetic fields, magnetic field of a moving charge, induced emf. 3 lectures, 1 laboratory. Prerequisite: PHYS 131, MATH 132 or MATH 142.

PHYS 137 General Physics: Applied Physics for Architects (4)  
Applied physics problems related to architecture. Damped, forced, and coupled oscillations in mechanical structures and electric circuits. Earthquakes and structures. Elementary electric circuit and wiring concepts. Energy transport, and efficient use of energy and passive solar energy in buildings. For School of Architecture and Environmental Design majors. 3 lectures, 1 laboratory. Prerequisite: PHYS 132, MATH 142.

PHYS 200 Special Problems for Undergraduates (1–2)  
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

PHYS 201 Learning Center Tutor (1) (CR/NC)  
Act as a tutor in the Physics Learning Center. Help students with problem solving techniques and introductory physics course material. Total credit limited to 3 units, with a maximum of 1 unit per quarter. Credit/No Credit grading only. Prerequisite: PHYS 133 and consent of instructor.

PHYS 202 Physics and the Computer (2)  
Introduction to microcomputer tools for physics. Graphics, plotting, spreadsheet, integration, differential equations, simulation. 2 lectures. Prerequisite: PHYS 133, CSC 101 or CSC 110 or equivalent.

PHYS 206, 207 Instrumentation in Experimental Physics (2) (2)  
L-R-C circuits and electronic circuit elements emphasizing the applications of analog and digital electronics to instrumentation in modern physics. 2 lectures. Prerequisite: MATH 143, course in the use of Pascal or FORTRAN programming language, PHYS 133 and concurrent enrollment in PHYS 256, PHYS 257.

PHYS 210 Introduction to Modern Physics (4)  
Fundamental principles of modern physics, emphasizing atomic and nuclear phenomena. Introduction to special relativity, wave particle duality, Bohr theory, quantum mechanics, radioactivity, interaction of radiation with matter, and nuclear reactions. Not open to students who have taken PHYS 211. 4 lectures. Prerequisite: PHYS 133 or EL 207 or PHYS 123 and MATH 132.

PHYS 211 Modern Physics (4)  
Special relativity, fundamental principles of quantum mechanics, emphasizing the modern description of atomic phenomena. Kinetic theory, wave particle duality, Bohr theory, Schroedinger equation, elementary atomic structure. 4 lectures. Prerequisite: PHYS 133 or EL 207 or equivalent, MATH 133 or MATH 241.

PHYS 213 Introduction to Nuclear Physics (3)  
Nuclear radiations and interactions. Detection methods, instruments and radioactive hazards. Nuclear reactions and induced radioactivity. Nuclear energy. 3 lectures. Prerequisite: PHYS 211.
PHYS 215  Physics of Sound and Music (3)  GEB B.1.a.
Wave nature of sound. Musical instruments and production of sound, overtones and tone quality, musical scales, decibels and noise hazards. Speech and hearing. Recording and reproduction of sound. Electronic instruments and synthesizers. Room acoustics. 3 lectures. Prerequisite: PHYS 104 or PHYS 122 or PHYS 132 or PSC 101 or consent of instructor.

PHYS 243  Introductory Nuclear Physics Laboratory (1)  GEB B.1.a.
Techniques of nuclear radiation detection and measurement including Geiger, proportional and scintillation counting. Properties of alpha, beta and gamma radiation. 1 laboratory. Prerequisite or concurrent: PHYS 210 or PHYS 213, PHYS 256 or equivalent.

PHYS 256, 257  Electrical Measurements Laboratory (1) (1)
Experimental studies of circuit analysis and electronics; introduction to digital techniques; instrumentation. 1 laboratory. Prerequisite: PHYS 133, MATH 143, and concurrently PHYS 206, PHYS 207.

PHYS 301  Thermal Physics I (3)  GEB B.1.a.
Thermodynamics and statistical mechanics. Entropy, temperature, chemical potential, free energy. Selected applications including paramagnetism, ideal gas, Fermi-Dirac distribution. 3 lectures. Prerequisite: PHYS 132, PHYS 210 or PHYS 211, MATH 241.

PHYS 302  Analytical Mechanics (3)  GEB B.1.a.

PHYS 303  Analytical Mechanics (3)  GEB B.1.a.
Dynamics of a rigid body. Three-dimensional motion of a rigid body. Introduction to Lagrange's and Hamilton's equations. 3 lectures. Prerequisite: PHYS 302. Concurrent: MATH 304.

PHYS 310  Physics of Energy (3)  GEB B.1.a.
Physics and mathematics applied to broad energy topics. Efficient useage, transportation, solar energy, nuclear fission and fusion. Plasma, hydrogen economy, fuel cells, wind wave, tidal, and geothermal energy. Transmission, storage, fossils. National planning, and energy economics. 3 lectures. Prerequisite: PHYS 133.

PHYS 313  Introduction to Atmospheric Physics (3)  GEB B.1.a.
Properties of the atmosphere, atmospheric motions, solar and terrestrial radiation. Atmospheric optics and cloud physics. 3 lectures. Prerequisite: PHYS 132 or PHYS 122 and MATH 143 or MATH 133 or equivalent.

PHYS 315  Introduction to Lasers and Laser Applications (3)
Interaction of radiation with matter, theory of laser action, characteristics and modification of laser output, types of lasers. Holography and other applications. 3 lectures. Prerequisite: PHYS 133 or EL 207 or equivalent, or PHYS 123 with MATH 133 or MATH 143.

PHYS 317  Special Theory of Relativity (3)  GEB B.1.a.
Fundamental experiments and basic postulates of special relativity. Simultaneity, length and time measurements. Lorentz transformations. Four-Vectors. Space-time diagrams. Relativistic mechanics and electromagnetism. 3 lectures. Prerequisite: PHYS 210 or PHYS 211.

PHYS 323  Optics (4)  GEB B.1.a.
Maxwell's electromagnetic equations, light as an electromagnetic wave, refraction and geometrical optics, lenses and lens systems, polarization, interference, diffraction. 3 lectures, 1 laboratory. Prerequisite: PHYS 133, MATH 241.

PHYS 341, 342  Quantum Physics Laboratory (1) (2)  GEB B.1.a.
Experimental studies of particles and radiation, their quantum properties and interactions with atoms and nuclei. 1 laboratory, 2 laboratories. Prerequisite: PHYS 243.

PHYS 363  Undergraduate Seminar (2)
Study and oral presentation of physics topics of interest to students and faculty. Discussion of projects and research by students and faculty. 2 seminars.
PHYS 400  **Special Problems for Advanced Undergraduates (1–2)**
Individual investigations, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

PHYS 401  **Thermal Physics II (3)**
Additional topics in thermodynamics and statistical physics, including chemical equilibrium, phase transitions, transport processes, and cryogenics. 3 lectures. Prerequisite: PHYS 301.

PHYS 403  **Nuclear Physics (3)**

PHYS 405  **Quantum Mechanics (3)**
Wave nature of matter and the basic postulates of quantum mechanics. The wave function, operators, and their interpretation. Schroedinger's equation and its solutions for one dimensional problems. 3 lectures. Prerequisite: PHYS 211, MATH 242. Recommended: MATH 304.

PHYS 406  **Quantum Mechanics (3)**
Angular momentum operators and problems in three dimensions including the hydrogen atom. The elements of matrix mechanics and spin wave functions. Perturbation theory. 3 lectures. Prerequisite: PHYS 405.

PHYS 408, 409  **Electromagnetic Fields and Waves (4) (3)**
Electric and magnetic field theory using vector analysis. Electric fields, dielectric materials, magnetic fields, induced emf's, magnetic materials, Maxwell's equations, wave equations, plane electromagnetic waves. Dipole radiation, radiation from an accelerated charge. 4 lectures, 3 lectures. Prerequisite: MATH 304, PHYS 206, PHYS 207 or consent of instructor.

PHYS 410  **Physics of the Solid Earth (3)**
Gravity and the figure of the earth. Body wave seismology, structure and composition of the earth, heat flow and heat sources, earth tides, rotational dynamics, the geomagnetic field and its source, paleomagnetism. 3 lectures. Prerequisite: PHYS 133 and MATH 242 or equivalent.

PHYS 411  **Solid State Physics (3)**
Crystalline structure of solids. Vibrational and electronic energies in the crystal lattice. Electrical, thermal, and magnetic properties of metals, insulators, and semiconductors. 3 lectures. Prerequisite: PHYS 405.

PHYS 412  **Solid State Physics for Engineers (3)**
Basic quantum mechanics. Application to atomic structure and bonding. Crystal structures and their determination. Elementary treatments of Fermi statistics, free electron theory and band theory of solids, bulk properties of metals and semiconductors. Application to optical properties of solids and to selected current topics of interest (lasers, superconductivity, etc.). 3 lectures. Prerequisite: PHYS 211.

PHYS 413  **Advanced Topics in Solid State Physics (3)**
Semiconductor statistics and devices. Fermi surfaces in metals, superconductivity, magnetism in solids. 3 lectures. Prerequisite: PHYS 411 or PHYS 412, or consent of instructor.

PHYS 416  **Theoretical Acoustics (3)**
Mathematics-based theoretical treatment of vibrations and normal modes; wave equation and solutions; radiation from vibrating sources, resonators and filters; impedance; decibel scale; speech, hearing and psychological acoustics. 3 lectures. Prerequisite PHYS 132 and MATH 318.

PHYS 423  **Advanced Optics (3)**
Lens aberrations, interference and diffraction, Fourier optics, quantum optics, image formation and holography, non-linear optics. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 activity. Prerequisite: PHYS 323.
PHYS 424  Theoretical Physics (3)
Contour integration in the complex plane, properties of the delta function, properties of some common functions of theoretical physics, Green’s function techniques for solving differential equations. 3 lectures. Prerequisite: MATH 304, MATH 242, MATH 319, PHYS 133.

PHYS 451  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 411 or PHYS 412. Prerequisite: PHYS 341 or consent of instructor.

PHYS 452  Solid State Physics Laboratory for Engineers (1)
Selected experiments on the solid state of matter using electrical, optical, and x-ray methods. 1 laboratory. Prerequisite or concurrent: PHYS 412.

PHYS 461, 462  Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

PHYS 470  Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

PHYS 471  Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

PI-POULTRY INDUSTRY

PI 100  Enterprise Project (1–4) (CR/NC)
Selection and completion of a management/production project under faculty supervision. Project participation is voluntary and subject to approval by the department head and the Cal Poly Foundation. Degree credit limited to 12 units. Credit/No Credit grading only.

PI 121  Poultry Industry Development (4)
Development, scope and importance of the poultry industry as a part of agriculture in California and the U.S. Organization of the commercial poultry industry, employment opportunities, sources of information and development of poultry related skills. 3 lectures, 1 laboratory.

PI 122  Replacement Programs and Broiler Production (4)
Organization and planning of layer replacement programs and broiler production enterprises. Current brooding and rearing practices and management techniques as applied to commercial poultry operations. 3 lectures, 1 laboratory.

PI 133  Poultry Incubation (3)
Fundamentals of avian embryology. Application of artificial incubation practices and management of the commercial poultry hatchery. Genetic and environmental factors affecting the hatch. 2 lectures, 1 laboratory.

PI 200  Special Problems for Undergraduates (2–3)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 3 units per quarter. Prerequisite: Consent of department head.

PI 221  Poultry Selection and Egg Production (3)
Current management techniques and practices as applied to the commercial egg production flock. Selection of egg production stock and environmental factors affecting egg numbers and quality. 2 lectures, 1 laboratory.
PI 222  Poultry Products, Processing and Marketing (3)
Processing, quality determination, distribution and merchandising of poultry meat and eggs. Governmental regulations applicable to the processing and marketing of poultry products. Development and promotion of consumer products. 2 lectures, 1 laboratory.

PI 230  General Poultry Production (3)
Survey of modern poultry production including breeding, reproduction, nutrition and flock health. Organization of the commercial industry and marketing of poultry products. Not open to Poultry Industry majors. 2 lectures, 1 laboratory.

PI 231  Poultry Anatomy and Physiology (3)
Structure and function of the principal organ systems of domestic poultry. 2 lectures, 1 laboratory. Prerequisite: ZOO 131.

PI 233  Poultry Plant Design and Equipment (2)
Planning a modern commercial poultry production operation. Application of current technology to the design of poultry housing. Coordination of buildings, equipment and operational procedures for maximum plant efficiency. 1 lecture, 1 laboratory.

PI 305  Game Bird Propagation and Management (3)
Habitat needs, management and propagation of North American game bird species in the wild and in captivity. Reproduction, nutrition and maintenance of flock health as practiced by commercial game bird operations. 3 lectures. Prerequisite: One quarter college mathematics, one quarter animal biology.

PI 306  Game Bird Propagation and Management Laboratory (1)
Field trips and basic skills in game bird propagation and management in support of PI 305. 1 laboratory. Prerequisite: PI 305.

PI 322  Poultry Business Organization (4)
Organization and management of commercial poultry operations. Recruiting, training and supervising personnel. Managing the finance, public relations, production scheduling, product distribution and sales of a commercial poultry enterprise. 3 lectures, 1 laboratory. Prerequisite: Consent of instructor.

PI 323  Poultry Diseases and Hygiene (4)
Prevention and control of poultry diseases and parasites. Planning and management of poultry flock health maintenance programs. 3 lectures, 1 laboratory. Prerequisite: BACT 221, PI 231.

PI 331  Turkey Industry (3)
Coordination and operation of commercial egg-hatching and turkey-meat production enterprises. Application of current techniques and practices as related to turkey reproduction, nutrition, disease control and flock management. Planning and supervising the specialized phases of a turkey production enterprise. 2 lectures, 1 laboratory. Prerequisite: Consent of instructor.

PI 333  Applied Poultry Feeding and Nutrition (4)
Nutritional requirements, feeding principles and current feeding practices as applied to commercial poultry flocks. Least-cost ration formulation and feed manufacture for various ages and classes of poultry. 3 lectures, 1 laboratory. Prerequisite: ASCI 202, CHEM 326 or consent of instructor.

PI 400  Special Problems for Advanced Undergraduates (2-4)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

PI 422  Advanced Poultry Enterprise Supervision (3)
Coordination and supervision of the modern commercial poultry enterprise. Analysis and application of operational procedures, efficiency practices, cost and quality control techniques. Relationship of business practices to the success of the commercial enterprise. 3 lectures. Prerequisite: Consent of instructor.
PI 431  Applied Poultry Breeding (4)
Application of genetics and breeding techniques to the improvement of economic traits in commercial poultry stocks. Developing selection and breeding programs for genetic progress. 3 lectures, 1 laboratory. Prerequisite: BIO 303.

PI 461, 462  Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

PI 463  Undergraduate Seminar (2)
Preparing and presenting in an organized manner reports on new trends, special problems, research developments related to the poultry industry. Group discussion of industry special problems. 2 seminars.

PI 470  Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

PI 581  Graduate Seminar in Poultry (3)
Current trends and characteristics of the poultry industry enterprise. Group discussion of skills, techniques and practices to improve teaching of vocational agriculture as it applies to poultry. 3 seminars.

POLS—POLITICAL SCIENCE

POLS 100  Political Inquiry (3)
Introduction to the scope, language, concepts and approaches of the discipline of political science. Includes emphasis on basic methodological and research strategies for assessing political issues and events. 3 lectures.

POLS 105  Introduction to International Relations (3)
Introduction to dynamics, character and substance of power relations among nations; conflict and accommodation, including the nature of the state and the international community. 3 lectures.

POLS 200  Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

POLS 204  Basic Concepts of Political Thought (3)
Introduction to major concepts (such as authority, equality, force, individual, justice, law, political obligation, power, rights, state) which affect our thinking about social relations. Social and political theories of thinkers from Socrates to Machiavelli. 3 lectures. Prerequisite: POLS 210.

POLS 206  Judicial Process (3)
Examination of the legal process with emphasis on the social and political influences affecting the law and its enforcement. Topics considered include types of law, the structure of the judicial system including Supreme Court decision making, police, judges and lawyers. 3 lectures.

POLS 210  American and California Government (3)  GEB D.1.

POLS 212  Comparative Politics (3)
Comparative study of the government of the United Kingdom and other selected Western European countries. 3 lectures. Prerequisite POLS 105 or POLS 210.
POLS 250 Model United Nations (2)
Preparation for participation in the campus Model United Nations. Procedure, MUN rules of debate, preparation of country positions, area papers, and policy statements suitable for use in mock United Nations sessions. Total credit limited to 6 units. 2 lectures. Prerequisite: One course in POLS or consent of instructor.

POLS 301 California State and Local Politics (3)
Political culture, processes, behavior, institutions, public policy and distribution of power in California state and substate governments. 3 lectures. Prerequisite: POLS 210. 

POLS 303 Minority Group Politics (3)
Analysis of political factors affecting minority groups in America. Involvement, organization and role of minority groups in the political process. Emphasis on the political behavior of black and Chicano minorities. 3 lectures. Prerequisite: POLS 210. 

POLS 304 Politics of Global Survival (4)
Consideration of global survival from east-west, north-south and global perspectives. Arms race, development, and the political dimensions of energy, environment, food and population. 4 lectures. Prerequisite: POLS 105 or junior standing. 

POLS 305 Political Analysis (5)
Introduction to methodology research design and quantitative methods used in survey research and political analysis. Bi-variate inferential statistics and SPSS statistical computer programs will be used to analyze political phenomena. 3 lectures, 2 laboratories. Prerequisite: POLS 100 and STAT 211. 

POLS 306 Modern Political Thought (3)
Theories of political control and the relationship between man and the state. 3 lectures. Prerequisite: POLS 204. 

POLS 307 American Political Thought (3)
Central political ideas of America’s leading thinkers from Thomas Paine to the present. 3 lectures. Prerequisite: POLS 204. 

POLS 308 Revolutions and Collective Violence (3) (Also listed as SOC 308)
Causes, methods, outcomes of and authority responses to collective violence and revolutionary movements. Contemporary events including terrorist and other forms of collective violence in industrialized and developing nations. 3 lectures. Prerequisite: One course in sociology or political science, or consent of instructor. 

POLS 311 Inter-American Relations (3)
Inter-American affairs. Political, economic, and social problems; forces motivating cultural behavior, industrial development, trade techniques, agriculture methods. Opportunities for employment in agriculture, engineering, and business. Finding and evaluating authoritative source materials on Latin American affairs. 3 lectures. Prerequisite: POLS 105, or junior standing. 

POLS 312 International Politics (3)
International political processes and problems. Foreign policies and politics in relations between states. Conflicts and adjustments. Analyses of selected problems. 3 lectures. Prerequisite: POLS 105, or junior standing. 

POLS 313 National Security Policy (3)
Theoretical approaches to the study of war and peace and the evolution of contemporary defenses and strategies, especially those pertaining to the United States. Impact of national strategy on both national and international politics. 3 lectures. Prerequisite: POLS 105 or POLS 210. 

POLS 314 Public Administration (3)

POLS 321 American Constitutional Law (3)
Basic principles of American constitutional law. Role of the Supreme Court as arbiter of separation of powers and federalism. 3 lectures. Prerequisite: POLS 210.
POLS 322 Civil Liberties (3)
Role of Supreme Court as interpreter of Constitutional rights and liberties, freedom of expression, civil and criminal procedural guarantees, search and seizure, due process, and equal protection of the laws. 3 lectures. Prerequisite: POLS 210.

POLS 331 Political Parties and Interest Groups (3)
Makeup and major functions of political parties. Role of political parties and special interest groups in a democracy. Degree of consensus and conflict between present day political parties and special interest groups in their attempts to influence public policy. 3 lectures. Prerequisite: POLS 210.

POLS 332 Public Opinion and Political Participation (3)
Origins and dimensions of public opinion. Focus on contemporary political campaigns and elections in the U.S. Impact of political ideology, mass media, high technology, pressure groups on electoral outcomes. Voting behavior and other forms of political participation in the U.S. 3 lectures. Prerequisite: POLS 210.

POLS 334 Jurisprudence (3) (Also listed as PHIL 334)

POLS 335 Legislative Process (4)
Theory and practice of representative government in the United States and other selected political systems. Organization and procedures in Congress, state legislatures and local legislative bodies. Use of simulations will be encouraged. 4 lectures. Prerequisite: POLS 210.

POLS 340 Government Internship (1–12) (CR/NC)
Supervised work experience in a government or related public agency as approved by the school dean. Intern will function as an employee subject to all the duties and responsibilities of employees engaged in comparable work. 30 hours of work experience per unit of credit. Maximum of 4 units of credit per quarter except for full-time assignments in Sacramento, Washington, D.C. or equivalent. Credit/No Credit grading. Recommended preparation: Junior standing with a minimum 2.5 GPA.

POLS 342 The American Presidency (3)
Nature and problems of contemporary presidential leadership emphasizing the impact of bureaucracy, congress, public opinion, the courts, interest groups, and the party system upon the presidency and national policy making. 3 lectures. Prerequisite: POLS 210.

POLS 350 Advanced Model United Nations (2)
Participation in the campus Model United Nations. Procedure, MUN rules of debate, preparation of country positions, area papers, and policy statement for use in mock United Nations sessions. Total credit limited to 6 units. 2 lectures. Prerequisite: POLS 250 or consent of instructor.

POLS 370 Contemporary Global Political Issues (3) GEB D.4.b.
Coverage of current international political issues. Directed toward making students more aware of issues, problems, tensions in the international arena, relationship of the western and nonwestern countries to these issues, emphasizing both causes and effects. 3 lectures. Prerequisite: POLS 210.

POLS 371 World Food Politics (3) GEB D.4.b.
Self-reliant, food-first politics of the hungry poor in the less-developed countries; political support of food policies in the U.S. and other developed nations. Moral, ecological and commodity politics of food in a variety of cultural settings which direct food production, consumption and distribution and reduce food demand through population stabilization. 3 lectures. Prerequisite: POLS 105 or junior standing.

POLS 380 Political Behavior (4)
Political behavior of individuals and groups examined in light of biological, economic, psychological and social-psychological theories and research, including emphasis on the relationship between attitudes and behavior. 4 lectures. Prerequisite: POLS 210.
POLS 384 Politics of Developing Areas (3)
Process of political development in the Third World with appropriate examples taken from particular areas and countries. 3 lectures. Prerequisite: POLS 105 or junior standing.

POLS 400 Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

POLS 401 State and Local Government (4)
Theoretical approaches to and structure, function and problems of state, county and local governments, including simulations and/or computer research exercises. 4 lectures. Prerequisite: POLS 210.

POLS 403 Municipal Government (4)
Organization, politics, power/structure and problems of contemporary American municipalities. Major issues and developments in urban life and government. 4 lectures. Prerequisite: Consent of department head.

POLS 404 Science, Technology and Public Policy (3)
Analysis of the problems stemming from the relationship of technology and politics. Ecology, energy crisis, civilian-military complex, electronic eavesdropping, governmental support of technology, policy implications of technological change. Individual’s role and responsibilities in a democracy. 3 lectures. Prerequisite: POLS 210.

POLS 405 Politics of Finance and Planning (3)
Political and economic considerations affecting the decision-making process. Intergovernmental relations in finance, debt management. Appropriations and audits in government departments, commissions and government bodies. 3 lectures. Prerequisite: POLS 210.

POLS 411 Contemporary U.S. Foreign Policy (3)
Formulation and conduct of U.S. foreign policy. Analysis of the theory and elements of U.S. strategy; diplomacy, propaganda, economic operations, psychological warfare, and military strategies. 3 lectures. Prerequisite: POLS 105 or POLS 210.

POLS 415 Politics in Britain (4)
Politics and processes of government in Britain, the operation of parliamentary government, the responses of the political system to the issues and problems in contemporary Britain and the Commonwealth. 4 lectures. Prerequisite: POLS 105 or junior standing.

POLS 417 Asian Politics (3)
Analysis of political, economic, and social institutions and conditions in selected Asian nations. 3 lectures. Prerequisite: POLS 105 or junior standing.

POLS 418 Soviet Politics (3)
Analysis of political, economic, and social institutions and conditions of the U.S.S.R. 3 lectures. Prerequisite: POLS 105 or junior standing.

POLS 425 Public Policy Analysis (4)
Methods of analyzing the actions or inactions of government. Techniques for evaluating the outputs and impacts of governmental policies. Case studies on various domestic issue areas such as transportation, education, housing, welfare, and law enforcement. 4 lectures. Prerequisite: POLS 210.

POLS 441 Administrative Theory and Behavior (4)
Theories, concepts and case studies related to organizations and to the individuals and groups that work in them. Application of concepts to public and non-profit organizations. Research paper required. 4 lectures. Prerequisite: POLS 210 and POLS 314.

POLS 442 Public Personnel Administration (4)
Concepts, techniques, and issues related to human resource administration. Techniques and concepts for public and nonprofit organizations. Case studies utilized to illustrate issues in the bureaucracy. Research papers on legislation, application, litigation, and other aspects of personnel administration required. 4 lectures. Prerequisite: POLS 210 and POLS 314.
POLS 450  Community Research Seminar (2)
Participation in small groups performing action research requested by one or more community agencies. May include surveys, interviewing, on-site evaluations and computer data analysis. Total credit limited to 6 units. 1 seminar, 1 activity. Prerequisite: POLS 210, junior standing and consent of instructor.

POLS 461, 462  Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

POLS 463  Undergraduate Seminar (3)
Preparation and presentation of current developments in the field of political science. 3 seminars. Prerequisite: POLS 461, POLS 462.

POLS 465  Middle Eastern Politics (4)
Analysis of political, economic, and social institutions of the Middle East and North Africa. Turkey, Iran, Egypt and Israel are used as case studies to illustrate the mosaic of nationalisms that have developed in that region. 4 lectures. Prerequisite: POLS 105 or junior standing.

POLS 468  African Politics (4)
Analysis of indigenous institutions, Western influences, and nationalism in Africa south of the Sahara. Emphasis on post-independence with selective case studies including South Africa. Impact of outside powers on Africa. 4 lectures. Prerequisite: POLS 105 or junior standing.

POLS 470  Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: POLS 210, junior standing.

POLS 510  Administration in Developing Nations (4)
Processes of administration with reference to the differing cultural, political, and economic environments of the developing areas of the world. Impact of technological developments in emerging nations. 4 seminars. Prerequisite: Graduate standing.

POLS 590  Seminar in Political Science (3)
Special problems in selected areas of Political Science. Each seminar will have a subtitle describing its nature and content. 3 seminars. Maximum of 6 units may be earned. Prerequisite: Graduate standing.

PSC—PHYSICAL SCIENCE

Introduction to the basic principles of physical science and application of these principles in modern society. Objects at rest and in motion, energy and power, fluids, heat, light, and sound. 3 lectures, 1 laboratory.

PSC 102  The Physical Environment: Atoms and Molecules (4)  GEB B.1.a.
Introduction to the basic principles of the atomic, molecular, and sub-atomic behavior of matter, and applications of these principles in modern society. Electricity and magnetism, electrical nature of matter, organic and inorganic chemistry, modern physics, the nucleus. 3 lectures, 1 recitation. Prerequisite: PSC 101.

PSC 103  The Physical Environment: Earth and the Universe (4)  GEB B.1.a.
Introduction to the basic principles of the earth sciences and astronomy, and applications of these principles in modern society. Structure and formation of the earth, earthquakes, weather, oceanography, solar system, stars, and cosmology. 3 lectures, 1 recitation. Prerequisite: PSC 101.

PSC 110  Energy for the Present and the Future (3)  GEB B.1.a.
Detailed qualitative presentation of current and future energy sources along with the associated environmental problems. Energy production, energy consumption, efficient use of energy, fossil fuels, nuclear fission and alternative sources such as solar, geothermal and fusion energy. 3 lectures.
PSC 171 Nuclear Arms Race (3)
Science and technology of fission/fusion weapons, offensive and defensive systems. Effects of nuclear war, proliferation technologies, verification and their effect on arms control treaties. 3 lectures.

PSC 201 Introduction to Physical Oceanography (3)

PSC 303 Earth and Space Science (4)
Concept oriented treatment of astronomy and space science, geology, oceanography, atmospheric physics, and meteorology designed for prospective elementary school teachers. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 activity. Prerequisite: PSC 101 and PSC 102, or consent of instructor.

PSC 304 Applications of Physical Science (4)
Serious problems faced by technological societies worldwide, such as the destruction of ozone, runaway greenhouse effect, smog, acid rain, water pollution, nuclear radiation hazards, and the depletion of fossil fuels. 3 lectures, 1 activity. Prerequisite: PSC 101, PSC 102, PSC 103 or equivalent.

PSC 424 Organizing and Teaching of Physical Sciences (3)
Techniques, aims and objectives in the teaching of physical sciences and general sciences at the secondary level. Selection and organization of teaching material. Evaluation of results. 3 lectures. Prerequisite: Evidence of satisfactory preparation in physics and chemistry.

PSC 436 Demonstration Experiments in Physical Science (1)
Investigation and illustration of the principles of physical science through demonstration experiments, designed and assembled by students according to their background and interest, largely from inexpensive, easily obtainable materials. Total credit limited to 2 units. 1 activity. Prerequisite: 6 quarter units of physical science.

PSC 461 Senior Project (2)
Selection and completion of a project under faculty supervision. Project results are presented in a formal report. Minimum of 60 hours total time.

PSY–PSYCHOLOGY

PSY 104 Effective Study Techniques (2) (CR/NC)
Designed to acquaint students with basic aims and objectives of attending college. Provides adequate instruction and practice in specific study skills such as effective study methods, note-taking, time-planning, memory, concentration, reading and test taking. Credit/No Credit grading only. 2 lectures.

PSY 200 Special Problems for Undergraduates (1–3)
Individual investigation, research, study or survey of selected problems in consultation and with prior approval of instructor. Written report required. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: PSY 201 or PSY 202 and consent of department head.

PSY 201 General Psychology (3)
Introduction to the psychological study of human beings; applications of research in psychobiology, perception, learning, motivation, consciousness, cognition, personality, emotion, development, psychological assessment, social behavior, psychopathology, and psychotherapy. A student may enroll for credit in either PSY 201 or PSY 202, but not both. 3 lectures.

PSY 202 General Psychology (3)
Introduction to the psychological study of human beings. Applications of research in psychobiology, perception, learning, motivation, consciousness, cognition, personality, emotion, development, psychological assessment, social behavior, psychopathology, and psychotherapy. A student may enroll for credit in either PSY 202 or PSY 201, but not both. 2 lectures, 1 recitation.
PSY 205  Human Sexuality (2) (CR/NC)
Understanding aspects of personal sexuality. Sexual development, attitudes, gender identity, gender role, coercive sex, intimacy, biological aspects of sexuality, homosexuality, heterosexuality, sexual dysfunction, family planning and ethical issues. Credit/No Credit grading only. 2 lectures.

PSY 212  Interpersonal Communication (4) (Also listed as SPC 212)
Introduction to the interaction process in two-person (dyadic) communication settings. Emphasis on the functions of varying messages in the initiation, development, maintenance and termination of personal and professional relationships. 4 lectures.

PSY 251  Laboratory in Group Activities (1–3) (CR/NC)
Skills and techniques of solving problems in large and small groups. Conducting and reporting meetings. Analyses of leadership dynamics in campus organizations. Credit/No Credit grading only. Total credit limited to 6 units. 1–3 activities.

PSY 301  Psychology of Personal Development (3)

PSY 302  Behavior in Organizations (3)
Characteristics of functioning organizations and their effects on individuals. Psychological issues relevant to the maintenance of the organization. Motivation, leadership, group phenomena, communication, decision-making, attitudes, personnel selection and organizational change. 3 lectures. Prerequisite: PSY 201 or PSY 202.

PSY 304  Physiological Psychology (3)
Relationship between physiological and behavioral processes. Learning, motivation, emotion, perception, individual differences, social and abnormal behaviors as a function of the nervous and endocrine systems, sensory structures, genetic factors, effects of drugs. 3 lectures. Prerequisite: PSY 201 or PSY 202.

PSY 307  Abnormal Psychology (3)
Abnormal behavior of individuals. Dynamics, etiology, symptoms, treatment and prevention of the more severe personality and behavior disorders. Includes organic mental disorders; substance abuse; psychoses; affective, anxiety, psychosexual, psychosomatic and personality disorders. 3 lectures. Prerequisite: PSY 201 or PSY 202.

PSY 309  Psychology of Consciousness (3)
Characteristics and functions of selected, qualitatively unique patterns of consciousness such as hypnosis, meditation, dreaming, drug experiences and parapsychological phenomena, with particular emphasis on adaptive and maladaptive expressions of these states of consciousness. 3 lectures. Prerequisite: PSY 201 or PSY 202.

PSY 310  Death, Dying and Bereavement (3)

PSY 311  Environmental Psychology (3)
Interrelationship between behavior and the built and natural environments. Evaluating and understanding environments, environmental stress, and the human aspects of environmental problems. 3 lectures. Prerequisite: PSY 201 or PSY 202.

PSY 314  Psychology of Women (3)
Central issues in feminine psychology including stereotypes, gender differences, sex-roles, sex-typing, female sexuality, pregnancy and childbirth, women as victims, mental and emotional disorders of women, and aging. 3 lectures. Prerequisite: PSY 201 or PSY 202.
PSY 315  Psychology of Men (3)
Central issues in male psychology including stereotypes, gender differences, sex-roles and their development, sex and role typing, male sexuality and models of masculinity. Health, mental and emotional disorders of men, and aging. 3 lectures. Prerequisite: PSY 201 or PSY 202.

PSY 317  Psychology of Stress (3)
Examines the present status of research in psychology on the relationship between stress and psychological and physical well-being. Psychological factors influencing stress. Description and critical evaluation of methods of stress reduction. 3 lectures. Prerequisite: PSY 201 or PSY 202.

PSY 318  Psychology of Aging (3)
Psychological and physiological aging in the context of the culture. Theories and research relating to positive and negative changes in perception, learning, memory, intelligence, personality, identity, motivation, sexuality, family relationships, career. Disorders, institutionalization, death and bereavement, coping strategies. 3 lectures. Prerequisite: PSY 201 or PSY 202.

PSY 320  Nonverbal Communication (4) (Also listed as SPC 320)
Influence of kinesic, proxemic, artifactual, olfactory, paralinguistic and environmental factors in human communication. Theory, research and practice in nonverbal communication. 4 lectures. Prerequisite: SPC 212 or consent of instructor.

PSY 323  The Helping Relationship (4)
Basic skills and approaches common to helping relationships with children, adults, and families. Examines theoretical, empirical, and practical applications of helping. Differentiation between professional, paraprofessional, and nonprofessional helping relationships. 2 lectures, 2 laboratories. Prerequisite: Junior standing, ETHS 114 or ETHS 210, HD 130 or HD 140 or HD 150, or consent of instructor.

PSY 327  Leisure Counseling (3) (Also listed as REC 327)
Philosophical, psychological, educational and practical aspects of leisure counseling. Therapeutic recreation intervention processes and procedures. Historical foundations and leisure counseling models. 3 lectures. Prerequisite: REC 252 or consent of instructor.

PSY 329  Research Methods in Psychology and Human Development (3)
Introduction to research design methods and research literature in psychology and human development. Topics include experimental and correlational research design, basic statistical analysis, survey, observation, structured situation methods, and library search procedures. 2 lectures, 1 activity. Prerequisite: Junior standing, PSY 201 or PSY 202, STAT 211 or STAT 130 or equivalent, HD 101.

PSY 330  Behavioral Effects of Psychoactive Drugs (3)
Behavioral effects of the major categories of drugs. Factors influencing a person's choice to use and abuse drugs; personal and social consequences of abuse of alcohol and other drugs. 3 lectures. Prerequisite: PSY 201 or PSY 202.

PSY 400  Special Problems for Advanced Undergraduates (1-3)
Individual investigation, research, study or survey of selected problems in consultation and with prior approval of instructor. Written report required. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: PSY 201 or PSY 202 and consent of department head.

PSY 402  Social Psychology (3)
Human behavior as it is influenced by other people and social situations. Socialization processes, attitude formation and change, aggression, behavior in groups, impression formation and factors involved in attraction, love and prejudice. 3 lectures. Prerequisite: PSY 201 or PSY 202.

PSY 407  Behavior Disorders of the Aged (3)
Behavior disorders affecting the elderly, including description, possible causes, present methods of care and treatment, and legal aspects. 3 lectures. Prerequisite: PSY 307, junior standing.
PSY 655

PSY 422 Life Span Sexuality (3)
Sexual interest, activity, and functioning from birth through the late adult years. Influence of sexual roles, attitudes, and adaptation during the life span. Sexual practices in our society. Therapies for enhancing a comfortable sexuality. 3 lectures. Prerequisite: PSY 201 or PSY 202, or PSY 205, and junior standing.

PSY 429 Experimental Psychology (3)
Examination of research methodology, design and analysis of experimental application of psychology content areas within the life span. Content areas include developmental changes in animal and human learning, memory, cognitive abilities, and psychophysical processes. 2 lectures, 1 laboratory. Prerequisite: PSY 329, junior standing or consent of instructor.

PSY 432 Psychological Testing (3)
Principles and procedures of selection, administration, scoring, and interpretation of achievement tests, aptitude tests including scholastic aptitude, interest inventories, and personality inventories. 3 lectures. Prerequisite: PSY 201 or PSY 202, junior standing.

PSY 452 Personality (3)
Personality theories and research. Human motivation and emotions, description and development of personality characteristics. Adjustment and self-actualization. 3 seminars. Prerequisite: PSY 201 or PSY 202, junior standing.

PSY 453, 454 Supervised Fieldwork (6) (6) (Also listed as HD 453, 454) (CR/NC)
Supervised fieldwork experience in various community, governmental, and educational settings. Applied psychological, developmental, or educational experiences determined by participating institution, supervising faculty member, and student. Maximum of 6 units per quarter. Credit/No Credit grading only. Prerequisite: HD 101, PSY 323, HD majors, junior standing and consent of instructor.

PSY 456 Behavioral Disorders in Children (3)
Applications of psychological principles to childhood behavioral disorders. Aggression, delinquency, stress reactions, motivational, perceptual-attentional deficiencies, psychoses, anxiety disorders, biological dysfunctions, and retarded social and cognitive development. 3 seminars. Prerequisite: PSY 201 or PSY 202, junior standing.

PSY 458 Learning and Memory (3)
Principles of conditioning, motivation, verbal learning, observational learning, concept formation, language development, short-term and long-term memory; applications to problems such as behavioral disorders, learning disabilities, mental retardation, drug abuse, aggression and prejudice. 3 seminars. Prerequisite: PSY 201 or PSY 202, junior standing.

PSY 459 Life Span Development (3)
Comparative study of theories that attempt to explain life span development. Controversial issues, evaluations and applications of theories. Emphasis on biological, psychological, and social aspects of life span development. 3 seminars. Prerequisite: PSY 201 or PSY 202, HD 108 or consent of instructor, senior standing.

PSY 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

PSY 494 Psychology of Technological Change (3)
Examines the impact of technological change on the psychological and social characteristics of people and organizations. Identifies personal, social and organizational factors which provide obstacles and opportunities for technological change. Survey of methods of reducing the negative impact of change. 3 seminars. Prerequisite: PSY 201 or PSY 202 and senior standing.
PSY 504  Psychoneurology and Pharmacology (3)
Advanced study of neuropsychological and pharmacological concepts including neuroanatomical systems, neurochemical processes, brain dysfunctions, basic neurological assessment, alcohol and psychoactive substance abuse, antidepressants, antianxiety agents, antipsychotics. Current theoretical perspectives and research findings will be reviewed. 3 seminars. Prerequisite: PSY 304, PSY 330, graduate standing or consent of instructor.

PSY 564  Ethics and the Law: MFC Counseling (3) (Also listed as ED 564)
Ethics, client rights, and laws related to individual, child, family and group therapy counseling. 3 seminars. Prerequisite: ED 560, ED 561, HD 450 or consent of instructor.

PSY 565  Diagnosis and Treatment: Psychopathology (3) (Also listed as ED 565)
Assessment of mental status. Diagnostic and statistical Manual of Mental Disorders, treatment planning, treatment case documentation and research applied to client psychopathology. 3 seminars, 1 activity. Prerequisite: ED 560, PSY 307, PSY 432, or consent of instructor.

PSY 567  Counseling the Elderly and Their Families (3) (Also listed as ED 567)
Dynamics of aging and family transitions as applied to counseling. Application of medical, psychological, DSM III, physiological, crisis and ethnic concerns with a required practicum. 2 seminars, 1 activity. Prerequisite: ED 555, HD 421 or PSY 459 or consent of instructor.

PSY 570  Selected Topics in Psychology and Human Development (3)
Directed group study of selected topics for advanced students. Open to graduate students and selected seniors. Class Schedule will list topic selected. Total credit limited to 6 units. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

PSY 571  Advanced Marital and Family Therapy (4) (Also listed as ED 571)
Theory and application of process, structural and systems approaches to family and couple therapy. Assessment, diagnosis, treatment and follow-up of family and couple therapy with required supervised activities. Ethics and law related to family therapy. 3 seminars, 1 activity. Prerequisite: HD 450, ED 555 or consent of instructor.

PSY 572  Child Therapy (4) (Also listed as ED 572)
Assessment, diagnosis, treatment planning and therapeutic modalities appropriate for children and adolescents. Seven hours of instruction in abuse and neglect of children with relevant ethics and law. Effective parenting approaches and integration of family treatment. 3 seminars, 1 activity. Prerequisite: ED 560, ED 561, PSY 307, PSY 456 or consent of instructor.

PSY 574  Applied Psychological Testing (3)
Commonly used psychological tests, report writing and communication of test results to clients and other professionals. Administering, scoring, and interpreting self-report inventories used in public and private agencies for marriage and family counseling. 3 seminars. Prerequisite: PSY 432 and STAT 512.

PSY 575  Sexual Dysfunction Therapy (3) (Also listed as ED 575)
Analysis of physiological, social, and psychological antecedents to sex role identity. Sexual behavior, disease, sexual dysfunction. Assessment, diagnosis, and treatment of sexual dysfunction. Ethics. 3 seminars. Prerequisite: ED 560 and HD 450.

REC–RECREATION ADMINISTRATION

REC 100  Leisure Education and Lifestyle Management (2)  GEB E.2.
Exploration of the impact of work, play, and leisure upon society. Analysis of theoretical views of play and the relationship of positive leisure values upon the development of a well-integrated lifestyle. Foundations for understanding and assessment of personal leisure well-being. 2 lectures.

REC 101  Introduction to Recreation and Leisure Services (3)
History, philosophy, theory, and community organization of recreation. Various agencies providing recreation and leisure services. Emphasis upon functions, areas, facilities, clientele, and career opportunities. Field visits required. 3 lectures.
REC 102 Backcountry Ethics and Safety (2)
Generalized outdoor course designed to prepare students for participation in the Outdoor Recreation Skill sequence. Wilderness and backcountry characteristics are reviewed in terms of potential hazards, safety precautions, and of the user's potential adverse impact on the environment. 2 lectures.

REC 105 Recreation Leadership (3)
Recreation leadership with small and large groups. Emphasis upon appropriate theories and techniques for specific clientele. 2 lectures, 1 laboratory.

REC 210 Programming for Leisure (3)
Methods of program planning, organization, implementation and evaluation in public and private settings. Interrelationship of needs and interests of people, physical settings, and activity content. Emphasis on program construction and scheduling. 2 lectures, 1 activity. Prerequisite: REC 101, REC 105 or consent of instructor.

REC 245 Adaptive Aquatics in Physical Education and Recreation (2) (Also listed as PE 245)
Adaptive techniques in working with the disabled in aquatics; physical, mental, emotional, social, and recreational involvements utilizing aquatics as the treatment modality. 1 lecture, 1 activity.

REC 252 Introduction to Therapeutic Recreation (4)
Adaptation of recreation and leisure services for persons with special needs. Role of institutions and community agencies. Specialized leadership techniques. Modification requirements for programs, areas, facilities, equipment, and supplies. Field visits required. 3 lectures, 1 activity. Prerequisite: REC 210 or consent of instructor.

REC 260 Intramural and Recreational Sports (3)
Philosophy, foundations, policy and techniques underlying intramurals and recreational sport programs in schools, public, private and commercial settings. 2 lectures, 1 activity. Prerequisite: REC 210 or consent of instructor.

REC 301 Outdoor Recreation Education (3)
Seasonally selected outdoor leadership and skill development activities as specified by subtitle. Land, snow, and water based outdoor curriculum. Total credit limited to 9 units. Passing a basic proficiency test may be required. Field trips required. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 activity. Prerequisite: REC 102 or consent of instructor.

REC 302 Outdoor Experiential Education (3)
Experiential education and techniques to apply it outdoors. Experiential learning cycle, focusing, feedback, support, processing, and effective communication techniques. Educational strategies include individual, competitive, and cooperative learning. 2 lectures, 1 activity. Prerequisite: REC 210.

REC 310 Program Administration in Leisure Services (3)
Management of a full service program delivery system in a variety of settings. Needs assessment, program selections, program evaluation, grant and proposal writing, long range planning. Field visits required. 3 lectures. Prerequisite: REC 210.

REC 312 Employee Services and Recreation (3)
Administrative patterns, financing, programming, personnel, and legal concerns in programs designed to utilize leisure for employee motivation and productivity. Analysis of military, corporate, agency programs. Field visits required. 3 lectures. Prerequisite: REC 210.

REC 314 Travel and Tourism—Implications for Leisure (3)
Trends of travel and tourism with specific emphasis on the Western United States and the international market. Travel motivations, settings involved in tourism development, travel research, and careers in tourism. Field visits required. 3 lectures. Prerequisite: Junior standing and consent of instructor.

REC 316 Commercial Recreation Entrepreneurship (1)
Management, finance, personnel considerations in commercial recreation business. Qualities and problems of the leisure entrepreneur specific to recreation business pursuits. 1 seminar. Prerequisite: BUS 101, or consent of instructor.
REC 320  Processes and Techniques in Therapeutic Recreation (4)
Philosophy, principles, and techniques in the utilization of recreation as a treatment modality in rehabilitating people with illness or disability. Sociological foundations of recreation and leisure in the community and implications for the exceptional individual. Role of recreation in total rehabilitation process of various agencies and institutions. Field visits required. 3 lectures, 1 laboratory. Prerequisite: REC 252 or consent of instructor.

REC 323  Supervisory Roles in Recreation Administration (3)
Analysis of the supervisory roles in public, private, commercial and voluntary agencies offering organized leisure services. Methods, techniques, and evaluation systems. Emphasis on development of a professional philosophy, ethics and interpersonal skills. Field visits required. 3 lectures. Prerequisite: REC 210.

REC 324  Legal and Managerial Patterns in Recreation Administration (3)
Scope, levels, concepts, structure, and legal aspects of public, private, commercial, and non-profit recreation and leisure services agencies. Risk management and ethics. Emphasis on the development of a professional philosophy. Field visits required. 3 lectures. Prerequisite: BUS 101, REC 101, REC 105, REC 210.

REC 325  Recreation Therapy in a Physical Rehabilitation Setting (4)
Therapeutic recreation for people who are physically disabled. Emphasis on the nature of and adapted techniques and equipment for spinal cord injury, head trauma, and stroke. Treatment planning, behavior management, leisure education, sports classification by degree of injury, and mainstreaming. 4 seminars. Prerequisite: REC 252 or consent of instructor.

REC 327  Leisure Counseling (3) (Also listed as PSY 327)
Philosophical, psychological, educational and practical aspects of leisure counseling. Therapeutic recreation intervention processes and procedures. Historical foundations and leisure counseling models. 3 lectures. Prerequisite: REC 252 or consent of instructor.

REC 328  Aging and Leisure (3)
Analysis of the psycho-social aspects of aging as related to leisure and recreation; physiological responses to leisure activity; special precautions and activity adaptations. Field visits required. 2 lectures, 1 activity. Prerequisite: REC 252 or consent of instructor.

REC 329  Team Procedures and Processes for Recreation Therapists (4)
Clinical principles, procedures and processes for the recreation therapist in working in an interdisciplinary milieu. Treatment strategies for maximizing the effectiveness of therapeutic recreation services. Cooperative and coordinative assessment, program design, and documentation. Philosophical, ethical and legal considerations in therapeutic recreation. Field visits required. 3 lectures, 1 activity. Prerequisite: REC 252 or consent of instructor.

REC 330  Directed Field Experience (3)
Practical work experience in related phases of recreation administration in organization or agency under qualified supervision. Minimum of nine hours per week. Total credit limited to 9 units. Prerequisite: REC 210 and consent of instructor.

REC 364  Commercial Recreation and Leisure Services (3)
Analysis of the types of commercial and private for profit enterprises. Marketing leisure services. Probable trends and directions. Requirements and procedures for planning and organizing commercial recreation services. Field visits required. 2 lectures, 1 activity. Prerequisite: BUS 101, REC 210.

REC 400  Special Problems For Advanced Undergraduates (1–3)
Individual investigation, research, studies, or surveys of selected problems. For Therapeutic Recreation (T.R.) Concentration students. Problem must be T.R. content-specific. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Consent of curriculum coordinator.

REC 407  Programming and Adaptive Techniques in Therapeutic Recreation (4) (Also listed as PE 407)
Description, etiology, and nature of specific disabilities, with an emphasis on the development of individualized therapeutic recreation programs for the physically handicapped, the developmentally disabled, and the emotionally troubled individual. 3 lectures, 1 laboratory. Prerequisite: PE 306 or REC 252 or consent of instructor.
REC 416 Physical Education and Recreation Facilities (3) (Also listed as PE 416)
Management, clientele considerations, facilities and outdoor areas planning and operations, personnel, finance, and equipment as related to physical education and recreation areas and facilities. Consideration of architectural and environmental barriers. Field visits required. Miscellaneous course fee required—see Class Schedule. 3 lectures. Prerequisite: Upper division standing and consent of instructor for non-PE/REC majors.

REC 424 Financing Recreation and Leisure Services (3)
Financing leisure products and services in public, private, commercial and voluntary settings. Emphasis on sources and methods of financing; forecasting, budgeting, pricing and fiscal master planning through use of computer technology. 2 lectures, 1 laboratory. Prerequisite: CSC 120, ECON 211, REC 323, REC 324.

REC 431 Therapeutic Recreation Internship (3)
200 hours full-time practical work experience over a five-week period in a California Board of Recreation and Park Certified (CBRPC)-approved site under supervision of a Therapeutic Recreation Specialist (TRS), with the National Council for Therapeutic Recreation Certification (NCTRC). Out-of-state placement permitted only under supervision of TRS with NCTRC. Concurrent enrollment in REC 432 required. Both internships must be at same site. Prerequisite: Minimum overall GPA of 2.0; completion of all coursework other than internship, and approval of Curriculum Adviser.

REC 432 Internship (6)
400 hours of full-time concentration-specific practical work experience over a ten-week period in an approved agency. Comprehensive involvement in agency program. Concurrent enrollment in REC 431 required. Therapeutic Recreation students must meet CBRPC requirements. Prerequisite: Minimum GPA of 2.0; completion of all required Recreation major courses (REC 101–REC 460). T.R. students must have completed all coursework other than internship, and approval of Curriculum Adviser.

REC 460 Research in Recreation Administration (4)
Research design, questionnaire and interview schedule construction, sampling methods, data array and analysis, and computer applications. Selection and preliminary investigation of senior project topic. 4 lectures. Prerequisite: CSC 120 or CSC 444, SOC 333, STAT 211.

REC 461, 462 Senior Project (3) (2)
Selection and completion, under faculty supervision, of an investigative project typical of problems which graduates must solve in their fields of employment. Required minimum of 150 hours. Analytical, formal report is required. Prerequisite: Senior standing and completion of REC 369.

REC 464 Delivery of Commercial Recreational Services (3)
Requirements and procedures for opening, operating, and evaluating commercial recreation enterprises. Feasibility analysis process applied to specific case scenarios. 2 lectures, 1 laboratory. Prerequisite: REC 364.

REC 470 Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

REC 471 Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to graduate and undergraduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

SCM–SCHOOL OF SCIENCE AND MATHEMATICS

SCM 100 Orientation to the School of Science and Mathematics (2) (CR/NC)
Application of learning strategies, problem-solving methodologies, academic planning and career selection for students in the science and mathematics disciplines. Concurrent enrollment in specific orientation or content course is desirable. Credit-No Credit grading only. 1 lecture, 1 activity.

SCM 300 Early Field Experience, Science/Mathematics (2) (CR/NC)
A minimum of 20 hours of supervised observation of secondary school science or mathematics classes. These observations will be discussed and evaluated during weekly meetings. Credit/No Credit grading only. 2 lectures.
SOC-SOCIOLOGY

SOC 105 Introduction to Sociology (3)
Orientation to the nature of the study of society. Survey of approaches to social analysis. Emphasis upon primary concepts describing environment, social structure, and social change for increased understanding of human relations. An overview of the systems of social relationships. 3 lectures.

SOC 106 Social Problems (3)
Appraisal of various factors from which the social problems of contemporary American society emerge and alternative procedures for dealing with such problems. 3 lectures.

SOC 301 Social Work in the U.S.A. (3)
Introduction to the field of social welfare. Development of American social work. Scope and diversity of specific programs designed to meet welfare problems in contemporary society. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

SOC 302 Social Welfare Institutions (3)
Development of public welfare services; current problems and policy issues; analysis of current programs of social insurance, public assistance programs; interagency relationships. 3 lectures. Prerequisite: SOC 301 or consent of instructor.

SOC 305 Sociology of Social Movements (3)
Analysis of the causes and impact of social movements, with a focus on the contemporary world. Included are events ranging from riots, lynchings and panics to political, religious and racial social movements. 3 lectures. Prerequisite: 3 units of sociology or consent of instructor.

SOC 306 Sociology of the Family (3)
Analysis of basic concepts of family structure. Types of families, marriages, conjugal relations and kinship in contemporary society. Emphasis on the dynamic nature of family interaction and its correlates. Social class, communication patterns, family size, and conflict. 3 lectures. Prerequisite: SOC 105 or consent of instructor.

SOC 308 Revolutions and Collective Violence (3) (Also listed as POLS 308)
Focus on the causes, methods, outcomes of, and authority responses to collective violence and revolutionary movements. Contemporary events including terrorist and other forms of political violence in industrialized and developing nations. 3 lectures. Prerequisite: One course in sociology or political science, or consent of instructor.

SOC 309 World System and Its Problems (3)
Analysis of the world system, its structure, its effects upon developed and developing nations, and the relations among the nations. 3 lectures. Prerequisite: Junior standing or consent of instructor.

SOC 310 Socialization: Self, Organizations and Society (3)
Analysis of social interaction relating to development of self. Reciprocal influences between individuals, organizations and society. Development of social roles and the symbolic nature of interaction. 3 lectures. Prerequisite: One course in sociology, or consent of instructor.

SOC 311 Sociology of Sex Roles (3)
Description and analysis of sex roles in modern society. Special attention given to the learning process and how sex stereotypes affect individuals' life chances and the social structure. Exploration of the sociobiological bases of sex role differentiation in societies. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

SOC 313 Urban Sociology (3)
Structure of social relationships in the community. Physical structure of communities, patterns of community cooperation and conflict. Changing patterns of urban community life. Social class and political influence on the community level. 3 lectures. Prerequisite: One sociology course or consent of instructor.

SOC 315 Race Relations (3)
Diverse structures of unequal relationships among racial and ethnic groups in several countries. Theories about sources of economic and social discrimination. Evaluation of methods to restructure race and ethnic relations. International case histories. 3 lectures. Prerequisite: Junior standing.
SOC 316 American Minorities (3)
Dynamics of minority relations in the U.S. ethnic conflict, pluralism, assimilation. Dynamics of intergroup relations. Sources and manifestation of economic and social discrimination patterns and how they affect the individual's life chances. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

SOC 323 Social Stratification (3)
Social class and the distribution of status and power in society, with emphasis on contemporary United States; social mobility; relationships of stratification to mental illness, race, family systems, crime and delinquency, etc. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

SOC 326 Sociology of Aging (3)
Age as a social phenomenon. Roles of the elderly in industrial societies. Changes in social structures and people as the shift occurs from middle to older age. Sociological theories about aging. Implications of an aging population. Public policies and aging. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

SOC 330 Social Change (3)
Description and analysis of social change in contemporary American society as it relates to major revolutionary changes in this century; variables alleged to affect social change; impact of social change upon traditional societies; prospects for future social change. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

SOC 333 Social Research Methods I (3)
Survey research experimentation, field research and content analysis as research techniques. Relationship between theory and research conceptualization and operationalization. Basic sampling techniques. Approaches to interviewing. 3 lectures. Prerequisite: Two sociology courses and STAT 211 or consent of instructor.

SOC 334 Social Research Methods II (3)
Univariate and multivariate data analysis using packaged statistical computer programs. Scale and index development. Causal analysis. 2 lectures, 1 laboratory. Prerequisite: SOC 333.

SOC 344 Sociology of Poverty (3)
Variable indicators of poverty in modern society. Chief features of the subculture of the poor. Analysis of different explanations for the persistence of poverty. Survey of proposals for reducing poverty. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

SOC 350 Social Organization of Modern Japan (3)
Social and cultural features of modern Japan. Japanese group processes. Investigation of contemporary Japanese institutions: family, education, mass media, industry, politics, including an overview of popular culture. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

SOC 351 Women in East Asia (3)
Traditional roles and status of women in Chinese, Japanese and Korean societies. Changes due to industrialization, the impact of Western ideas and their implications for today's women. 3 lectures. Prerequisite: One sociology course at the 100/200 level or consent of instructor.

SOC 395 Sociology of Complex Organizations (3)
Bureaucracies and informal organizations from a sociological perspective. Organizational networks within and between organizations, relationship between organizations and their environment, and organizational socialization and career patterns. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

SOC 402 Crime and Delinquency (3)
Theories of delinquent and criminal behavior; analysis of institutional and other approaches to rehabilitation of criminals and delinquents. 3 lectures. Prerequisite: Junior standing.

SOC 412 Treatment of Criminals and Delinquents (3)
Approaches to the control and rehabilitation of adult and juvenile offenders; philosophy of treatment strategies; history and analysis of probation, imprisonment, parole and preventive programs. 3 lectures. Prerequisite: SOC 402.
SOC 413 Methods of Social Work (3)
Theories, concepts, values stressed in social work. Social casework. Principles and practices used by social workers serving individuals and families in correctional, public assistance, medical, psychiatric youth services, and other settings. Discussion of case material and available literature. 3 seminars. Prerequisite: SOC 302.

SOC 421 Social Theory (3)
Concepts and theories in sociology, anthropology and geography. Modern and classical perspectives. Usefulness of theories for understanding present social problems. 3 lectures. Prerequisite: Two sociology courses or consent of instructor.

SOC 431 Population Problems (3)
Description and analysis of population variables and their sociological consequences. 3 lectures. Prerequisite: One sociology course and STAT 211 or consent of instructor.

SOC 470 Selected Advanced Topics in Sociology (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

SOCS—SOCIAL SCIENCES

SOCS 200 Special Problems for Undergraduates (1-3)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 3 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

SOCS 366 Research and Writing Seminar in Social Sciences (3)
Development of research and bibliographic skills in the process of composing a major research paper in Social Sciences. Thesis formation, development or organizational and analytic skills, and utilization of social science data and formats. 3 seminars. Prerequisite: ENGL 215 or ENGL 218 or consent of instructor.

SOCS 400 Special Problems for Advanced Undergraduates (1-3)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Consent of department head.

SOCS 424 Organizing and Teaching Social Sciences (3)
Organization, selection, presentation, application, and interpretation of social sciences subject matter for teaching at the secondary level. 3 lectures. Prerequisite: Senior standing and/or consent of instructor.

SOCS 440 Supervised Fieldwork (3-6)
Supervised observation, research and work in community organizations, public agencies, etc., with attention to the barrio and ghetto. Total credit limited to 18 units. Prerequisite: Senior standing and/or consent of instructor.

SOCS 461, 462 Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time. Prerequisite: SOCS 366, senior standing or consent of instructor.

SOCS 463 Undergraduate Seminar (3)
Intensive study of selected social problems with application of techniques for analysis. 3 seminars. Prerequisite: Senior standing or consent of instructor.

SPAN—SPANISH

SPAN 101, 102, 103 Elementary Spanish (4) (4) (4)
For beginners. Class practice and assigned outside work in pronunciation, sentence structure, reading, writing, and basic conversation. Laboratory drill required. Language taught in its cultural context. Credit not available for students who have completed SPAN 104. To be taken in numerical sequence. 3 lectures, 1 activity.
SPAN 104  Intensive Elementary Spanish (12)
Class practice in pronunciation, syntax, reading, writing, and conversation. Offered in summer only. Not open to students with credit in SPAN 101, 102, 103. Laboratory drill required. 9 lectures, 3 activities.

SPAN 111, 112, 113  Elementary Hispanic Language and Culture (4) (4) (4)
Inductive Spanish grammar with special focus on vocabulary and culture from American agribusiness and the Hispanic cultures of the United States and Latin America. Open to all students with little or no knowledge of Spanish. 3 lectures, 1 activity. To be taken in numerical sequence.

SPAN 201, 202  Intermediate Spanish (4) (4)
Review of Spanish grammar and practice in writing and oral expression based on social and cultural values. 3 lectures, 1 activity. Prerequisite: SPAN 103 or consent of instructor.

SPAN 204  Intensive Intermediate Spanish (8)
Review of grammar and practice in written and oral expression based on social and cultural values. 6 lectures, 2 activities. Prerequisite: SPAN 103 or SPAN 104 or permission of instructor.

SPAN 233  Critical Reading in Hispanic Literature (4)  GEB C.1.
Selected readings from major Hispanic authors that show the Hispanic literary tradition from the Middle Ages to the present in both Spain and Latin America. Includes works by such Medieval, Renaissance, Colonial, Realistic, and 20th century authors as Juan Ruiz, Cervantes, Lope de Vega, Sor Juana Inés de la Cruz, Martí, Unamuno, Lorca, Neruda, and Borges. 4 lectures. Prerequisite: SPAN 202 or equivalent.

SPAN 301  Advanced Spanish Composition and Grammar (4)
Oral and written development of structural grammar, syntax, and complex components of Spanish. Vocabulary expansion and idiomatic construction. Written composition. Translations to examine linguistic and semantic differences. 4 lectures. Prerequisite: SPAN 202, or equivalent, or consent of instructor.

SPAN 302  Advanced Spanish Conversation and Grammar (4)
Topics based on student interest. Outlines and/or abstracts constitute written assignments. Individual presentations to elicit spontaneous response. Group presentations to allow cooperative research and preparation. 4 lectures. Prerequisite: SPAN 202, or consent of instructor.

SPAN 305  Significant Writers in Spanish (4)  GEB C.3.
Critical analysis and oral discussion of poetry, essays, novels and plays by selected Hispanic writers. Class Schedule will list topic selected. Total credit limited to 12 units. 4 lectures. Prerequisite: SPAN 233 or equivalent.

SPAN 323  Spanish Phonetics (3)
Spanish sound system. Acoustic and articulatory phonetics using the International Phonetic Alphabet and contemporary methods of linguistic analysis. 2 lectures, 1 activity. Prerequisite: SPAN 202, or consent of instructor.

SPAN 330  Spanish for Bilingual Speakers (4)
For students with a high degree of oral proficiency in Spanish. Review of Spanish grammar and practice in written expression. Social and cultural realities of Chicanos in the United States. 3 lectures, 1 activity. Prerequisite: SPAN 202 or consent of instructor.

SPAN 405  Hispanic Literature in English Translation (4)  GEB C.3.
Selected works to be read by students in the original or in English translation. Critical analysis, interpretation, and comparison of individual works by outstanding Hispanic writers. Lecture in English. Class Schedule will list topics selected. Total credit limited to 8 units. 4 lectures. Prerequisite: One literature course or consent of instructor.

SPAN 470  Selected Advanced Topics (1-4)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.
SPC—SPEECH COMMUNICATION

SPC 101 Introduction to Speech Communication (1) (CR/NC)
Theory and practice of interpersonal, group, organizational and public communication. Fundamentals of scholarship; professional and trade journals in the discipline. No final exam. Credit/No Credit grading only. 1 lecture.

SPC 125 Critical Thinking (3) (Also listed as ENGL 125 and PHIL 125) GEB A.2.
Nature of critical thinking. Analysis of inductive and deductive arguments. Practice in the criticism and composing of arguments in English. 3 lectures. Prerequisite: ENGL 114.

SPC 201 Public Speaking (3) GEB A.3.
Introduction to the principles and types of public speaking. Practical experience in the development, presentation, and critical analysis of speeches to inform, to persuade, and to actuate. Not open to students with credit in SPC 202. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

SPC 202 Principles of Speech Communication (3) GEB A.3.
Introduction to the fundamentals and principles which underlie effective speech communication. Practical experience in various types of speaking situations: informative speaking, persuasive speaking, and panel discussion. Not open to students with credit in SPC 201. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

SPC 212 Interpersonal Communication (4) (Also listed as PSY 212)
Introduction to the interaction process in two-person (dyadic) communication settings. Emphasis on the functions of varying messages in the initiation, development, maintenance and termination of personal and professional relationships. 4 lectures.

SPC 213 Organizational Communication (4)
Introduction to communication within the organization and between the organization and its environment. Effects of networks, superior/subordinate message patterns, team building, climate, message flow patterns and distortion on organizational effectiveness. 4 lectures.

SPC 217 Small Group Communication (4)
Basic principles and techniques of discussion. Survey of the importance of discussion in contemporary society, including study of and practice in informal group discussion, panel discussion, symposium, and forum. 4 lectures.

SPC 250 Forensic Activity (1)
Lower division participation in intercollegiate forensic activities. Any student who wishes to receive academic credit for participation in such activities during the quarter should enroll. Specific assignments will be determined by instructor. Total credit limited to 6 units. 1 activity.

SPC 300 Voice and Phonetics (4)
Physiology of normal speech. The basis of speech sounds in American English, their development, symbolization and production using International Phonetic Alphabet. Assessment and improvement of student’s vocal and articulation practices to enhance oral skills. 4 lectures.

SPC 301 Business and Professional Communication (4)
Communication skills and functions for all levels of organizational employees. Interviewing, oral briefings, motivational and conference speaking. 4 lectures. Prerequisite: SPC 201 or SPC 202 or consent of instructor.

SPC 302 Introduction to Communicative Disorders (4)
Survey of speech, language, and hearing disorders emphasizing causes, symptoms, and treatment. Role of the speech therapist in the community and in public schools. Role of the classroom teacher in speech improvement. 4 lectures. Prerequisite: SPC 201 or SPC 202.

SPC 303 Development of Speech and Language (3)
Development of speech and language from birth to adolescence. Physical and psychological processes contributing to the emergence, practice, and mastery of speech and language. 3 lectures. Prerequisite: SPC 300, SPC 302.
SPC 305 Performance of Literature (4)
Poetry, prose, nonfiction and dramatic literature performed to communicate the levels of meaning within each work to the audience. 4 lectures. Prerequisite: SPC 201 or SPC 202, 3 units of literature.

SPC 310 Performing Literature in the Classroom (4)
Techniques for performing literature in primary and secondary teaching situations. Selection, preparation and presentation of literature for an audience; literature exercises to enhance the reading experience for students. Poetry, storytelling, oral reading and research paper. 4 lectures. Prerequisite: SPC 201 or SPC 202.

SPC 312 Communication Theory (4)
Concepts and theories of the human communication process. Psycho-sociological aspects of attitude change. Interpersonal relations in an informational-behavioral context. 4 lectures. Prerequisite. PSY 201 or PSY 202, SPC 212, consent of instructor.

SPC 316 Cross-Cultural Communication (4)
Examination and clarification of cultural aspects and communication problems within and between ethnic groups. 4 lectures. Prerequisite: SPC 201 or SPC 202.

SPC 320 Nonverbal Communication (4) (Also listed as PSY 320)
Influence of kinesic, proxemic, artifactual, olfactory, paralinguistic and environmental factors in human communication. Theory, research and practice in nonverbal communication. 4 lectures. Prerequisite: SPC 212 or consent of instructor.

SPC 321 Intermediate Public Speaking (4)
Further consideration of the principles of public address. Advanced practice in manuscript, extemporaneous, and impromptu speaking. 4 lectures. Prerequisite: SPC 201 or SPC 202.

SPC 322 Persuasion (4)
Persuasive theory including methods of attention, suggestion, motivation, and adaptation employed to influence feelings, attitude, change and action. Analysis of persuasive discourse and the application of persuasive methods in speaking. 4 lectures. Prerequisite: SPC 201 or SPC 202.

SPC 325 Argumentation (4)
Techniques of argumentation, logic and reasoning. Fallacies of reasoning. Experience in various forms of formal argument, and evaluation systems. 4 lectures. Prerequisite: SPC 201 or SPC 202.

SPC 330 Classical Rhetorical Theory (4) GEB C.3.
Early development of rhetorical theory in Greco-Roman civilization. Analysis of the canons of rhetoric. Rhetorical thought of Sophists, Isocrates, Plato, Aristotle, Cicero and Quintilian. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

SPC 331 Contemporary Rhetorical Theory (4)
Contemporary concepts of rhetoric. Contributions of Burke, Weaver, Richards, Toulmin and McLuhan. Issues of ethics and communication, mass media, freedom of speech and dramatistic theory. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

SPC 350 Advanced Forensic Activity (2)
Upper division participation in intercollegiate forensics. Administration and operation of tournaments held annually on campus and in the community. Total credit limited to 6 units. 2 activities. Prerequisite: SPC 250.

SPC 380 Media Effects (4)
Analysis of theoretical assumptions and methodologies of mass media effects research. Influence of media on specific audiences. 4 lectures. Prerequisite: SPC 201 or SPC 202.

SPC 385 Mass Media Criticism (4) (Also listed as ENGL 385 and JOUR 385)
Examines mass media (especially broadcasting) from a rhetorical/critical perspective. Aims to expand students' understanding of media issues, media's role as critic, and the role of criticism. 4 lectures. Prerequisite: SPC 201 or SPC 202.
SPC 400  Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of instructor, junior standing.

SPC 404  Classroom Communication (4)
Exploration of communication development, preschool and elementary school children. Construction, presentation, and evaluation of appropriate instructional experiences. Student-teacher-parent interaction. Communication style, environmental stimuli, dialectal differences and bilingualism, measurement of communication competence. 4 lectures. Prerequisite: Junior standing.

SPC 405  Group Performance of Literature (4)
Examination and experience in the various modes of group performance of literature. Readers Theatre, Chamber Theatre, Story Theatre. Scripting, directing, performing and critiquing of group performance of literature. 4 lectures. Prerequisite: SPC 305 or SPC 310, junior standing.

SPC 411  Communication Research (4)
Exploration of communication research strategies and methodologies. Basic methods of designing research in empirical communication studies. 4 lectures. Prerequisite: STAT 211, SPC 312, junior standing.

SPC 413  Advanced Organizational Communication (4)
Describing and measuring the organization's human message system. Planning and implementing communication training and development for the organization. New functions, careers and opportunities for the communication professional. 4 lectures. Prerequisite: Junior standing, SPC 213 and SPC 301 or consent of instructor.

SPC 430  Rhetorical Criticism (4)
Theory and method used in the analysis and evaluation of rhetorical discourse. Study of critical essays. Practice in interpreting and evaluating persuasive discourse. 4 lectures. Prerequisite: Junior standing, SPC 330 or consent of instructor.

SPC 435  Great Speeches (4)
Selected speakers and speeches from the Greco-Roman era to the present. Analysis and discussion of oratory's role in the shaping of historical events and the development of civilization. 4 lectures. Prerequisite: Junior standing, SPC 430 or consent of instructor.

SPC 450  Internship: Speech Communication (2–4) (CR/NC)
Supervised practicum and application of principles and theories of communication in organizational settings. Total credit limited to 8 units. Credit/No Credit grading only. Prerequisite: Junior standing, 2.5 GPA, and consent of instructor.

SPC 460  Undergraduate Seminar (1)
Discussion and design of individual projects, oral reports on material in current professional writings. 1 seminar. Prerequisite: Junior standing.

SPC 461  Senior Project (3)
Completion of approved project under faculty supervision. Project results are presented in a formal written report. Minimum 90 hours total time. Prerequisite: SPC 460.

SPC 470  Selected Advanced Topics (1–4)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1–4 lectures. Prerequisite: Junior standing.

SS–SOIL SCIENCE

SS 100  Enterprise Project (1–4) (CR/NC)
Selection and completion of a management/production project under faculty supervision. Project participation is voluntary and subject to approval by the department head and the Cal Poly Foundation. Degree credit limited to 12 units. Credit/No Credit grading only.
SS 110 Orientation in Soil Science (1)
Understanding the depth and breadth of soils as a science. Examine potential career opportunities. Introduction to both student and professional organizations. 1 activity.

SS 121 Introductory Soil Science (4)
Biological, chemical, physical and genetic soil properties. Interpretation of soils information for agricultural management and production. Proper land use and conservation, soil and water management. 3 lectures, 1 laboratory.

SS 200 Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

SS 202 Soil and Water Conservation (3)
Climate, topography, soils and land use in relation to soil and water losses. Evaluation of soil and water conservation programs and practices. Miscellaneous course fee required—see Class Schedule. 3 lectures. Prerequisite: SS 121 or consent of instructor.

SS 221 Fertilizers and Plant Nutrition (4)
Plant nutrient requirements. Composition, value, and use of fertilizer materials, conditioners and agricultural minerals. Methods of manufacturing, distributing, and applying fertilizers. 3 lectures, 1 laboratory. Prerequisite: SS 121.

SS 223 Rocks and Minerals (4)
Origin, composition, identification and weathering of rocks, minerals, and clays important in the development of soils. Parent materials as related to the nature and properties of soils. 3 lectures, 1 laboratory. Prerequisite: SS 121, CHEM 122 or CHEM 128.

SS 310 Urban Soils (3)
Manipulation, creation, and management of soils in urban environments. Measurement and interpretation of physical and chemical properties. Selection of soil materials for interior and exterior plantings. 2 lectures, 1 laboratory. Prerequisite: SS 121.

SS 312 Agricultural Climatology (3)
Influence of climate, climatic factors and the plant canopy microclimate on plant growth, and yield. Managing climatic factors for improving crop production. 2 lectures, 1 activity. Prerequisite: SS 121 and junior standing, or consent of instructor.

SS 321 Soil Morphology (4)
Identification of soil horizons and morphological properties. Correlation of soil physical and chemical properties with landscapes and land use. Techniques of interpretations for agriculture, forest, range and urban development. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: SS 121.

SS 322 Soil Fertility (3)
Investigation and evaluation of the nutrient supplying ability of soils. Examination of the conditions and transformations involved in the transfer of mineral nutrients from the soil to the plant. Effects of cultural treatments on soil fertility. 3 lectures. Prerequisite: SS 221, CHEM 122 or CHEM 128.

SS 323 Soil Fertility Laboratory (1)
Interpretation of data integrating soils, applied fertilizers and plant growth. Diagnostic techniques in soil and plant analysis. 1 laboratory. Prerequisite: Concurrent enrollment in SS 322.

SS 350 Computer Software Applications in Agronomy (2)
Computer software applications for soil science and agriculture including word processing, data storage and manipulation, statistical analysis of data, graphics preparation and presentations. 1 lecture, 1 laboratory. Prerequisite: AG 250 or CSC 110 or consent of instructor.

SS 400 Special Problems for Advanced Undergraduates (2–4)
Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.
SS 422 Soil Microbiology (3)
Biochemical activities of soil organisms. Effect of soil organisms on the formation, characteristics, and productivity of soils. Methods of studying soil organisms. 2 lectures, 1 laboratory. Prerequisite: SS 221, BACT 221 or BACT 224, CHEM 328 or consent of instructor.

SS 423 Soil and Water Chemistry (4)
Application of concepts in chemistry and clay mineralogy to the management, use and understanding of soils and water. Quantitative approach to understanding and altering the chemical environment in saline, sodic and acidic soils for optimizing their use. 3 lectures, 1 laboratory. Prerequisite: SS 322, CHEM 129.

SS 431 Soil Resource Inventory (3)
Development and production of soil surveys for interpretive purposes. Use of soil taxonomy and land classification systems to evaluate land for best management practices. 1 lecture, 2 laboratories. Prerequisite: SS 321.

SS 432 Soil Physics (4)
Fundamentals of soil physical properties. Structure, texture, water, air and temperature and their application to agricultural and engineering practices. 2 lectures, 2 laboratories. Prerequisite: SS 121, PHYS 121 or PHYS 131, CHEM 122 or CHEM 128, or consent of instructor.

SS 433 Land Use Planning (3)
Development of plans and practices for management of agricultural, recreational and urban land use by evaluating the soil capabilities through the use of Soil Survey Reports. 2 lectures, 1 laboratory. Prerequisite: SS 121.

SS 440 Forest and Range Soils (4)
Ecosystem approach to the chemical, biological, physical and mechanical properties of forest and range soils. Interpretation of specific research findings and their applications to management problems. Preparation of soil management reports similar to those required by various land management organizations. Overnight field trips. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: SS 121.

SS 442 Soil Vadose Zone Remediation (3)
Water movement in the vadose zone. Monitoring and predicting management effects on water quality. Strategies for selecting the best remediation. Case histories which demonstrate handling of different monitoring problems. 3 lectures. Prerequisite: CHEM 326, GEOL 201, SS 121.

SS 444 Soil Judging (2)
Morphological description of soils in the field. Taxonomic determination of classifications and interpretive properties from soil descriptions. Participation in collegiate soil judging contests. Total credit limited to 12 units. 1 lecture, 1 laboratory. Prerequisite: SS 321 or consent of instructor.

SS 453 Tropical Soils (4)
Nature and properties of soils occurring in the tropics, their origin, morphology, classification, fertility, management and conservation. Examine social implications in international agriculture. 3 lectures, 1 laboratory. Prerequisite: SS 121, CHEM 122 or CHEM 128.

SS 461 Soils Senior Project (1)
Senior project topic selection and contract development with project advisor. Statement of problems, subproblems, assumptions, objectives, hypothesis, methods of analysis and statistical design. Development of literature review and budget of time and finances. Proper format and presentation of tabular and graphic information. 1 activity.

SS 462 Soils Senior Project (3)
Implementation of materials and methods. Collection, analysis and interpretation of data. Completion of formal written report under advisor supervision. Minimum 90 hours. Prerequisite: SS 461.

SS 463 Undergraduate Soils Seminar (2)
Review of current research, experiments, and problems related to the student's major field of interest. Preparation and presentation of reports on problems or research activities. 2 seminars.
SS 470 Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

SS 471 Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

SS 501 Scientific Investigation (3)
Problem solving and research planning for agriculture, natural resources and related sciences. Preparation of study plans which identify problems, review appropriate literature, formulate objectives, develop methods and provide for presentation and interpretation of results. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

SS 508 Landscape Management for Erosion Control (3)
Techniques for the development of soil erosion control and the dispersal of surface runoff water on urban, industrial, recreational and dwelling sites. Land grading ordinances and their limitations. Miscellaneous course fee required—see Class Schedule. 3 lectures. Prerequisite: Introductory soils course and graduate standing, or consent of instructor.

SS 521 Soil Genesis and Classification (3)
Morphological characteristics and genesis of soils and their relationship with major landform features. New techniques used in modern systems of soil classification and mapping. 2 lectures, 1 laboratory. Prerequisite: SS 321 or consent of instructor.

SS 522 Advanced Soil Fertility (3)
Current research frontiers in soil fertility. Evaluating soil testing philosophy, theories and interpretation. Optimizing soil conditions for maximizing crop production. Consequences of environmental pollution, trace elements and organic amendments. Chemical reactions including solubility and chelate equilibria, adsorption phenomena, nutrient mobility, soil mineralogy and weathering. Use of foliar fertilization. Radioisotopes in soil fertility. 3 lectures. Prerequisite: SS 322, graduate standing or consent of instructor.

SS 581 Graduate Seminar in Soils (3)
Current research, experiments and problems related to soil science. 3 seminars.

SS 582 Advanced Land Management (3)
Development of plans and practices for the management of crop, range, and woodland. 2 seminars, 1 laboratory. Prerequisite: Graduate standing, SS 433.

SS 599 Thesis (1–6)
Individual research in soil science under faculty supervision, leading to a scholarly written presentation exhibiting originality, clarity, critical and independent thinking, proper analysis of data, appropriate organization and format, and accurate and thorough documentation. Six units required for the M.S. degree. Prerequisite: Graduate standing and consent of instructor.

STAT–STATISTICS

STAT 130 Introduction to Statistical Reasoning (3) GEB B.2.
Survey of statistical ideas and philosophy. Emphasis on concepts rather than in-depth coverage of statistical methods. Topics include sampling, experimentation, data exploration, chance phenomena, and methods of statistical inference. Credit not allowed for students with previous Statistics course. 3 lectures. Prerequisite: Intermediate algebra or equivalent.

STAT 200 Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.
STAT 211 Elementary Probability and Statistics (3)  
Classification of statistical data. Calculation and uses of various averages, measures of variability, elementary probability. Binomial and normal distributions. Random sampling, confidence intervals. Introduction to hypothesis testing. Not open to students with credit in STAT 251 or STAT 321. 3 lectures. Prerequisite: Intermediate algebra or equivalent.

STAT 212 Statistical Methods (3)  
Tests of hypotheses, and confidence intervals on common parameters. Linear regression and correlation, multiple regression. Analysis of variance and enumerative data. Nonparametric methods. Not open to students with credit in STAT 211 or STAT 321. 3 lectures. Prerequisite: STAT 211.

STAT 251 Statistical Inference for Management I (3)  
Descriptive statistics. Review of probability distributions. Point and interval estimation of common population parameters. Hypothesis tests of population means, proportions, and variances. Chi-square analysis. Use of calculators and minitab as computing tool. Not open to students with credit in STAT 211 or STAT 321. 3 lectures. Prerequisite: STAT 211.

STAT 252 Statistical Inference for Management II (3)  
Regression, correlation, multiple regression, time series, and forecasting. Use of computers assumed throughout course. Experience with large statistical computer packages in analyzing information in data-bases. 3 lectures. Prerequisite: STAT 251 and CSC 120 or one course in computer programming.

STAT 313 Applied Experimental Design and Regression Models (3)  
Applications of statistics for students not majoring in statistics or mathematics. Analysis of variance including the one-way classification, randomized blocks, Latin squares, and factorial designs. Introduction to multiple regression and to analysis of covariance. Use of computer software in the solution of statistical problems. 3 lectures. Prerequisite: STAT 212.

STAT 321, 322 Statistical Analysis (3) (3)  
Probability and probability distributions for statistical procedures. Statistical techniques based on sampling from normally distributed populations. Regression and correlation, introduction to analysis of variance, analysis of covariance, distribution free procedures. Use of computing facilities in the solution of statistical problems. 3 lectures. Prerequisite: STAT 212.

STAT 323 Analysis of Variance (3)  
Single and two factor analyses of variance, fixed and random effects, Latin square and other special designs, nested designs, factorial designs and analysis of $2^n$ factorial experiments, analysis of covariance. 3 lectures. Prerequisite: STAT 322.

STAT 324 Applied Regression Analysis (3)  
Simple linear regression, aptness of model, special topics in simple linear regression, multiple linear regression, indicator variables, selection of "best subset," and introduction to nonlinear regression models. 3 lectures. Prerequisite: STAT 212 or STAT 252 or STAT 322.

STAT 330 Statistical Uses of Computers (3)  
Techniques available to the statistician for efficient use of a digital computer to perform statistical computations and to handle large amounts of data. Use of special languages. Analysis of computer software used in the solution of statistical problems. 3 lectures. Prerequisite: STAT 212 or STAT 252 or STAT 322, and one course in computer programming.

STAT 400 Special Problems for Advanced Undergraduates (1-2)  
Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

STAT 415 Nonparametric Methods in Statistics (3)  
Hypothesis testing when form of parent population is unknown. Tests based on Binomial Distribution. Measures of dependence. Contingency tables, tests based on ranks. Kolmogorov- Smirnov-type tests. 3 lectures. Prerequisite: STAT 212 or STAT 322.
STAT 416 Statistical Analysis of Time Series (3)
Descriptive smoothing methods, regression models for time series data, forecasting via exponential smoothing, methods for seasonal data, ARIMA models and Box-Jenkins methods, frequency domain analysis, filtering. 3 lectures. Prerequisite: STAT 252 or STAT 322.

STAT 418 Analysis of Cross-Classified Data (3)
Discrete multivariate statistics, including analysis of cross-classified data, log-linear models for multidimensional contingency tables, goodness of fit statistics, measures of association, model selection, and hypothesis testing. 3 lectures. Prerequisite: Two courses in statistics and MATH 204 or consent of instructor.

STAT 419 Applied Multivariate Statistics (3)
Continuous multivariate statistics. Multivariate linear model, principal components and factor analysis, discriminant analysis, clustering, and canonical correlation. 3 lectures. Prerequisite: Two courses in statistics and MATH 204 or consent of instructor.

STAT 421 Sampling Techniques (3)
Planning, execution, and analysis of sampling from finite populations. Sampling designs and estimation procedures. Nonsampling errors. Questionnaire analysis. Case studies. 3 lectures. Prerequisite: STAT 212, STAT 252, or STAT 322.

STAT 423 Linear Models (3)
General linear model—a unified approach to various applied methods. Regression, t-test, analysis of variance and covariance. Programming statistical problems. Advanced topics in statistical designs. Split plot design, confounding, fractional factorial, response surfaces. 3 lectures. Prerequisite: STAT 323, MATH 204.

STAT 425 Probability Theory and Applications I (3)
Basic probability theory, conditional and marginal probability, stochastic independence, probability models for random phenomena, probability distributions, mathematical expectation and transformation. 3 lectures. Prerequisite: STAT 321, MATH 241.

STAT 426 Probability Theory and Applications II (3)
Multivariate normal distribution, sampling distributions, theory of estimation and hypothesis testing. 3 lectures. Prerequisite: STAT 425.

STAT 427 Mathematical Statistics (3)
Investigation of statistical theory, including the topics of Bayesian inference, regression and linear hypotheses, and sequential analyses. 3 lectures. Prerequisite: STAT 426.

STAT 461, 462 Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

STAT 463 Undergraduate Seminar (2) (CR/NC)
Reports and discussions by students through seminar methods, based on topics of interest to persons preparing for a career in statistics. Offered only on a Credit/No Credit basis. 2 seminars.

STAT 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

STAT 512 Statistical Methods (3)
Statistical methods in research for graduate students not majoring in mathematical sciences. Probability distributions, confidence intervals, hypothesis testing, contingency tables, linear regression and correlation. Application of statistics in the student’s major field. 3 seminars. Prerequisite: Intermediate algebra or equivalent.
TH–THEATRE

TH 210  Introduction to Theatre (3)  GEB C.2.
Play production process and approach to the theatre including theatrical terminology, methods, aesthetics and technology. 3 lectures.

TH 327, 328  Theatre History and Literature (3) (3)  GEB C.3.
History of theatre in the Western world and representative plays from the Greeks through the French Seventeenth Century, and from Eighteenth Century England to the present. 3 lectures. Prerequisite: TH 210 or consent of instructor.

TH 330  Stagecraft (3)
Sound, costume construction, stage lighting, make-up, and construction and painting of stage scenery. Total credit limited to 9 units. Prerequisite: Consent of instructor.

TH 340  Acting (3)
Basic acting techniques, improvisation, characterization, pantomime and movement. 2 lectures, 1 activity. Prerequisite: Consent of instructor.

TH 342  Directing (3)
Script analysis, motivation and blocking of action, preparation of the prompt book. Direction of one-act plays. 1 lecture, 2 activities. Prerequisite: Junior standing and consent of instructor.

TH 345  Rehearsal and Performance (3)
Preparation of a play for public presentation, including acting, stage management, publicity and house management. Admission to course by audition only. Total credit limited to 9 units. 3 laboratories.

TH 380  Children's Drama (3)
Role-playing, group dramatization, and related activities. For students preparing to teach. 1 seminar, 2 activities. Prerequisite: Any GEB Area C.2 or C.3 course and sophomore standing.

TH 400  Special Problems for Undergraduates (1–2)
Individual investigation, research, or project centering around theatre. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

TH 430  Introduction to Stage Design: Scenery (3)
Theories and contemporary practices in stage scenic design. Script analysis and production concept through shop plans, renderings and models, property plots. Drafting and design projects. 1 seminar, 2 activities. Prerequisite: Consent of instructor.

TH 432  Introduction to Stage Design: Costume (3)
Adapting historic and contemporary fashion for the stage. Script analysis for costume detail. Contemporary professional practices. Design projects. 1 seminar, 2 activities. Prerequisite: Consent of instructor.

TH 434  Introduction to Stage Design: Lighting and Sound (3)
Lighting and sound design for the stage, dance concerts and exhibitions. From script analysis, exhibition proposal, through the rendering of production lighting and sound plots. Light and color. Contemporary instrumentation and controls. Production analysis. Practical execution in performance situations. 1 seminar, 2 activities. Prerequisite: Consent of instructor.

TH 450  Theatre Management (3)
Organization and operation of a theatre company. Staffing, program selection, publicity, house and box office operation, budgeting. Project proposals for individual companies. 1 seminar, 2 activities. Prerequisite: Consent of instructor.

TH 470  Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.
TH 471  Selected Advanced Laboratory (1–3)
Directed group laboratory study of selected topics for theatre students. Class Schedule will list topics selected. Total credit limited to 6 units, 1–3 laboratories. Prerequisite: Consent of instructor.

VGSC—VEGETABLE SCIENCE

VGSC 100  Enterprise Project (1–4) (CR/NC)
Selection and completion of a management/production project under faculty supervision. Project participation is subject to approval by the department head and the Cal Poly Foundation. Degree credit limited to 12 units. Credit/No Credit grading only.

VGSC 230  General Vegetable Crops (4)
Principles involved in production, harvesting, packaging, and marketing of major California vegetable crops. Survey of the vegetable industry for other than crop science majors. Field trip required. Not open to students with credit in VGSC 232. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory.

VGSC 232  Vegetable Crops Production (4)
Production, adaptation, utilization of vegetable crops such as cole crops, beans, celery, peppers, squash, melons, cucumbers, lettuce, carrots, spinach, sweet potatoes. Field trip to a major California vegetable production area required. Not open to students with credit in VGSC 230. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: CRSC 133.

VGSC 250  Home Vegetable Production (2)
Practical aspects of growing vegetable crops in the home garden. Seedbed preparation, seeding, transplanting, fertilizing, mulching, composting, irrigation, trellising, pest control, harvest and storage. Organic and conventional cultural practices presented. 1 lecture, 1 laboratory.

VGSC 324  Harvesting and Packaging Vegetable Crops (4)
Harvesting methods and procedures. Current handling and packaging techniques, containers, precooling and refrigerated storage. Post harvest physiology of fresh market vegetables. Field trip to a major California vegetable production area required plus local grower visits. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: VGSC 232 or consent of instructor.

VGSC 424  Vegetable Crop Management (4)
Organization, management, and operation of commercial vegetable production considering the varied aspects of the entire commercial vegetable industry. Field trip to a major California vegetable production area required. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: VGSC 232 or consent of instructor.

VGSC 426  Advanced Vegetable Production (4)
Advanced studies of recent developments and problems of vegetable production. Cultural practices associated with mechanization. Field trip to a major California vegetable production area required. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: VGSC 232.

VGSC 521  Advanced Vegetable Science (4)
Advanced study of vegetable science. Special study projects. 3 lectures, 1 laboratory. Prerequisite: Graduate standing and consent of instructor.

VS—VETERINARY SCIENCE

VS 109  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, VS 203 and VS 302. Not open to degree students for degree credit. Prerequisite: BIO 101.
VS 123 Anatomy and Physiology (3)
Structural aspects and the normal functions of the principal systems of the various farm animals. 2 lectures, 1 laboratory. Prerequisite: ZOO 131.

VS 200 Special Problems for Undergraduates (2-3)
Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 3 units per quarter. Prerequisite: Consent of department head.

VS 203 Animal Parasitology (3)
Identification, life cycles, prevention and control of the common external and internal parasites causing economic loss in livestock. 3 lectures. Prerequisite: ZOO 131.

VS 241 Veterinary Technology (2)
Application of paraprofessional knowledge and skills including medical terminology, pharmacological metrology, and animal identification, behavior, and restraint. 2 activities.

VS 302 Animal Hygiene (3)
Basic disease concepts, transmission of infectious diseases, fundamentals of immunology. Infectious disease preventive principles. Livestock producer's role and responsibilities in governmental farm animal disease control programs. 3 lectures. Prerequisite: BACT 221.

VS 310 Zoonosis (2)
Significant public health diseases transmissible to man through domestic and wild animals, vectors, and food resources. 2 lectures. Prerequisite: ZOO 131 or BIO 101.

VS 341 Veterinary Technology—Advanced (2)
Application of advanced paraprofessional knowledge involving principles of asepsis, anesthesia, veterinary instrumentation and radiology. Supportive techniques in anesthesia, surgical preparation, and veterinary hematology. 2 activities. Prerequisite: VS 241.

VS 400 Special Problems for Advanced Undergraduates (2-4)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

VS 438 Systemic Animal Physiology (4)
Homeostatic relationships of organ systems. Cardiovascular, respiratory, urogenital and neuro-endocrinological functions. 3 lectures, 1 laboratory. Prerequisite: VS 123, CHEM 328.

WS–WOMEN’S STUDIES

WS 301 Introduction to Women’s Studies (3)
Introduction to women's contributions to various areas of human life and to women’s place in history and society. Students will increase their understanding of women as a principal category of scholarly investigation. 3 lectures. Prerequisite: ENGL 114, ENGL 125 or PHIL 125 or SPC 125, upper division standing.

WS 401 Seminar in Women’s Studies (3)
Opportunity to explore scholarly works on women's contributions to various areas of human life. Discussion and reports on library research will be incorporated into the course. Field research or service is required. 3 seminars. Prerequisite: WS 301, upper division standing.

WS 411 Women, Race and Class (3)
Interactive roles of ethnicity, gender and class on the lives of individual women, and society as a whole. Examination of social conditions faced by different groups of contemporary women and the diverse ethnic and class heritages with which they shape their lives. 3 lectures. Prerequisite: WS 301, one course in SOC or WS, upper division standing.

ZOO–ZOOLOGY

ZOO 131 General Zoology (4)
Cells, tissues, and organ systems of vertebrates. Emphasis on man and domestic animals. 2 lectures, 2 laboratories.
ZOO 132 General Zoology (4)  
Embryology, genetics, taxonomy, ecology, evolution, and survey of the chordates. 2 lectures, 2 laboratories. Prerequisite: ZOO 131.

ZOO 133 General Zoology (4)  
Variety, structure and distribution of invertebrate animals. 2 lectures, 2 laboratories. Prerequisite: ZOO 132.

ZOO 237 Human Anatomy (3)  
Structure of the human body as the basis of function. Supplemented with demonstrations of human cadavers. Not open for Anatomy and Physiology Concentration credit to students who have completed ZOO 326. 2 lectures, 1 laboratory. Prerequisite: ZOO 131.

ZOO 303 Vertebrate Embryology (3)  
Developmental processes from the egg to the formation of the body and the establishment of the principal organs and systems. 3 lectures. Prerequisite: ZOO 132.

ZOO 304 Vertebrate Embryology Laboratory (2)  
Developmental anatomy of selected stages of the frog, chicken and pig. 2 laboratories. Prerequisite or concurrent: ZOO 303.

ZOO 321 Mammalogy (4)  
Biology and economic importance of mammals. Classification and identification of mammals, with emphasis on California species. 2 lectures, 2 laboratories. Prerequisite: ZOO 132.

ZOO 322 Ichthyology (4)  
Phylogeny, anatomy, functional morphology, physiology, and ecology of marine and freshwater fishes. Special reference to local and economically important species. Laboratory emphasis on taxonomy of California species, especially marine groups. 2 lectures, 2 laboratories. Prerequisite: ZOO 132.

ZOO 323 Ornithology (4)  
Classification and identification of birds, with emphasis on California species. Anatomy, physiology, ecology and behavior. Saturday field trips required. 2 lectures, 2 laboratories. Prerequisite: ZOO 132.

ZOO 324 Zoo Biology (3)  
Wild animals in captivity. Principles and problems of maintaining them for recreational, educational and scientific purposes. 3 lectures. Prerequisite: One course in biology or zoology.

ZOO 326 Comparative Anatomy of the Chordates (5)  
Comparative structure of chordate organ systems. Laboratory emphasis on dissection techniques. 3 lectures, 2 laboratories. Prerequisite: ZOO 132.

ZOO 329 Vertebrate Field Zoology (4)  
Identification and natural history of terrestrial vertebrates, with emphasis on field studies and local species. 2 lectures, 2 laboratories. Prerequisite: ZOO 132.

ZOO 331, 332 Human Physiology I, II (3) (3)  
Function of various human organ systems with appropriate laboratory experiments. Credit not allowed for students in the Anatomy and Physiology Concentration who have completed ZOO 432 or ZOO 433. 2 lectures, 1 laboratory. Prerequisite: ZOO 331: ZOO 237 and CHEM 121 or CHEM 124 or CHEM 127. ZOO 332: ZOO 331.

ZOO 336 Invertebrate Zoology (4)  
Invertebrate groups of animals with emphasis on taxonomy, morphology, distribution and economic importance. 2 lectures, 2 laboratories, and fieldwork. Prerequisite: ZOO 133.

ZOO 340 Human Muscle Anatomy (2)  
Muscles of a human cadaver. 1 lecture, 1 laboratory. Prerequisite or concurrent: ZOO 237.

ZOO 341 Herpetology (4)  
Living and extinct reptiles and amphobians; an adaptive approach to their diversity, biology, and classification. 2 lectures, 2 laboratories. Prerequisite: ZOO 132.
ZOO 356  Neurobiology (3)  GEB B.1.b.
Survey of the nervous system with emphasis on functional anatomy of the human brain, Motor and sensory systems. Neural control mechanisms, including neurotransmitters and neuromodulators. Development, aging, and common disorders. 3 lectures. Prerequisite: ZOO 131.

ZOO 422  Histology (4)
Functional microscopic anatomy of principal tissues and organs of vertebrates. 2 lectures, 2 laboratories. Prerequisite: ZOO 132.

ZOO 425  Parasitology (4)
External and internal parasites of man and animals. Life history. Parasite-host relationships. Control and recognition of species of clinical importance. 2 lectures, 2 laboratories. Prerequisite: ZOO 132. Recommended: ZOO 133.

ZOO 426  Serology and Immunology (4)
Nature of beneficial and harmful immune reactions. Theory and techniques of serological methods in diagnosing disease. Designed for preparing laboratory technologists. 2 lectures, 2 laboratories. Prerequisite: Consent of instructor.

ZOO 428  Hematology (4)

ZOO 432  Physiology II: Comparative Systems (4)
Physiological mechanisms involved in osmotic and ionic regulations, digestion, circulation, respiratory energetics and thermal acclimation. Laboratory experiments in physiological processes and their ecological importance. 2 lectures, 2 laboratories. Prerequisite: BIO 431.

ZOO 433  Physiology III: Endocrine and Reproductive (4)
Introduction to the endocrine and reproductive systems of vertebrate animals. Includes not only classical actions of hormones but also mechanisms of hormone action, relationship between nervous and endocrine systems, hormone bioassay, and selected clinical aspects of endocrinology. 3 lectures, 1 laboratory. Prerequisite: BIO 431.

ZOO 437  Animal Behavior (4)
Behavioral adaptations of animals to their environment and way of life. Analysis of behavior patterns, use of patterns in clarifying evolutionary and ecological relationships. 3 lectures, 1 laboratory. Recommended: ZOO 132. Recommended: BIO 325.

ZOO 524  Functional Vertebrate Morphology (3)
Analysis of locomotor and feeding mechanisms. 2 seminars, 1 laboratory. Prerequisite: Graduate standing.

ZOO 530  Behavioral Ecology (3)
Function and evolution of behavioral phenomena as they relate to ecological phenomena. Topics include habitat selection, spacing mechanisms, reproductive strategies, feeding strategies, agonistic, parasitic, and altruistic behavior; migration, and comparative social systems. 3 seminars. Prerequisite: Graduate standing, BIO 325 or BOT 326, ZOO 437. Recommended: BIO 315, PSY 304.
Directories

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UNIVERSITY ADMINISTRATION

OFFICE OF THE PRESIDENT

President ................................................................. Warren J. Baker
Administrative Assistant ................................................... Grace Arvidson
Executive Assistant to the President ................................. Howard West

ACADEMIC AFFAIRS

Vice President for Academic Affairs (Interim) ......................... Philip S. Bailey
Associate Vice President for Academic Affairs and University Dean ....... Glenn W. Irvin
Academic Program Planner .............................................. Position Vacant
Coordinator, Writing Skills Program ................................... Mary Kay Harrington
Director, Extended Education ........................................... Howard M. Vollmer
Associate Vice President for Academic Resources ......................... Frank T. Levens
Associate Vice President for Enrollment Support Services ................. Position Vacant
Admissions Officer (Interim) ............................................. Helen M. Linnstrom
Registrar ........................................................................ Paula Ringer
Supervisor, Evaluations ..................................................... Gerald N. Piches
Associate Vice President for Graduate Studies, Research and
Faculty Development ....................................................... Robert A. Lucas
Director, Grants Development ........................................... Margaret Cardoza
Coordinator, Graduate Student Services and International Programs .... Marilyn R. York
Director, Institutional Studies ............................................ Walter R. Mark
Director, Intercollegiate Athletics ....................................... Kendrick W. Walker
Dean, Library Services .................................................... David B. Walch
Assistant Dean .............................................................. Angelina Martinez

Schools and Departments

SCHOOL OF AGRICULTURE ................................................................. Dean, Lark P. Carter
Associate Dean, A. Charles Crabb (Interim)
Associate Dean, Joseph E. Sabol (Interim)

Agribusiness ........................................................................ M. LeRoy Davis
Agricultural Education ......................................................... Glen R. Casey
Agricultural Engineering ....................................................... Edgar J. Carnegie
Animal Sciences and Industry ................................................ John W. Algeo
Crop Science ....................................................................... George Cowgani
Dairy Science ..................................................................... Eugene E. Starkey
Food Science and Nutrition ................................................... Joseph Montecalvo
Natural Resources Management ............................................ Norman H. Pillsbury
Ornamental Horticulture ....................................................... Ronald D. Regan
Soil Science ...................................................................... Terry L. Smith

SCHOOL OF ARCHITECTURE AND ENVIRONMENTAL DESIGN ........ Dean, G. Day Ding
Associate Dean, K. Richard Zweifel

Architectural Engineering ..................................................... Mark Berrio
Architecture ......................................................................... W. Mike Martin
City and Regional Planning .................................................. Linda Dalton (Interim)
Construction Management ................................................... James Rodger
Landscape Architecture ....................................................... Gerald L. Smith
SCHOOL OF BUSINESS ........................................... Dean, Kenneth D. Walters
                        Associate Dean, Kenneth Reiner
Accounting .............................................................. James A. Anderson
Business Administration ................................................... Jeffrey E. Danes
Economics ........................................................................ Panagiotis Papakyriazis
Management ........................................................... David A. Peach

SCHOOL OF ENGINEERING ....................................... Dean, Peter Y. Lee
                        Associate Dean, J. Kent Butler
Aeronautical Engineering ............................................... Doral Sandlin
Civil Engineering and Environmental Engineering ................... Stephen Hockaday
Computer Science ...................................................... Roger C. Camp
Electronic and Electrical Engineering ....................................... Martin E. Kaliski
Engineering Technology ................................................... Paul E. Rainey
Industrial Engineering .................................................... Unny Menon
Mechanical Engineering ................................................... Ronald L. Mussulman
Metallurgical and Materials Engineering .................................. Robert Heidersbach

SCHOOL OF LIBERAL ARTS ...................................... Dean, Position Vacant
                        Associate Dean, Harry Sharp, Jr. (Interim)
Art and Design ........................................................... Charles Jennings
English ..................................................................... Brent H. Keech
Foreign Languages and Literatures ......................................... William T. Little
History ...................................................................... Max Riedlspenger
Journalism ................................................................. Nishan Havandjian
Music ........................................................................ Clifton E. Swanson
Philosophy ...................................................................... Laurence D. Houlgate
Political Science ................................................................ Dianne N. Long
Social Sciences ................................................................ Warren DeLey
Speech Communication .................................................... Bernard K. Duffy
Theatre and Dance ........................................................... Michael R. Malkin

SCHOOL OF PROFESSIONAL STUDIES AND EDUCATION ...... Dean, Harry J. Busselen, Jr.
                        Associate Dean, Position Vacant
Education .................................................................... Richard L. Warren
Ethnic Studies, Coordinator ........................................... David J. Sanchez
Graphic Communication .................................................. Harvey R. Levenson
Home Economics ............................................................ Barbara P. Weber
Industrial Technology ...................................................... Gerald E. Cunico
Liberal Studies, Coordinator .............................................. Margaret J. Glaser
Military Science ................................................................ Lt. Col. Sol M. Garrett
Physical Education and Recreation Administration ....................... Dwayne G. Head
Psychology and Human Development .................................. Kathleen Ryan

SCHOOL OF SCIENCE AND MATHEMATICS ....................... Dean, Harry L. Fierstine (Interim)
                        Associate Dean, Position Vacant
Biological Sciences ................................................................ V.L. Holland
Chemistry ....................................................................... Norman Eatough
Mathematics ..................................................................... Thomas P. Hale
Physics ........................................................................ John Mottmann
Statistics ....................................................................... James C. Daly

BUSINESS AFFAIRS
Vice President, Business Affairs ........................................ James R. Landreth
                        Associate Vice President, Business Affairs ............... Position Vacant
Budget Officer ............................................................. Richard M. Ramirez
Director, Public Safety ................................................... Richard C. Brug
Financial Manager ........................................................... Anthony B. Flores
Director, Housing and Conference Services ......................... Joseph C. Risser
Procurement and Support Services Officer ............................. Ray Macias
FACILITIES ADMINISTRATION

Executive Dean ................................................................. E. Douglas Gerard
Architectural Coordinator .................................................. Peter K. Phillips
Director, Plant Operations .................................................. Edward M. Naretto
  Associate Director, Plant Operations ................................... John E. Martin
  Energy Coordinator .......................................................... Norman F. Jacobson
Manager, Administrative Services ....................................... T. Leigh Elfrink
Manager, Architectural Trades ............................................. Gerry Gentilucci
Manager, Engineering Services ............................................. Robert Pahlow

INFORMATION SYSTEMS

Vice President for Information Systems ................................. Arthur S. Gloster, II
  Director, Academic Computing Services .................................. Robert C. Clover
  Director, Administrative Systems ......................................... Jeffrey T. Williams
  Director, Communication Services ........................................ Norman Johnson
  Director, Computer Aided Productivity Center ....................... Arthur J. Chapman (Interim)
  Resource Director and Interim Director, Computer Center ........... David J. Yang
Manager, Student Data Systems ............................................ Thomas L. Zuur

PERSONNEL AND EMPLOYEE RELATIONS

Director ................................................................................. Janet L. Pieper
  Associate Director ............................................................. Michael H. Suess
  Affirmative Action Officer .................................................... Position Vacant
  Human Resource Manager ...................................................... Barbara Melvin
  Staff Personnel Officer ....................................................... Robert M. Negranti
  Personnel Programs Manager ................................................ Joan Lund

STUDENT AFFAIRS

Vice President for Student Affairs .......................................... Hazel Scott
  Associate Vice President for Student Affairs ............................ Roger M. Swanson
  Associate Dean, Student Affairs ............................................. W. Carl Wallace
  Director, Student Life and Activities ...................................... Kenneth B. Barclay
  Coordinator, Greek Affairs ................................................... Walter M. Lambert
  Coordinator, Human Corps .................................................... Patricia (Sam) Lutrin
  Coordinator, International Student Programs ......................... Barbara Andre
  Coordinator, Recreational Sports ......................................... Marci Snodgrass
  Director, Counseling and Testing .......................................... Kerry T. Yamada
  Coordinator, Learning Assistance Center ................................ Patricia A. Stewart
  Director, Student Academic Services and Educational Equity Officer . Armando A. Pezo-Silva
  Director, Developmental Outreach ......................................... Everardo Martinez
  Director, Minority Engineering Program ................................... David Cantu
  Director, Student Support Services ........................................ Glenda Keil
  Director, Upward Bound ...................................................... Andrea Mitchell
  Coordinator, Disabled Student Services ................................... Harriet Clendenen
  Director, Financial Aid ....................................................... Lawrence J. Wolf
  Director, Health Services ................................................... James H. Nash, M.D.
  Director, Housing .................................................................. Robert M. Bostrom
  Director, Cooperative Education and Placement Services .......... Richard M. Equinoa
UNIVERSITY RELATIONS

Vice President, University Relations ......................................................... Position Vacant
Executive Director, University Relations and Development ......................... Charles R. Allen
Associate Vice President, University Relations ........................................... Larry R. Voss
Director, Alumni Relations ................................................................. Steven B. Shockley
Director, Annual Giving and University Development Services .............. Susan Childers-Kraft
Director, Public Affairs ..................................................................... Stan Bernstein
Public Information Officer ................................................................. C. Robert Anderson
Public Information Officer ................................................................. Donald L. McCaleb
Director, Publications and Special Events ........................................ Darlene Slack
Publications Editor ................................................................. Ginny Monteen

AUXILIARY ORGANIZATIONS

Associated Students, Inc.

Executive Director, A.S.I. Business Affairs ................................................... Roger Conway
Associate Director, Concerts and Events ..................................................... Stephen H. Adams
Associate Director, Programs ..................................................................... Rod Neubert

Foundation

Executive Director ........................................................................ Alfred W. Amaral
Associate to Executive Director .......................................................... Robert E. Griffin
Controller ....................................................................................... James A. Neal
Director, El Corral Bookstore ............................................................... C. Court Warren
Director, Financial Services ............................................................... Don Shemenske
Director, Food Services .................................................................... Nancy Williams
Director, Vocational Education Productions ........................................ Patrick Smith
Personnel Manager ........................................................................ Barry Welchel
Sponsored Programs Administrator ...................................................... Thomas C. Davis

CAL POLY CHIEF EXECUTIVE OFFICERS

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

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

FACULTY EMERITI

(Dates indicate period of service)

Robert E. Kennedy (1940–1979) ........................................................ President Emeritus
Robert W. Adamson (1953–1983) ......................................................... Aeronautical and Mechanical Engineering
William Alexander (1958–1988) ........................................................... Political Science
John K. Allen (1952–1970) ................................................................. Veterinary Science
Elizabeth B. Anderson (1958–1980) ...................................................... English
Olive M. Andersen (1957–1972) .................................................... Mathematics
Richard A. Anderson (1947–1983) .............................................. Physical Education
Roy E. Anderson (1949–1978) .................................................. Business
Warren R. Anderson (1946–1979) ...................................................Electronic and Electrical Engineering
Dale W. Andrews (1950–1983) .................................................... Executive Vice President
John H. Applegarth (1952–1972) ............................................. Biological Sciences
William W. Armentrout (1953–1980) ...................................................Education
James H. Babb (1959–1982) ..........................................................Graphic Communications
Roger S. Bailey (1962–1979) ..........................................................Art
Stanley L. Barr (1959–1980) ..........................................................English
George C. Beatie (1959–1980) .......................................................Music
Lyman L. Bennion (1938–1967) ......................................................Animal Husbandry
Joy G. Berghell (1956–1975) ..............................................................Library
Ellard W. Betz (1947–1976) ............................................................Engineering Technology
Charles R. Beymer (1966–1989) ...................................................University Library
Ralph O. Bille (1948–1965) ............................................................Agricultural Engineering
Richard Birkett (1955–1988) ......................................................Animal Science and Industry
Chester O. Bishop (1957–1973) ....................................................Mechanical Engineering
Charles R. Black (1973–1989) ....................................................Mechanical Engineering
Emmett A. Bloom (1946–1974) ....................................................Animal Science
Enrico P. Bongio (1948–1979) ..............................................................Engineering Technology
James S. Booth (1972–1988) ...........................................................Biological Sciences
Woodford E. Bowls (1937–1973) ...................................................Physics
William M. Boyce (1962–1978) ....................................................Management
J. Philip Bromley (1947–1973) ....................................................Agricultural Management
Howard C. Brown (1943–1983) .....................................................Ornamental Horticulture
Athol J. D. Brunk (1957–1980) ..........................................................Physics
LaVerne Bucy (1955–1978) ............................................................Animal Science
H. H. Burlingham (1948–1972) ....................................................Agricultural Education
Wallace Burt (1968–1986) ...............................................................Accounting
Arthur G. Butzbach (1950–1970) .......................................................Education
Tracey G. Call (1962–1980) ...........................................................Biological Sciences
James H. Carrington (1943–1967) ....................................................Agricultural Engineering
Marjorie Cass (1957–1974) ..............................................................Education
Everett M. Chandler (1951–1977) .....................................................Student Affairs
Daniel C. Chase (1954–1979) ....................................................Agricultural Management
Gaylord Chizek (1958–1989) ............................................................Agricultural Management
George Clucas (1968–1982) ...........................................................Political Science
Ralph C. Collins (1955–1974) ..........................................................Education
Spelman B. Collins (1940–1968) ...................................................Animal Husbandry
E. Wesley Conner (1963–1988) ......................................................Ornamental Horticulture
David W. Cook (1941–1977) ...........................................................Mathematics and Academic Affairs
Frank G. Coyes (1965–1983) ..............................................................Agricultural Engineering
Franklin S. Crane (1958–1985) .....................................................Mechanical Engineering
A. Norman Cruikshanks (1947–1971) ..................................................Social Sciences
James T. Culbertson (1953–1977) ......................................................Philosophy
Carl C. Cummins (1958–1983) ........................................ Dean of Communicative Arts and Humanities
William D. Curtis (1961–1989) ................................ Psychology and Human Development
Max Dammele (1967–1989) .......................................... English
Charles P. Davis (1958–1983) ........................................ Civil and Environmental Engineering
Arnold M. Dean (1949–1982) ........................................ Soil Science
Bruce A. Dickson (1952–1978) ......................................... Soil Science
Ralph W. Dils (1944–1973) ................................ History
Wesley T. Dunn (1959–1974) ................................ Graphic Communications
Bernard W. Dusek (1965–1989) ..................................... Art and Design
Walter E. Elliott (1965–1983) ........................................ Physics
Edward J. Ernatt (1958–1983) ....................................... Education
Oswald J. Falkenstern (1953–1977) ................................ Mathematics
Harry C. Finch (1962–1980) ........................................... Biological Sciences
Anne C. Fowler (1965–1982) ........................................ Social Science
Frank Fox (1957–1988) ................................................ Animal Science and Industry
George S. Furimsky (1955–1973) ................................ Engineering Technology
Vincent J. Gates (1958–1977) ........................................ Journalism
J. Cordner Gibson (1949–1976) ................................ Agricultural Education and Dean of Agriculture
and Natural Resources
David M. Grant (1950–1980) .......................................... English and Academic Affairs
Lester W. Gustafson (1947–1971) ................................... Aeronautical Engineering
Richard E. Hall (1946–1977) ........................................ Engineering Technology
Leroy M. Harris (1954–1986) ...................................... Animal Sciences and Industry
John R. Healey (1947–1980) ........................................ Journalism
Anatol Helman (1957–1974) ....................................... Architecture
Frank J. Hendel (1967–1973) ........................................ Aeronautical Engineering
Harold J. Hendriks (1952–1978) ....................................... Electronic and Electrical Engineering
Donald W. Hensel (1960–1989) ...................................... History
Earl R. Hesch (1956–1983) ........................................ Engineering Technology
William R. Hicks (1957–1983) ...................................... Physical Education
George E. Hoffman (1956–1979) .................................... Industrial Engineering
Wilbur C. Hogan (1959–1973) ....................................... Philosophy
Roy B. Hollsten (1973–1988) ....................................... Computer Science
Ernest R. Houston (1957–1983) Ornamental Horticulture
LeRoy B. Hughes (1950–1971) Physical Education
Robert J. Huot (1963–1986) English
James J. Jensen (1948–1973) Physical Education
Mead R. Johnson (1956–1980) English
Miles B. Johnson (1957–1983) English
Thomas V. Johnston (1967–1985) Art and Associate Dean of Communicative Arts and Humanities
Paul Kenyon (1957–1982) Business Administration
Paul S. Lansman (1964–1979) Mathematics
Richard I. Leach (1930–1971) Poultry Industry
Thomas Lee (1952–1988) Physical Education and Recreation Administration
Vance D. Lewis (1946–1972) Physics and School of Science and Mathematics
Charles H. Lindamood (1958–1979) English
Bernice B. Loughran (1958–1960) Art
Thomas M. Lukes (1962–1985) Food Science
Ena L. Marston (1946–1970) English
James M. McGrath (1946–1975) Engineering Technology
Malcolm McLeod (1973–1988) Biological Sciences
Mac McBride (1962–1979) Industrial Technology
Thomas O. Meyer (1955–1979) Food Science
David H. Montgomery (1956–1985) Biological Sciences
Donald Morgan (1968–1988) Industrial Engineering
Robert A. Mott (1946–1978) Physical Education
Richard F. Nelson (1960–1989) Biological Sciences
Dell O. Nickell (1964–1980) ..................................................... Architectural Engineering
Glenn A. Noble (1947–1973) ..................................................... Biological Sciences
Thomas F. Nolan (1949–1974) ..................................................... Political Science
Howard R. O’Daniels (1938–1971) ..................................................... Business Administration
Michael J. O’Leary (1951–1982) ..................................................... Social Science
Barton C. Olsen (1968–1989) ..................................................... History
Leon F. Osteyee (1957–1983) ..................................................... Aeronautical and Mechanical Engineering
Philip H. Overmeyer (1958–1972) ..................................................... Business Administration
Evelyn I. Pellaton (1966–1982) ..................................................... Physical Education
James M. Peters (1958–1980) ..................................................... Chemistry
James J. Peterson (1964–1984) ..................................................... English
Richard A. Pimentel (1952–1983) ..................................................... Biological Sciences
Curtis Piper (1964–1988) ..................................................... Soil Science
Derek Price (1957–1989) ..................................................... Mechanical Engineering
Peter Rabe (1967–1986) ..................................................... Psychology and Human Development
Oscar E. Reece (1956–1973) ..................................................... Crop Science
R. Howell Reece (1946–1964) ..................................................... Mechanical Engineering
R. Wallace Reynolds (1953–1979) ..................................................... Engineering Technology
Howard Rhoads (1956–1983) ..................................................... Crop Science
Glenn W. Rich (1953–1979) ..................................................... Agricultural Engineering
Carlos C. Richards (1946–1971) ..................................................... Engineering Technology
Torleif M. Rickansrud (1944–1969) ..................................................... Physics
Rol W. Rider (1960–1982) ..................................................... Business Administration
Robert L. Rosenberg (1970–1985) ..................................................... History
Glenn W. Salo (1955–1989) ..................................................... Agricultural Engineering
Leo E. Sankoff (1942 and 1946–1980) ..................................................... Agricultural Education
Harry H. Scales (1958–1976) ..................................................... Education
Paul E. Scheffer (1964–1983) ..................................................... Industrial Engineering
Walter P. Schroeder (1957–1980) ..................................................... Education
Glenn E. Seeber (1954–1979) ..................................................... Engineering Technology
Vard M. Shepard (1932–1960) ..................................................... Animal Husbandry and Dean of Agriculture
Gordon A. Silver (1964–1986) ..................................................... Physics
Howard F. Smith (1968–1983) ..................................................... Economics
M. Eugene Smith (1946–1974) ..................................................... History
Warren T. Smith (1952–1973) ..................................................... Dean of Agriculture
Ruth G. Spencer (1967–1982) ..................................................... Library
John Stechman (1960–1989) ..................................................... Animal Sciences and Industry
Edward Stoffel (1957–1988) ..................................................... Mechanical Engineering
J. Edward Strasser (1960–1984) ..................................................... Industrial Technology
John S. Stuart (1964–1983) ..................................................... Architecture
Guy Thomas (1968–1989) ..................................................... Graphic Communication
In 1963 the University instituted a program of recognizing outstanding teaching efforts through the Distinguished Teacher Awards. Selections for this honor are based upon recommendations of the Academic Senate committee which follows the procedure of soliciting nominations from students and colleagues. Evaluations and subsequent recommendations of the nominees are based upon an in-depth review by the committee, including classroom visitations. Recipients of the Distinguished Teacher Awards and their departments since the inception of the program are listed below.

1963–64  Robert E. Holmquist, Physics  
        John L. Merriam, Agricultural Engineering
1964–65  Joy O. Richardson, Mechanical Engineering  
        Milo E. Whitson, Mathematics
1965–66  A. Norman Cruikshanks, Social Sciences  
        Richard F. Johnson, Animal Husbandry  
        George R. Mach, Mathematics
1966–67  Robert W. Adamson, Mechanical Engineering  
        Kenneth G. Fuller, Mathematics  
        William D. Curtis, Psychology
1967–68  Rodney G. Keif, Environmental Engineering  
        David M. Grant, English  
        Wesley S. Ward, Architecture
Distinguished Teacher Award Recipients

1968-69
Robert M. Johnson, Mechanical Engineering
Bruce Kennelly, Chemistry
Alice E. Roberts, Education

1969-70
Donald W. Hensel, History
David H. Montgomery, Biological Sciences
Philip H. Overmeyer, Business Administration
Willard M. Pederson, English
Omer K. Whipple, Chemistry

1970-71
Robert L. Cleath, Speech
Kenneth E. Schwartz, Architecture
Hewitt G. Wight, Chemistry

1971-72
Stuart E. Larsen, Aeronautical Engineering
Barton C. Olsen, History
Ronald L. Ritschard, Biological Sciences
Joseph N. Weatherby, Political Science (Social Sciences)

1972-73
Lyle G. McNeal, Animal Science
Charles W. Quinlan, Architecture
James E. Simmons, English

1973-74
William J. Phaklides, Engineering Technology
Louis D. Pippin, Education
Duane O. Seaberg, Agricultural Management

1974-75
Peter Jankay, Biological Sciences
Josephine S. Stearns, Child Development
George J. Suchand, Social Sciences

1975-76
James Hayes, Journalism
William V. Johnson, Music
Erna Knapp, Art

1976-77
Harry L. Fierstine, Biological Sciences
Grant D. Venerable II, Chemistry
Ralph M. Warten, Mathematics

1977-78
Timothy M. Barnes, History
Donald P. Grant, Architecture and Environmental Design
John C. Syer, Political Science

1978-79
Pat Pendse, Biological Sciences
Dane Jones, Chemistry
Adelaide Harmon-Elliott, Mathematics

1979-80
David J. Keil, Biological Sciences
Thomas Ruehr, Soil Science
Stephen Weinstein, Mathematics
Michael D. Zohns, Ornamental Horticulture

1980-81
Sarah E. Burroughs, Food Science and Nutrition (Child Development and Home Economics)
Christina Orr-Cahall, Art
Kendrick W. Walker, Philosophy

1981-82
Christina A. Bailey, Chemistry
Kenneth E. Ozawa, Physics
Thomas L. Richards, Biological Sciences

1982-83
James Bermann, Agricultural Engineering
Donald J. Koberg, Architecture
Jack D. Wilson, Aeronautical and Mechanical Engineering

1983-84
Euel W. Kennedy, Mathematics
William L. Preston, Social Sciences
Michael J. Wenzl, English

1984-85
Robert S. Cichowski, Chemistry
Harvey C. Greenwald, Mathematics
Max E. Riedlsperger, History
1985–86  Edward H. Baker, Mechanical Engineering  
Sue McBride, Education  
Phillip K. Ruggles, Graphic Communication  

1986–87  Boyd W. Johnson, Mathematics  
Craig H. Russell, Music  
Calvin H. Wilvert, Social Sciences  

1987–88  James R. Mueller, Mathematics  
Ronald S. Mullisen, Mechanical Engineering  
Robert G. Reynolds, Art and Design  

1988–89  Stephen W. Ball, Philosophy  
George B. Cotkin, History  
Abraham B. Shani, Management  

STAFF EMERITI  
(Dates indicate period of service)  

<table>
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<tr>
<th>Name</th>
<th>Service Period</th>
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<td>Vic Allen</td>
<td>1951–1976</td>
<td>Custodial Services</td>
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<td>1961–1978</td>
<td>Food Services</td>
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<td>1944–1967</td>
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<td>Jerold L. Budoff</td>
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<td>Agriculture and Natural Resources</td>
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<td>University Library</td>
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<td>Donald M. Coats</td>
<td>1964–1988</td>
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<td>George W. Cockriel</td>
<td>1957–1977</td>
<td>University Police</td>
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<td>Loretta I. Costen</td>
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<td>Engineering and Technology</td>
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<td>Richard T. Crosby</td>
<td>1949–1971</td>
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<td>Donald J. Curtis</td>
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<td>Elizabeth D. Dickens</td>
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<td>Lloyd G. Dietrich</td>
<td>1953–1973</td>
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<td>1947–1971</td>
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<td>Lloyd R. Evans</td>
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<td>Financial Aid</td>
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<td>1968–1989</td>
<td>Facilities Administration</td>
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Patricia A. Eilers Farrow (1957–1972) .......................................................... Health Center
Leroy Fauset (1966–1983) ...................................................................... El Corral Bookstore
James Fiscallini (1966–1982) ................................................................. Farm Shop
Altha Freeman (1967–1988) .................................................................. Evaluations
Jack Fryer (1968–1984) ........................................................................... Foundation Personnel
Helen K. Garing (1966–1983) ................................................................. Crop Science
Lena Gianollini (1949–1972) ................................................................. Business Affairs
Ruth Gran (1957–1975) ........................................................................ Health Center
Margaret Green (1960–1977) ................................................................. Food Services
Mary Lee Green (1948–1976) ................................................................. El Corral Bookstore
Michael C. Grom (1968–1986) ................................................................. Plant Operations
Joseph C. Hampl (1943–1971) ................................................................. Foundation
Dora L. Harter (1968–1983) ................................................................. Learning Assistance Center
Walter Heffner (1965–1983) ................................................................. Computer Center
John A. Heinz (1953–1986) ................................................................. Audiovisual Services
Norma Henderson (1949–1983) ............................................................... Academic Affairs
Ferdinand Herriman (1966–1987) ............................................................... Plant Operations
Alicemae Hollings (1966–1982) ............................................................... Foundation
Lillian R. Hooks (1964–1980) ................................................................. Library
Irene R. Horvath (1950–1983) ................................................................. Communicative Arts and Humanities
Margaret Hoyt (1948–1981) ................................................................. El Corral Bookstore
Clara Huffman (1959–1974) ................................................................. El Corral Bookstore
Hazel L. Hunter (1965–1980) ................................................................. Evaluations
Esther Iglesias (1972–1988) ................................................................. Philosophy
Marie Williams Janolis (1962–1977) ........................................................ Engineering Technology
Elmer R. Johnson (1966–1982) ............................................................... Physics
Mary L. Johnson (1950–1976) ................................................................. Administrative Affairs
Tommie L. Jones (1964–1980) ............................................................... Business Affairs
Connie Jonte (1961–1983) ................................................................. Alumni Services
George Lancaster (1962–1979) ................................................................. Plant Operations
Ronald J. Larsen (1968–1983) ................................................................. Public Safety
Lois L. Larson (1962–1978) ................................................................. Health Center
Alfons P. Lerno (1965–1983) ................................................................. Plant Operations
Wayne Lindsey (1953–1983) ................................................................. Farm Shop
Irene Lund (1961–1984) ................................................................. Foundation
Ruth Lundquist (1960–1979) ................................................................. Business Affairs
Josephine E. Maddalena (1965–1980) ........................................................ Physical Education
Jerry T. Magetti Jr. (1960–1984) ............................................................... Mail Center
James Mapes (1961–1977) ................................................................. University Police
Anne B. Marcell (1961–1982) ................................................................. Evaluations
Dorothy J. McDonald (1963–1985) ............................................................ Telecommunications
Malcolm McLeod (1973–1988) .............................................................. Biological Sciences
Florence H. Mesler (1962–1983) ............................................................. Health Center
Julius F. Metz (1968–1983) ................................................................. Plant Operations
Lionel Middlecamp (1942–1976) ............................................................ Head Farmer
Viola E. Hughes Milburn (1956–1978) .................................................. Health Center
Peggy Milburn (1966–1988) ................................................................. Foundation
A. Teresa Mounier (1970–1986) ............................................................... Purchasing
Valdora Myers (1960–1978) ................................................................. Health Center
Harold A. Nash (1947–1974) ................................................................. Power Plant
Margaret Nelson (1959–1977) ............................................................... Housing
Edward L. Nolan (1953–1979) ............................................................... Mechanical Engineering
Jack O’Dell (1953–1986) ................................................................. Foundation
Lee Owen (1946–1978) ................................................................. Plant Operations
Kathryn Patterson (1960–1982) ............................................................. Procurement and Support Services
Alfred J. Pelucca (1956–1971) ............................................................... Custodial Services
Charles O. Penwell (1946–1971) ............................................................ Foundation
Wilma Pierce (1971–1988) ................................................................. Foundation
Donna Porter (1962–1986) ................................................................. Student Health Services
Joan Roberts (1958–1980) ................................................................. Foundation
Al Sanders (1964–1979) ................................................................. Grounds
Aldora Santos (1972–1988) ................................................................. Physical Education
Ralph Schurtz (1949–1973) ................................................................. Custodial Services
Mary E. Scrivner (1966–1983) ............................................................... Academic Programs
Mary Smith (1960–1988) ................................................................. Personnel and Employee Relations
F. Yvonne Southgate (1963–1980) ...................................................... Mechanical Engineering
Jean Steck (1960–1975) ................................................................. Industrial Engineering
Marcie Steger (1962–1979) ................................................................. Food Services
Frank Y. Sweeney (1963–1983) ............................................................. Plant Operations
Arthur A. Thorn (1962–1979) ............................................................... Business Affairs
Thomas Ward (1969–1989) ................................................................. Civil and Environmental Engineering
Edith Welter (1963–1988) ................................................................. Business Affairs
Boyd Wettlauffer (1960–1976) .............................................................. Audovisual
Gerald Whiteford (1960–1983) ............................................................. El Corral Bookstore
Alfred T. Wilcox (1960–1975) ............................................................... Custodial Services
John Wilcox (1963–1986) ................................................................. Foundation
Smiley E. Wilkins (1974–1989) ............................................................. Personnel and Employee Relations
Margaret Wilmot (1952–1979) ............................................................... Library
Frank H. Wyman (1956–1972) ............................................................. Plant Operations
The 1972–73 academic year saw the inception of the Outstanding Staff Employee Award. This honor is bestowed upon permanent, full-time employees of the university, Foundation, or Associated Students, Inc. who are in at least their third year of employment at Cal Poly. In order to be considered for this award, an employee should be truly dedicated and loyal; exhibit expertise in job performance; demonstrate a willingness to assist others enthusiastically; take initiative in making his or her department more efficient and productive; maintain an excellent relationship with co-workers, faculty, and students; and make contributions to both the university and the community. Nominations are solicited from staff employees, faculty members, and department or division heads. Selection of the awardees is made by a committee of former recipients of the award. Outstanding Staff Employees Award recipients are listed below.

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FACULTY AND STAFF

(Number in parentheses indicates year of appointment)
Listed as of March, 1990

ABITIA, FRED (1969) ......................................................... Industrial Technology

ABSHIRE, FRANKLIN P. (1977) ........................................... Engineering Technology

ACETO, JEANNE C. (1981) ................................................ Cooperate Education and Placement Services

ACORD, DORIS (PAT) (1980) ........................................ Physical Education and Recreation Administration

ADALIAN, PAUL T., JR. (1978) ........................................ University Library

ADAMS, JOHN P., JR. (1970) ............................................... Economics

ADAMS, STEPHEN H. (1974) ........................................... Associated Students, Inc./University Union
B.S., Southern Illinois University, Edwardsville, 1969; M.S., Kansas State University, 1973. Associate Director, Concerts and Events.

AHERN, JAMES J. (1980) ................................................... Agribusiness
B.S., California State Polytechnic College, Pomona, 1971; M.S., University of Maryland, 1973; Ph.D., 1980. Professor.

Aiken, JAMES L. (1976) ............................................... Counseling Services

ALGEO, JOHN W. (1985) ................................................... Animal Sciences and Industry
B.S., State College of Washington, 1948; M.S., 1949. Professor and Department Head. Registered Professional Animal Scientist.

AL-HADAD, SABAH (1965) .............................................. Mathematics

ALLEN, CHARLES E. (1986) ........................................... University Relations
B.A., Kansas Wesleyan University, 1957; M.Ed., Xavier University, 1958. Executive Director, University Relations and Development.

AMANZIO, JOSEPH C. (1971) ........................................ Architecture

AMARAL, ALFRED W. (1967) ......................................... University Foundation

AMEDDE, GASTON (1976) ............................................. Soil Science
B.S., University of Haiti, 1963; M.S., University of Connecticut, 1971; Ph.D., Cornell University, 1974. Professor.

AMSPACHER, WILLIAM H. (1985) ................................ Agribusiness
B.S., Clemson University, 1978; M.S., 1980; Ph.D. University of California, Davis, 1988. Associate Professor.

ANDERSON, C. ROBERT (1982) .......................................... University Relations

ANDERSON, JAMES A. (1987) ........................................ Accounting
B.A., DePauw University, 1968; Ph.D., Washington University, 1973. Professor and Department Head.

ANDERSON, MARSHALL L. (1975) .................................. Civil and Environmental Engineering
B.S., University of Minnesota, 1943; M.S., 1949; Ph.D. University of Wisconsin, 1972. Professor. Registered Professional Engineer, South Dakota.

ANDERSON, RUSSELL K. (1955) ........................................ Animal Sciences and Industry
B.S., University of Minnesota, 1948; M.S., Iowa State College, 1950; Ph.D., 1956. Professor.
B.A., University of California, Santa Barbara, 1970. Assistant Director.

ANDERSON, YVONNE M. (1980) ........................................... Student Health Services
A.B., University of Kansas, 1951; Medical Technology Internship, 1952. Clinical Laboratory Technologist. California Licensed Clinical Laboratory Technologist, American Association of Bioanalysts Supervisor Certified.

ANDOLI, FREDERICK P. (1968) ........................................... Biological Sciences

ANDRE, BARBARA R. (1973) ........................................... Student Life and Activities

ANDREOLI, ALFRED E. (1963) ........................................... Aeronautical Engineering
B.S., University of Colorado, 1954; M.S., California Institute of Technology, 1956; additional graduate study, University of Colorado. Professional Engineer, California.

ANDRESEN, JAMES G. (1956) ........................................... Mechanical Engineering
B.S., California State Polytechnic College, 1956; M.Eng., 1979. Associate Professor.

ANDREWS, CHARLES T. (1972) ........................................... Accounting

ANGERLEY, STEPHEN F. (1982) ........................................... Ornamental Horticulture
B.S., Berea College, 1969; M.S., Clemson University, 1972. Associate Professor.

APFELBERG, HERSCHEL L. (1971) ........................................... Graphic Communication

ARMSTRONG, GENE A. (1970) ........................................... Animal Sciences and Industry
B.S., California Polytechnic State University, 1972. Professor.

ARMSTRONG, MARY BETH (1984) ........................................... Accounting
B.S., University of Nevada, Reno, 1968; M.B.A., California State Polytechnic University, Pomona, 1976; Ph.D., University of Southern California, 1984. Professor. Certified Public Accountant.

ARVIZU, MARIA (1987) ................................................... Student Academic Services
B.S., California Polytechnic State University, 1987. Coordinator, Local Outreach.

ASCOLI, RICHARD V. (1986) ........................................... Student Health Services
B.S., College of William and Mary, 1965; M.D., Medical College of Virginia, 1974; Internship and Residency in Emergency Medicine, University of Southern California–Los Angeles County General Hospital, 1982. Physician.

ASSAL, AMR F. (1986) ................................................... Electronic and Electrical Engineering
B.Sc., Cairo University, Egypt, 1977; M.Sc., 1979; Ph.D., University of California, Santa Barbara, 1986. Assistant Professor.


ATTALA, EMILE E. (1970) ................................................... Computer Science
B.S., Cairo University, Egypt, 1958; M.S., University of California, Berkeley, 1964; Ph.D., University of California, Santa Barbara, 1974. Professor.

ATWOOD, LINDA (1974) ................................................... Chemistry

AVEY, RENNY J. (1973) ................................................... Agribusiness
B.S., California State Polytechnic College, 1969; M.S., Oregon State University, 1972; Ph.D., University of Hawaii, 1974. Professor.

AVILES, BRIAN A. (1989) ................................................... Landscape Architecture

AXELROTH, ELIE (1984) ................................................... Counseling Services

BABOS, PARASCHOS (1972) ................................................... Biological Sciences

BACHMAN, ALFRED M. (1970) ........................................... Mathematics
BACHMANN, JOHN E., CPT. (1987) ............................................................................. Military Science

BAGNALL, JAMES R. (1969) .................................................................................... Architecture

BAILEY, CHRISTINA ANNE (1978) ........................................................................... Chemistry
B.S., College of Saint Elizabeth, New Jersey, 1964; Ph.D., Purdue University, 1970. Professor.

BAILEY, PHILIP S. (1969) ....................................................................................... Academic Affairs
B.S., University of Texas, 1964; Ph.D., Purdue University, 1969. Interim Vice President.

BAILLE, ALLAN S. (1978) ........................................................................................ Management

BAKER, WARREN J. (1979) ..................................................................................... President
B.S., University of Notre Dame, 1960; M.S., 1962; Ph.D., University of New Mexico, 1966. President.

BALL, STEPHEN W. (1983) ...................................................................................... Philosophy
B.A., Purdue University, 1972; M.A., University of Michigan, 1973; Ph.D., 1978. Associate Professor.

BALL, R. WAYNE (1969) .......................................................................................... Mathematics
B.A., School of Science, 1974; M.A., University of California, San Diego, 1980; Ph.D., 1986. Assistant Professor.

BANKS, BERNARD W. (1969) ................................................................................... Economics

BARATA, ANTONIO G. (1985) .................................................................................. Music
B.A., Towson State University, 1977; M.M., Northwestern University, 1979; D.M.A., University of Illinois, 1985. Assistant Professor.

BARCLAY, KATHLEEN A. (1989) .............................................................................. English
B.A., University of Illinois, 1974; M.A., University of California, Berkeley, 1989. Associate Professor.

BARTHELS, KATHARINE M. (1978) .......................................................................... Physical Education and Recreation Administration

BATTENBURG, JOHN (1989) .................................................................................. English
B.A., Andrews University, 1982; M.A., Ohio University, 1984; Ph.D., Purdue University, 1989. Assistant Professor.

BATTERSON, RONALD E. (1971) ............................................................................... Architecture

BAUR, LAWRENCE E., JR. (1965) ............................................................................. Accounting
BEARDSLEY, GEORGE L., JR. (1975) ................................................ Economics

BEASON, STEVE B. (1985) ................................................ Intercollegiate Athletics

BEECHER, LLOYD N. (1969) ................................................ History

BENNETT, DARRELL F. (1971) ................................................ Student Health Services

BENSON, GAYE G. ............................................................ Business Administration
B.S., Shimer College, 1963; M.S., University of Missouri, 1969; Ph.D., Michigan State University, 1986. Assistant Professor.

BERC, LORRAINE M. (1983) .................................................. Student Health Services

BERGMANN, JAMES (1964) ................................................... Political Science

BERNSTEIN, STAN (1980) ................................................... University Relations

BERTRIO, MARGARET M. (1989) ............................................. Political Science
B.A., Oberlin College, 1964; M.A., Southern Illinois University, 1967; M.S., Tufts University, 1972; Ph.D., Indiana University, 1974. Assistant Professor.

BERTRIO, MARK (1986) ....................................................... Political Science
B.S., University of El Salvador, 1955; B.S., University of Guatemala, 1963; M.S., University of Michigan, 1965; Ph.D., Michigan State University, 1971. Associate Professor and Department Head. Registered Engineer, Guatemala.

BERTOZZI, DAN, JR. (1974) ................................................ Business Administration

BETHER, A. C. W. (1968) ..................................................... Philosophy

BEUG, JAMES L. (1973) .................................................... Computer Science

BEYER, EDGAR H. (1981) ..................................................... Crop Science
B.S., University of Illinois, 1958; M.S., Purdue University, 1963; Ph.D., 1964. Associate Professor.

B.S., Ohio State University, 1968; M.B.A., University of Missouri, Kansas City, 1971; Ph.D., Ohio State University, 1975. Professor.

BLASI, JOSEPH R. (1987) ..................................................... Management
B.S., University of Pittsburgh, 1972; Ed.D., Harvard University, 1977. Professor.

BLATTNER, ERNEST W. (1983) ............................................. Mechanical Engineering
M.S., Swiss Federal Institute, Zurich, 1953. Professor. Registered Professional Engineer, Utah.

B.S., California Polytechnic State University, San Luis Obispo, 1977; M.S., 1987. Associate Professor.

BLODGET, ROBERT L. (1974) .............................................. Psychology and Human Development
B.A., Willamette University, 1965; Ed.D., University of Massachusetts, 1973. Associate Professor.

BLUM, MICHAEL L. (1981) .................................................... Graphic Communication

BOELE, H. KENNETH (1978) ................................................ Management
B.S., University of California, Los Angeles, 1963; Ph.D., 1970. Associate Professor.

BOCHE, RAYMOND E. (1969) .............................................. Computer Science
B.S., California State Polytechnic College, 1958; M.S., San Jose State College, 1966; Ph.D., Texas Tech University, 1971. Professor.

BONDS, ROBERT V. (1972) .................................................. Learning Assistance Center

BOONE, JOSEPH C. (1968) .................................................. Physics

BOSTROM, ROBERT M. (1956) .............................................. Housing
BOTWIN, MICHAEL (1981) ................................................................. Architectural Engineering
B.S., University of Miami, 1962; M.S., Rensselaer Polytechnic Institute, 1964; Ph.D., 1968. Professor.

BOWKER, LESLIE S. (1974) ........................................................................................................ Biological Sciences
B.S., University of Massachusetts, 1963; M.S., Rutgers University, 1965; Ph.D., Washington State University, 1974. Professor.

BOYTTON, WILLIAM C. (1985) ......................................................................................... Accounting

BRADY, LOIS (1988) ................................................................................................................... Computer Science
B.S., Wagner College, 1958; M.S., University of Iowa, 1960; M.S., University of Wisconsin, 1984; Ph.D., 1988. Professor.

BRADY, MARY L. (1968) ......................................................................................... Student Health Services

BRAUNINGER, ANDREA L. (1986) .............................................................................................. Student Health Services

BREAIZALE, CONNIE R. (1966) ............................................................................................... Home Economics

BRECKENRIDGE, PATRICIA HAMER (1975) ................................................................. Ornamental Horticulture
B.S., California State Polytechnic College, 1970; M.A., California State Polytechnic University, Pomona, 1979. Additional graduate study, California Polytechnic State University. Professor.

BREITENBACH, JEROME R. (1986) ........................................................................................... Electronic and Electrical Engineering
B.S., California Polytechnic University, Pomona, 1977; M.S., California Institute of Technology, 1978; Ph.D., University of California, Los Angeles, 1983. Associate Professor.

BREITENBACH, STACEY M. (1981) .......................................................................................... Electronic and Electrical Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1989. Academic Adviser.

BREMER, WALTER D. (1981) ................................................................................................ Landscape Architecture

BRENNER, PATRICIA A. (1970) ................................................................................................ English
B.S., Bob Jones University, 1957; M.A., Middlebury College, 1963; Ph.D., Kent State University, 1970. Professor.

BRODIE, DAVID A. (1970) ...................................................................................................... Architecture

BROSS, VALEIRIE (1988) ........................................................................................................ University Library

BROWN, BARBARA, P. (1981) .................................................................................................. Student Health Services

BROWN, C. ANDREA (1987) ..................................................................................................... Physical Education and Recreation Administration

BROWN, CARL R.V. (1982) ...................................................................................................... English


BROWN, KENNETH L. (1980) ................................................................................................ Engineering Technology
B.V.E., California Polytechnic State University, San Luis Obispo, 1979; M.A., 1980; Ph.D., Colorado State University, 1988. Assistant Professor.

BROWN, ROBERT J. (1969) ................................................................................................. Biological Sciences
B.S., California State College, Los Angeles, 1964; M.S., Arizona State University, 1967; Ph.D., University of Toronto, Canada, 1972. Professor.

BROWN, RONALD F. (1974) .................................................................................................. Physics

BROWN, WILLIAM H. (1957) ................................................................................................ Architecture
B.Arch., University of Florida, 1954; M.Arch., 1968; additional graduate study, University of Sydney. Professor. Registered Architect, California.

BRUG, RICHARD C. (1978) ..................................................................................................... Business Affairs
B.A., California State University, Long Beach, 1974. Director Public Safety.
BRUMLEY, RICHARD L. (1981) ................................................................. University Library
B.S., Utah State University, 1963; M.S., 1965; M.L.S., University of California, Berkeley, 1975. Associate Librarian.

BRUSCHI, RICHARD E. (1989) ......................................................... Student Health Services

BUCCOLA, VICTOR A. (1962) ......................................................... Physical Education and Recreation Administration

BUFFA, ANTHONY J. (1970) .......................................................... Physics
B.S., Rensselaer Polytechnic Institute, 1964; M.S., University of Illinois, 1966; Ph.D., 1969. Professor.

BURGUNDER, LEE B. (1983) .......................................................... Business Administration

BURNS, CHARLOTTE B. (1974) ..................................................... Ornamental Horticulture
B.A., University of California, Los Angeles, 1951; M.A., 1978, California Polytechnic State University, San Luis Obispo; graduate study, University of Hawaii; University of California, Berkeley and Irvine. Professor.

BURRELL, SHEILA A. (1973) ......................................................... Cooperative Education and Placement Services
B.A., University of California, San Diego, 1971; M.A., California Polytechnic State University, San Luis Obispo, 1981. Associate Director.

BURROUGHS, SARAH E. (1967) ................................................. Food Science and Nutrition
B.S. and Certificate in Medical Technology, University of Michigan, 1956; Ph.D., University of California, 1967. Professor.

BURT, CHARLES M. (1978) .......................................................... Agricultural Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1973; M.S., Utah State University, 1975; Ph.D., 1983. Professor. Registered Civil Engineer and Agricultural Engineer, California.

BURTON, ROBERT E. (1968) ........................................................ History

BUSSELEN, HARRY J., JR. (1975) ........................................... School of Professional Studies and Education
B.S., California State College, Sacramento, 1959; M.S., 1962; Ph.D., Florida State University, 1970; additional graduate study, University of Oregon. Professor and Dean.

BUTLER, J. KENT (1977) ........................................................ School of Engineering
B.S., Arizona State University, 1961; M.S., 1963; Ph.D., 1971. Professor and Associate Dean.

BUXBAUM, JAMES M. (1978) ..................................................... Business Administration

BYARS, NAN A. (1985) ............................................................... Engineering Technology
B.S., Clemson University, 1978; M.S., West Virginia University, 1981. Associate Professor. Registered Professional Engineer, South Carolina.

CAIRNS, EDWARD A. (1969) ....................................................... English

CAMP, ROGER C. (1984) ................................................................. Computer Science
B.S., Oklahoma State University, 1955; M.S., Iowa State University, 1957; Ph.D., 1962. Professor and Department Chair.

CANO, RAUL J. (1974) ............................................................... Biological Sciences

CANTU, R. DAVID (1980) ......................................................... Student Academic Services
B.S., California State Polytechnic College, 1969; M.S., 1974; M.A., 1975. Director, Minority Engineering Program.

CARDOZA, MARGARET (1981) ................................................ Graduate Studies, Research and Faculty Development
B.A., California State University, Sacramento, 1972. Director of Grants Development.

CARNegie, E. J. (1963–64) (1965) ........................................... Agricultural Engineering
B.S., California State Polytechnic College, 1962; M.Eng., University of California, Davis, 1963. Professor and Department Head. Registered Mechanical Engineer, California.

Carpenter, Thomas W. (1968) .................................................. Mechanical Engineering
B.S., Virginia Polytechnic Institute, 1961; M.S., 1964; Ph.D., Purdue University, 1969. Professor.

Carr, Janice L. (1983) ............................................................... Accounting
B.S., California State University, Northridge, 1971; M.S., 1975; Ph.D., Arizona State University, 1985. Associate Professor. Certified Public Accountant.

Carter, Lark P. (1981) ............................................................... School of Agriculture
B.S., Iowa State University, 1953; M.S., 1956; Ph.D., 1960. Dean.
CARY, ARTHUR S. (1974) ................................................................. Physics
                             B.A., Fisk University, 1949; M.A., 1951; Ph.D., University of California, Riverside, 1969. Professor.

CASEY, GLEN R. (1982) ................................................................ Agricultural Education
                             B.S., Chico State College, 1966; M.S., California Polytechnic State University, San Luis Obispo, 1979; Ed.D,
                             Oklahoma State University, Stillwater, 1987. Associate Professor and Interim Department Head.

CENSULLO, ALBERT C. (1974) ............................................................. Chemistry
                             B.S., Villanova University, 1963; Ph.D., Pennsylvania State University, 1975. Professor.

CHAMBERLAIN, JANE (1980) ................................................................. Cooperative Education and Placement Services

CHAMBERS, WILLIAM C. (1985) .......................................................... Industrial Technology
                             B.S., United States Naval Academy, 1953; M.S., Air Force Institute of Technology, 1959. Associate Professor.
                             Registered Professional Engineer, Ohio.

CHANG, JANICE C. (1989) ................................................................. Industrial Engineering
                             B.S., National Cheng-Kung University, Taiwan, 1982; M.S., University of Pittsburgh, 1984; Ph.D., 1989. Assistant
                             Professor.

CHAPMAN, ARTHUR J. (1972) .............................................................. Architecture, Information Systems
                             B.S., B.Arch., California State Polytechnic College, 1970; M.S., Pennsylvania State University, 1971; additional
                             graduate study, University of California, Los Angeles. Professor and Interim Director, Computer-Aided Productivity
                             Center.

CHEDA, ARCHIE D. (1980) ................................................................. Engineering Technology
                             B.S., California State Polytechnic College, 1969; M.S., University of Minnesota, 1978. Professor. Registered
                             Professional Engineer, California.

CHEEK, DONALD K. (1973) ................................................................. Education
                             B.S., Seton Hall University, 1953; M.S.W., Fordham School of Social Service, 1955; Ph.D., Temple University,
                             1971. Professor.

CHESTNUT, F. STUART (1963) .............................................................. Physical Education and Recreation Administration
                             B.S., Indiana University, 1951; M.S., 1963; additional graduate study, Indiana University, University of Oregon.
                             Professor.

CHEW, MARIE (1976) ......................................................................... Student Health Services
                             R.N., St. Joseph College, Maryland; 1959; B.S., 1959. N.P., Brigham Young University, 1981. ANA Board Certificate,

CHILDERS-KRAFT, SUSAN E. (1988) ...................................................... University Relations
                             B.S., California Polytechnic State University, San Luis Obispo, 1976; M.A., Mills College, 1978. Director, Annual
                             Giving and University Development Services.

CHIPPING, DAVID H. (1971) ............................................................... Physics

CHIRICA, LAURIAN M. (1984) ............................................................. Computer Science
                             M.S., University of Bucharest, Romania, 1964; Ph.D., University of California, Los Angeles, 1976. Professor.

CHRISTENSEN, MARGARET M., MAJ. (1989) ........................................ Military Science

CHRISTENSEN, ROBERT A. (1970) ....................................................... Psychology and Human Development
                             B.S., University of Utah, 1963; M.S., Brigham Young University, 1968; Ph.D., 1970. Professor.

CIANO, DAVID A. (1973) ................................................................. Financial Aid

CICHOWSKI, ROBERT S. (1971) .......................................................... Chemistry
                             B.S., Purdue University, 1964; Ph.D., Alfred University, 1968. Professor.

CIRONNE, JOAN M. (1971) ................................................................. Student Health Services
                             R.N., Cuesta College, 1971; Nurse Practitioner, University of California, Los Angeles, 1974; B.S.N., California State
                             College, Bakersfield, 1979; M.A., California Polytechnic State University, San Luis Obispo, 1983; M.P.A.,

CIROVIC, MICHAEL M. (1968) ............................................................. Electronic and Electrical Engineering

CLARK, KEVIN (1988) ...................................................................... English
                             B.A., University of Florida, 1972; M.A., 1979; Ph.D., University of California, Davis, 1986. Assistant Professor.

CLARK, NANCY L. (1989) ................................................................. History
                             B.A., University of California, Los Angeles, 1972; M.A., 1974; M.A., Yale University, 1982; M.Phil., 1983; Ph.D.,
                             1988. Assistant Professor.
CLARK, NEILL V. (1985) ................................................... Engineering Technology
B.S.E.E., California State Polytechnic College, Pomona, 1968; M.S.E.E., University of California, Santa Barbara, 1973. Associate Professor.

CLARK, WILLIAM E. (1977) ................................................... Mechanical Engineering
B.M.E., University of Minnesota, 1964; M.S., 1966; Ph.D., 1972. Professor. Registered Professional Engineer, California.

CLAUSE, ODILE M. (1976) ................................................... Foreign Languages

CLENDENEN, HARRIET (1977) ................................................... Student Academic Services

CLOGSTON, FRED L. (1960) ................................................... Biological Sciences

CLOONAN, CLIFFORD B. (1957) ................................................... Electronic and Electrical Engineering
B.S., University of Colorado, 1955; M.S., Montana State University, 1961; Ph.D., University of Colorado, 1975. Professor.

CLOVER, ROBERT C. (1990) ................................................... Information Systems

COCHRAN, BURT, JR. (1976) ................................................... Student Health Services
M.D., University of Southern California Medical School, 1949. Certified American Board of Internal Medicine, 1957. Physician.

COCHRANE, MONA (1970) ................................................... Student Health Services

COLEMAN, JAMES W. (1973) ................................................... Social Sciences
B.A., California State University, Northridge, 1969; M.A., University of California, Santa Barbara, 1971; Ph.D., 1975. Professor.

COLEMAN, WILLI M. (1980) ................................................... Counseling Center
B.A., San Francisco State College, 1966; M.S.W., University of California, Berkeley, 1971; Ph.D., University of California, Irvine, 1982. Counseling Center Liaison.

COLOMÉ, JAIME S. (1972) ................................................... Biological Sciences

COLVIN, MICHAEL R. (1979) ................................................... Mathematics

CONNELLY, JOHN B. (1970) ................................................... Computer Science
B.A., University of Southern California, 1958; M.S., Oregon State University, 1968; Ph.D., University of Southern California, 1970. Professor.

CONWAY, JAMES R. (1969) ................................................... Speech Communication

CONWAY, ROGER (1984) ................................................... Associate Students, Inc./University Union

COOK, BARBARA E. (1972) ................................................... Social Sciences

COOMBS, LEE C. (1969) ................................................... Chemistry
B.A., San Diego State College, 1963; M.S., 1965; Ph.D., Purdue University, 1970. Professor.

COOPER, ALAN F. (1970) ................................................... Biological Sciences
B.S., California State Polytechnic College, Pomona, 1964; Ph.D., University of California, Riverside, 1969. Professor.

COOPER, ALLAN R. (1975) ................................................... Architecture

COOPER, MARK A. (1978) ................................................... Engineering Technology

COOPER, MARY P. (POLLY) (1974) ................................................... Architecture
COTA, HAROLD M. (1966) ................................................................. Civil and Environmental Engineering
B.S., University of California, 1959; M.S., Northwestern University, 1960; Ph.D., Oklahoma University, 1966. Professor. Registered Professional Engineer, California; Diplomat of the Academy of Environmental Engineers.

COTKIN, GEORGE B. (1980) .......................................................... History

CRABB, A. CHARLES (1978) ............................................................ School of Agriculture
B.S., University of California, Davis, 1973; M.S., Bowling Green State University, 1974. Additional graduate study, University of California, Davis. Professor and Interim Associate Dean.

CRUIKSHANKS, RANDAL L. (1972) .................................................. Political Science
B.A., University of California, Berkeley, 1963; M.A., University of Oregon, 1965; Ph.D., 1968; additional graduate study, University of Michigan. Professor.

CULVER, JOHN H. (1975) ............................................................... Political Science
B.S., University of California, 1968; M.S., 1970; Ph.D., University of New Mexico, 1975. Professor.

CUMMINGS, RUSSELL M. (1986) ........................................................ Aeronautical Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1977; M.Engr., 1985; E.A.E., University of Southern California, 1982. Associate Professor.

CUNICO, GERALD E. (1988) ......................................................... Industrial Technology
B.S., University of New Mexico, 1964; M.S., 1968; Ed.D., Utah State University, 1973. Professor and Department Head.

CURRIER, BETH (1981) ................................................................. Student Academic Services

CURRIER, SUSAN (1980) ............................................................... English

D'ALBRO, JAMES A. (1969) .............................................................. Ornamental Horticulture
B.S., Cornell University, 1966; M.S., University of California, Davis, 1969; Ph.D., Michigan State University, 1980. Professor.

DALTON, LINDA C. (1983) .............................................................. City and Regional Planning

Daly, James C. (1972) ................................................................. Statistics
B.S., Gonzaga University, 1966; Ph.D., Oregon State University, 1973. Professor and Department Chair.

Dana, Charles H. (1982) ............................................................... Computer Science
B.A., University of California, Santa Barbara, 1972; M.S., 1974; Ph.D., 1981. Professor.

Danes, Jeffrey E. (1986) ............................................................... Business Administration
B.A., San Jose State University, 1972; M.A., 1974; Ph.D., Michigan State University, 1976. Professor and Department Head.

Datta, Samir Kumar (1968) ............................................................ Electronic and Electrical Engineering

Dauffenbach, Marilynn (1979) ...................................................... Student Health Services

Daugherty, Steven M. (1988) ....................................................... Animal Sciences and Industry
B.S., New Mexico State University, 1977; M.S., Colorado State University, 1979; Ph.D., New Mexico State University, 1984. Assistant Professor.

Davidman, Leonard (1977) ......................................................... Education

Davidson, Otto C. (1968) .............................................................. Mechanical Engineering
B.S., Bucknell University, 1955; M.S., Massachusetts Institute of Technology, 1956; Ph.D., Stanford University, 1960. Professor. Registered Professional Engineer, California.

Davies, Thomas H. (1983) ............................................................. Music
B.M.E., Bowling Green State University, 1975; M.A., 1977; D.M.A., University of Southern California, 1983. Associate Professor.

Davis, Donna (1984) ................................................................. Cooperative Education and Placement Services

Davis, Kim (1979) ................................................................. Engineering Technology
DAVIS, M. LeROY (1976) ....................................................... Agribusiness
B.S., California State Polytechnic College, 1966; M.S., Iowa State University, 1968; Ph.D., Colorado State University, 1973. Professor and Department Head.

DAVIS, MARJORIE A. (1976) ....................................................... Student Health Services

DAVIS, STEVEN C. (1987) ....................................................... Physical Education and Recreation Administration
B.S., University of California, Davis, 1979; M.S., San Diego State University, 1983; Ph.D., Pennsylvania State University, 1986. Assistant Professor.

DeONG, ALVIN A. (1974) ....................................................... Biological Sciences

DeKLEINE, GLORIA J. (1983) ....................................................... Social Sciences
B.A., Stanford University, 1956; M.A., University of California, Los Angeles, 1963; C. Phil., 1968; Ph.D., 1970. Professor and Department Chair.

DeMERS, GERALD (1989) ....................................................... Physical Education and Recreation Administration
B.S., Mankato State College, 1971; M.S., 1972; Ph.D., University of Utah, 1979. Assistant Professor.

DeNATALE, JAY S. (1988) ....................................................... Civil and Environmental Engineering
B.S., University of California, Davis, 1977; M.S., 1979; Ph.D., 1983. Associate Professor.

DENEL, M. BILGI (1981) ....................................................... Architecture

DENEL, SERIM (1983) ....................................................... Architecture
B.Arch., Middle East Technical University, Turkey, 1962; M.Arch., 1963; M.S., Pratt Institute, 1964; Ph.D., Istanbul Technical University, 1982. Associate Professor. Registered Architect, Turkey.

DENSHAM, ROBERT S. (1980) ....................................................... Art and Design

DETTOFF, ERLAND G. (1967) ....................................................... Education

DEVORE, JAY L. (1977) ....................................................... Statistics
B.S., University of California, Berkeley, 1966; M.S., Stanford University, 1968; Ph.D., 1971; additional graduate study, Sheffield University, England. Professor.

DIAZ, JOE V. (1976) ....................................................... Counseling Services

DICKERSON, ARTHUR F. (1980) ....................................................... Electronic and Electrical Engineering
B.S., University of Texas, 1946; M.S., University of Southern California, 1980. Professor. Registered Professional Engineer, California.

DICKERSON, ROBERT H. (1970) ....................................................... Physics
B.S., University of Arizona, 1959; M.S., 1963; Ph.D., 1964. Professor.

DILLS, KEITH W. (1983) ....................................................... Art and Design

DIMMITT, LAURA SAENZ (1975) ....................................................... Financial Aid
B.A., University of California, Santa Barbara, 1971; M.A., California Polytechnic State University, San Luis Obispo, 1980. Scholarship Program Manager.

DING, G. DAY (1985) ....................................................... School of Architecture and Environmental Design

DINGUS, DELMAR D. (1973) ....................................................... Soil Science
B.S., Berea College, 1966; M.S., West Virginia University, 1968; Ph.D., Oregon State University, 1973. Professor.

DIRKES, LOIS M. (1972) ....................................................... Counseling Services
B.S., University of California, Los Angeles, 1958; M.S., University of Maryland, 1963; Ph.D., 1973. Professor and Counselor.

DOMINGUES, ANTHONY (1985) ................................................ Student Affairs B.S., California Polytechnic State University, San Luis Obispo, 1979. Assistant Director, Relations with Schools and Articulation Officer.


EATough, Norman L. (1968) ........................................ Chemistry B.S., Brigham Young University, 1957; B.E.S., 1958; M.S., 1959; M.S.Ch.E., University of Washington, 1960; Ph.D., Brigham Young University, 1968. Professor and Department Chair.

EDMISTEN, JOHN W. (1968) .......................................... Architectural Engineering B.S., California State Polytechnic College, 1965; M.Engr., University of California, Berkeley, 1967. Professor. Registered Civil Engineer, California; Registered Architect, California.


ELLIS, REBECCA (1987) ........................................................ Management

ELTZROTH, THOMAS E. (1967) ........................................................ Ornamental Horticulture
B.S., Ohio State University, 1965; M.S., 1966. Professor.

ENDRES, LELAND S. (1969) ........................................................ Chemistry

ENGLE, PATRICIA L. (1980) ........................................................ Psychology and Human Development

ENGLUND, DAVID L. (1973) ........................................................ Psychology and Human Development
B.A., Ohio State University, 1956; M.A., University of Hawaii, 1965; Ph.D., University of Wisconsin, 1969. Professor.

EPSTEIN, GARY M. (1969) ........................................................ Mathematics
B.A., University of California, Riverside, 1964; Ph.D., 1969. Professor.

EQUINOA, RICHARD M. (1973) .................................................... Cooperative Education and Placement Services

ERICSON, JON M. (1970) ........................................................ Speech Communication

ESPINOZA, MONICA (1989) ........................................................ English

ESTES, ANGELA M. (1987) ........................................................ English

ETHERIDGE, JAMES N. (1988) ..................................................... Computer Science
B.S., University of West Florida, 1971; M.A., 1982; M.S., University of Southwestern Louisiana, 1986; Ph.D., 1989. Associate Professor.

FABRICIUS, EUGENE DAVID (1970) ............................................ Electronic and Electrical Engineering
B.S., Missouri School of Mines, Rolla, 1956; M.S., 1958; D.Sc., Newark College of Engineering, New Jersey, 1968. Professor.

FAGAN, KATHY (1987) ........................................................ English
B.A., California State University, Fresno, 1980; M.F.A., Columbia University, 1982; Ph.D., University of Utah, 1987. Assistant Professor.

FAHS, MICHAEL L. (1983) ........................................................ Speech Communication
A.B., California State College, Long Beach, 1972; M.A., University of Southern California, 1974; Ph.D., 1976. Associate Professor.

FARRELL, GERALD P. (1970) ........................................................ Mathematics

FARUQUE, OMAR (1989) ........................................................ Landscape Architecture

FELDMAN, JACOB (1971) ........................................................ Architectural Engineering
B.S., University of Delaware, 1961; M.S., 1968. Professor. Registered Civil Engineer, California.

FERREIRA, LESLIE S. (1978) ......................................................... Dairy Science
B.S., California State Polytechnic College, 1970; M.S., University of Illinois, 1972; Ph.D., Utah State University, 1980. Professor.

FETZER, PHILIP L. (1988) ........................................................ Political Science
A.B., Princeton University, 1965; M.A.T., Reed College, 1970; Ph.D., University of Oregon, 1981. Associate Professor.

FIELD, GARY G. (1984) ........................................................ Graphic Communication

FIERSTINE, HARRY L. (1966) ....................................................... School of Science and Mathematics
B.S., Long Beach State College, 1957; M.A., University of California, Los Angeles, 1967; Ph.D., 1965. Professor and Interim Dean.

FIORITO, BASIL A. (1977) ........................................................ Psychology and Human Development

FITZPATRICK, MICHAEL JOHN (1975) ......................................... Electronic and Electrical Engineering
B.S., California State Polytechnic College, 1962; M.S., Ph.D., University of California, Santa Barbara, 1975. Professor.

FLANAGAN, JAMES ROBERT (1959) ............................................. Animal Sciences and Industry
B.S., California State Polytechnic College, 1959; M.S., 1974. Professor.
FLEISHON, NEIL L. (1985) ............................................................................................................. Physics
S.B., Massachusetts Institute of Technology, 1973; M.A., University of California, Berkeley, 1975; Ph.D., 1979. Associate Professor.

FLORES, ANTHONY B. (1979) .................................................................................................. Business Affairs
B.A., California State University, Fullerton, 1973; M.P.A., University of Southern California, 1979; additional graduate study, University of California, Irvine, University of Southern California, California Polytechnic State University, San Luis Obispo. Financial Manager.

FLORES, ROBERT A. (1983) .................................................................................................. Agricultural Education
B.S., California Polytechnic State University, San Luis Obispo, 1977; M.S., Texas A & M University, 1978; Ph.D., 1989. Associate Professor.

FLOYD, DONALD R. (1974) ...................................................................................................... Social Sciences

B.Met.E., Cornell University, 1958; Ph.D., Purdue University, 1962. Professor.

FORD, ROBERT A. (1987) ......................................................................................................... Social Sciences
University of Southern California, Los Angeles, 1978; Ph.D., 1984. Assistant Professor.

FREEBERG, LAURA A. (1987) ................................................................................................. Psychology and Human Development
B.A., University of California, Los Angeles, 1974; M.A., 1975; Ph.D., 1979. Assistant Professor.

FREEMAN, CAROL A. (1985) ................................................................................................. Student Health Services

FRENCH, STEVEN P. (1970) ................................................................................................... Physics
B.S., University of Santa Clara, 1961; M.S., University of Washington, 1963; Ph.D., 1965. Professor.

FRENCH, THOMAS G. (1970) ..................................................................................................... Chemistry

FREY, DONNIS F. (1970) ........................................................................................................... Biological Sciences
B.S., Oklahoma State University, 1963; M.S., Virginia State College, 1967; Ph.D., Oklahoma State University, 1970. Professor.

FREY, THOMAS G. (1970) ......................................................................................................... Geography

FRIEDMAN, FRED S. (1975) ...................................................................................................... Engineering Technology
B.S., University of California, Santa Barbara, 1969; M.S., Loyola University, Los Angeles, 1972. Professor. Registered Professional Engineer, California.

FRIEDMAN, MARCIA A. (1973) ................................................................................................. Enrollment Support Services
B.S., California Polytechnic State University, San Luis Obispo, 1984. Assistant Manager; Student Data Systems.

FRIETZSCHE, ARTHUR H. (1965) ............................................................................................. English
B.A., University of California, 1944; M.A., 1945; Ph.D., 1949. Professor.

FRYER, ANN (1983) ................................................................................................................ Student Academic Services

FUJITAN, SHARON H. (1977) ................................................................................................. University Library
B.A., University of California, Santa Barbara, 1963; M.L.S., University of Hawaii, 1974; M.A., Pepperdine University, 1976. Senior Assistant Librarian.

FULLBRIGHT, CARL D. (1986) ................................................................................................. Student Health Services
B.S., University of California, Irvine, 1969; M.D., University of Southern California, 1973; Straight Surgical Internship, University of Iowa Hospitals and Clinics, 1974; Diplomate of American Board of Emergency Medicine, 1982. Physician.

GAINES, MERRILL C. (1988) .................................................................................................... Physics
B.S., University of California, San Diego, 1961; M.S., 1963; Ph.D., 1967. Professor.

GAINES, MERRILL C. (1976) .................................................................................................... Business
B.A., National University of Iran; M.A., California State University, Northridge, 1973; C. Phil., University of California, Los Angeles, 1978; Ph.D., 1984. Associate Professor.

FOUNTAIN, H. PAUL (1965) ..................................................................................................... Crop Science
B.S., California Polytechnic College, 1963; M.S., University of California, Davis, 1974. Professor.

FRANKEL, RICHARD B. (1988) .................................................................................................. Physics
B.S., University of Missouri, 1961; Ph.D., University of California, Berkeley, 1965. Professor.

FRANKLIN, WILLIAM D. (1980) .............................................................................................. Psychology and Human Development
B.A., University of Southern California, Los Angeles, 1979; Ph.D., 1985. Professor.

FLOYD, DONALD R. (1974) ...................................................................................................... Social Sciences

FORD, ROBERT A. (1987) ......................................................................................................... Social Sciences
University of Southern California, Los Angeles, 1978; Ph.D., 1984. Associate Professor.

FREEMAN, CAROL A. (1985) ................................................................................................. Student Health Services

FRENCH, STEVEN P. (1970) ................................................................................................... Physics
B.S., University of Santa Clara, 1961; M.S., University of Washington, 1963; Ph.D., 1965. Professor.

FREY, DONNIS F. (1970) ........................................................................................................... Biological Sciences
B.S., Oklahoma State University, 1963; M.S., Virginia State College, 1967; Ph.D., Oklahoma State University, 1970. Professor.

FREY, THOMAS G. (1970) ......................................................................................................... Geography

FREY, WINTON H. (1972) ......................................................................................................... Ornamental Horticulture
B.S., California State Polytechnic College, 1958; M.S., Fresno State University, 1972. Professor.
GALLAGHER, MELISSA G. (1978) ........................................... Student Health Services

GAMBLE, LYNNE E. (1976) ........................................................ University Library

GAMBS, ROGER D. (1974) .......................................................... Biological Sciences

GANG, DONNA D. (1967) ............................................................ Student Health Services

GARNER, EDWARD R. (1967) ...................................................... Mechanical Engineering
B.S., Bradley University, 1962; M.S., University of Arizona, 1965; Ph.D., Montana State University, 1973. Professor.

GARRETT, SOL M., III, LT. COL. (1987) ................................................ Military Science
B.S., University of Arkansas, 1967; M.S., Boston University, 1980. Department Head.

B.S.M.E., University of Kansas, 1957; M.S.E., University of Michigan, 1959; Ph.D., 1968. Professor. Registered Professional Engineer, Utah.

GASKIN, TIMOTHY A. (1970) ......................................................... Ornamental Horticulture
B.S., University of California, 1954; M.S., University of Delaware, 1956; Ph.D., Purdue University, 1958; M.B.A., Ohio State University, 1968. Professor.

GAY, LARRY W. (1979) ............................................................... Industrial Technology

GEDAYLOO, TEYMOOR (1965) ....................................................... Physics
B.A., Macalester College, 1957; M.S., University of Washington, 1959; Ph.D., University of Kansas, 1973. Professor.

B.S., Utah State University, 1976; M.S., 1981; Ph.D., Mississippi State University, 1988. Research Scientist.

GENEREUX, DOUGLAS G. (1970) .................................................. Agribusiness
B.S., University of Nebraska, 1964; M.S., 1969; Ph.D, Colorado State University, 1979. Professor.

GEORG, DAVID L. (1970) ............................................................ Political Science
A.B., San Diego State College, 1962; M.A., 1968; Ph.D., University of Oregon, 1970; additional graduate study, Yale University, University of Michigan Survey Research Center. Professor.

GERARD, E. DOUGLAS (1951) ....................................................... Facilities Administration
B.S., University of British Columbia, 1950; M.S., University of Saskatchewan, 1951. Executive Dean.

GILLHAM, JOHN F. (1975) .......................................................... Landscape Architecture

B.S., Mississippi State University, 1973; M.S., 1975; Ph.D., 1979. Associate Professor.

GIREOLO, JACK E. (1970) ........................................................... Mathematics

GITTES, KATHARINE SLATER (1983) ......................................... English

GLASER, MARGARET J. (1973) ...................................................... Education

GLASSCO, D. EDWARD (1968) ..................................................... Mathematics
B.S., Harvey Mudd College, 1963; M.A., University of Southern California, 1966; Ph.D., 1971. Professor.
GLASSMEYER, SONJA M. (1979) ........................................... Physical Education and Recreation Administration B.S., California Polytechnic State University, San Luis Obispo, 1973; M.S., 1974; Ed.D., Brigham Young University, 1981. Professor.


GORDON, RAYMOND G. (1967) ................................................................. Mechanical Engineering B.S., Western New England College, 1966; M.S., University of Michigan, 1967; Ph.D., University of California, Santa Barbara, 1974. Professor. Registered Professional Engineer, California.

GORDON, ROBERT L. (1967) ................................................................. Ornamental Horticulture B.S., California Polytechnic State University, San Luis Obispo, 1981. Associate Professor.


GRIFFIN, ROBERT E. (1976) ................................................................. University Foundation B.S., University of Southern California, 1966; J.D., Western State University, 1974. Associate to Executive Director.


GRINNELL, ROBIN R. (1967) ................................................................. Agricultural Engineering B.S., Purdue University, 1955; M.S., University of Minnesota, 1961; Ph.D., Purdue University, 1976. Professor.


HALE, THOMAS E. (1966) ...................................................... Mathematics
B.S., Indiana State University, 1960; M.S., 1963; M.S., St. Louis University, 1967; Ph.D., 1973. Professor and Department Chair.


HALL, MICHAEL H. (1974) ...................................................... Animal Sciences and Industry
B.S., California Polytechnic State University, 1973; M.S., Kansas State University, 1975. Professor.

HALLMAN, BARBARA McCULLING (1973) ..................................... History

HALLOCK, BRENT G. (1979) ...................................................... Soil Science

HANDSHY, PATRICIA A. (1984) ...................................................... Student Health Services
B.S.N., N.P., Purdue University, 1982. Nurse Practitioner.

HANNINGS, DAVID W. (1974) ...................................................... Ornamental Horticulture
B.S., Auburn University, 1972; M.S., Cornell University, 1974. Professor.

HANSEN, CAROLE L. (1987) ...................................................... Housing

HANSEN, PHYLLIS JEAN (1963) ...................................................... University Library
A.B., University of Illinois, 1960; M.S., 1961; M.A., California Polytechnic State University, San Luis Obispo, 1964. Senior Assistant Librarian.

HANSON, MICHAEL T. (1978) ...................................................... Biological Sciences

HARGRAVE, TERRY C. (1979) ...................................................... Architecture

HARMON-ELLIOTT, ADELAIDE T. (1974) ...................................................... Mathematics
B.S., Fordham University, 1955; M.S., 1964; Ph.D., New York University, 1969. Professor.

HARRIGAN, JOHN E., JR. (1969) ...................................................... Architecture

HARRIGAN, PAULINE W. (1983) ...................................................... Housing
B.S., University of Massachusetts, 1979; M.S.W., University of Connecticut, 1981. Assistant Director.

HARRINGTON, JOHN F. (1976) ...................................................... English

HARRIS, JAMES G. (1982) ...................................................... Electronic and Electrical Engineering
B.S., University of California, Berkeley, 1961; M.S., 1962; Ph.D., Syracuse University, 1968. Professor.

HARRIS, JOHN H. (1978) ...................................................... Natural Resources Management
B.S., Humboldt State College, 1968; M.S., 1970; Ph.D., Utah State University, 1972. Professor.

HARRIS, WALTER L. (1973) ...................................................... Student Academic Services

HARTER, LANCE L. (1979) ...................................................... Intercollegiate Athletics
B.S., Texas Tech University, 1972; M.S., Colorado State University, 1974. Coach.

HARTIG, DONALD G. (1979) ...................................................... Mathematics
B.S., Rensselaer Polytechnic Institute, 1964; M.S., University of Wisconsin, Milwaukee, 1966; Ph.D., University of California, Santa Barbara, 1970. Professor.

HASSLEIN, GEORGE J. (1949) ...................................................... Architecture
B.Arch., University of Southern California, 1945. Professor. FAIA.

HATCHER, DAVID S. (1980) ...................................................... Architectural Engineering
B.S., University of Wyoming, 1953; Ph.D., University of Illinois, 1961. Professor. Registered Civil Engineer, California.

HAVANDJIAN, NISHAN (1980) ...................................................... Journalism
B.A., Haigazian College, Lebanon, 1970; M.A., University of Georgia, 1972; Ph.D., University of Texas at Austin, 1979. Professor and Department Head.
HAWES, MICHAEL (1967) .............................................. Engineering Technology
B.Engr., University College, Dublin, Ireland, 1958; M.S., Ohio State University, 1967. Professor. Registered Professional Engineer, Ohio.

B.S., Western Illinois University, 1975; M.S., University of Tennessee, 1979; Ph.D., 1984. Assistant Professor.

HAYDEN, JILL E. (1977) ................................................ Counseling Services

HAYES, JAMES H. (1969) .............................................. Journalism
B.A., San Jose State College, 1950; M.A., University of Florida, 1966; additional graduate study, University of Minnesota. Professor.

HAYNES, RAY M. (1989) .............................................. Management

HAYNES, ROY (1989) .............................................. Student Academic Services
B.S., Austin Peay State University, 1980. Retention Coordinator, Minority Engineering Program.

HAYNES, ROY (1989) .............................................. Archer
B.S., University of California, Davis, 1960; M.S., 1973. Associate Professor.

HENDERSON, THOMAS R. (1982) .............................................. Intercollegiate Athletics

HENRY, DAVID (1976) .............................................. Speech Communication
A.B., University of California, Berkeley, 1970; M.A., University of California, Davis, 1974; Ph.D., Indiana University, 1976. Professor.

HENSEL, BEVERLY J. (1972) .............................................. Career Counseling

HERLIHY, JACQUELINE (1975) ............................................. Agribusiness

HEWITT, CLARISSA (1976) .............................................. Art and Design

HEMSTRA, HENRY (1967) .............................................. Art and Design
B.S., California State University, 1951. Professor.

HENRY, DAVID (1976) .............................................. Speech Communication
A.B., University of California, Berkeley, 1970; M.A., University of California, Davis, 1974; Ph.D., Indiana University, 1976. Professor.

HENSLEY, JOE (1972) .............................................. School of Business

HILDEBRAND, ROBERT (1986) .............................................. Metallurgical and Materials Engineering

HILL, JILL E. (1977) .............................................. Intercollegiate Athletics

HINKLE, MARY ANN (1978) .............................................. Financial Aid
B.S., California State Polytechnic College, San Luis Obispo, 1969. Loan Program Manager.
HOLLAND, V.L. (1972) .................................................... Biological Sciences


HOMAN, DENNIS N. (1966) ................................................ Biological Sciences
B.A., University of Iowa, 1955; M.S., 1958; Ph.D., 1960. Professor.

HOOD, J. MYRON (1977) .................................................... Mathematics

HOOVER, ROBERT L. (1970) ................................................ Social Sciences
A.B., University of California, Berkeley, 1965; M.A., 1969; Ph.D., 1971; additional graduate study, University of California, Berkeley, Stanford University. Professor.

HORTON, WILLIAM F. (1968) ................................................. Electronic and Electrical Engineering
B.S., California Institute of Technology, 1946; M.S., 1948; Ph.D., University of California, Los Angeles, 1966. Professor.

HOUHAGATE, LAURENCE D. (1979) ........................................... Philosophy
B.A., California State College, Los Angeles 1960; M.A., Ph.D., University of California, Los Angeles, 1967. Professor and Department Chair.

HOULES, JEROME F. (1959) ................................................ Chemistry
B.S., California State Polytechnic College, 1958; graduate study, California State Polytechnic College. Associate Professor.

HOWARD, LORRAINE H. (1964) ........................................... Counseling Services

HOWARD, WILLIAM A. (1980) ................................................ Animal Sciences and Industry

HOWELL, ROBERT (1974) ................................................... Art and Design

HSIEH, CARL C. F. (1970) ..................................................... Civil and Environmental Engineering
B.S., National Taiwan University, 1961; M.S., So. Dakota School of Mines and Technology, 1965; Ph.D., Northwestern University, 1968. Professor. Registered Professional Engineer, California.

HSU, JOHN Y. S. (1970) ................................................... Computer Science
B.S., National Taiwan University, 1959; M.S., University of California, Berkeley, 1964; Ph.D., 1969. Professor.

HUEHN, KEMPTON L. (1968) ................................................. Mathematics
B.S., Iowa State University, 1957; M.S., 1962; Ph.D., Colorado School of Mines, 1975. Professor.

HUFF, EARL D. (1970) ........................................................ Political Science

HUNT, ROGER M. (1979) ................................................... Animal Sciences and Industry
B.S., California State Polytechnic College, 1971; M.S., California Polytechnic State University, San Luis Obispo, 1978. Associate Professor.

HUTCHINSON, JAMES R. (1971) ............................................. Graphic Communication

HUTTON, REX L. (1966) .................................................... Mathematics

HYNES, C. DENNIS (1957) .................................................. Biological Sciences
B.A., Macalester College, 1951; M.S., University of Michigan, 1953; Ph.D., University of Florida, 1957. Professor.

IANNCE, MICHAEL A. (1978) ................................................ Mechanical Engineering
B.S., Valparaiso University, 1961; M.S., University of California, Los Angeles, 1968; Ph.D., 1971. Professor.

IKENOYAMA, GEORGE K. (1964) ........................................... Architecture

INCHAUSTI, ROBERT L. (1984) ............................................. English
B.A., California State University, Sacramento, 1974; M.A., 1976; Ph.D., University of Chicago, 1981. Associate Professor.
IQBAL, M. ZAFAR (1979) ........................................................ Accounting

IRVIN, GLENN W. (1986) .................................................... Academic Programs
B.A., Arizona State University, 1964; M.A., 1971; Ph.D., 1978. Associate Vice President for Academic Affairs and University Dean.

JACOBSON, RALPH A. (1975) .................................................... Chemistry

JAMESON, LYNN M. (1980) .................................................... Physical Education and Recreation Administration

JANKAY, PETER (1973) .................................................... Biological Sciences

JANSSON, A. KIRBY (1985) .................................................... School of Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1979. Administrative Assistant.

JEFFERSON, DOROTHY (1982) .................................................... Student Academic Services

JELINEK, CYNTHIA J. (1976) .................................................... School of Science and Mathematics
B.S., Marietta College, 1967. Director of Advising Center.

JENNINGS, CHARLES W. (1968) .................................................... Art and Design

JERCICH, GEORGE D. (1976) .................................................... Art and Design

JOHNSON, BOYD WALKER (1969) .................................................... Mathematics
B.S., United States Naval Academy, 1951; M.S., North Carolina State College, 1956; Ph.D., North Carolina State University, 1963. Professor.

JOHNSON, ERIC B. (1980) .................................................... Art and Design

JOHNSON, ERIC V. (1969) .................................................... Biological Sciences

JOHNSON, MADELEINE M. (1985) .................................................... University Library

JOHNSON, MARK S. (1989) .................................................... Mechanical Engineering
B.S., Stanford University, 1983; M.S., 1983; Ph.D. 1990. Assistant Professor.

JOHNSON, RICK (1983) .................................................... Student Life and Activities

JOHNSON, WILLIAM C. (1989) .................................................... Physical Education and Recreation Administration
B.S., University of Wisconsin, Whitewater, 1971; M.S., University of Oregon, 1983; Ph.D., 1989. Assistant Professor.

JOHNSON, WILLIAM V. (1966) .................................................... Music

JOHNSTON, HAROLD A. (1988) .................................................... Construction Management

JONES, DANE R. (1976) .................................................... Chemistry
B.A., University of Utah, 1969; Ph.D., Stanford University, 1974. Professor.

JONES, JACK B. (1969) .................................................... Education

JORGENSEN, NANCY ANN (1968) .................................................... Counseling Services

JUNCO, MARIA L. (1989) .................................................... Theatre and Dance

KALATHIL, JAMES S. (1965) .................................................... Physics
KALISKI, MARTIN E. (1986) ................................................. Electronic and Electrical Engineering Professor and Department Chair. 
B.S., Massachusetts Institute of Technology, 1966; M.S., 1968; Ph.D., 1971. 
KAMINAKA, M. STEPHEN (1984) ........................................ Agricultural Engineering 
B.S., University of California, Davis, 1968; M.S., University of Hawaii, 1973; Ph.D., Cornell University, 1977. 
KANN, DAVID J. (1969) .......................................................... English 
KATEKARU, JAMES Y. (1987) ................................................... Food Science and Nutrition 
B.S., University of Oregon, 1956; M.S., University of Arizona, 1961; Ph.D., University of Cincinnati, 1965. 
KATO, GORO C. (1981) .......................................................... Mathematics 
B.S., Shizuoka University, Japan, 1972; M.A., West Virginia University, 1974; Ph.D., University of Rochester, 1979. 
KAY, THOMAS D. (1958) ......................................................... Engineering Technology 
B.S., Wayne State University, 1957; M.A., California State Polytechnic College, 1967. 
KEELING, DAVID L. (1975) .................................................... Chemistry 
B.S., Arizona State University, 1969; Ph.D., University of Hawaii, 1974. 
KEEP, ROGER L. (1968) ....................................................... Industrial Technology 
B.S., Brigham Young University, Hawaii, 1967; M.S., Stout State University, 1968; Ed.D., Utah State University, 
1972. 
KEESEY, DOUGLAS (1988) ...................................................... English 
KEETCH, BRENT H. (1967) ..................................................... English 
B.A., Utah State University, 1965; M.A., 1966; Ph.D., University of Utah, 1971. 
KEIL, DAVID J. (1976) .......................................................... Biological Sciences 
B.S., Arizona State University, 1968; M.S., 1970; Ph.D., Ohio State University, 1973. 
KEIL, GLENDRA (1987) ....................................................... Student Academic Services 
KELLER, EARL C. (1987) ......................................................... Accounting 
B.B.A., University of Houston, 1963; B.M.A., University of Washington, 1970; Ph.D., University of Washington, 
KELLER, ELMO A., JR. (1963) .............................................. Computer Science 
B.A., Brigham Young University, 1959; M.A., 1961; Ph.D., Iowa State University, 1972. 
KELLERMAN, MARTIN A. (1968) ............................................ Chemistry 
B.S., Polytechnic Institute of Brooklyn, 1953; Ph.D., University of Washington, 1966. 
KELLOGG, WILLIAM C. (1983) ............................................ Agricultural Education 
B.S., California Polytechnic State University, San Luis Obispo, 1976; M.S., 1983; Ph.D., Colorado State University, 
1987. Associate Professor. 
B.S., East Central State University, 1962; M.S., University of Utah, 1964; Ph.D., 1972. 
KERO, HAROLD R. (1977) ..................................................... Social Sciences 
KERSTEN, TIMOTHY W. (1971) ............................................... Economics 
KESNER, BRIAN B. (1980) .................................................... Architecture 
KHALIL, HANY M. (1987) ..................................................... Food Science and Nutrition 
B.S., University of Alexandria, Egypt, 1973; M.S. University of Illinois, Urbana, 1983; Ph.D., 1987. Associate 
Professor. 
KIM, CHI SU (1974) ............................................................. University Library 
KING, LAURA M. (1989) ......................................................... Psychology and Human Development 
B.A., University of Arkansas, 1977; M.S., Kansas State University, 1980; Ph.D., 1989. Assistant Professor. 
KNABLE, ANTHONY E. (1973) .............................................. Biological Sciences 
KNECHT, GEORGE N. (1973) .............................................. Biological Sciences 
B.S., Rutgers University, 1962; M.S., 1969; Ph.D., University of Arizona, 1975. Professor.
KNIGHT, RANDALL D. (1989) ................................................................. Physics
B.S., Washington University, 1972; Ph.D., University of California, Berkeley, 1979. Associate Professor.

KOBERG, DONALD J. (1962) ................................................................. Architecture

KOHLEN, KEN (1983) ........................................................................... Architecture

B.S., Cairo University, Egypt, 1969; M.S., University of Cincinnati, 1978; Ph.D., Louisiana State University, 1982; additional graduate study, Cairo University. Professor. Registered Professional Engineer, Egypt.

KOSZEWKI, WANDA M. (1988) ............................................................. Food Science and Nutrition
B.S., Utah State University, Logan, 1981; M.S., University of Nebraska, Lincoln, 1984; Ph.D., Kansas State University, Manhattan, 1988. Associate Professor.

KOURAKIS, JOSEPH M. (1970) ............................................................. City and Regional Planning

KLANZDORF, RICHARD B. (1971) ............................................................ Political Science

KREJSA, RICHARD J. (1968) ................................................................. Biological Sciences

KRIEGER, DANIEL E. (1971) ................................................................. History

KUNG, R. (1987) ................................................................................. Business Administration

KUBINSKI, A. MARK (1975) ................................................................. Biological Sciences
B.S., Gonzaga University, 1968; M.S., Washington State University, 1971; Ph.D., 1974. Professor.

LABARBERA, JEANNE (1984) ................................................................. University Union

LABHARD, LEZLIE A. (1967) ................................................................. Home Economics
B.S., University of California, Davis, 1965; M.S., 1967. Professor.

LAKEMAN, SANDRA DAVIS (1981) ....................................................... Architecture

LAMB, STEPHAN R. (1979) ................................................................. Housing

LAMBERT, ROYCE L. (1969) ............................................................... Soil Science

LAMBERT, WALTER M. (1969) ............................................................. Student Life and Activities

LAMBERT, RANDALL D. (1969) ........................................................... Physics
B.S., Washington University, 1972; Ph.D., University of California, Berkeley, 1979. Associate Professor.

KOBERG, DONALD J. (1962) ................................................................. Architecture

KOHLEN, KEN (1983) ........................................................................... Architecture

B.S., Cairo University, Egypt, 1969; M.S., University of Cincinnati, 1978; Ph.D., Louisiana State University, 1982; additional graduate study, Cairo University. Professor. Registered Professional Engineer, Egypt.

KOSZEWKI, WANDA M. (1988) ............................................................. Food Science and Nutrition
B.S., Utah State University, Logan, 1981; M.S., University of Nebraska, Lincoln, 1984; Ph.D., Kansas State University, Manhattan, 1988. Associate Professor.

KOURAKIS, JOSEPH M. (1970) ............................................................. City and Regional Planning

KLANZDORF, RICHARD B. (1971) ............................................................ Political Science

KREJSA, RICHARD J. (1968) ................................................................. Biological Sciences

KRIEGER, DANIEL E. (1971) ................................................................. History

KUNG, R. (1987) ................................................................................. Business Administration

KUBINSKI, A. MARK (1975) ................................................................. Biological Sciences
B.S., Gonzaga University, 1968; M.S., Washington State University, 1971; Ph.D., 1974. Professor.

LABARBERA, JEANNE (1984) ................................................................. University Union

LABHARD, LEZLIE A. (1967) ................................................................. Home Economics
B.S., University of California, Davis, 1965; M.S., 1967. Professor.

LAKEMAN, SANDRA DAVIS (1981) ....................................................... Architecture

LAMB, STEPHAN R. (1979) ................................................................. Housing

LAMBERT, ROYCE L. (1969) ............................................................... Soil Science

LAMBERT, WALTER M. (1975) ............................................................. Student Life and Activities

LANDRETH, JAMES R. (1956) ............................................................... Business Affairs
B.A., Mexico City College, 1954; M.B.A., Stanford University, 1956; additional graduate study, Claremont University College, California Polytechnic State University, San Luis Obispo. Vice President for Business Affairs.

LANDWEHR, ALFRED W. (1970) .......................................................... English

LANG, MARTIN T. (1969) ................................................................ Mathematics

LANGE, JOHN H. (1975) ..................................................................... Architecture

LAMBERT, RANDALL D. (1989) ........................................................... Physics
B.S., Washington University, 1972; Ph.D., University of California, Berkeley, 1979. Associate Professor.

KOBERG, DONALD J. (1962) ................................................................. Architecture

KOHLEN, KEN (1983) ........................................................................... Architecture
LAPORTE, MARY L. (1985) ................................................................. Art and Design

LARSEN, STUART E. (1969) ............................................................ Civil and Environmental Engineering
B.S., University of Cincinnati, 1963; M.S., 1965. Professor.

LaSALLE, TIMOTHY J. (1974) ............................................................. Dairy Science
B.S., California State Polytechnic College, 1970; M.S., Virginia Polytechnic Institute and State University, 1972. Professor.

LASCOLA, RUSSELL A. (1970) ......................................................... Philosophy

LASSANSKE, DANIEL E. (1975) ....................................................... Ornamental Horticulture

LAZERE, DONALD P. (1977) ............................................................. English

LEBENS, FRANK T. (1972-78) (1981) .............................................. Academic Affairs
B.S., Iowa State University, 1964; M.B.A., California Polytechnic State University, 1972; M.A., 1975. Associate Vice President for Academic Resources.

LEE, PETER Y. (1981) ................................................................. School of Engineering
B.S., National Taiwan University, 1961; M.S. Tulane University, 1965; Ph.D., 1966. Professor and Dean. Registered Professional Engineer, Louisiana.

LEONESIO, ROBERT B. (1972) ......................................................... Metallurgical and Materials Engineering
B.S., University of Massachusetts, 1963; M.S., Stanford University, 1964; Ph.D., Lehigh University, 1970. Professor. Registered Professional Engineer, California.

LEONG, KINGSTON L. (1970) ............................................................. Biological Sciences
B.S., University of Hawaii, 1963; M.S., 1966; Ph.D., Oregon State University, 1970. Professor.

LEWIS, ALEXANDER (MICKEY) (1989) .............................................. Student Academic Services

LEWIS, GEORGE M. (1967) ............................................................. Mathematics

B.Commerce, National Chengchi University, Taiwan, 1975; M.S.B.A., Texas Tech University, 1978; Ph.D., 1981. Associate Professor.

LIJE, KARL D. (1981) ................................................................. Engineering Technology

LINDVALL, JOHN R. (1973) ............................................................. Business Administration

LINSTRUM, HELEN M. (1970) ........................................................ Enrollment Support Services

LITTLE, H. CLAY (1973) ............................................................... Agribusiness
B.S., University of Missouri, 1950; M.S., 1957; Ph.D., 1965. Professor.

LITTLE, WILLIAM T. (1983) ......................................................... Foreign Languages

LIU, HONG-TING (1984) ............................................................. Architectural Engineering
B.S., Zhejiang University, 1952; Ph.D., University of Minnesota, 1984. Associate Professor.

LO, CHIEN-KUO (1983) ................................................................. Civil and Environmental Engineering
B.S., National Cheng Kung University, 1969; M.S., 1973; Ph.D., University of Iowa, 1981. Professor.
LOCASCIO, JAMES GASPARE (1981) ................................................................. Mechanical Engineering
B.S., Newark College of Engineering, 1970; M.S., University of California, Santa Barbara, 1971; Ph.D., 1988. Associate Professor.

LOE, NANCY E. (1982) .......................................................................................... University Library
B.A., Aurora College, 1975; M.S., M.A., Catholic University of America, 1977. Associate Librarian.

LOFTUS, ROBIN L. (1978) ..................................................................................... Financial Aid

LOH, ALICE C. (1974) ............................................................................................ Landscape Architecture

LOH, LARRY (1979) ................................................................................................. Architecture
B.Arch., University of Manitoba, Canada, 1965; M.Arch. in U.D., Washington University, 1969. Professor.

LOMAS, CHARLES G. (1988) ................................................................................... Engineering Technology
B.S., University of Maryland, 1957; B.S.M.E., 1964; M.S.M.E., 1975. Associate Professor.

LONG, DIANNE N. (1982) ....................................................................................... Political Science
B.S., State University of New York College at Buffalo, 1964; M.P.A., Michigan State University, 1977; Ph.D., 1982. Professor and Department Chair.

LOPEZ, JORGE A. (1989) .......................................................................................... Physics
B.S., University of Texas, El Paso, 1977; M.S., 1979; Ph.D., Texas A & M University, 1986. Assistant Professor.

LORD, DAVID (1985) ................................................................................................. Architecture

LORD, SARAH (1986) .............................................................................................. Home Economics

LUCAS, NANCY (1977) ............................................................................................. English

LUCAS, ROBERT A. (1975) ..................................................................................... Graduate Studies, Research and Faculty Development
A.B., John Carroll University, 1961; M.A., University of Illinois, 1963; Ph.D., 1970. Associate Vice President.

LUNA, GEORGE W. (1977) ...................................................................................... Mathematics

LUND, JOAN (1977) ................................................................................................. Personnel and Employee Relations
B.A., California Polytechnic State University, San Luis Obispo, 1985. Personnel Programs Manager.

B.S., North Dakota State University, 1970; M.S., 1981. Associate Professor.

LUTRA, SHAM S. (1972) ......................................................................................... Computer Science
B.A., Punjab University, India, 1952; M.A., 1954; M.S., University of Alberta, Canada, 1969; Ph.D., University of Minnesota, 1974. Professor.

LUTRIN, CARL E. (1970) ......................................................................................... Political Science
B.A., Adelphi University, 1962; M.S., University of Wisconsin, 1965; Ph.D., University of Missouri, 1971; additional graduate work, Stanford University. Professor.

LUTRIN, PATRICIA (1975) ....................................................................................... Student Life and Activities

MAAS, DONALD K. (1976) ...................................................................................... Education

MacCARLEY, CARL A. (1988) ................................................................................ Electronic and Electrical Engineering
B.S., University of California, Los Angeles, 1976; M.S., 1978; Ph.D., Purdue University, 1987. Associate Professor.

MacCURDY, CAROL A. (1987) ................................................................................ English
B.A., Southern Methodist University, 1972; M.A., University of South Carolina, 1975; Ph.D., 1980. Assistant Professor.

MACH, GEORGE R. (1954) ...................................................................................... Mathematics
B.A., Iowa State Teachers College, 1950; M.S., State University of Iowa, 1951; Ph.D., Purdue University, 1963. Professor.

MACIAS, RAY (1980) ............................................................................................... Business Affairs

MACK, MARGARET A. (1986) ................................................................................ Cooperative Education and Placement Services
MAKSOUDIAN, Y. LEON (1963) .................................................................................... Statistics
B.S., California State Polytechnic College, 1957; M.S., University of Minnesota, 1961; Ph.D., University of

MALKIN, MICHAEL R. (1974) .................................................................................... Theatre and Dance
A.B., Tufts University, 1965; M.A., 1970; Ph.D., 1971. Professor and Department Chair.

B.E., Mysore University, India, 1958; M.E., University of Oklahoma, 1966; Ph.D., 1968. Professor. Registered
Professional Engineer, Louisiana and Indiana.

MALMBORG, FREDRICK B. (1969) ................................................................................... Mechanical Engineering
B.S., New York University, 1955; M.S., Columbia University, 1963. Associate Professor.

MARK, WALTER R. (1972) .................................................................................... Institutional Studies
B.S., Utah State University, 1968; M.S., Colorado State University, 1970; Ph.D., 1972. Director.

MARLIER, JOHN F. (1981) .................................................................................... Chemistry
B.S., University of Wisconsin, Stevens Point, 1972; Ph.D., University of Wisconsin, Madison, 1978. Professor.

MARTIN, W. MIKE (1965) ................................................................................... Architecture
B.Arch., University of Colorado, 1969; M.Arch., University of Washington, 1971; Ph.D., University of California,
Berkeley, 1983. Professor and Department Head. Registered Architect, Kansas and California. NCARB Certifi-
cate.

MARTINEZ, ANGELINA (1966) .................................................................................... University Library
B.A., Inter-American University, San German, Puerto Rico, 1943; B.S., Louisiana State University, 1945; M.S.,
University of Illinois, 1957. Assistant Dean.

MARTINEZ, EUGENE J. (1980) .................................................................................. Counseling Services

MARTINEZ, EVERARDO (1982) ................................................................................... Student Academic Services
B.S., California Polytechnic State University, San Luis Obispo, 1980; M.S., 1983. Director Developmental Out-
reach.

MARX, STEVEN R. (1988) .................................................................................... English

MASON, ANTHONY K. (1980) .................................................................................... Industrial Engineering
B.S., University of Southern California, 1959; M.S., 1963; Ph.D., 1967. Professor. Registered Professional Engineer,
California.

MAXWELL, JOHN C. (1978) .................................................................................... Chemistry
B.S., Whittier College, 1969; Ph.D., Colorado State University, 1979. Professor.

MAYO, EDWARD L. (1968) .................................................................................... History

McBRIDE, SUSAN L. (1979) .................................................................................... Education

McCaleb, Donald L. (1962) ................................................................................... University Relations
B.S., California State College, Los Angeles, 1958; M.A., California State Polytechnic College, 1970. Public Informa-
tion Officer.

McCombs, John W. (1960) ................................................................................... Electronic and Electrical Engineering
B.S., Clemson University, 1950; B.S., 1957; M.S., 1961; M.A., Northern Arizona University, 1971. Professor.

McCorkle, Robert E. (1962) ................................................................................... Agribusiness
B.S., California State Polytechnic College, 1960; M.S., University of California, 1962; additional graduate study,
Oregon State University, University of Wisconsin. Professor.

McDermott, Steven T. (1989) ................................................................................... Speech Communication
B.A., San Jose State University, 1973; M.A., 1976; Ph.D., Michigan State University, 1980. Associate Professor.

McDill, Jean M. (1973) ................................................................................................. Mathematics
B.S., University of Texas, 1957; M.S., University of Florida, 1968; Ph.D., 1971. Professor.


McDonnell, Robert A. (1975) ..................................................................................... English
B.A., St. John's University, 1951; M.A., University of Minnesota, 1954; Ph.D., 1958. Professor.

McDougall, Michael E. (1972) .................................................................................. City and Regional Planning
B.Arch., University of Hong Kong, 1955; graduate study, Architectural Association School, London, 1956-57;
M.C.R.P., Cornell University, 1958. Professor.

B.S., Brigham Young University, 1979; M.S., 1980; Ph.D., Washington State University, 1984. Associate Professor.
McKIBBIN, CARROLL R. (1974) ......................................... Political Science
B.A., Drake University, 1959; M.A., 1960; Ph.D., University of Kansas, 1967. Professor.

MCKIM, PATRICK C. (1973) ............................................ Social Sciences

MCKINSTRY, JOHN A. (1968) ........................................... Social Sciences

McMORRAN, WAYNE E. (1962) ........................................ Electronic and Electrical Engineering
B.S., California State Polytechnic College, 1960; M.S., New York University, 1962. Professor.

McNEIL, ROBERT J. (1976) .............................................. Crop Science
B.S., Rutgers University, 1967; M.S., 1970; Ph.D., 1975. Professor.

MEEGHER, JAMES D. (1988) ........................................... Mechanical Engineering

MEHDIJADEH, AMROLLAH (1984) ..................................... Mechanical Engineering
B.S., Abadan Institute of Technology, 1980; M.S., University of Southern California, 1980; Ph.D., 1984. Associate Professor.

MELVIN, BARBARA A. (1973) ........................................ Personnel and Employee Relations

MENDENHALL, JOHN P. (1980) ......................................... Art and Design

MENG, SHIEN YI (1968) .................................................. Electronic and Electrical Engineering
B.S., Taiwan Provincial Cheng Kung University, 1953; M.S., Oklahoma State University, 1958; Ph.D., Ohio State University, 1968. Professor.

MENON, UNNY (1978) .................................................... Industrial Engineering
A.P., Sheffield Polytechnic, England, 1969; M.Phil., 1972; Ph.D. University of Nottingham, 1985. Professor and Interim Department Head; Registered Professional Engineer, Great Britain.

METCALF, LYNN E. (1986) .............................................. Business Administration
B.A., University of Oregon, 1978; Ph.D., M.I.M. American Graduate School of International Management, 1981. Associate Professor.

MEYERS, ROBERT E., JR. (1977) .................................... Physical Education and Recreation Administration
A.B., Stanford University, 1953; M.S., San Jose State University, 1965; D.Crim., University of California, Berkeley, 1974. Professor.

MICHELFELDER, DIANE P. (1981) .................................. Philosophy
A.B., Bryn Mawr College, 1975; Ph.D., University of Texas, 1982. Associate Professor.

MIKLOWITZ, PAUL S. (1988) .......................................... Philosophy
B.A., University of California, Santa Cruz, 1977; M.A., University of Chicago, 1979; Ph.D., Yale University, 1988. Assistant Professor.

MILLER, ALEX K. (1986) .............................................. Cooperative Education and Placement Services


MILLER, HAROLD R. (1968) ........................................... Accounting

MILLER, JAMES C., III (1987) ........................................ Cooperative Education and Placement Services

MILLER, PAMELA COOK (1978) .................................... Speech Communication
B.A., Purdue University, 1968; M.A., 1970; Ph.D., University of Southern California, 1976. Professor.


MISIC, DRAGOSLAV M. (1970) ........................................ Civil and Environmental Engineering
Diploma Engineer, University of Ljubljana, Yugoslavia, 1957; M.S., Ph.D., Northwestern University, 1963. Professor. Registered Professional Engineer, California.

MITCHELL, ANDREA (1983) ........................................... Student Academic Services
B.S., California Polytechnic State University, San Luis Obispo, 1984. Director, Upward Bound.
MOIR, NEIL J. (1970) ............................................................ Chemistry

MONTECALVO, JOSEPH (1983) ............................................................ Food Science and Nutrition
B.S., University of Rhode Island, 1972; M.S., 1975; Ph.D., 1979. Professor and Department Head.

MONTEN, GINNY (1983) ............................................................ University Relations

MONTGOMERY, WAYNE R. (1982) ............................................................ University Library
A.B., University of California, Berkeley, 1977; M.L.S., University of California, Los Angeles, 1981. Senior Assistant Librarian.

MOORE, CAROLE M. (1980) ............................................................ Counseling Services

MOREIRA, SIXTO EMILIO (1972) ............................................................ Architecture
B.S., University of Oklahoma, 1975; M.Arch., 1971; additional graduate study, University of California, Los Angeles. Professor. Registered Architect, California.

MOREY, KRISHNANUM S. (1970) ............................................................ Food Science and Nutrition
B.S., Nagpur University, India, 1955; M.S., 1958; M.S., University of California, San Francisco, 1963; Ph.D., University of California, Berkeley, 1967. Professor.

MORGAN, ANN (1980) ............................................................ Psychology and Human Development

MORI, BARBARA L. ROWLAND (1986) ............................................................ Social Sciences


MORRIS, NANCY A. (1985) ............................................................ Home Economics
B.S., Central Michigan University, 1973; M.S., 1978; Ph.D., Ohio State University, 1983. Associate Professor.

MORRISON, KENT E. (1979) ............................................................ Mathematics
B.A., University of California, Santa Cruz, 1971; Ph.D., 1977. Professor.

MOSHER, LYNN S. (1974) ............................................................ Industrial Technology

MOTT, W. STEPHEN (1972) ............................................................ Graphic Communication
B.S., California State Polytechnic College, 1959; M.A., California Polytechnic State University, San Luis Obispo, 1973. Professor.

MOTTELER, ZANE C. (1982) ............................................................ Computer Science
B.S., Stanford University, 1957; M.S., 1962; Ph.D., 1964; M.S., Michigan State University, 1981; additional graduate study, University of Minnesota, University of New Mexico. Professor.

MOTTMANN, JOHN (1974) ............................................................ Physics

B.S., University of Alexandria, 1960; M.S., University of California, Davis, 1963; Ph.D., Michigan State University, 1967. Professor. Registered Professional Engineer, Illinois and Iowa.

MOULTON, JOHN C. (1988) ............................................................ Construction Management
B.S., Northeast Louisiana University, 1972; M.S., University of Florida, 1978. Associate Professor.

MUELLER, JAMES R. (1980) ............................................................ Mathematics
B.A., University of Wisconsin, 1975; Ph.D., California Institute of Technology, 1982. Professor.

MUELLER, WESLEY J. (1984) ............................................................ Crop Science
B.S., Brigham Young University, 1977; M.S., 1981, Ph.D., 1983. Utah State University. Assistant Professor.

MULDER, GEORGE (1968) ............................................................ Counseling Services

MULLIGAN, PATRICIA A. (1988) ............................................................ Education

MULLIS, RONALD S. (1977) ............................................................ Mechanical Engineering
B.S., California State Polytechnic College, 1969; M.Eng., 1976; Ph.D., Colorado State University, 1983. Associate Professor. Registered Professional Engineer, California.

MUNROE, PATRICK A. (1980) ............................................................ Graphic Communication
MURPHY, JAMES L. (1981) ........................................ Industrial Technology  

MURPHY, NORMAN C. (1976) ........................................ Counseling Services  

MURPHY, PAUL F. (1970) ........................................ Mathematics  
  A.B., Catholic University of America, 1961; M.A., Brooklyn College, 1966; Ph.D., Michigan State University, 1971. Professor.

MURRAY, GEORGE T. (1978) ........................................ Metallurgical and Materials Engineering  
  B.S., University of Kentucky, 1949; M.S., University of Tennessee, 1951; Sc.D., Columbia University, 1958. Professor. Registered Professional Engineer, California.

MURRAY, RANDALL L. (1977) ........................................ Journalism  
  B.S., Ohio University, 1960; M.S., 1961; Ph.D., University of Minnesota, 1973. Professor.

MUSULMAN, RONALD (1987) ........................................ Mechanical Engineering  
  B.S., University of Illinois, 1965; M.S., 1967; Ph.D., 1973. Professor and Department Head. Registered Professional Engineer, Montana.

MYERS, LEONARD D. (1984) ........................................ Computer Science  
  B.S., Illinois State University, 1963; M.S., 1966; Ph.D., University of Kansas, 1977. Professor.

NAFISI, AHMAD (1983) ........................................ Electronic and Electrical Engineering  
  B.S., Arya Mehr University of Technology, Iran, 1975; M.S., University of Southern California, 1977; Ph.D., 1983. Professor.

NAHVI, MAHMOOD (1987) ........................................ Electronic and Electrical Engineering  
  B.S., University of Teheran, 1959; M.S., University of Michigan, 1963; Ph.D., Massachusetts Institute of Technology, 1967. Professor.

NAKAMURA, RAYMOND M. (1980) ........................................ Physical Education and Recreation Administration  
  B.S., Northern Illinois University, 1965; M.S. 1967; M.S., DePaul University, 1980; Ph.D., University of Toledo, 1974. Professor.

NAKAMURA, ROYDEN (1978) ........................................ Biological Sciences  

NARAPREDHY, VIJAYA (1988) ........................................ Management  
  B.Com., Mysore University, India, 1972; M.B.A., 1974; Ph.D., University of Illinois, Urbana-Champaign, 1987. Associate Professor.

NARETTO, EDWARD M. (1979) ........................................ Facilities Administration  
  B.S., California State Polytechnic College, 1967. Director of Plant Operations.

NASH, JAMES H. (1978) ........................................ Student Health Services  
  B.A., Swarthmore College, 1947; M.D., Stanford University, 1953; Internship, U.S. Naval Hospital, Philadelphia; board certified American Board of Family Practice; graduate study, University of San Francisco. Director.

NEEL, PAUL R. (1962) ........................................ Architecture  

NEELANDS, JAMES G. (1957) ........................................ School of Science and Mathematics  
  B.S., California State Polytechnic College, 1956; graduate study, University of Washington. Supervisor of Instructional Support.

NEGRIANI, ROBERT M. (1974) ........................................ Personnel and Employee Relations  
  B.S., San Jose State College, 1967. Staff Personnel Officer.

NELSON, LAWRENCE H. (1972) ........................................ Mechanical Engineering  
  B.S., California Institute of Technology, Pasadena, 1958; M.S., University of California, Davis, 1968; Ph.D., 1972. Professor.

NELSON, LINDEN L. (1970) ........................................ Psychology and Human Development  
  B.A., University of Northern Iowa, 1966; Ph.D., University of California, Los Angeles, 1970. Professor.

NEUBERG, ROD (1978) ........................................ University Union  
  B.S., California State Polytechnic College, 1971; M.A., California Polytechnic State University, San Luis Obispo, 1979. Associate Director, Program Management.

NICOVICH, RALPH R. (1978) ........................................ Information Systems  
  B.S., California Polytechnic State University, 1975; M.S., 1983. Network Engineer, Communications Services.
NIELSEN, KEITH E. (1959) .............................................. Speech Communication

NIKIU, SAEED (1983) ....................................................... Mechanical Engineering
B.S., Tehran Polytechnic University, 1975; M.S., Stanford University, 1976; Ph.D., University of California, Davis, 1982. Professor. Registered Professional Engineer, California.

NILES, PHILIP W.B. (1967) ............................................. Mechanical Engineering
B.S., University of California, 1957; M.S., 1958; additional graduate study, University of California, Los Angeles. Professor. Registered Professional Engineer, California.

NIU, SHIEN HWEI (1969) .................................................. University Library
B.A., National Taiwan University, 1951; M.A., Bucknell University, 1957; additional graduate study, University of Wisconsin; M.A., Indiana University, 1967. Associate Librarian.

NOBLE, WILLIAM E. (1973) ............................................. Ornamental Horticulture
B.S., University of Maryland, 1964; M.S., 1969; Ph.D., University of Florida, 1974. Professor.

NORDQUIST, RAYMOND E. (1964) ........................................... Architecture

NOVAK, MATTHEW S. (1989) .................................................. English
B.A., Cleveland State University, 1976; M.A., 1978; Ph.D., Case Western Reserve University, 1989. Assistant Professor.

NOWATZKI, EDWARD A. (1989) ............................................. Civil and Environmental Engineering
B.S., St. Joseph's College, 1957; B.C.E., Manhattan College, 1962; M.S.C.E., University of Arizona, Tuscon, 1965; Ph.D., 1966. Associate Professor.

NOYES, O. ROBERT (1974) ................................................ Food Science and Nutrition

NULMAN, DENNIS M. (1977) ............................................... Education
B.A., University of San Diego, 1970; M.Ed., 1972; Ph.D., University of Southern California, 1977. Professor.

NUTTER, DAVID E. (1974) ................................................ Accounting

OCHS, NANCY C. (1977) ..................................................... Agribusiness

O’CONNOR, EUGENE L. (1964) ............................................. Business Administration
B.S., St. Louis University, 1957; M.S., 1963. Professor.

OFFERMANN, GENE P. (1970) ............................................. Crop Science
B.S., Southern Illinois University, 1964; M.S., 1965; Ph.D., University of California, Davis, 1970. Professor.

O’KEEFE, TIMOTHY G. (1983) ............................................... Natural Resources Management

OLDS, ALEXIS S. (1988) ..................................................... Speech Communication
B.A., San Jose State College, 1975; M.A., 1980; Ph.D., University of Utah, 1989. Assistant Professor.

OLIVER, S. RONALD (1988) ................................................ Computer Science
B.A., Morningside College, 1970; M.S., University of Kansas, 1975; Ph.D., Colorado State University, 1988. Associate Professor.

O’NEILL, THOMAS D. (1973) ............................................. Mathematics

O’NEILL, GERTRUDIS M. (1972) ......................................... University Library
B.A., Inter-American University, Puerto Rico, 1953; M.F.A., University of Cincinnati, 1962; M.L.S., Western Michigan University, 1967; additional graduate study, Art Academy of Cincinnati. Senior Assistant Librarian.

B.A., University of California, Santa Barbara, 1959; M.A., San Francisco State College, 1963; Ph.D., Claremont Graduate School, 1974. Professor.

ORTZ, MARIA E. (1972) .................................................... Biological Sciences
B.S., Southwest Texas State University, 1968; M.A., 1970; Ph.D., Texas Woman's University, 1973. Professor.

OSBALDESTON, ROGER J. (1972) ............................................. Landscape Architecture
O'TOOLE, FREDERICK J. (1972) ................................................. Philosophy
B.A., University of California, Los Angeles, 1966; M.A., University of California, Davis, 1968; Ph.D., 1972.
Associate Professor.

OZAWA, KENNETH S. (1963) ................................................ Physics
B.S., John Carroll University, 1959; M.S., 1960; Ph.D., University of Kansas, 1975. Professor.

PAGE, P. LANE (1963) ........................................................ University Library
B.A., University of Mississippi; M.S., Louisiana State University, 1963; M.A., California Polytechnic State University,
San Luis Obispo, 1984. Associate Librarian.

PALMER, KENNETH F. (1984) ..................................................... Education
B.S., Iowa State University, 1964; M.S., 1969; Ph.D., 1972. Professor.

PANETTA, DANIEL L. (1986) .................................................... Architecture
B.S., California Polytechnic State University, San Luis Obispo, 1976; M. Arch., University of California, Berkeley,
1986. Associate Professor. Registered Landscape Architect, California.

PANOTRA, PREM P. (1989) ........................................ City and Regional Planning
B.T., Indian Institute of Technology, Delhi, 1974; M.B.A., Indian Institute of Technology, Calcutta, 1976; M.S.,
University of Wisconsin, Madison, 1981; Ph.D., 1988. Assistant Professor.

PAPAKYRIAZIS, ARTEMIS (1982) ................................................ Economics
B.A., Athens School of Political Science, 1962; M.A., University of California, Santa Barbara, 1969; Ph.D.,
University of California, Riverside, 1982. Professor.

PAPAKYRIAZIS, PANAGIOTIS A. (1971) ........................................... Economics
Professor and Department Head.

PARKER, LEE R. (1974) ..................................................... Biological Sciences
B.S., Brigham Young University, 1966; M.S., 1968; Ph.D., Michigan State University, 1976. Professor.

PATTERSON, WILLIAM B. (1977) ................................................... Mechanical Engineering

PAULTZ, ROLAND K. (1959) .......................................... Animal Sciences and Industry
B.S., Oregon State College, 1957; M.S., Oregon State University, 1968. Professor.

PEACH, DAVID (1987) ........................................................ Management

PECK, ROXY L. (1979) ....................................................... Statistics
B.A., University of California, Riverside, 1972; Ph.D., 1979. Professor.

PEDERSEN, MARY E. (1981) .................................................... Food Science and Nutrition
B.A., University of California, Santa Barbara, 1973; M.S., University of California, Los Angeles, 1976; Ph.D., 1980.
Professor.

PENDSE, PRATAPSINHA C. (1966) ........................................................... Biological Sciences
B.S., Bombay University, 1947; M.S., Poona University, 1951; M.S., Utah State University, 1959; Ph.D., 1965.
Professor.

PEREZ, MARINA E. (1975) ................................................... Student Health Services
Nurse Practitioner.

PERLICK, WALTER W. (1979) ................................................... Business Administration
B.S., M.S., Northern Illinois University, 1965; Ph.D., Pennsylvania State University, 1973. Professor.

PERRYMAN, ELIZABETH K. (1972) ................................................... Biological Sciences
B.S., Memphis State University, 1964; M.S., Texas Technological College, 1967; Ph.D., University of Arizona,
1972. Professor.

PETERS, RALPH A. (1969) ............................................. Physics
B.S., Georgetown University, 1949; M.S., Pennsylvania State University, 1951; Ph.D., Fordham University, 1967.
Professor.

PEZO-SILVA, ARMANDO A. (1973) ................................................... Student Academic Services
B.S., California State Polytechnic College, 1970; M.A., California Polytechnic State University, San Luis Obispo,
1974; M.S., 1979. Director.

PFISTER, HENRY L. (1990) .................................................. Industrial Engineering
B.S., Lamar University, 1965; M.S., San Jose State College, 1969; Ph.D., University of Southern California, 1974.
Associate Professor.

PHILLIPS, JOHN C. (1974) .................................................. Crop Science
B.S., Washington State University, 1967; M.S., Colorado State University, 1969; Ph.D., Oregon State University,
1974. Professor.
PHILLIPS, PETER K. (1968) ................................................................. Facilities Administration
B.S., California State Polytechnic College, 1959. Architectural Coordinator.

PIEL, DANIEL D. (1980) ................................................................. Art and Design

PIEPER, JANET L. (1984) ................................................................ Personnel and Employee Relations

PIERCE, DAVID R., JR. (1981) ............................................................ Construction Management

PIETERS, LEON W. (1982) ................................................................. Student Health Services

PIEXTO, DOUGLAS D. (1985) ............................................................. Natural Resources Management
B.S., University of Nevada, Reno, 1970; M.S., Colorado State University, 1971; Ph.D., University of California, Berkeley, 1977. Professor. Registered Professional Forester, California.

B.S., Humboldt State College, 1968; M.S., 1972; Ph.D., Colorado State University, 1976. Professor and Department Head. Registered Professional Forester, California.

PINARD, LEO W., II (1970) ................................................................. Social Sciences

PIPPIN, LOUIS D. (1970) ................................................................. Education

PLUMB, TIMOTHY R. (1981) ............................................................... Natural Resources Management
B.S., Oregon State University, 1954; M.S., University of California, Berkeley, 1959; Ph.D. University of California, Riverside, 1970. Professor. Registered Professional Forester, California.

PLUMMER, WILLIAM E. (1979) ........................................................... Animal Sciences and Industry
B.S., North Carolina State University, 1970; M.S., 1976; Ph.D., Utah State University, 1979. Professor.

POHL, JENS C. (1973) ................................................................. Architecture

POKORN, CORNEL K. E. (1983) ......................................................... Computer Science
M.S., Technical University Vienna, Austria, 1973; Ph.D., 1977. Professor.

POLING, JOHN E. (1976) ................................................................. Physics
B.A., University of Chicago, 1965; M.S., University of Iowa, 1969; Ph.D., 1975. Professor.

POLINSKY, ELLEN B. (1986) ........................................................... Cooperative Education and Placement Services

PONCE, PATRICIA (1988) ................................................................. Student Academic Services

POURAUGHABACHER, A. REZA (1979) ............................................. Industrial Engineering
B.A., University of Colorado, 1972; M.S., University of California, 1973; Ph.D. University of Iowa, 1977. Professor. Certified in Production and Inventory Management (CPIM).

PRESTON, WILLIAM L. (1980) ............................................................ Social Sciences

PRITCHARD, EILEEN ELLEN (1973) .................................................... University Library
B.A., California State College, Chico, 1961; Ph.D., University of Kansas, 1967; M.L., Emporia State University, 1972. Associate Librarian.

PROCTOR, ANDREW J. (1973) ............................................................ Physical Education and Recreation Administration

PROCTOR, CAROLYN (1973) ............................................................. Cooperative Education and Placement Services
B.S., Kansas State University, 1972; M.A., California Polytechnic State University, San Luis Obispo, 1975. Career Placement Adviser.

PUNCHES, GERALD N. (1971) ......................................................... Enrollment Support Services

QUINLAN, CHARLES W. (1966) .......................................................... Architecture
B.Arch., Cornell University, 1959; M.A., University of Sheffield, 1974. Professor. Registered Architect, California.

RAILEY, JIMMY H. (1977) ................................................................. Physical Education and Recreation Administration
B.S., Murray State University, 1957; M.S., Indiana University, 1959; D.P.E., 1969. Professor.
RAINEY, PAUL E. (1987) ............................................... Engineering Technology
B.S.M.E., B.S.Met.E., Purdue University, 1967; M.S., Massachusetts Institute of Technology, 1968; Ph.D., Texas A & M University, 1981. Professor and Department Head. Registered Professional Engineer, Texas.

RAMIREZ, RICHARD M. (1975) ............................................... Business Affairs
B.B.A., New Mexico State University, 1971, Budget Officer.

RANDAZZO, ANTHONY JAMES (1977) ............................................... Industrial Technology

RATHBUN, LARRY P. (1970) ............................................... School of Agriculture
B.S., California State Polytechnic College, 1964; M.A., 1967; Ph.D., Ohio State University, 1974. Professor and Chief of Party, Costa Rica Project.

RAWLINGS, DON (1980) ............................................... Mathematics

REGAN, CYNTHIA L. (1989) ............................................... Home Economics
B.S., California State Polytechnic College, 1970; M.S., University of Wisconsin-Stout, 1985. Assistant Professor.

REGAN, RONALD D. (1977) ............................................... Ornamental Horticulture
B.S., California State Polytechnic College, 1951; M.A., Los Angeles State College, 1959; additional graduate study, University of Southern California. Professor and Department Head.

REGIER, RONALD (1987) ............................................... School of Liberal Arts

REILLY, PETER E. (1987) ............................................... Housing

REYNOLDS, ROBERT G. (1963) ............................................... Art and Design

REYNOSO, WENDY DEMKO (1978) ............................................... Financial Aid

RICE, MARILYNN F. (1977) ............................................... Education
A.B., University of California, Los Angeles, 1960; M.Ed, California State University, Northridge, 1969; Ph.D., University of California, Santa Barbara, 1977. Professor.

RICE, THOMAS J., JR. (1981) ............................................... Soil Science
B.S., University of Wisconsin, Madison, 1974; M.S., Montana State University, 1976; Ph.D., North Carolina State University, 1981. Associate Professor. Certified Professional Soil Scientist.

RICE, WALTER E. (1964) ............................................... Economics

RICH, RITA A. (1985) ............................................... Student Health Services

RICHARDS, THOMAS L. (1969) ............................................... Biological Sciences

B.S., Ohio State University, 1950; M.S., 1954; Ph.D., 1958. Professor.

RIEDLSPERGER, MAX E. (1969) ............................................... History
A.B., Wabash College, 1959; M.A., University of Michigan, 1961; Ph.D., University of Colorado, 1969. Professor and Department Chair.

RIENER, KENNETH D. (1983) ............................................... School of Business
B.S., University of Idaho, 1968; M.S., Purdue University, 1969; Ph.D., 1976. Professor and Associate Dean.

RIFE, WILLIAM C. (1977) ............................................... Chemistry

RIGGINS-PIMENTEL, RHONDA L. (1972) ............................................... Biological Sciences
B.S., Austin Peay State College, 1966; M.S., Iowa State University, 1969; Ph.D., 1972. Professor.

RIHAL, SATWANT S. (1969) ............................................... Architectural Engineering
B.S., University of Delhi, India, 1961; M.S., University of Minnesota, 1964; Ph.D., University of New Mexico, 1969. Professor. Registered Civil Engineer, California.


ROCKMAN, ILENE F. (1975) ................................................. University Library B.A., University of California, Los Angeles, 1972; M.S., University of Southern California, 1974; M.A., California Polytechnic State University, 1978; Ph.D., University of California, Santa Barbara, 1985. Librarian.


ROEST, ARYAN I. (1955) .................................................. Biological Sciences B.S., University of Virginia, 1945; B.S., Oregon State College, 1948; M.S., 1949; Ph.D., 1954. Professor.


ROGERS, JOHN M. (1970) .................................................. Statistics B.S., Marion College, 1962; M.S., Kansas State University, 1966; Ph.D., Virginia Polytechnic Institute and State University, 1975. Associate Professor.


ROSEN, ARTHUR Z. (1953) .................................................. Physics A.B., University of California, 1941; Ph.D., 1952. Professor.


RYAN, L. DIANE (1973) ................................................................. Financial Aid

RYUJIN, DONALD H. (1989) ..................................................... Psychology and Human Development
B.A., Stanford University, 1968; M.A., University of Michigan, 1972; Ph.D., 1983. Assistant Professor.

SAAM, PATRICIA (1966) .......................................................... Food Science and Nutrition
B.S., College of St. Catherine, 1950; M.S., California Polytechnic State University, 1973. Professor. Registered Dietitian.

SABOL, JOSEPH E. (1972) ............................................................ School of Agriculture
B.S., Fresno State College, 1963; M.Ed., University of California, 1965; Ph.D., Colorado State University, 1976. Professor and Interim Associate Dean.

SAENZ, RICHARD A. (1980) ......................................................... Physics
A.B., University of California, Berkeley, 1972; M.S., Cornell University, 1975; Ph.D., 1977. Professor.

SALTZMAN, JUDY D. (1975) ........................................................ Philosophy

SANchez, DAVID J. (1970) ........................................................... Education
B.B.A., University of Texas at El Paso, 1950; graduate study, University of California, Santa Barbara. Associate Professor and Coordinator of Ethnic Studies.

SANDERSON, James D. (1967) .................................................... University Relations

SANDLIN, DORAL R. (1969) .......................................................... Aeronautical Engineering
B.S., U.S. Naval Academy, 1954; M.S., Air Force Institute of Technology; Ph.D., University of Arizona, 1972. Professor and Department Chair.

SCHAFFNER, DAVID J. (1972) ....................................................... Agribusiness
B.S., University of California, Davis, 1964; M.B.A., University of California, Berkeley, 1970; M.S., California Polytechnic State University, San Luis Obispo, 1978; Ph.D., Golden Gate University, 1980. Professor.

SCHNUPP, ALVIN J. (1988) ............................................................ Theatre and Dance
B.S., Millersville State College, 1974; M.A., Bowling Green State University, 1979; Ph.D. University of California, Los Angeles, 1985. Assistant Professor.

SCHLUTZ, NED W. (1976) ........................................................... Psychology and Human Development
B.S., Pennslyvania State University, 1973; M.A., 1975; Ph.D., Ohio State University, 1976. Professor.

SCHUMANN, THOMAS G. (1971) .................................................... Physics

SCOTT, HAZEL J. (1988) ............................................................. Student Affairs

SCOTT, JACK F. (1967) .............................................................. Agribusiness

SCOTT, KENNETH C. (1975) ....................................................... Agribusiness
B.S., Brigham Young University, 1970; Ph.D., Washington State University, 1975. Associate Professor.

SCOTTO, KENNETH C. (1970) ...................................................... Animal Sciences and Industry
B.S., California State Polytechnic College, 1966; M.S., University of Nevada, 1969. Professor.

SCRIVEN, TALMAGE ERNEST (1980) ........................................... Philosophy

SEDELTZKY, MARCEL E. (1972) .................................................... Architecture
Candidate of Architecture Technical University, Graz, Austria, 1949; B.S., University of Cincinnati, 1952; M.Arch., University of California, Berkeley, 1973. Professor. Registered Architect, California.

SEIFODDINI, AHMAD K. (1984) .................................................... Industrial Engineering
B.S., Abadan Institute of Technology, 1965; M.S., Oklahoma State University, 1973; Ph.D., 1976. Professor.

SEIM, EDWIN C. (1978) ............................................................. Crop Science
B.S., University of Missouri, 1954; M.S., University of Minnesota, 1966; Ph.D., 1970. Professor.

SENA, JAMES (1987) ................................................................. Management

SENNETT, ROBERT EARL (1970) ................................................ Civil and Environmental Engineering
B.S., University of Pennsylvania, 1959; M.S., 1961; Ph.D., 1963. Professor. Registered Professional Engineer, California.
SETENCICH, LYLE (1987) ........................................ Intercollegiate Athletics
B.A., Fresno State College, 1968; Head Football Coach.

SETTLE, ALLEN K. (1970) .........................................................................Political Science

B.S., University of Tripoli, 1974; M.S., University of Southern California, 1978; Ph.D., Oregon State University, 1985. Assistant Professor.

SHAFFER, RICHARD A. (1974) ...................................................... Social Sciences

SHAH, RAMESH T. (1969) ..................................................... Mechanical Engineering
B.E., Maharaja Sayajirao University of Baroda, India; Dr. Ing., Hochschule Fur Schwermaschinenbau, Magdeburg, East Germany, 1959. Professor. Registered Professional Engineer, California.

SHANI, ABRAHAM B. (1963) ........................................................ Management
B.A., University of Tel Aviv, 1972; M.A., 1978; Ph.D., Case Western Reserve University, 1981. Professor.

SHANK, CAROLYN B. (1974) .................................................. Physical Education and Recreation Administration
B.S., California State Polytechnic College, 1969; M.S., 1975; Ed.D., University of Utah, 1981. Professor.

SHAPIRO, STEVEN G. (1989) .......................................................... Journalism
B.S., Drexel University, 1967; M.S., Temple University, 1972; Ph.D., 1986. Associate Professor.

SHARP, HARRY, JR. (1975) ...................................................... School of Liberal Arts
A.B., College of the Pacific, 1959; M.S., Purdue University, 1961; Ph.D., 1967. Professor and Interim Associate Dean.

SHEIK, HABIB (1967) .......................................................... English

SHELTON, MARK D. (1982) ...................................................... Crop Science
B.S., University of Idaho, 1977; M.S., Purdue University, 1980; Ph.D., Utah State University, 1989. Associate Professor. Registered Professional Entomologist.

SHIERS, ALDEN F. (1975) ........................................................ Economics
B.S., University of Maine, 1967; Ph.D., University of California, Santa Barbara, 1977. Associate Professor.

SHOCKLEY, STEVEN B. (1985) ........................................ University Relations
B.S., University of Alabama, 1971. Director, Alumni Relations.

SILVESTRI, MICHAEL G. (1978) ............................................ Chemistry
B.S., University of California, Santa Barbara, 1973; Ph.D., University of California, Santa Cruz, 1977. Professor.

SIMEK, JAN W. (1977) ........................................................... Chemistry

SIMMONS, JAMES E. (1966) ........................................................... English
B.A., University of California, Santa Barbara, 1959; M.A., University of Wisconsin, 1960; Ph.D., 1966. Professor.

SIMON, RICHARD K. (1988) ........................................................... English

SINGLETON, DAVID R., CPT. (1988) ............................................ Military Science

SLACK, DARLENE L. (1983) ..................................................... University Relations
B.A., California State College, Northridge, 1969. Director of Publications and Special Events.

SLEM, CHARLES M. (1975) ....................................................... Psychology and Human Development

SMIDT, ROBERT K. (1978) ............................................................. Statistics
B.S., Manhattan College, 1971; M.S., Rutgers University, 1973; Ph.D., University of Wyoming, 1976. Professor.

SMITH, DALE A. (1973) ......................................................... Animal Sciences and Industry

SMITH, DOUGLAS B. (1977) ....................................................... English

SMITH, GERALD L. (1980) ..................................................... Landscape Architecture
B.S., Iowa State University, 1961; M.L.A., University of Illinois, 1968. Professor and Department Head.

B.A., University of Utah, 1967; M.S., Air Force Institute of Technology, 1969; M.S., University of California, Riverside, 1979; Ph.D., 1981. Professor.
SMITH, NELSON L., III (1962) ............................................ Industrial Technology
B.S., Lowell Technological Institute, 1960; M.S., 1962; additional graduate study, University of Iowa. Professor.

SMITH, PATRICK (1976) ..................................................... University Foundation

SMITH, TERRY L. (1980) ...................................................... Soil Science
B.S., University of Nebraska, Lincoln, 1972; M.S., 1975; Ph.D., Iowa State University, 1980. Professor and Department Head.

SNETSINGER, JOHN (1970) ................................................... History
A.B., University of California, Los Angeles, 1963; M.A., University of California, Berkeley, 1966; Ph.D., Stanford University, 1969; additional graduate study, Stanford School of Law. Professor.

SNODGRASS, MARCI (1984) ........................................... Student Life and Activities

SOENEN, LUC A. (1989) .................................................. Business Administration

SOMAYAJI, SHAN (1979) .................................................. Civil and Environmental Engineering
B.E., University of Mysore, 1968; M.Tech., 1974; M.S., South Dakota School of Mines and Technology, 1975; Ph.D., University of Illinois, Chicago, 1979. Professor. Registered Professional Engineer, California.

SOMPPI, SUSAN (1978) ...................................................... Student Academic Services

SORENSEN, DAREL F. (1984) .................................................... Extended Education

SPARLING, SHIRLEY R. (1963) ........................................... Biological Sciences
B.S., Iowa State College, 1950; M.S., 1951; Ph.D., University of California, 1956. Professor.

SOMMER, ROBERT (1989) .................................................. Animal Sciences and Industry
B.S., California State Polytechnic College, 1969; M.S., 1971; Ph.D., Oregon State University, 1974. Professor.

STALEY, CLINTON A. (1988) .................................................. Computer Science
B.A., Principia College, 1980; M.S., University of California, Santa Barbara, 1982; Ph.D., 1987. Associate Professor.

STALLARD, MARY L. (1965) .................................................. Physical Education and Recreation Administration
B.A., Fresno State College, 1957; M.S., University of Washington, 1965; Ph.D., University of Utah, 1974. Professor.

STANSFIELD, WILLIAM D. (1963) ..................................... Biological Sciences
B.S., California State Polytechnic College, 1953; M.A., 1959; M.S., University of California, Davis, 1962; Ph.D., 1963. Professor.

STANTON, GEORGE C. (1981) ........................................... Counseling Services

STARKY, EUGENE E. (1978) .................................................. Dairy Science
B.S., California State Polytechnic College, 1952; M.S., University of Wisconsin, 1954; Ph.D., 1958. Professor and Department Head.

STEARS, DANIEL J. (1986) .................................................. Computer Science
B.S., University of California, 1965; M.S., California Polytechnic State University, San Luis Obispo, 1974. Associate Professor.

STEARS, JOSEPHINE S. (1969) ........................................... Psychology and Human Development
B.A., University of New Hampshire, 1958; M.A., Michigan State University, 1969; Ph.D., Texas Woman’s University, 1982. Professor.


STECHMAN, JOHN V. (1960) .................................................. Animal Sciences and Industry
B.S., University of California, Davis, 1957; M.S., 1960. Professor.

STEINBERG, HOWARD (1970) .................................................. Mathematics
B.M.E., City College of New York, 1950; M.S., New York University Graduate School, 1966; Ph.D., 1969. Professor.

STEWART, PATRICIA A. (1971) ........................................... Learning Assistance Center
STIPICEVICH, JOHN (1985) ................................................................. University Union
B.A., San Jose State University, 1985. Interim Assistant Director of Operations.

STIRLING, JEAN E. (1979) ................................................................. Student Affairs
B.S., California Polytechnic State University, San Luis Obispo, 1989. Assistant Director, Relations with Schools.

STOFFEL, EDWARD O. (1957) ............................................................... Mechanical Engineering

STOKES, CLIFFORD (1988) ................................................................. Animal Sciences and Industry
B.S., Ohio State University, 1975; M.S., 1976; Ph.D., Colorado State University, 1989. Assistant Professor.

STOLTZ, RONALD R. (1990) ................................................................. Landscape Architecture

STOWE, KEITH S. (1971) ................................................................. Physics

STRAHL, RICHARD A. (1985) ............................................................... Engineering Technology
B.S., Michigan Technological University, 1966; M.S., 1969. Associate Professor. Registered Professional Engineer, Ohio.

STRAICKMEIER, H. BERNARD (1970) ....................................................... Mathematics

STROHMAN, ROLLIN D. (1969) ............................................................. Agricultural Engineering
B.S., University of Illinois, 1962; M.S., 1965; Ph.D., Purdue University, 1969. Professor.

STROKMEIER, H. BERNARD (1970) ....................................................... Mathematics

SUHR, MOON JA MINN (1969–71) (1972) ................................................ Theatre and Dance
B.S., Ewha Women's University, Seoul Korea, 1963; M.A., University of Northern Colorado, 1969; Ph.D., Texas Woman's University, 1988. Professor.

SULLIVAN, EDWARD C. (1989) ......................................................... Civil and Environmental Engineering
S.B., Massachusetts Institute of Technology, 1966; S.M., 1967; Ph.D., University of California, Berkeley, 1971. Associate Professor.

SULLIVAN, GERALD J. (1968) ............................................................... English

SUN, CHENG (1989) ................................................................. Electronic and Electrical Engineering
B.S., National Taiwan University, Taiwan, 1958; M.S., Cornell University, 1962; Ph.D., 1965. Professor.

SUTTLE, DALE A. (1973) ................................................................. Landscape Architecture

SWANSON, ROGER M. (1984) ................................................................. Student Affairs

SWEARINGEN, DON E. (1974) ............................................................... Architecture

SWIDERSKI, MICHAEL (1983) ............................................................. Physical Education and Recreation Administration
B.S., University of Southern California, 1972; M.A., 1974; Ph.D., University of Oregon, 1981. Associate Professor.

SYNDOR, WILLIAM E. (1981) ............................................................. Learning Assistance Center
TAKKEN, MEREDITH R. (1976) ................................................................. Financial Aid
Pell Grant Program Manager.

TANDON, SHYAMA (1983) ................................................................. Electronic and Electrical Engineering
B.S., Banaras University, India, 1965; M.S., University of Iowa, 1971; Ph.D., Texas A & M, 1976. Professor.

TARTAGLIA, LAURE CHANTAL (1982) ........................................... Associated Students, Inc.
B.S., California Polytechnic State University, San Luis Obispo, 1982. Assistant Program Coordinator.

TARTAGLIA, RICHARD A. (1959) ..................................................... Facilities Administration
B.S., California State Polytechnic College, 1957. Associate Director of Plant Operations.

TASKEY, RONALD D. (1977) ............................................................. Soil Science
B.S., University of Montana, 1970; M.S., 1972; Ph.D., Oregon State University, 1978. Professor. Certified Profes-
sional Soil Scientist; Certified Professional Soil Erosion and Sediment Control Specialist.

TAYLOR, QUINTARD, JR. (1977) .................................................... History

TELEW, FUAD H. (1960) ................................................................. Economics
B.S., College of Commerce and Economics, Baghdad, Iraq, 1950; M.A., University of Southern California, 1954;

TERRY, RAYMOND D. (1974) .......................................................... Mathematics
B.S., State University of New York, 1966; M.S., Michigan State University, 1968; Ph.D., 1972. Professor.

Professor.

THOMAS, GUY H., JR. (1968) ......................................................... Graphic Communication

THOMAS, JOHN W. (1968) .............................................................. Biological Sciences
B.A., Los Angeles State College, 1957; Ph.D., University of Southern California, Los Angeles, 1968. Professor.

THOMPSON, ROBERT C. (1981) ....................................................... Agribusiness
B.S., California State Polytechnic College, 1969; M.S., University of California, Davis, 1970. Associate Professor.

TICE, RUSSELL L. (1965) ............................................................... Chemistry
B.S., Marshall University, 1960; Ph.D., University of California, Los Angeles, 1965. Professor.

TIPPO, RAY E. (1986) ................................................................. Journalism
B.A., Yale University, 1960; M.A., University of Oregon, 1972. Associate Professor.

TONG, PHILLIP S. (1988) ............................................................... Dairy Science
B.S., University of California, Davis, 1977; M.S., Cornell University, 1982; Ph.D., 1986. Research Scientist.

TORRES, EVELYN M. (1989) .......................................................... English
Assistant Professor.

TORRES, LUIS A. (1989) ............................................................... English
B.A., University of Colorado, 1972; M.A., University of Washington, 1974; Ph.D., 1989. Assistant Professor.

TOWNSEND, NEAL R. (1965) .......................................................... Mathematics
B.S., Wisconsin State College, 1953; M.A., San Diego State College, 1961; Ph.D., Purdue University, 1972.
Professor.

TROY, BERNARD A. (1970) .............................................................. Education
B.A., University of Notre Dame, 1957; S.T.L., Universidad Catholica de Chile, 1961; M.A., University of Notre
Dame, 1965; Ph.D., University of Southern California, 1974; Fulbright Fellow, Ministry of Education, Montevideo,
Uruguay. Professor.

TRYON, BETTE W. (1976) .............................................................. Psychology and Human Development
B.S., University of Maryland, 1966; M.S., 1973; Ph.D., Syracuse University, 1976. Professor.

TRYON, WALTER M. (1976) .......................................................... Landscape Architecture

LL.B., National Taiwan University, 1950; LL.M. Southern Methodist University, 1957; B.S., Illinois Institute of
Technology, 1964; M.S., 1966; Ph.D., Southern Methodist University, 1978. Professor. Registered Professional
Engineer, Texas.

B.A., Buena Vista College, 1982; M.S., Iowa State University, 1984. Assistant Professor.

URISTA, ALBERTO (ALURISTA) (1986) .......................................... Foreign Languages
Professor.
VANCE, ROBERT D. (1972) .......................................... Food Science and Nutrition
B.S., Brigham Young University, 1966; M.S., Ohio State University, 1968; Ph.D., 1971. Professor.

VAN EPS, JOHN (1974) ............................................. Mathematics

VAN WYNGAARDEN, WILLEM L. (1965) ..................................... Physics
B.S., McMaster University, 1961; M.S., University of Manitoba, 1964; Ph.D., Louisiana State University and A & M College, 1975. Professor.

VELASQUEZ, GLORIA (1985) .......................................................... Foreign Languages

VIGIL, SAMUEL A. (1982) ...................................................... Civil and Environmental Engineering
B.S., University of California, Berkeley, 1969; M.S., Texas A & M University, 1974; Ph.D., University of California, Davis, 1981. Professor. Registered Professional Engineer, California.

VILKITIS, JAMES R. (1980) .......................................................... Natural Resources Management
B.S., Michigan State University, 1965; M.S., University of Idaho, 1968; Ph.D., University of Massachusetts, 1970; additional graduate study 1973-74. Professor.

VILLEGAS, DANIEL J. (1987) .......................................................... Economics
B.S., University of Southern California, Los Angeles, 1972; A.M., Stanford University, 1975; Ph.D., 1979. Assistant Professor.

VIX, MARLIN DALE (1977) ............................................................ Agribusiness
B.S., San Jose State College, 1968; M.S., California Polytechnic State University, San Luis Obispo, 1977. Assistant Professor.

VOLLMER, HOWARD M. (1982) ..................................................... Extended Education
B.A., Stanford University, 1950; M.A., 1951; Ph.D., University of California, Berkeley, 1959. Director, Extended Education.

VOSS, LARRY R. (1968) ............................................................. University Relations
B.A., Sacramento State College, 1956; graduate study, Sacramento State College, California State College at Los Angeles. Associate Vice President.

WADDELL, JOSEPH JAMES (1976) ..................................................... University Library

WALCH, DAVID B. (1980) ............................................................... University Library

WALKER, HOWARD D. (1957) ............................................................ Chemistry
B.A., New York University, 1947; M.S., 1948; Ph.D., University of California, Los Angeles, 1955. Professor.

WALKER, KENDRICK W. (1973) .......................................................... Intercollegiate Athletics
B.A., University of Southern California, 1965; M.A. 1969; Ph.D., 1974. Associate Professor and Director.

WALKER, ROBERT E. (1983) .............................................................. Agricultural Engineering
B.S., California State Polytechnic College, 1968; M.S., Utah State University, 1978. Professor. Registered Professional Engineer, Colorado.

WALL, LEONARD W. (1969) ............................................................ Physics
B.S., Louisiana Tech University, 1963; Ph.D., Iowa State University, 1969. Professor.

WALL, MATTHIAS R. (1976) ............................................................. Construction Management

WALLACE, WILLIAM CARL (1970) .................................................... Student Affairs
B.S., California State Polytechnic College, 1967; California Polytechnic State University, San Luis Obispo, M.A., 1973; additional graduate study, University of California, Santa Barbara. Associate Dean.

WALLER, JULIA R. (1983) ................................................................. Financial Aid

WALSH, DANIEL W. (1986) ............................................................. School of Engineering
B.S., Rensselaer Polytechnic Institute, 1973; M.S., 1976; Ph.D., 1985. Professor and Associate Dean.

WALTER, VIRGINIA R. (1974) ...................................................... Ornamental Horticulture
B.S., Ohio State University, 1970; M.S., 1972. Professor.

WALTERS, DIRK R. (1969) .............................................................. Biological Sciences
B.S., Western Illinois University, 1965; M.A., Indiana University, 1966; Ph.D., 1969. Professor.

WALTERS, KARLA K. (1987) ............................................................. English
WALTERS, KENNETH D. (1983) ............................................................. School of Business

WALTERS, ROBERT W. (1970) ............................................................. Student Life and Activities

WARFIELD, DAVID L. (1975) ............................................................. Crop Science

WARREN, RICHARD L. (1981) ............................................................. Education
B.A., Harvard University, 1947; M.A., Peabody College for Teachers, 1950; Ph.D., Stanford University, 1966. Professor and Department Head.

WARSHAW, PAUL R. (1989) ............................................................. Business Administration

WASSEL, GUSTAV N. (1980) ............................................................. Electronic and Electrical Engineering

WATERBURY, ARCHIE M. (1973) .......................................................... Biological Sciences

WEATHERBY, JOSEPH N., JR. (1968) .................................................... Political Science
B.A., Baylor University, 1958; B.F.T., American Institute for Foreign Trade, 1961; M.A., Baylor University, 1962; Ph.D., University of Utah, 1968; additional graduate study, Baldwin Wallace College, Ohio; Hamline University, Minnesota; American University, Cairo; Cambridge University. Professor.

WEATHERFORD, ALAN M. (1986) ........................................................ Business Administration
B.A., Louisiana State University, 1969; A.D., Northwestern State University, 1977; M.B.A., University of Dallas, 1981; Ph.D., The University of Texas, Dallas, 1985. Associate Professor.

WEBB, JAMES L. (1969) ................................................................. Physical Education and Recreation Administration

WEBER, BARBARA P. (1966) .......................................................... Home Economics
B.S., University of Nevada, 1951; M.A., California State Polytechnic College, 1968; additional graduate study, University of Nevada, California Polytechnic State University, Oregon State University. Professor and Department Head.

WEBRE, NEIL W. (1969) ................................................................. Computer Science
B.S., Louisiana State University, 1969; A.M., Harvard University, 1968; additional graduate study, Columbia University, University of Munich. Professor.

WEINSTEIN, STEPHEN T. (1969) ..................................................... Mathematics

WEISENTHAL, HOWARD (1984) ...................................................... Architecture

WENZL, MICHAEL J. (1969) ............................................................. English
B.A., University of Oregon, 1961; M.A., 1965; Ph.D., University of New Mexico, 1969; postdoctoral study, University of California, Berkeley. Professor.

WESSELS, HENRY (1970) ............................................................... Art and Design
B.S., Northern Illinois University, 1957; M.F.A., University of Southern California, 1970. Professor.

WEST, HOWARD (1959) ................................................................. Office of the President

WESTOVER, JAMES D. (1971) .......................................................... Chemistry

WHALEY, GLENN V. (1963) ............................................................. University Library

WHALEY, RUSSELL G. (1982) ........................................................ Theatre and Dance
B.A., Emerson College, 1950; graduate study, Yale University. Professor.

WHEATLEY, JO ANN C. (1980) ......................................................... Crop Science
B.A., Southeastern Louisiana University, 1961; M.S., California Polytechnic State University, 1978; additional graduate study, Louisiana State University. Professor.

WHEATLEY, PATRICK O. (1970) ......................................................... Computer Science
B.A., St. Mary's Seminary, 1956; M.S., University of Chicago, 1963; Ph.D., University of Houston, 1970. Professor.

WHEELER, MARYLINDA (1975) ......................................................... Physical Education and Recreation Administration
WHEELER, ROBERT R. (1961) ................................................................. Animal Sciences and Industry
B.S., Colorado State University, 1952; M.S., 1955; Ph.D., Oregon State University, 1962. Professor.

WILSON, J ACK D. (1976) ................................................................. Mechanical Engineering

WILLIAMS, DOUGLAS W. (1983) ......................................................... Agricultural Engineering
WILLIAMS, BRIAN K. (1985) ................................................................. University Library
WILK, EDWARD A. (1966) ................................................................. University Library
WIGHT, HEWITT C. (1952) ................................................................. Chemistry
WHITEFORD, MARY A. (1982) ............................................................. Academic Programs
WHITE, DONALD E. (1987) ................................................................. Industrial Engineering
WHEELER, ROBERT R. (1961) ................................................................. Animal Sciences and Industry
WILVERT, CALVIN H. (1973) ................................................................. Social Sciences
WILT, PETER J. (1983) ................................................................. Theatre
WILSON, WALTER D. (1969) ................................................................. Physics
WILBERT, CALVIN H. (1973) ................................................................. Social Sciences
WINEBRENNER, TERRENCE C. (1983) ................................................................. Speech Communication
WINGER, DONLEY J. (1963) ................................................................. Electronic and Electrical Engineering
WOLF, LAWRENCE J. (1970) ................................................................. Financial Aid
WOLF, ROBERT S. (1975) ................................................................. Mathematics
WOLLMAN, MICHAEL T. (1982) ................................................................. Electronic and Electrical Engineering
WOLFF, PAUL (1971) ................................................................. Architecture
WOLF, ROBERT S. (1975) ................................................................. Mathematics
WOOLARD, DONALD S. (1986) ................................................................. Architecture
WOOTEN, RUDY A. (1977) ................................................................. Food Science and Nutrition
WU, SING-CHOU (1969) .......................................................... Statistics
B.A., National Taiwan University, 1959; M.S., Utah State University, 1966; Ph.D., Colorado State University, 1970. Professor.

WYSOCK, RAYMOND ANTHONY (1970) .......................................................... Industrial Technology

YAMADA, KERRY T. (1981) .......................................................... Counseling Services
B.A., Dakota Wesleyan University, 1952; M.A., University of South Dakota, 1960; Ph.D., Ottawa University, Canada, 1968. Director.

YANG, ALAN I. (1981) .......................................................... Student Affairs
B.A., University of Hawaii, 1972; M.A., 1976; Ph.D., 1981. Associate Vice President.

YANG, DAVID J. (1972) .......................................................... Information Systems

YANG, TAO H. (1987) .......................................................... Industrial Engineering
B.S., Tunghai University, Taiwan, 1978; M.S., San Jose State University, 1982; Ph.D., Arizona State University, 1987. Associate Professor.

YEH, CHUAN-SUNG (1970) .......................................................... Electronic and Electrical Engineering
B.S., Naval College of Technology, Taiwan, 1953; M.S., National Chiayi-Tung University, Taiwan, 1964; M.E., McMaster University, Canada, 1966; Ph.D., 1969. Professor.

YIP, CHRISTOPHER L. (1988) .......................................................... Architecture

YONEDA, STEVEN H. (1972) .......................................................... Intercollegiate Athletics

YONG, YUEN-CJEN (1978) .......................................................... Mechanical Engineering

YORK, MARILYN R. (1975) .......................................................... Graduate Studies, Research and Faculty Development
B.S., California Polytechnic State University, San Luis Obispo, 1974; M.A., 1981. Coordinator, Graduate Student Services and International Programs.

YOSHIMURA, MICHAEL A. (1975) .......................................................... Biological Sciences

ZAMMIT, RONALD E. (1986) .......................................................... Physics
B.S., Louisiana State University, 1969; M.S., Purdue University, 1971; Ph.D., 1975. Professor.

ZAREK, DAVID S. (1971) .......................................................... Student Health Services

ZAYED, AHMED I. (1980) .......................................................... Mathematics
B.S., Cairo University, 1970; M.S., 1974; Ph.D., University of Wisconsin, 1979. Professor.

ZETZSCHE, JAMES B., JR. (1968) .......................................................... Agricultural Engineering
B.S., Texas Technological College, 1962; M.S., 1967. Professor. Registered Agricultural Engineer, California.

ZEUSCHNER, RAYMOND F. (1980) .......................................................... Speech Communication

ZIA, OMAR (1988) .......................................................... Engineering Technology
B.S.E.E., Warsaw Technical University, Poland, 1966; M.S.E.E., 1968; Ph.D., 1972. Associate Professor.

ZOHNS, MARK A. (1986) .......................................................... Agricultural Engineering
B.S., California Polytechnic State University, 1981; M.S., University of California, Davis, 1983; Ph.D., 1986. Associate Professor.

ZOHNS, MICHAEL D. (1974) .......................................................... Ornamental Horticulture
B.S., California Polytechnic State University, San Luis Obispo, 1972; M.S., 1975. Professor.

ZUUR, THOMAS L. (1981) .......................................................... Information Systems

ZWEIFEL, K. RICHARD (1972) .......................................................... School of Architecture and Environmental Design
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PRIVACY RIGHTS OF STUDENTS IN EDUCATION RECORDS

The federal Family Educational Rights and Privacy Act of 1974 (20 U.S.C. 1232g) and regulations adopted thereunder (34 C.F.R. 99) and California Education Code Section 67100 et seq., set out requirements designed to protect the privacy of students concerning their records maintained by the campus. Specifically, the statute and regulations govern access to student records maintained by the campus, and the release of such records. In brief, the law provides that the campus must provide students access to records directly related to the student and an opportunity for a hearing to challenge such records on the grounds that they are inaccurate, misleading or otherwise inappropriate. The right to a hearing under the law does not include any right to challenge the appropriateness of a grade as determined by the instructor. The law generally requires that written consent of the student be received before releasing personally identifiable data about the student from records to other than a specified list of exceptions. The institution has adopted a set of policies and procedures concerning implementation of the statutes and the regulations on the campus. Copies of these policies and procedures may be obtained at the Judicial Affairs Office. Among the types of information included in the campus statement of policies and procedures are: 1) the types of student records and the information contained therein; 2) the official responsible for the maintenance of each type of record; 3) the location of access lists which indicate persons requesting or receiving information from the record; 4) policies for reviewing and expunging records; 5) the access rights of students; 6) the procedures for challenging the content of student records; 7) the cost which will be charged for reproducing copies of records; and 8) the right of the student to file a complaint with the Department of Education. An office and review board have been established by the Department to investigate and adjudicate violations and complaints. The office designated for this purpose is: The Family Educational Rights and Privacy Act Office (FERPA), U.S. Department of Education, 330 "C" Street, Room 4511, Washington, D.C. 20202.

The campus is authorized under the Act to release "directory information" concerning students. "Directory information" includes the student's name, address, telephone listing, date and place of birth, major field of study, participation in officially recognized activities and sports, weight and height of members of athletic teams, dates of attendance, degrees and awards received, and the most recent previous educational agency or institution attended by the student. The above designated information is subject to release by the campus at any time unless the campus has received prior written objection from the student specifying information which the student requests not be released. Written objections should be sent to the Director, Judicial Affairs.
The campus is authorized to provide access to student records to campus officials and employees who have legitimate educational interests in such access. These persons are those who have responsibilities in connection with the campus' academic, administrative or service functions and who have reason for using student records connected with their campus or other related academic responsibilities.

USE OF SOCIAL SECURITY NUMBER

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

CAREER PLACEMENT

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

STUDENT DISCIPLINE

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

Article 1.1, Title 5, California Administrative Code

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

(a) Cheating or plagiarism in connection with an academic program at a campus.

(b) Forgery, alteration or misuse of campus documents, records, or identification or of knowingly furnishing false information to a campus.

(c) Misrepresentation of oneself or of an organization to be an agent of a campus.

(d) Obstruction or disruption, on or off campus property, of the campus educational process, administrative process, or other campus function.

(e) Physical abuse on or off campus property of the person or property of any member of the campus community or of members of his or her family or the threat of such physical abuse.

(f) Theft, of, or non-accidental damage to, campus property, or property in the possession of, or owned by, a member of the campus community.

(g) Unauthorized entry into, unauthorized use of, or misuse of campus property.

(h) On campus property, the sale or knowing possession of dangerous drugs, restricted dangerous drugs, or narcotics as those terms are used in California statutes, except when lawfully prescribed pursuant to medical or dental care, or when lawfully permitted for the purpose of research, instruction or analysis.

(i) Knowing possession or use of explosives, dangerous chemicals or deadly weapons on campus property or at a campus function without prior authorization of the campus president.

(j) Engaging in lewd, indecent, or obscene behavior on campus property or at a campus function.

(k) Abusive behavior directed toward, or hazing of, a member of the campus community.
(I) Violation of any order of a campus president, notice of which had been given prior to such violation and during the academic term in which the violation occurs, either by publication in the campus newspaper, or by posting on an official bulletin board designated for this purpose, and which order is not inconsistent with any of the other provisions of this Section.

(m) Soliciting or assisting another to do any act which would subject a student to expulsion, suspension or probation pursuant to this Section.

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

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

(2) The term "campus property" includes:

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

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

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

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

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

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

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

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

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

The President may immediately impose an interim suspension in all cases in which there is reasonable cause to believe that such an immediate suspension is required in order to protect lives or property and to insure the maintenance of order. A student so placed on interim suspension shall be given prompt notice of charges and the opportunity for a hearing within 10 days of the imposition of interim suspension. During the period of interim suspension, the student shall not, without prior written permission of the President or designated representative, enter any campus of the California State University and Colleges other than to attend the hearing. Violation of any condition of interim suspension shall be grounds for expulsion.
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41303. **Conduct by Applicants for Admission.** Notwithstanding any provision in this Chapter 1 to the contrary, admission or readmission may be qualified or denied to any person who, while not enrolled as a student, commits acts which, were he enrolled as a student, would be the basis for disciplinary proceedings pursuant to Sections 41301 or 41302. Admission or readmission may be qualified or denied to any person who, while a student, commits acts which are subject to disciplinary action pursuant to Section 41301 or Section 41302. Qualified admission or denial of admission in such cases shall be determined under procedures adopted pursuant to Section 41304.

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

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

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

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

**INSTITUTIONAL AND FINANCIAL ASSISTANCE**

The following information concerning student financial assistance may be obtained from the Director, Financial Aid, Administration 213, 756-2927:

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

The following information concerning the cost of attending Cal Poly is available from the Director, Financial Aid, Administration 213, 756-2927:

1. fees and tuition (where applicable);
2. estimated costs of books and supplies;
3. estimates of typical student room and board costs or typical commuting costs;
4. any additional costs of the program in which the student is enrolled or expresses a specific interest.

Information concerning the refund policy of Cal Poly for the return of unearned tuition and fees or other refundable portions of costs is available from the Registrar, Administration 219, 756-2541.
Information concerning the academic programs of Cal Poly may be obtained from the Vice President for Academic Affairs, Administration 305, 756-2186. This information may include:

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

Information regarding special facilities and services available to handicapped students may be obtained from Disabled Student Services, University Union 202, 756-1395.

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

The 20 campuses and the Chancellor’s Office of The California State University are financed primarily through funding provided by the taxpayers of California. The total State appropriation to the CSU for 1989-90, including capital outlay and employee compensation increases, is $1,831,731,000. The total cost of education for CSU, however, is $2,023,455,068 which provides support for a projected 267,380 full-time equivalent (FTE) students.

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

Thus, excluding costs which relate to capital outlay (i.e., building amortization), the average cost of education per FTE student is $7,568. Of this amount, the average student fee support per FTE is $1,106. The calculation for this latter amount includes the amount paid by nonresident students.

Source of Funds and Average Costs for 1989/90 CSU Budget
(Projected Enrollment: 267,380 FTE)

<table>
<thead>
<tr>
<th>Source of Funds</th>
<th>Amount</th>
<th>Average Cost Per Student (FTE)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Cost of Education</td>
<td>$2,023,455,068</td>
<td>$7,568</td>
<td>100.0</td>
</tr>
<tr>
<td>State Appropriation</td>
<td>$1,644,823,000</td>
<td>$6,152</td>
<td>81.0</td>
</tr>
<tr>
<td>Student Fee Support</td>
<td>$295,759,156</td>
<td>$1,106</td>
<td>15.0</td>
</tr>
<tr>
<td>Support from Other Sources</td>
<td>$82,872,912</td>
<td>$310</td>
<td>4.0</td>
</tr>
</tbody>
</table>

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

\[b\] The estimated replacement cost of all the system’s permanent facilities and equipment on the 20 campuses is currently valued at $6.5 billion, excluding the cost of land.

\[c\] This figure does not include the capital outlay appropriation of $186,908,000.

\[d\] The average costs paid by a student include the State University Fee, Student Services Fee, Application Fee, and Nonresident Tuition. Individual students may pay less than $1,106 depending on whether they are part-time, full-time, resident or nonresident students.
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