The natural rock formation in 1903, with almost no surrounding vegetation, and a peek of the original Administration Building, giving a hint of a campus that had just opened with 15 students enrolled. A special thanks to the family of Oscar Leslie Heald, the first teacher hired at Cal Poly, for donating this photo.

The same rock formation in 1993 with the new Business Building in the background. It is a park-like setting with a fountain, pond, trees and benches, offering a wonderful study-spot. Photo by Doug Allen.

Cover:
"CAL POLY REMEMBRANCE POND"
In Memory of Wilbur (Ted) Howes
Watercolor 20" x 26 1/2"
March 1994
by Robert Reynolds

ROBERT REYNOLDS, Professor, Cal Poly Art and Design Department.
His paintings are in public and private collections throughout the United States. He is a past recipient of the university's Distinguished Teaching Award and was honored in 1993 with the University President's Art Award. His recently released book, Painting Nature's Peaceful Places (North Light Books) is filled with Reynolds' watercolors celebrating his keen vision of nature's special places. Reynolds' work is represented in California by Visions Art Gallery, Morro Bay; the New Masters Gallery, Carmel; and Galerie Iona, Stockton.

CAL POLY REMEMBRANCE POND
The pond was created at the base of the rock formation in the mid-1930's. In 1953, the pond and surrounding area were dedicated in memory of Ted Howes. Camellias and other shrubs were donated by the California Nurserymen's Association. Students from the OH Club volunteered to do the planting and construction.

WILBUR (TED) HOWES, Cal Poly Ornamental Horticulture, department head and instructor (1932-1952). In 1940, Ted was named the first OH department head. He was helpful and inspirational to both Cal Poly students and to California agricultural teachers. Special thanks to Howard C. Brown, OH (1943-1983), for sharing his knowledge of the Pond and Ted Howes.

DOUG ALLEN, 1991 Cal Poly graduate, Art and Design, Photography Concentration, produced many of the photos shown in this catalog. Doug is a former staff photographer at Hearst Castle.
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THE CATALOG

Copies of the Catalog may be purchased at El Corral Bookstore. The price per copy is $9.15. To order by mail, please call 805-756-1101 or 800-367-0771. The quarterly Class Schedule is also available at El Corral Bookstore.

The Catalog is prepared in the office of the Associate Vice President for Academic Affairs, Dr. Glenn Irvin. The catalog coordinator is Mary Whiteford. The catalog assistant is Kay Jensen.

Photos by Doug Allen, Joe Codispoti, Stephen Hughes, Rod Neubert, Ray Sanchez and Marty Sconduto.

Special thanks to Ginny Monteen, Editor, Cal Poly Today, for sharing photographs and information, and to Fred Relyea, Office of the State Printer, for his patience and expertise.

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# TABLE OF CONTENTS

## INTRODUCING CAL POLY
- The Program ........................................ 7
- The Place .......................................... 11
- The History ........................................ 13

## Guide to Using the Catalog .......................... 17

## The Program .......................................... 7

## The Place .......................................... 72

## General Requirements for the Bachelor's Degree .. 73

## SPECIAL PROGRAMS AND RESOURCES .............. 36
- Alumni Association .................................. 36
- Computing at Cal Poly .............................. 36
- Conferences and Workshops ........................ 37
- Continuing Education in Agriculture .............. 37
- Extended Education ................................ 37
- The Foundation ..................................... 37
- Health Sciences—Preprofessional Preparation .... 38
- Research and Project Involvement .................. 40
- Robert E. Kennedy Library ......................... 40
- Services to Vocational Agriculture ............... 41
- Study Abroad Programs ................................ 41
- Teacher Preparation Programs ..................... 42
- University Development ................................ 43

## STUDENT ACTIVITIES AND SERVICES .......... 45
- Student Activities .................................. 45
  - Associated Students, Inc. ......................... 45
  - Campus Organizations ............................. 45
  - Children's Center ................................ 45
  - Craft Center ...................................... 45
  - Escape Route ..................................... 45
  - Fraternities and Sororities ....................... 45
  - Galerie ........................................... 46
  - Multicultural Center ................................ 46
  - Program Board ..................................... 46
  - Recreational Sports ................................ 46
  - Rose Float ........................................ 47
  - Students Serving in the Community ............... 47
  - Travel Center ..................................... 47
  - The University Union ................................ 47
  - Week of Welcome .................................. 47
  - Women's Programs and Services ................... 48

## Student Services .................................. 48
- Career Services ..................................... 48
- Food Service ........................................ 49

## Health Services .................................... 49

## Residential Life and Education .................... 49

## Psychological Services ............................. 50

## Student Academic Services .......................... 50

## Intercollegiate Athletics Department ............. 52

## ADMISSIONS .......................................... 54
- Undergraduate Application Procedures ............ 54
  - The Admission Process .................................. 54

## Undergraduate Admission Requirements ............ 55
- Freshman Requirements ................................ 55
- Transfer Requirements ................................ 56
- Test Requirements .................................. 57

## Other Admissions Information ........................ 57
- Returning Students .................................. 57
- Adult Students ...................................... 57
- High School Students ................................ 57
- International (Foreign) Student General .... 57
- Admission Requirements ................................ 57
- Determination of Residence for Nonresident .... 57
  - Tuition Purposes .................................. 57

## FEES, EXPENSES AND FINANCIAL AID ............ 61
- Fees and Expenses .................................. 61
  - State University Fee ................................ 61
  - Schedule of Fees .................................. 61
  - Duplicate Degree Tuition ......................... 61
  - Refund of Fees ................................... 62
  - Debts Owed to the University ..................... 62
  - Credit Cards ....................................... 62
  - Procedure for the Establishment of a Student ... 62
  - Body Fee ........................................... 62

## Financial Aid ....................................... 63
- Typical Student Expenses .......................... 63
- Alan Pattee Scholarships ............................ 63
- University Scholarships ............................ 63
- Scholarships ......................................... 64
- Loans ................................................ 67
- Grants ................................................ 68
- State Aid to the Physically Handicapped .......... 68

## ACADEMIC REQUIREMENTS AND POLICIES ........ 70
- Academic Placement .................................. 70
  - English Placement Test (EPT) ...................... 70
  - Entry Level Mathematics (ELM) Exam ............. 70
  - Cal Poly Mathematics Placement Exam (MAPE) ... 71
  - Evaluation of Transfer Credit .................... 71
  - Other Academic Credit ................................ 71
  - Student Classification ............................. 72

## General Requirements for the Bachelor's Degree .. 73
- Choice of Catalog .................................... 73
- General Graduation Requirements .................... 73
- Graduation Requirement in Writing Proficiency ... 74
- Curriculum Substitution ................................ 74
- Change of Major ...................................... 74
- Double Majors ....................................... 74
- Second Bachelor's Degree ............................ 74
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduate Credit Taken by Undergraduates</td>
<td>75</td>
</tr>
<tr>
<td>Honors</td>
<td>75</td>
</tr>
<tr>
<td>Minors</td>
<td>75</td>
</tr>
<tr>
<td>Commencement</td>
<td>75</td>
</tr>
<tr>
<td>U.S. Cultural Pluralism</td>
<td>76</td>
</tr>
<tr>
<td>General Education and Breadth</td>
<td>77</td>
</tr>
<tr>
<td>Registration</td>
<td>81</td>
</tr>
<tr>
<td>Class Attendance</td>
<td>81</td>
</tr>
<tr>
<td>Holding of Records</td>
<td>81</td>
</tr>
<tr>
<td>Enrollment Status</td>
<td>81</td>
</tr>
<tr>
<td>Maximum Unit Load</td>
<td>81</td>
</tr>
<tr>
<td>Add/Drop</td>
<td>81</td>
</tr>
<tr>
<td>Leaves of Absence</td>
<td>81</td>
</tr>
<tr>
<td>Returning Students</td>
<td>82</td>
</tr>
<tr>
<td>Health Screening</td>
<td>82</td>
</tr>
<tr>
<td>Grading</td>
<td>83</td>
</tr>
<tr>
<td>Grading Symbols</td>
<td>83</td>
</tr>
<tr>
<td>Credit/No Credit Grading</td>
<td>83</td>
</tr>
<tr>
<td>Administrative Grading Symbols</td>
<td>83</td>
</tr>
<tr>
<td>Repeating a Course</td>
<td>84</td>
</tr>
<tr>
<td>Withdrawals / Renewal</td>
<td>85</td>
</tr>
<tr>
<td>Academic Standards</td>
<td>85</td>
</tr>
<tr>
<td>Academic Obligations</td>
<td>85</td>
</tr>
<tr>
<td>Academic Probation and Disqualification</td>
<td>86</td>
</tr>
<tr>
<td>Administrative-Academic Probation or Disqualification</td>
<td>86</td>
</tr>
<tr>
<td>Eligibility for Intercollegiate Athletics</td>
<td>86</td>
</tr>
<tr>
<td>Eligibility for Student Activities</td>
<td>87</td>
</tr>
<tr>
<td>Student Grievance, Conduct, Discipline</td>
<td>87</td>
</tr>
<tr>
<td>GRADUATE PROGRAMS</td>
<td>89</td>
</tr>
<tr>
<td>Admission</td>
<td>89</td>
</tr>
<tr>
<td>Academic Requirements and Responsibilities</td>
<td>92</td>
</tr>
<tr>
<td>General Policies Governing Graduate Studies</td>
<td>92</td>
</tr>
<tr>
<td>COLLEGE OF AGRICULTURE</td>
<td>98</td>
</tr>
<tr>
<td>Departments:</td>
<td></td>
</tr>
<tr>
<td>Agribusiness</td>
<td>104</td>
</tr>
<tr>
<td>Agricultural Education</td>
<td>107</td>
</tr>
<tr>
<td>Agricultural Engineering</td>
<td>110</td>
</tr>
<tr>
<td>Animal Science</td>
<td>115</td>
</tr>
<tr>
<td>Crop Science</td>
<td>117</td>
</tr>
<tr>
<td>Dairy Science</td>
<td>122</td>
</tr>
<tr>
<td>Food Science and Nutrition</td>
<td>124</td>
</tr>
<tr>
<td>Military Science</td>
<td>129</td>
</tr>
<tr>
<td>Natural Resources Management</td>
<td>131</td>
</tr>
<tr>
<td>Ornamental Horticulture</td>
<td>137</td>
</tr>
<tr>
<td>Soil Science</td>
<td>139</td>
</tr>
<tr>
<td>COLLEGE OF ARCHITECTURE AND ENVIRONMENTAL DESIGN</td>
<td>143</td>
</tr>
<tr>
<td>Departments:</td>
<td></td>
</tr>
<tr>
<td>Architectural Engineering</td>
<td>144</td>
</tr>
<tr>
<td>Architecture</td>
<td>146</td>
</tr>
<tr>
<td>City and Regional Planning</td>
<td>150</td>
</tr>
<tr>
<td>Construction Management</td>
<td>154</td>
</tr>
<tr>
<td>Landscape Architecture</td>
<td>156</td>
</tr>
<tr>
<td>COLLEGE OF BUSINESS</td>
<td>160</td>
</tr>
<tr>
<td>Departments:</td>
<td></td>
</tr>
<tr>
<td>Accounting</td>
<td>165</td>
</tr>
<tr>
<td>Business Administration</td>
<td>167</td>
</tr>
<tr>
<td>Economics</td>
<td>169</td>
</tr>
<tr>
<td>Industrial Technology</td>
<td>172</td>
</tr>
<tr>
<td>Management</td>
<td>176</td>
</tr>
<tr>
<td>COLLEGE OF ENGINEERING</td>
<td>180</td>
</tr>
<tr>
<td>Departments:</td>
<td></td>
</tr>
<tr>
<td>Aeronautical Engineering</td>
<td>188</td>
</tr>
<tr>
<td>Civil and Environmental Engineering</td>
<td>193</td>
</tr>
<tr>
<td>Computer Engineering</td>
<td>200</td>
</tr>
<tr>
<td>Computer Science</td>
<td>203</td>
</tr>
<tr>
<td>Electronic and Electrical Engineering</td>
<td>208</td>
</tr>
<tr>
<td>Engineering Science</td>
<td>212</td>
</tr>
<tr>
<td>Industrial and Manufacturing Engineering</td>
<td>215</td>
</tr>
<tr>
<td>Materials Engineering</td>
<td>221</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>224</td>
</tr>
<tr>
<td>COLLEGE OF LIBERAL ARTS</td>
<td>228</td>
</tr>
<tr>
<td>Women's Studies</td>
<td>230</td>
</tr>
<tr>
<td>Departments:</td>
<td></td>
</tr>
<tr>
<td>Art and Design</td>
<td>231</td>
</tr>
<tr>
<td>English</td>
<td>234</td>
</tr>
<tr>
<td>Foreign Languages and Literatures</td>
<td>238</td>
</tr>
<tr>
<td>Graphic Communication</td>
<td>240</td>
</tr>
<tr>
<td>History</td>
<td>243</td>
</tr>
<tr>
<td>Journalism</td>
<td>245</td>
</tr>
<tr>
<td>Liberal Studies</td>
<td>247</td>
</tr>
<tr>
<td>Music</td>
<td>250</td>
</tr>
<tr>
<td>Philosophy</td>
<td>252</td>
</tr>
<tr>
<td>Political Science</td>
<td>254</td>
</tr>
<tr>
<td>Psychology and Human Development</td>
<td>257</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>263</td>
</tr>
<tr>
<td>Theatre and Dance</td>
<td>269</td>
</tr>
<tr>
<td>COLLEGE OF SCIENCE AND MATHEMATICS</td>
<td>272</td>
</tr>
<tr>
<td>Departments:</td>
<td></td>
</tr>
<tr>
<td>Biological Sciences</td>
<td>274</td>
</tr>
<tr>
<td>Chemistry</td>
<td>281</td>
</tr>
<tr>
<td>Mathematics</td>
<td>285</td>
</tr>
<tr>
<td>Physical Education and Kinesiology</td>
<td>289</td>
</tr>
<tr>
<td>Physics</td>
<td>294</td>
</tr>
<tr>
<td>Statistics</td>
<td>298</td>
</tr>
<tr>
<td>ETHNIC STUDIES</td>
<td>301</td>
</tr>
<tr>
<td>UNIVERSITY CENTER FOR TEACHER EDUCATION</td>
<td>303</td>
</tr>
<tr>
<td>COURSES</td>
<td>311</td>
</tr>
<tr>
<td>FACULTY AND STAFF DIRECTORIES</td>
<td>487</td>
</tr>
<tr>
<td>APPENDIX</td>
<td>519</td>
</tr>
<tr>
<td>Student-Right-to-Know Disclosure of Graduation Rate</td>
<td>519</td>
</tr>
<tr>
<td>Privacy Rights of Students in Education Records</td>
<td>519</td>
</tr>
<tr>
<td>Student Discipline</td>
<td>519</td>
</tr>
<tr>
<td>Institutional and Financial Assistance</td>
<td>521</td>
</tr>
<tr>
<td>Average Annual Cost of Education</td>
<td>522</td>
</tr>
<tr>
<td>INDEX</td>
<td>523</td>
</tr>
<tr>
<td>FOR MORE INFORMATION</td>
<td>528</td>
</tr>
<tr>
<td>DIRECTORY</td>
<td>Inside Back Cover</td>
</tr>
<tr>
<td>CAMPUS MAP</td>
<td>Inside Back Cover</td>
</tr>
</tbody>
</table>
Photo by Doug Allen.

Introducing CAL POLY
INSIDE THE NEW RECREATION CENTER
Photo by Doug Allen.
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 one of the largest Cooperative Education Programs 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, nine are available within the CSU system only at Cal Poly, and another eight 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, and journalism. Those and other professional programs are offered in addition to curricula in the arts, sciences, mathematics and humanities.
HUMAN ANATOMY CLASS
Biology professor, Harry Fierstine, and Mondrick Thompson, biology student, discuss the human skeleton.

FRUIT SCIENCE LAB
Crop Science professor Paul Fountain and students Patricia Saldívar and Jorge Hernandez examine a sample of just-picked grape clusters.  
Photo by Doug Allen.

COMPUTERIZED DESIGN
Graphics Communication professor Patrick Munroe instructs student Rebecca Just on the finer points of creating and preparing design for printing using the department's new computerized design system.  
Photo by Ray Sanchez.
And those programs are state-of-the-art education. Many are accredited or recognized at the national level by independent reviewing bodies.

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, as well as through Cal Poly's spring- and summer-quarter London Study Program and a variety of special study programs involving the faculty and staff as well as students. One example: Cal Poly was chosen by the U.S. Agency for International Development to lead in creating a wholly new agricultural college in Costa Rica.

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.

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.
ROPES COURSE
The ASI Chumash Challenge Ropes Course Workshop encourages teambuilding, communication and leadership skills. A cross-section of campus participates in the course, including student government, clubs, faculty and staff. Photo by Rod Neubert.

SUMMER SCHOLARS
Mike Flippin, Veronica Marquez, LaShanda Cooper and Josue Cruz, participants in the Summer Scholars Academy of the Minority Access to Health Careers program.

CAREER COUNSELING
Donna Davis, Career Counselor, advises the student how to prepare her resume and with formation of her career plans.
Cal Poly is at San Luis Obispo, a pleasant, progressive city of about 44,000 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. Other examples among many are a $4.3 million high-tech dairy instructional facility and the student computer lab in the campus's new Business Building — one of the most sophisticated networking computer labs in the nation.

The university's spacious, modern library contains about 860,000 books and 100,000 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 sandwich shop, a pizza place, an ice cream parlor, a convenience store 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 10,000 of Cal Poly's 15,400 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 win some of the most-coveted prizes in that New Year's Day event.

Cal Poly's reputation for success applies to sports, too. In intercollegiate athletics, the university is completing the transition from NCAA Division II to Division I. In the campus intramurals program, almost 1,000 teams participate in 25 sports open to both men and women. Students also can join more than 30 clubs involved in more-exotic sports like rugby, crew and ultimate Frisbee. Extensive athletic and other recreation facilities are available until late at night. A $13.5 million recreational sports and events center opened in 1993.

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. The Administration Building lobby is the starting point for guided campus tours, offered several times a week. For tour days and times, call (805) 756-2792, or write to the University Outreach Services 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 community of just over 3,000 people. What's now the Cal Poly campus was farm land some distance north of town. The Southern Pacific had just completed the last link in its coastal route and supported the proposal to build a technical school as one way of increasing business for the new line. 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. 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 programs and facilities to meet the need for an ever-more-sophisticated education in today's rapidly changing and interdependent world. They're the kinds of challenges Cal Poly has always anticipated and met.

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.
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.

COLLEGES AND DEPARTMENTS

The faculty of Cal Poly is organized into academic departments, and the departments are grouped into Colleges and the University Center for Teacher Education. All of the degree programs offered by the university are described in the catalog. Sections for each College follow in alphabetical order. Departments are arranged alphabetically within the appropriate College.

DEGREES

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 graduate degree.

At the undergraduate level, Cal Poly grants the
* Bachelor of Arts (B.A.),
* Bachelor of Science (B.S.),
* Bachelor of Architecture (B.Arch.), and
* Bachelor of Landscape Architecture (B.L.A.).

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.)

Cal Poly doesn't offer programs leading to doctoral degrees.

MAJORS

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 an academic department.

Cal Poly students select a major at the time they apply for admission. A complete listing of majors, arranged by College and department, may be found on page 22.

General requirements for bachelor's degrees are given in "Academic Requirements," and for master's degrees in "Graduate Programs." 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 courses arranged by Major, Support, General Education and Breadth, and Electives. Some programs also show a curriculum display with the suggested order for taking courses and group them into the traditional four years for an undergraduate program (five years for the B.Arch. and B.L.A.).

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

Descriptions of Cal Poly courses are located in the back half of the catalog, arranged alphabetically by course prefix (an abbreviation that represents the subject).

The courses in a bachelor's degree curriculum are identified as major courses, support courses, general education and breadth courses, and electives.

Major courses are designed to provide competence in the professional field in which a degree is earned. 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 page 77.

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

Course Numbering System

Courses are generally numbered according to the plan shown below.

010-099 Nondegree credit or short courses.

100-299 Courses primarily for freshman and sophomore students.

300-399 Courses primarily for advanced undergraduate students with prerequisite coursework.

400-499 Courses for advanced undergraduates. Certain 400-level courses can be used in graduate programs. See page 94.

500-599 Graduate courses.

600-699 Courses for professional advancement within a special field. They do not carry credit for degree requirements in any of the curricula.

Prerequisites

Prerequisites inform the student of previous coursework needed in preparation 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 classes meet for 2 hours per unit of credit.

Laboratory classes meet for 3 hours per unit of credit.

Lecture classes meet for 1 hour per unit of credit.

Seminar classes meet for 1 hour per unit of credit.

Experimental courses are new courses approved after the publication of the catalog and may be distinguished by an "X" in the course number. Course descriptions appear in the quarterly Class Schedule.

Concentrations and Specializations

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

A specialization is a similarly specialized group of courses in a master's degree program. Completion of a 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 75.

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 X 1.5 = 9 quarter units.
# ACADEMIC CALENDAR

*Please note:* This is not intended to be construed as an employee work calendar. Please refer to the Class Schedule for the 1996-97 Academic Calendar.

## SUMMER QUARTER 1994

<table>
<thead>
<tr>
<th>Date</th>
<th>Day</th>
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<td>July 1</td>
<td>Friday</td>
<td>End of second week of instruction</td>
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<td>Last day to drop a class</td>
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<td>July 4</td>
<td>Monday</td>
<td>Academic holiday – Independence Day Observed</td>
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<tr>
<td>July 5</td>
<td>Tuesday</td>
<td>Last day to add a class</td>
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<tr>
<td>July 11</td>
<td>Monday</td>
<td>Last day to register late and pay late registration fee</td>
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<tr>
<td>August 8</td>
<td>Monday</td>
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<tr>
<td>August 26</td>
<td>Monday</td>
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<tr>
<td>August 29–September 2</td>
<td>Monday–Friday</td>
<td>Final examination period</td>
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<tr>
<td>September 2</td>
<td>Friday</td>
<td>End of summer quarter</td>
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<tr>
<td>September 3–11</td>
<td>Saturday–Sunday</td>
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## FALL QUARTER 1994

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<tbody>
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<td>September 12</td>
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<td>September 19</td>
<td>Monday</td>
<td>Fall quarter classes begin</td>
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<tr>
<td>September 30</td>
<td>Friday</td>
<td>End of second week of instruction</td>
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<td>October 3</td>
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<td>Last day to add a class</td>
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<td>October 7</td>
<td>Friday</td>
<td>Last day to register late and pay late registration fee</td>
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<td>November 4</td>
<td>Friday</td>
<td>End of third week of instruction – Census date</td>
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<tr>
<td>November 11</td>
<td>Friday</td>
<td>End of seventh week of instruction</td>
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<tr>
<td>November 23–27</td>
<td>Wednesday–Sunday</td>
<td>Academic holiday – Thanksgiving</td>
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<tr>
<td>December 2</td>
<td>Friday</td>
<td>Academic holiday – Veterans' Day</td>
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<tr>
<td>December 5–9</td>
<td>Monday–Friday</td>
<td>Final examination period</td>
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<tr>
<td>December 10</td>
<td>Saturday</td>
<td>Mid-Year Commencement</td>
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<tr>
<td>December 11–January 2</td>
<td>Sunday–Sunday</td>
<td>End of fall quarter</td>
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## WINTER QUARTER 1995

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<tbody>
<tr>
<td>January 3</td>
<td>Tuesday</td>
<td>Beginning of winter quarter</td>
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<td></td>
<td>Winter quarter classes begin</td>
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<tr>
<td>January 16</td>
<td>Monday</td>
<td>Academic holiday – Martin Luther King, Jr. Birthday Observance</td>
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<tr>
<td>January 17</td>
<td>Tuesday</td>
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<tr>
<td>January 18</td>
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<td>February 20</td>
<td>Monday</td>
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<td>February 21</td>
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<tr>
<td>March 13</td>
<td>Monday</td>
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<tr>
<td>March 14–18</td>
<td>Tuesday–Saturday</td>
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<tr>
<td>March 18</td>
<td>Saturday</td>
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<td>March 19–26</td>
<td>Sunday–Sunday</td>
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### SPRING QUARTER 1995

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<td>March 27</td>
<td>Monday</td>
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<td>April 7</td>
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<td>Monday</td>
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<td>April 14</td>
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<td>May 12</td>
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### SUMMER QUARTER 1995

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<tr>
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<td>June 30</td>
<td>Friday</td>
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<td>Tuesday</td>
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<td>July 10</td>
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<td>August 7</td>
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<td>August 25</td>
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## SPRING QUARTER 1996

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<td>Friday</td>
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## SUMMER QUARTER 1996

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<tr>
<td>August 26–August 30</td>
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## ACADEMIC PROGRAMS

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<th>Curricula with Concentrations</th>
<th>Degrees, Minors</th>
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**College of Liberal Arts (continued)**

Social Sciences Department  
Social Sciences  
*Concentrations:*  
- Criminal Justice  
- Cross-Cultural Studies  
- Organizations  
- Social Sciences (Teaching)  
- Social Services  
  
Speech Communication Department  
Speech Communication  
  
Theatre and Dance Department  
Dance  
Theatre  
  
**College of Science And Mathematics**

Biological Sciences Department  
Biotechnology  
Biological Sciences  
*Concentrations (in B.S.):*  
- Anatomy-Physiology  
- Biology  
  
Ecology and Systematic Biology  
*Concentrations:*  
- Ecology  
- Marine Biology and Fisheries  
- Systematics  
- Wildlife Biology  
  
Microbiology  
Biochemistry  
Chemistry  
*Concentration:* Polymers and Coatings  
  
Chemistry Department  
B.S.  
  
Mathematics Department  
Physical Education  
*Concentrations (in B.S.):*  
- Commercial and Corporate Fitness  
- Health Education  
- Pre-Physical Therapy  
- Teaching  
  
Statistics Department  
B.S.  
Minor  
  
**Ethnic Studies**

Ethnic Studies  
Minor  
  
**University Center for Teacher Education**

Education  
*Specializations:*  
- Counseling and Guidance  
- Curriculum and Instruction  
- Educational Administration  
- Reading  
- Special Education  
M.A.
## Enrollment in Programs by College and Major, Fall 1993

### College of Agriculture

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### College of Architecture and Environmental Design

<table>
<thead>
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<tr>
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### College of Business

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<td>103</td>
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<td>2</td>
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<td>-</td>
<td>234</td>
<td>33</td>
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<tr>
<td>Vocational Education</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
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### College of Engineering

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<tbody>
<tr>
<td>Aeronautical Engineering</td>
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(College of Engineering continued on next page)
### Enrollments in Programs by College and Major, Fall 1993 (continued)

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#### College of Engineering, continued

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</thead>
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<tr>
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#### College of Liberal Arts

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<td>( _ )</td>
<td>1</td>
<td>( _ )</td>
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#### College of Science and Mathematics

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<td>75</td>
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#### University Center for Teacher Education

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#### Campus Totals

<table>
<thead>
<tr>
<th></th>
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<th>Grad.</th>
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<tbody>
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<td>8,843</td>
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ACCREDITATION

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 (undergraduate) - National Architectural Accrediting Board
- Business Administration (undergraduate and graduate) - American Assembly of Collegiate Schools of Business
- City and Regional Planning (undergraduate and graduate) - 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
- Industrial Technology - National Association of Industrial Technology
- 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 is committed to providing equal opportunities to men and women CSU students in all campus programs, including intercollegiate athletics.

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 for Civil Rights, Region 9, 50 U.N. Plaza, Room 239, San Francisco, California 94102.

Persons with Disabilities
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 and the Americans with Disabilities Act of 1990 prohibit such discrimination. Anna J. McDonald, Affirmative Action Director, 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 her. Where student discrimination occurs, referral may be made to either Disabled Student Services, Office of Student Affairs, or Affirmative Action Office.

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 and to the Affirmative Action Office.

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

SEXUAL HARASSMENT POLICY

What is Sexual Harassment?
Sexual harassment takes many different forms. In the university environment, repeated, unwanted verbal or physical sexual advances or the imposition of sexual attention are the types of sexual harassment that occur most often. If someone makes sexually explicit or sexually derogatory statements which affect you negatively, this also may constitute sexual harassment.

Sexual Harassment Distorts One's Self-Image
Sexual harassment can include, but is not limited to the following:

- Use of derogatory sexual remarks
- Unwelcome personal attention or touching
- Sexist jokes about your clothing or body
- Comments about sexual activities
- Requests for sex in exchange for grades, letters of recommendation, or employment opportunities
- Threatening demands for sexual favors

If Sexual Harassment Happens to You . . .
Take Action!
There is something you can do about sexual harassment. First of all, TELL SOMEONE.

Sexual harassment can only begin to be eliminated when we talk with someone about our experiences. If we remain silent, sexual harassment will continue to be perceived as a personal problem rather than as a social problem. Silence often keeps us feeling guilty rather than violated.

Sexual harassment is not always a sexually motivated act. Typically it represents an assertion of power expressed in a sexual manner. Individuals
experiencing sexual harassment are aware of the power the harasser wields. They perceive a threat, either implicit or explicit, and conclude that they have to "put up" with this type of behavior or suffer the consequences.

Sexual harassment continues to be a serious social problem. Both men and women (usually women) are harassed by persons of the same or opposite sex. Surveys show that a majority of women today, at one time or another, have been sexually harassed. Research also shows that sexual harassment, when ignored, will often continue or increase.

Either tell the harasser that the advances are unwanted and you want them to stop, or write a letter. Let the harasser know that you view the behavior as sexual harassment. Say that you will report these actions if they continue. Keep a record if the harasser continues. Keep track of dates, times, places and statements. If you can, get a witness to hear you say "No." This information can be helpful when filing a complaint.

A Sexual Harassment Advisor can assist you with informal resolutions to sexual harassment or with filing a formal complaint. Advisors receive informal complaints, help complainants evaluate informal complaints, provide campus procedures and may help attempt informal resolution. The role of the Advisor can be one of mediation between parties. Go to the Vice President for Student Affairs if you are a student, or to Affirmative Action or Human Resources if you are an employee. If you decide to file a formal complaint, a Sexual Harassment Complaint Facilitator can assist you in following the procedures in Cal Poly's Sexual Harassment Policy (AB 93-1).

PROCEDURES FOR CAL POLY

Copies of the policy are available from an advisor or the Affirmative Action Office. The following is a brief outline of the procedures:

Informal Procedures

* The Complainant directly, or through an Advisor, notifies harasser to stop offensive behavior, or
* The Complainant may attempt to resolve complaint with the respondent's department head/chair, or
* The Student Complainant may bring complaint directly to the Office of the Vice President for Student Affairs (Adm. 209), 756-1521.
* The Employee Complainant should contact the Affirmative Action Office (Adm. 401), 756-2062.

Formal Procedures

Students file written charges with the Vice President for Student Affairs (Adm. 209), within 120 days of the alleged date of harassment.

Employees file with the director of Affirmative Action (Adm. 401) within 42 days after the event unless their union contract specifies a different deadline and different complaint procedures. The respondent has 10 days to respond to charges.

Applicants for employment file written charges with the director of Affirmative Action (Adm. 401).

Sexual harassment investigators endeavors to complete review within 35 days and send preliminary report of findings to the complainant and respondent, who have 10 days to provide any additional information.

Sexual harassment investigators forward a final report with a recommended remedy to the President's designee with copies to the complainant and respondent.

Within 20 days the President's designee makes a decision regarding disposition of complaint. Legal constraints limit the University from disclosing confidential personnel decisions.

GENDER HARASSMENT

Sex discrimination in the form of gender harassment consists primarily of repeated comments, jokes, and innuendoes directed at persons because of their gender or sexual orientation. This behavior typically is not aimed at eliciting sexual cooperation, but, like racial harassment, it contaminates the learning and work environment and has no place at Cal Poly. Examples of gender harassment include the following:

* Disparaging women's intellectual abilities and potential;
* Using sexist statements in classroom discussions;
* Disparaging the life styles or behaviors of gays or lesbians.

These behaviors in isolation do not constitute sexual harassment as defined in AB 93-1. They are prohibited by federal, state, CSU and Cal Poly policies on discrimination.
STATEMENT ON RACISM AND DISCRIMINATION

Cal Poly will not tolerate acts of racism or discrimination of any type. The University is committed to being a community enriched by individual differences, in which diversity is valued and respected and in which all members live and work free from harassment, abuse, mockery, and discrimination.

STATEMENT ON ACADEMIC FREEDOM

Cal Poly recognizes and supports the principle of academic freedom, by which each faculty member has the right to teach, to conduct research, and to publish material relevant to that faculty member's discipline, even when such material is controversial. The University also guarantees to its faculty the same rights shared by all citizens which include: the right to free expression, the right to assemble, and the right to criticize and seek revision of the institution's regulations.

At the same time, the faculty should recognize an equally binding obligation to perform their academic duties responsibly and to comply with the internal regulations of the University. Each faculty member is expected to recognize the right of free expression of other members of the university community; intolerance and personal abuse are unacceptable. Faculty shall not claim to be representing the university unless authorized to do so.

CAMPUS STUDENT RELATIONS AND JUDICIAL AFFAIRS

A university is a place where you can develop intellectually, gain perspective on life and expand your sense of aesthetics and beauty. You should be encouraged to think logically, judge critically and communicate clearly.

To accomplish this, it is important to have candid discussion, intellectual honesty, openness to differing opinions and respect and tolerance for the rights of all individuals and groups. As a student at Cal Poly, you can expect a learning environment free from bias, discrimination, prejudice and harassment. Likewise, as a member of this academic community, it is your responsibility to afford those same rights and privileges to others.

In our society most institutions have some mechanisms to ensure and guarantee individual and group rights. Along with these rights comes corresponding responsibilities. On the Cal Poly campus the office of Student Affairs is a place where individual and university rights and responsibilities are defined, discussed, and enforced. Areas such as academic rights and responsibilities, freedom of association, publication and creative expression, community relations—on and off campus, assembly and advocacy, sexual harassment, ethnic discrimination, disability, sexual orientation, sexual assault, privacy and records, academic dishonesty, fairness board, student discipline and other administrative procedures can be addressed in the Office of Campus Student Relations and Judicial Affairs.

CHEATING AND PLAGIARISM

Cal Poly will not tolerate academic cheating or plagiarism in any form.

Learning to think and work independently is part of the educational process.

Cheating or plagiarism in any form is considered a serious violation of expected student behavior and may result in disciplinary action. All faculty and students are encouraged to review the formal policy on cheating and plagiarism (including definitions, sanctions, and appeal procedures) found in the Campus Administrative Manual, Section 684.

University policy can be summarized simply:

As a student, you are responsible for your own work and you are responsible for your actions.
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—began admitting students in fall 1990.

Responsibility for The California State University is vested in the Board of Trustees, consisting of ex officio members, alumni and faculty representatives, and members 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 of 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 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.

In fall 1993, the system enrolled approximately 326,000 students, taught by more than 16,000 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 20 campuses since 1960.

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CAMPUSES—THE CALIFORNIA STATE UNIVERSITY

California State University, Bakersfield
Dr. Tomas A. Ar津贴ga, President
9001 Stockdale Highway, Bakersfield, CA 93311-1099
(805) 664-2011

California State University, Chico
Dr. Manuel A. Esteban, President
1st and Normal Streets, Chico, CA 95929
(916) 898-6116

California State University, Dominguez Hills
Dr. Robert C. Detweiler, President
1000 East Victoria Street, Carson, CA 90747
(310) 516-3300

California State University, Fresno
Dr. John D. Welty, President
5241 North Maple Avenue, Fresno, CA 93740
(209) 278-4240

California State University, Fullerton
Dr. Milton A. Gordon, President
Fullerton, CA 92634-9480
(714) 773-2011

California State University, Hayward
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Hayward, CA 94542
(510) 881-3000

Humboldt State University
Dr. Alistair W. McCrone, President
Arcata, CA 95521
(707) 826-3011

California State University, Long Beach
Dr. Karl Anatol, Interim President
1250 Bellflower Boulevard, Long Beach, CA 90840
(310) 985-4111

California State University, Los Angeles
Dr. James M. Rosser, President
5151 State University Drive, Los Angeles, CA 90032
(213) 343-3000

California State University, Northridge
Dr. Blenda J. Wilson, President
18111 Nordhoff Street, Northridge, CA 91330
(818) 885-1200

California State Polytechnic University, Pomona
Dr. Bob Suzuki, President
3801 West Temple Avenue, Pomona, CA 91768
(909) 869-7659

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

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5500 University Parkway, San Bernardino, CA 92407
(909) 880-5000

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5300 Campanile Drive, San Diego, CA 92182
(619) 594-5000

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

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1600 Holloway Avenue, San Francisco, CA 94132
(415) 338-1111

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One Washington Square, San Jose, CA 95192
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(619) 752-4000

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(707) 664-2880

California State University, Stanislaus
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801 West Monte Vista Avenue, Turlock, CA 95380
(209) 667-3122
THE CALIFORNIA STATE UNIVERSITY

Humboldt State University
California State University, Chico
Sonoma State University
California State University, Sacramento
San Francisco State University
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California State University, Fresno
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Office of the Chancellor, Long Beach
California State University, Fullerton
California State University, San Bernardino
California State University, San Marcos
San Diego State University
ROBERT E. KENNEDY LIBRARY
The building features an interior courtyard design, open stack accessibility, and individual study stations. The Library collection contains over two million bibliographic items: 750,000-volume book collection, periodicals, art prints, nearly 3,000,000 microforms, senior projects, government documents, maps, audio visual materials, and various special collections. Photo by Doug Allen.

SPECIAL PROGRAMS and RESOURCES
SPECIAL PROGRAMS AND RESOURCES

ALUMNI ASSOCIATION
Alumni Relations, Alumni House, 805 756-2586

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 CA and across the nation.

The Alumni Association is governed by a president, a president elect, a secretary-treasurer, and a board of directors; the Office of Alumni Relations coordinates the activities of the association. The association has more than 30 active alumni chapters including chapters in Alaska, the District of Columbia, Hawaii, Chicago, Colorado, New England/Mid-Atlantic Region, Portland, Reno, and Seattle. These chapters offer social and educational events for Cal Poly alumni 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.

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 the Student Alumni Council, which is known as Poly Reps.

COMPUTING AT CAL POLY
Computer Science Bldg. (14), 805 756-5506

Information technology plays an increasingly important role on campus, both in the academic programs and administrative services. Computer literacy is a General Education and Breadth requirement at Cal Poly; thus students frequently encounter computers in their classes. Computer technology is used in all academic disciplines.

Professional techniques and systems are simulated in the classroom environment. Research grants, special projects, and equipment donations from industry supplement existing campus computing resources. Four departments serve the campus community:

Academic Computing Services (ACS) consults with and supports faculty; and plans, coordinates, and manages campuswide academic computing resources. The CSU Computer-Aided Productivity Center, located at Cal Poly, is devoted to the support of academic programs and instruction, including schools of business under the auspices of the CSU/IBM Academic Mainframe Specialty Center (AMSPEC).

Administrative Systems consults with and trains administrative staff; designs, analyzes and manages the central administrative data systems; and facilitates daily production of class lists, grades, and other reports.

Communications Services implements, coordinates, 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 part of Communications Services.

Computing Services ensures continuous operation of the campuswide computing systems; orders routine and emergency maintenance; and manages machine performance and environmental conditions.

Resources and Facilities

Current hardware systems include an IBM ES/9000-732 mainframe computer, IBM RS/6000 AIX cluster, Sun network, various departmental minicomputers, and advanced workstations. While some of the computers run specialized academic applications, many are available for use by all Cal Poly students. Cal Poly's mainframe provides access to electronic mail, a CSU systemwide network, Internet, and other national/global networks and information services.

Cal Poly has several microcomputer and terminal lab facilities for classroom instruction, independent study, and research and development. Apple Macintosh, Hewlett Packard, IBM and other systems are available to students.

An integrated database on the IBM mainframe facilitates administrative processes such as admissions and records, financial aid, class scheduling, fiscal operations and human resource management. These resources are linked through a campuswide data communications network.

The Faculty Multimedia Development Center supports curriculum development, delivery of instruction, and course materials electronically to both on- and off-campus sites. Other innovations, such as electronic applications and kiosks, are being implemented to
facilitate student access to university services and information. Use of these facilities is expected to expand with the increasing availability of interactive technologies and "information highways".

CONFERENCES AND WORKSHOPS
Sequoia (108), 805 756-7600

The Conference Coordinating Center coordinates facilities and services for conferences, professional meetings, workshops and other special programs related to the university's educational objectives. The staff provides assistance with planning, budgeting, advertising, registration, meeting rooms, housing, food services, transportation, and specialized services. Extended Education may provide publicity and instructional support, and coordinate the granting of academic or professional credit.

CONTINUING EDUCATION IN AGRICULTURE
Agricultural Education, Bldg. 10, Room 244, 805 756-2803

Cal Poly plays an active role in the professional development and continuing education of high school and community college teachers of agriculture. Instructional staff and facilities are provided for workshops and training programs cooperatively sponsored by the university and the State of California.

The campus offers 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. Cal Poly 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.

EXTENDED EDUCATION
Jespersen Hall (116), Room 101, 805 756-2053.

Extended education programs provide a variety of services to residents of San Luis Obispo, Santa Barbara, and southern Monterey Counties. These programs are self-supporting through student enrollment fees or agency funding. An up-to-date catalog, Excel, describes the programs and course schedule and is available at no cost. You may also request to be placed on the mailing list.

Extension Programs

The extension program provides a way to earn college credit, acquire skills, enhance career opportunities, and/or broaden awareness of today's world. Extension courses are offered on campus and at various locations throughout the tri-counties.

Many extension courses are seminars or workshops that offer opportunities for professional development or personal growth, but do not provide academic credit. These courses are attended by working people and community members of all ages. Some of these courses comprise programs that lead to a certificate of completion. Extension programs are scheduled throughout the year, including summer programs for youth and senior adults. A special program for seniors, Elderhostel, is offered during Winter Quarter.

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.

Enrollment in extension programs 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.

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 two weeks prior to the beginning of each quarter. This enrollment process is not available to regular matriculating students.

THE FOUNDATION
Foundation Administration Bldg. (15), 805 756-1131

The Cal Poly 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, Visual
Special Programs and Resources

Education Productions, and Campus Dining. 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; offering opportunities for students to combine learning and earning; and loaning operating capital for faculty-supervised and educationally significant projects.

A Board of Directors oversees the operation of the Foundation which is administered by a management staff. Foundation activities must be requested and approved by the university. 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**

**College of Science and Mathematics Advising Center, 805 756-2615**

**Health Professions Guidance and Evaluation Committee, 805 756-2209**

**Minority Access to Health Careers, 805 756-2840**

**Choosing a Major**

There is no "best" major to prepare students for professional school, as long as the prerequisite courses for the chosen profession are completed. The major should be chosen on the basis of interest and as preparation for an alternate career. Typically, Cal Poly students major in Biological Sciences or Biochemistry if interested in dental or medical school; major in Animal Science, Biological Sciences, or Dairy Science 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, or pharmacy) choose from a wide variety of majors. Specific requirements vary for each professional school, so students should contact the schools directly.

**Preprofessional Advising**

The Health Professions Guidance and Evaluation Committee assists students, regardless of their major, in all phases of applying to professional schools. Committee members assist students to identify the appropriate health profession, to select preparatory courses, and to develop the proper strategy for entrance. They also critique personal statements connected with applications, conduct interviews in order to write letters of evaluation, and help prepare students for interviews at professional schools. If appropriate, alternate careers are suggested.

The Committee consists of approximately 20 faculty from the departments of Animal Sciences, Biological Sciences, Chemistry, English, Mathematics, Physical Education and Kinesiology, Physics, Psychology and Human Development, and Speech, and staff members from Psychological Services and the Minority Access to Health Careers Office. Students who belong to groups traditionally underrepresented in the health professions (especially ethnic minorities who are Afro-American, Hispanic or Native American) are encouraged to seek assistance from the Minority Access to Health Careers (MAHC) Office.

**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 "The Chiropractic College Directory", KM Enterprises, P.O. Box 25978, Los Angeles, CA 90025. The following Cal Poly courses meet the minimum preparation:

- BIO 151, 153, 152 or BACT 221
- CHEM 127, 128, 129, 316, 317
- ENGL 114, 125, 215/218
- PHYS 121, 122, 123
- PSY 201/202, 304
- ZOO 237, 331, 332
- 7-8 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 to 12 schools. The following Cal Poly courses meet the minimum preparation:

- BIO 151, 153, 152 and/or BACT 221
- CHEM 127, 128, 129, 316, 317, 318
- ENGL 114, 125, 215/218
- PHYS 121, 122, 123

**Medical Technology (Clinical Laboratory Technology)**

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

- BACT 221, 222, 423
- BIO 151, 153
- CHEM 127, 128, 129, 326, 328, 331
- PHYS 121, 122, 123
- ZOO 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 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 2-6 osteopathic schools or 2-6 podiatric schools. The following Cal Poly courses meet the minimum preparation for most schools:

- BIO 151, 153; 152 and/or BACT 221
- CHEM 127, 128, 129, 316, 317, 318
- ENGL 114, 125, 215/218
- MATH 141
- PHYS 121, 122, 123

**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:

- ANT 201
- BACT 221
- BIO 151, 153
- CHEM 127, 128, 326, 328
- ENGL 114, 125
- FSN 210
- PSY 201/202, 307
- SOC 105
- ZOO 237, 238, 239

**Optometry**

Students generally complete 3-4 years of preprofessional coursework 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
- BIO 151, 152, 153
- CHEM 127, 128, 316, 317, 318 or 328
- ENGL 114, 215/218
- MATH 141, 142
- PHYS 121, 122, 123
- PSY 201/202
- STAT 211, 212
- ZOO 237, 238, 239

**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 (1426 Prince St., Alexandria, VA 22314-2841). Students usually apply to 2 to 3 schools. The following Cal Poly courses meet the minimum preparation:

- BACT 221
- BIO 151, 152, 153
- CHEM 127, 128, 129, 316, 317, 318
- ENGL 114, 125, 215/218
- MATH 120, 141, 142
- PHYS 121, 123
- PSY 201/202, 301
- SPC 201/202

**Physical Therapy**

Currently professional training occurs at either the Certificate, Baccalaureate or Graduate level. For exact prerequisites, check individual catalogs or the latest edition of "Directory of Physical Therapy Education Programs" published by the American Physical Therapy Association (1111 N. Fairfax St., Alexandria, VA 22314-1488). 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
- BIO 151, 153
- CHEM 127, 128, 129
- CSC 110
- ECON 211
- ENGL 114, 125, 215/218
- FSN 210
- MATH 120, 141, 142
- PHYS 121, 123
- PSY 201/202, 301
- SPC 201/202
- STAT 211
- ZOO 237, 238, 239, 340
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 "Physician Assistant Programs Directory" published by the Association of Physician Assistant Programs, 950 N. Washington St., Alexandria, VA 22314. The following Cal Poly courses meet the minimum preparation:

BACT 221
BIO 151, 153
CHEM 127, 128
ENGL 114
MATH 118
PHYS 121; 122 or 123
PSY 201/202, 307
SOC 105 or ANT 201
ZOO 237, 238, 239, 340

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 CA, but recently CA 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:

BACT 221
BIO 151, 152, 153, 303
CHEM 127, 128, 129, 316, 317, 318, 328/371
ENGL 114, 125, 215/218
PHYS 121, 122, 123
PSY 201/202
STAT 131 or 211
ZOO 405; 432, 433 or VS 438

RESEARCH AND PROJECT INVOLVEMENT

Research and Graduate Programs, Bldg. 38, Room 155, 805 756-1508

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 financial support for undergraduate and graduate student research.

Students who wish to become involved in significant applied research and development activities on the leading edge of their disciplines are encouraged to contact faculty members in their programs with ongoing projects to explore becoming part of the project team.

ROBERT E. KENNEDY LIBRARY

Building 35, 805 756-2598

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 750,000-volume book collection is supplemented by periodicals, art prints, nearly 3,000,000 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 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, 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 Reference Department also assists users in accessing the several on-line services made available by the library such as UnCover, Lexis-Nexis, FirstSearch, Dow-Jones News, etc.

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 for 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 cartographic material, the local government
collection, Agricultural Experiment Station and Extension Service publications, National Technical Information Services publications and United Nations documents. It is a full depository for U.S. nuclear power plant documents.

The Special Collections and University Archives Department consists of 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 Document Delivery. These can be supplied from one of the twenty CSU libraries, the University of California library system, or from other cooperating libraries throughout the United States and the world.

SERVICES TO VOCATIONAL AGRICULTURE
Agricultural Education, Bldg. 10, Room 244, 805 756-2803

Cal Poly staff offer a variety of services to secondary school vocational agriculture departments. Staff visit the schools and discuss current agricultural topics with teachers and students; including computer applications to agriculture; writing for agricultural magazines; and using the Agricultural Education Computer Network. Other activities are 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; and preparing a variety of teaching aids. These services are provided through a cooperative arrangement with the State. Communications Media Production staff of the Vocational Education Productions Department produce and distribute agricultural educational materials through catalog sales to teachers nationwide.

STUDY ABROAD PROGRAMS
Building 38, Room 100, 805 756-1477

The CSU International Programs
Developing intercultural communication skills and international understanding among its students is a vital mission of The California State University (CSU). Since its inception in 1963, the CSU International Programs has contributed to this effort by providing qualified students an affordable opportunity to continue their studies abroad for a full academic year. To date, over 10,000 CSU students have taken advantage of this unique study option.

International Programs participants earn resident academic credit at their CSU campuses while they pursue full-time study at a host university or special study center abroad. The International Programs serves the needs of students in over 100 designated academic majors. Affiliated with 35 recognized universities and institutions of higher education in 16 countries, the International Programs also offers a wide selection of study locales and learning environments.

Australia: The University of West Sydney
Brazil: Universidade de São Paulo
Canada: The universities of the Province of Quebec (13 institutions, including Université de Montréal, Concordia University, Université Laval, McGill University, Université du Québec system, Bishop's University, i.a.)
Germany: Ruprecht-Karls-Universität (Heidelberg), Eberhard-Karls-Universität (Tübingen)

Denmark: Denmark's International Study Program (the international education affiliate of the University of Copenhagen)

Germany: Ruprecht-Karls-Universität (Heidelberg), Eberhard-Karls-Universität (Tübingen)

Israel: The Hebrew University of Jerusalem
Italy: CSU Study Center (Florence), Università degli Studi di Firenze, La Accademia di Belle Arti di Firenze
Japan: Waseda University (Tokyo)

Mexico: Universidad Iberoamericana (Mexico City)

New Zealand: Lincoln University (Christchurch), Massey University (Palmerston North)

Spain: Universidad Complutense de Madrid, Universidad de Granada

Sweden: Uppsala Universitet

Taiwan: National Chengchi University (Taipei)

United Kingdom: Bradford University, Bristol University, Kingston University, Sheffield University, University of Swansea

Zimbabwe: University of Zimbabwe (Harare)
The International Programs pays all tuition and administrative costs for participating California resident students to the same extent that such funds would be expended to support similar costs in California. Participants are responsible for all personal costs, such as transportation, room and board, living expenses, and home campus fees. Participants remain eligible to receive any form of financial aid (except work-study) for which they can individually qualify.

To qualify for admission to the International Programs, students must have upper division or graduate standing at a CSU campus by the time of departure. Students at the sophomore level may, however, participate in the intensive language acquisition programs in France, Germany, and Mexico. California Community Colleges transfer students are eligible to apply directly from their community college if they can meet this requirement. Students must also possess a current cumulative grade point average of 2.75 or 3.0, depending on the program for which they apply. Some programs also have language study and/or other coursework prerequisites.

Many Cal Poly departments support the concept of international education and encourage students to investigate opportunities for overseas study. Additional information and application materials may be obtained from the International Programs Office, or by writing to The CSU International Programs, 400 Golden Shore, Long Beach, CA 90802-4275.

Applications for the academic year overseas must be submitted by February 1. Three countries are exceptions, and have the following deadlines: Zimbabwe (November 15), and Australia and New Zealand (May 1).

Cal Poly International Programs

**Australia Study—Agriculture, Ornamental Horticulture**

The College of Agriculture offers students an opportunity to study ornamental horticulture at the Victorian College of Agriculture and Horticulture in Melbourne, Australia.

**Australia Study—Architecture**

The College of Architecture offers students an opportunity to study architecture or landscape architecture at Deakin University in Victoria, Australia.

**Kenya Study**

The Agricultural Business Department offers an opportunity to do an internship with Farming Systems Kenya, Ltd., a government agency in Nakuru, Kenya.

**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 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**

*Dexter Building, Room 216, 805 756-2126*

Cal Poly is authorized by the Commission on 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/Language Arts Specialist
- Special Education (Learning Handicapped Specialist and Severely Handicapped Specialist)
- 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 University Center for Teacher Education section of this catalog.
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. Contributions to endowments are very beneficial in providing a stable source of resources for college and faculty support.

Several advisory groups provide valuable help in meeting university needs. Members of the President's Cabinet and the major donor groups are active in developing financial support from individuals and corporations. Advisory councils of the various colleges of the university provide additional assistance.

The athletic development program is designed to assist in funding athletic scholarships and other athletic program needs not included in the university's budget.
PHOTOS BY DOUG ALLEN.

RECREATION CENTER
91,500 sq.ft. opened June '93
50-meter pool, double-level gym, weight rooms, aerobics studio, 9 racquetball courts, concert seating for 3,500.

STUDENT ACTIVITIES and SERVICES
STUDENT ACTIVITIES and SERVICES

STUDENT ACTIVITIES
ASSOCIATED STUDENTS INC.
University Union (65), Room 212, 805 756-1281

Student involvement and governance at Cal Poly is coordinated through the Associated Students Incorporated (ASI), a non-profit student owned and operated corporation. The ASI collects quarterly fees which support a wide variety of campus activities including Recreational Sports, the Children’s Center, and a multitude of cultural, educational and leisure activities.

A wide variety of leadership opportunities are open to interested students. These range from the elected College Council representatives that form the Board of Directors to appointed positions on the University Union Executive Committee, ASI Executive Staff and Finance Committee.

ASI Officers
The five chief officers of the corporation are the ASI President (C.E.O.), Chairman of the Board, Executive Vice President, Vice President for Finance, and Vice President for Operations. These officers are responsible for the daily operation of the ASI and are the recognized representatives of Cal Poly students. These positions are elected/appointed in Spring Quarter.

CAMPUS ORGANIZATIONS
There are over 350 clubs and organizations affording students the opportunity to become active in campus life. Clubs vary from academically related and professional organizations to hobby-interest clubs, honor societies, service clubs, sororities and fraternities, residential groups, ethnic and cultural groups, and spiritually-based groups.

CHILDREN’S CENTER
Children’s Center (133), 805 756-1267

ASI Children's Center is a year-round day care program serving children of students, faculty, and staff who are from four months to six years of age. During the summer, the Center provides a program for school age children called Poly trekkers. Professional staff provide a program rich in activities to meet the social, emotional, cognitive, physical development and nutritional needs of young children. Cal Poly students are encouraged to work in the Center's classrooms, office, and kitchen, and often have hands-on experience through internships and special projects.

CRAFT CENTER
University Union (65), Room 111, 805 756-1266

Facilities and services available to students include: tool rentals, potter's wheels, kilns, darkroom, bike repair equipment, wood working power tools, and poster making supplies. Materials and craft classes are available at a minimal cost.

Craft classes include: bead making, stained glass, photo development, wood working, bike repair, and ceramics. An extensive library and resources on a variety of leisure crafts and skills is available.

ESCAPE ROUTE
University Union (65), Room 112, 805 756-1287

The Escape Route is the outdoor adventure center. Students may rent equipment such as tents, sleeping bags, and cross country skis, at the lowest prices in the county. An extensive collection of outdoor books, information on state and national parks, and topographical maps, are available as well as resources on snow camping, bicycle touring, back-packing, canoeing, rock climbing, and other activities. A large selection of videos is available. In addition, the Escape Route offers student-guided outdoor excursions which are sponsored by the nation's sixth oldest collegiate all volunteer outdoor group, the ASI Outings Committee.

FRATERNITIES AND SORORITIES
Student Life & Activities, University Union (65), Room 217, 805 756-2476

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

Fraternities
Alpha Epsilon Pi  
Alpha Gamma Rho  
Alpha Phi Alpha  
Alpha Phi Omega  
Beta Theta Pi  
Delta Chi  
Delta Sigma Phi  
Delta Tau  
Delta Upsilon  
Kappa Chi  
Kappa Sigma  
Lambda Chi Alpha  
Nu Alpha Kappa  
Omega Psi Phi  
Phi Delta Theta  
Phi Kappa Alpha  
Phi Kappa Psi  
Phi Sigma Kappa  
Sigma Alpha Epsilon  
Sigma Chi  
Sigma Nu  
Sigma Phi Epsilon  
Sigma Pi  
Tau Kappa Epsilon
**Sororities**

- Alpha Chi Omega
- Gamma Phi Beta
- Alpha Kappa Alpha
- Kappa Alpha Theta
- Alpha Omicron Pi
- Sigma Alpha
- Delta Phi
- Sigma Kappa
- Delta Sigma Theta
- Zeta Tau Alpha

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

**GALERIE**

*University Union (65), Room 221, 805-756-1182*

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 visual arts, as presented by the Galerie program, are considered an integral part of a university education. The Galerie employs students and provides direct involvement in the arts through cultural and social interaction, fine arts educational and interdisciplinary programs.

**MULTICULTURAL CENTER**

*University Union (65), Room 202C, 805-756-1405*

The Multicultural 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, and a place for students to drop in, read, and learn more about themselves and the world around them.

**PROGRAM BOARD**

*University Union (65), Room 202A, 805 756-1112*

**Fun and Entertainment** 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.

- **Concerts Committee** books nationally and internationally-known touring groups, ranging from rock to jazz, to country and alternative sounds.
- **Cultural Advisory Committee** strives to create an environment of sensitivity and awareness to cultural diversity.
- **Fine Arts Committee** brings the classics to the campus in the form of professional musical ensembles, theatre and dance productions, and art exhibitions.
- **Special Events Committee** sponsors a diverse program including concerts, comedy shows, acrobats and general entertainment.
- **Speakers Forum** arranges for speakers and panels to explore political, cultural, religious, technical and environmental issues.

**RECREATIONAL SPORTS**

*Recreation Center (43), 805 756-1366*

Recreational Sports provides opportunities for individuals within the university community to participate in a variety of fitness, leisure and recreational activities. Recreational Sports is an essential component of the educational experience at Cal Poly. The staff recognizes the value of developing the total person by attaining a balance of mind, body, and spirit. Based on this philosophy, the mission of the Recreational Sports program is to:

- Provide broad based programming to meet the ever-changing needs of a diverse university community.
- Provide a fun, safe, health, and service oriented environment.
- Embrace and celebrate the similarities and differences of all people.
- Provide leadership development opportunities for student staff and participants.
- Promote positive lifestyle choices.

Recreational Sports is an Associated Students, Inc. program and is funded 100% by student and user fees. The program is administered by students and it exists for students, faculty, staff and alumni. The student population provides the leadership, vision and commitment to ensure that the program is a vital, vibrant part of university life and individual development.

**PROGRAM OVERVIEW**

**Informal Recreation** provides non-structured opportunities to participate in a variety of activities such as table tennis, cardiovascular exercise, life-cycles, stair masters, and free weight and weight machines. Staff members are available to assist with any questions or concerns about the programs.

**Intramural Sports** provide a variety of structured team activities to help facilitate positive interaction between teams and individuals. A sample of the sports offered...
are: volleyball, basketball, soccer, inntertube waterpolo, and ultimate Frisbee.

Sport Clubs are student administered intercollegiate competitions. Members of various teams compete against clubs from other universities, improve their skills through instruction, and develop leadership skills through the management of their organization. There are 13 Sport Clubs including: badminton, men's and women's crew, men's and women's lacrosse, rugby, fencing, and wheelmen.

Fitness and Instructional programs are designed to offer individuals an opportunity to acquire new skills, and participate in personal fitness programs in a relaxed and enjoyable setting. A few of the programs offered are aerobics, aqua aerobics, massage, and martial arts.

Special Events are scheduled each quarter. Twelve to fifteen events are offered each year, including tennis tournaments, fun runs, racquetball tournaments, and a triathlon.

RECREATION CENTER

The 91,500-squarefoot Center, which opened in June 1993, boasts a state-of-the-art exercise room; 50-meter pool; a multi-use, double-level gymnasium; nine racquetball courts; gymnastics, martial arts and weight rooms; an aerobics studio; concert seating for approximately 3,500; 3 1/2 outdoor basketball courts; and offices for Recreation Sports staff. The adjacent Physical Education Building provides 26 faculty offices and other administrative spaces.

ROSE FLOAT

University Union (65), Room 209, 805 756-1268

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 design to parade staging. The Cal Poly entry has won 36 awards.

STUDENTS SERVING IN THE COMMUNITY

Student Life & Activities, University Union (65), Room 217, 805 756-2476

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 volunteer and academically-related community service opportunities available to individuals and to groups through the Community Service Center next door to the Office of Student Life and Activities located in University Union.

TRAVEL CENTER

University Union (65), Room 102, 805 544-9442

The Travel Center is a full service agency complete with student travel counselors and professional travel agents to serve the campus community. The staff can help make plane, train, or ship travel arrangements plus help complete passport applications, Eurail, Britrail, and Amtrak passes, American Youth Hostel Cards, and International ID cards.

THE UNIVERSITY UNION

Lobby, University Union (65), 805 756-1154 (Voice or TDD)

The Julian A. McPhee University Union is a place for students, faculty, staff, alumni and guests to meet, relax and exchange ideas. The University Union provides numerous services such as the Information Desk, Julian's Coffee and Ice Cream Shop, Backstage Pizza, Multicultural Center, Galerie, Travel Center, McPhee's Games Area, Craft Center, Second Edition Copy Center, and Escape Route. Facilities available include: Bishop's Lounge for television viewing, conference rooms, Chumash Auditorium, and the Student Life and Activities Office, ASI Student Executive Offices, and ASI Business Office.

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. The WOW experience is designed to assist new students with successful academic, social and emotional transition to university life.

**WOMEN'S PROGRAMS AND SERVICES**

*Student Life & Activities, University Union (65), Room 217, 805 756-2476*

Programs and services support the personal and academic growth of women, encourage empowerment, and promote the understanding of women's issues on the Cal Poly campus. Students, faculty and staff work together to create activities, programs and services. Campuswide programs have included: Take Back the Night, Women's Week, International Women's Day, Women of Color Forum, Gender and the Law, Chicana/Latina Conference, and Civil Rights Awareness Week. These programs are planned and produced by cooperatively by many campus groups.

**STUDENT SERVICES**

**CAREER SERVICES**

*Student Services Bldg. (124), Room 114, 805 756-2501*

A centralized service is available to all students and alumni of the university. The Career Services staff 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.

**Career Counseling and Planning**

Through individual appointments and group seminars, students are guided through the exploration and formation of personal career plans. Under the direction of department staff, students may take advantage of interest and aptitude inventories, utilize computerized career guidance systems, review current literature on career profiles, trends, and work environments, attend department-sponsored career fairs or employer/industry information sessions, and meet informally with recent graduates who are currently in the career being considered.

Students who are considering a change of major are particularly encouraged to utilize these career services so that they may become better informed about their future career potential.

**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 employment opportunities and workshop are available on a first-come, first-served basis throughout the year.

A special effort is made to place students in career related part-time and/or summer employment. 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. Students gain on-site work experience in business, industry and governmental agencies and have the opportunity to work with professionals in their fields of study. Students who participate in Co-op may earn academic credit, receive competitive wages, gain marketable skills, and develop self-confidence. Generally, assignments are six months in duration.

Eligibility requirements vary among academic departments, but students need to have a minimum GPA of 2.0 and have completed their freshman year (or one quarter in residence for transfer students) to register and begin the Co-op job search process. Opportunities for students are primarily located in California and the Western States; 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.

It is a goal to enable all students to benefit from the Cooperative Education experience. Interested students are encouraged to stop by Career Services for further information.

**Career Placement**

All Cal Poly students should register with Career Services no later than the first quarter of their final year on campus. Through workshops and individual advisement, students are guided through the job search process which includes clarifying the career objective, how to identify, research and contact potential employers, preparation of the resume, and interview preparation.

Employer contacts may be generated through the on campus interview program, posted vacancy announcements, career and job fairs, as well as professional directories and publications geared
toward the hiring of new college graduates. Students are encouraged to take advantage of the Career Resource Center 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.

**FOOD SERVICE**

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

**The Campus Express Club**

Membership in the Campus Express Club is open to all students, faculty and staff. The Campus Express Club is a declining balance account that works like a credit card in reverse. Members deposit money to their account and then use their campus I.D. card to make purchases at most Campus Dining locations.

Membership has its privileges, including a 5% bonus for deposits of $100 or more and special discounts offered at Campus Dining locations.

**HEALTH SERVICES**

*Student Health Center (27), 805 756 1211 (Voice or TDD)*

The mission of the Student Health Center is to support the physical well being of all students attending Cal Poly. The 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 as part of the mandatory health fee and are described below.

**Basic outpatient care** is available Monday through Friday, year round, 8:00 a.m. to 4:30 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 at a low cost and include pharmacy items (prescription and over-the-counter items), lab tests when specimens are sent off campus for processing, immunizations, and orthopedic supplies.

**Major medical insurance** coverage for off-campus services is strongly recommended since major medical/surgical problems cannot be treated on campus at the Health Center.

**RESIDENTIAL LIFE AND EDUCATION**

*Housing Office (29) 805 756-1226*

Living on campus can be a unique and rewarding experience. For nearly two-thirds of all entering first year students it is the first experience in a new environment. Students participate in a variety of social interactions and share the same community with a diverse groups of individuals. It is this living environment, where diversity and culturalism are discussed, that provides residents with opportunities to explore their ideas and values in a safe learning community.

Residents are provided with an environment which educates, challenges, and supports their personal and academic development. Learning in the classroom is extended into the residence halls through formal programming, recreational activities, and the Living/Learning Programs. All activities are coordinated by the residents and the staff. Most students make lifelong friends while residing in the residence halls.

**Housing Staff**

Activities are administered by full-time professionals, Coordinators of Student Development. They are available to assist residents with counseling, crisis intervention, general referrals, and judicial actions. The Coordinators also supervise desk services and the Resident Advisors.

Resident Advisors, known as RAs, are upperdivision students who understand the challenges faced by new students and try to make the residence hall experience positive and memorable. The RAs are trained in academic advising, event planning, and crisis intervention to assist students through their first year.

**Living/Learning Halls**

Living/Learning Halls are centered around Cal Poly's academic colleges. Faculty, administrators, and alumni frequently meet with the students in an informal setting. The programming focuses on four fundamental areas: academic development and
support, personal development, professional affiliation, and leadership development. This provides many advantages for residents including direct faculty contact, study groups, events relating to the student's major, and career planning.

Development of a Campus Community

Student representatives are elected in fall term to serve on governing boards in each of the residence halls. Participants contribute to the their hall's community by planning social, recreational, and educational events; and by voicing student-related concerns. Additional opportunities for student involvement are provided by Networks in student community services, recreational sports and multicultural issues.

Convenient On-Campus Housing

Cal Poly's on-campus housing allows the resident convenient access to all campus services and events. Students interested in on-campus housing should return the Housing Application, which is found in the "Notice of Admission" packet, to the Hillcrest Housing Office. Housing licenses are then mailed to students. Priority for housing is generally assigned on a first come, first served basis. Students over 25 years of age should request permission of the Director of Housing. To receive housing consideration, signed licenses and payment must be returned by the stated deadline.

Living Expenses for Students in Campus Residence Halls (Subject to Change)

Room and Board are payable in advance or installments (service fee will be charged).

Room, annual license required ........... $2,318–2,348
(academic year, double occupancy)
Board ........................................ 2,121–2,277
(required, academic year)
Housing Security Deposit ......................... 25
(payable prior to occupancy)

Off-Campus Housing

The Housing Office maintains off-campus rental information 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. Rental information is available by telephone voice mail, (805) 756-5700. The University does not inspect, approve or disapprove any units offered for rent.

PSYCHOLOGICAL SERVICES

Student Services Bldg. (124), Room 119, 805 756-2511 (Voice or TDD)

Psychological Services offer counseling and learning experiences for a variety of students' personal needs such as anxiety and depression, and campus community improvement. Services include one-to-one and group counseling. In addition to receiving help in a time of transition, students can develop skills in such areas as communication; problem solving; decision making; and, through Testing Services, personality assessments can be done for interested students.

Faculty and staff can consult Psychological Services for help with such areas as group communication, organizational and group processes, test construction and other skills which will improve the learning environment for students. Counseling and Testing Services are located in the Student Services Building, across from the Mustang Stadium.

STUDENT ACADEMIC SERVICES

Hillcrest (81), 805 756-2301

The mission of Student Academic Services is to assist students from targeted underrepresented populations in achieving access to higher education and to promote their ongoing personal and educational success, as well as to assist Cal Poly in attaining its educational equity goals.

Eligible students can utilize a network of academic services, academic advisers and activities, and referrals to additional campus resources. Student Academic Services is a comprehensive program of transition and retention services that are all designed to support academic excellence.

Academic advisers work with each of the six colleges to provide assistance to students with class scheduling, diagnosis of academic skills, graduation planning, career clarification, and related learning and study skills. Specialized instructional and tutorial assistance is available in a variety of small group and individual study sessions.

Student Academic Services incorporates the following:

Academic Skills Center
Fisher Science (33), Room 290, 805 756-1256

Provides study skills programs to increase students' academic success and retention. Study strategies include: study skills assessment, learning styles, time management, listening, note taking, speed reading, how to study for math and science courses, motivation, test preparation, and test taking skills.

Disabled Student Services
University Union (65), Room 202, 805 756-1395, TDD 805 756-1399

Provides information and assistance to students who have either permanent or temporary disabilities. Specialized services include advisement, campus orientation, on-campus transportation, special parking permits, loan of adaptive equipment, and provision of
Student Activities and Services

direct services (readers, note takers, tutors, interpreters).

Educational Opportunity Program
Hillcrest (81), 805 756-2301

Improves access, retention, and graduation rates of educationally disadvantaged, low-income, and/or underrepresented students. Students are provided academic advising, course scheduling assistance, group study tutorials, peer advising, personal and career counseling, and financial aid information.

Minority Engineering Program
Engineering South (40), Room 105, 805 756-1433

Offers comprehensive services designed to promote academic excellence, professionalism, camaraderie, and career preparation for African-American, Hispanic, and Native American students majoring in engineering and computer science.

Student Support Services
Hillcrest (81), 805 756-2301

Provides academic advising, assistance in course selection, tutorial services, and activities designed to prepare low-income students, students with physical disabilities, and/or first-generation college students for academic success.

Summer Institute
Hillcrest (81), 805 756-2301

Provides a select group of freshmen and transfer students with a "mini-summer quarter." Students complete 4-6 units of Cal Poly coursework while living on campus, thus enhancing their academic and university skills.

Upward Bound
Hillcrest (81), 805 756-2301

Motivates and academically prepares local high school students (from groups that are underrepresented at the college level) to pursue a postsecondary education. The academic program and the residential summer school session at Cal Poly offer tutoring, career advisement, supplemental instruction, and cultural and recreational activities.
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 competes in the PAC 10 conference. The balance of the women's and men's programs are in the California Collegiate Athletic Association (CCAA). Through the end of 1991, Cal Poly has won 37 NCAA Division II team titles.

The California State University is committed to providing equal opportunities to men and women CSU students in all campus programs, including intercollegiate athletics.
ADMISSIONS

Admissions Office
Administration Bldg. (1), Room 213
(805) 756-2311, TDD (805) 756-2360

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 unsure 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 California State University campuses, or at any California high school or community college.

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

Cal Poly 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, either as described in the admission booklet, or by XAP, Cal Poly's new electronic disk application process. This is the preferred method of application and collects data for both the standard CSU application and Cal Poly's Admission Supplemental Questionnaire (ASQ).

The $55 non-refundable 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. An alternate campus and major may be indicated on the application, but applicants should list as an alternate campus only a CSU campus that also offers the major. Generally, an alternate major will be considered at the first choice campus before an application is redirected to an alternate choice campus.

Because all majors at Cal Poly are oversubscribed, it is important to file your application postmarked during the month of the application filing period.

Application Filing Periods

Fall Quarter ................................. November 1-30
*Winter Quarter ............................. June 1-30
*Spring Quarter ............................. August 1-31
Summer Quarter ............................ February 1-28

*Call the Admissions Office for the latest information on applications for Winter and Spring Quarters. Applications postmarked after the filing period will be considered only if openings are still available.

Exceptions—applicants to the following programs are admitted to the fall term only: Architecture, Architectural Engineering, City and Regional Planning, Construction Management, Landscape Architecture, Music, and Applied Art and Design.

THE ADMISSION PROCESS

Admission to Cal Poly is based on the competitive nature of each applicant's admission portfolio. The University utilizes a faculty-mandated multi-criteria selection process. Only candidates submitting an application during the correct filing period will be considered.

All candidates are screened and ranked by major and level: freshmen, lower division transfers or upper division transfers. Freshman candidates are evaluated and selected for admission based on five separate categories including core courses completed, grades earned in core courses, elective courses completed, test scores from either the ACT or SAT, and work experience or extra-curricular activities. Transfer candidates are selected based on completion of major area courses and general education courses, GPA, work experience, and extra-curricular activities.

After your application has been processed and initial transcripts, test scores and required supporting documents have been received, we verify that you have met the CSU admission requirements. We then send you an acceptance letter confirming your eligibility and a Statement of Intent to Register (SIR). It is mandatory that you return your SIR by the date indicated so that a space will be reserved for you.

Statement of Intent to Register Deadlines:

Fall.............................................May 1st
Winter ........................................October 15th
Spring ........................................December 1st
Summer ......................................No Deadline

When your final transcripts are received in the Admissions Office, you will receive your official letter of acceptance. At this time, you will be eligible to register for classes.

Applicants to the majors of Applied Art and Design and Music will be contacted by the department and asked to submit supplementary information. Applied Art and Design applicants will be requested to submit a portfolio, and Music applicants will be required to provide a tape of the applicant
performing or an audition will be scheduled. Admission to Applied Art and Design or Music will then be determined by the major department rather than through the regular selection process.

If you are not granted space at Cal Poly, but you listed an alternate campus on your application, your application will automatically be redirected to that campus if they still have openings in your major. However, we suggest you file separate applications with other CSU campuses that offer your major.

Hardship Petitions

The campus has established procedures for consideration of qualified applicants who would be faced with extreme hardship if not admitted to Cal Poly. Petitioners should write the Admissions Office regarding specific policies governing hardship admission. In general, a secondary review is granted to permanent San Luis Obispo County resident upper-division transfer students who, because of financial reasons or family obligations, would be unable to leave the area to continue their education. This action is initiated by a letter to the Director of Admissions from a denied applicant outlining the reasons why consideration through hardship should be granted.

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 each of the courses in the comprehensive pattern of college preparatory subject requirements (see "Subject Requirements"). Courses must be completed prior to the first enrollment at Cal Poly.

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").

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).

If your grade point average is 3.00 or above (3.61 for nonresidents), you are exempt from submitting test scores. However, you are urged to take the SAT or ACT since all campuses use test results for advising and placement purposes.

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.

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

Provisional Admission

Cal Poly may provisionally admit first-time freshman applicants based on their academic preparation through the junior year of high school and planned for the senior year. The campus will monitor the senior year of study to ensure that those so admitted complete their senior year of studies satisfactorily, including the required college preparatory subjects, and graduate from high school.

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>30</td>
<td>1200</td>
</tr>
<tr>
<td>2.20</td>
<td>26</td>
<td>1040</td>
</tr>
<tr>
<td>2.40</td>
<td>22</td>
<td>880</td>
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<tr>
<td>2.60</td>
<td>18</td>
<td>720</td>
</tr>
<tr>
<td>2.80</td>
<td>14</td>
<td>560</td>
</tr>
<tr>
<td>3.00**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

Honors Courses

Up to eight semesters of honors courses taken in the last two years of high school can be accepted. Each unit of A in an honors course will receive a total of 5 points; B, 4 points; and C, 3 points.

Subject Requirements

Cal Poly 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.
Admissions

- 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.

If you have completed at least 15 college preparatory units, you may offset a one-unit shortage in one subject area by completing an extra unit in another subject area. This option is available from fall 1992 through summer quarter 1995. Although you will be granted regular admission under this option, you are strongly advised to complete all courses in the college preparatory pattern, especially Mathematics and English, so you will be adequately prepared to begin your university studies. Please see your high school counselor for further information.

Foreign Language Subject Requirement

The foreign language subject requirement may be satisfied by 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 a campus admission officer for further information.

Subject Requirement Substitution for Students with Disabilities

Applicants with disabilities 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 or hearing impaired, are blind or 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 Cal Poly's 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 to 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.

TRANSFER REQUIREMENTS

You will meet qualifications for admission 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").
2. 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.
3. 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.
4. 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.

Transferable courses are those designated for baccalaureate credit by the college or university offering the courses.

Making Up Missing College Preparatory Subject Requirements

Undergraduate 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. One college course of at least three semester or four quarter units will be considered equivalent to one year of high school study.
3. Earn acceptable scores on specified examinations.
4. If you have 56 or more semester (84 quarter) units, you may complete one of the following alternatives:
   (a) 1987 or earlier high school graduates: complete the CSU general education requirements in communication in the English language (at least 9 semester units) and mathematics (usually 3 semester units) with a C or better in each course;
   (b) 1988 or later high school graduates: complete a minimum of 30 semester (45 quarter) units, with a C or better in each course, chosen from courses in English, arts and humanities, social science, science, and mathematics of a level at least equivalent to courses that meet general education 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 an admissions officer 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 credit must submit scores, unless exempt (see "Eligibility Index"), from either the Scholastic Aptitude Test (SAT) of the College Board or the American College Testing Program (ACT). If you are required to submit test scores, you should take the test no later than November. Test scores are also used for advising and placement purposes. Registration forms and dates for the SAT or ACT are available from high school or college counselors, or from a CSU campus testing office, or you may write or call:

American College Testing Program (ACT)
Registration Unit, P.O. Box 168
Iowa City, Iowa 52240
(319) 337-1270

The College Board (SAT)
Registration Unit, P.O. Box 592
Princeton, New Jersey 08541
(609) 771-7588

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 (TOEFL). Applicants should take the TOEFL at least six months prior to the term applying for in order for scores to be received in time for full consideration in the selection process.

OTHER ADMISSIONS INFORMATION

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 before the deadline dates listed below. The application fee must accompany the application for readmission.

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.

Application Deadlines for Returning Students

Summer Quarter: ........................................ April 1
Fall Quarter: ................................................. July 1
Winter Quarter: ............................................. October 1
Spring Quarter: ............................................ March 1

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 all of the following conditions:

1. Possesses a high school diploma (or has established equivalence through either the Tests of General Educational Development or the California High School Proficiency Examination).
2. Has not been enrolled in college as a full-time student for more than one term during the past five years.
3. If there has been any college attendance in the last 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 GENERAL ADMISSION REQUIREMENTS

Undergraduate and Graduate Application Deadlines:

Fall Quarter .............................................. June 1st
Winter Quarter ......................................... October 1st
Spring Quarter .......................................... February 1st
Summer Quarter ....................................... April 1st

To be considered for admission to an undergraduate or graduate program, you must have graduated from a secondary, higher secondary, or tertiary institution which is
recognized by the Ministry of Education. International applicants must have their admission portfolios completed by the deadline dates listed above. A completed portfolio includes: official transcripts from all schools attended showing evidence of graduation from secondary school and all coursework and any certificates or degrees received. All official documents must be submitted in native language and accompanied by a certified English translation; two letters of reference from instructors or professors; confidential financial statement; certificate of health; International Education Background form; and a Test of English as a Foreign Language with a score of 550 or more. Official proof of university graduation must be sent directly by the institution, and a Test of Written English with a score of 4.5 must be included.

After all required forms and academic documents have been received, we will determine your eligibility for admission and notify you of the results. If admitted, you will receive a Certificate of Eligibility (I-20 form) which is necessary to obtain a student visa to enter the United States or for requesting permission from the U.S. immigration and Naturalization Service for you to transfer to Cal Poly from another U.S. school. The I-20 form is valid for enrollment only at Cal Poly for the quarter indicated, and includes an expiration date. If it is necessary to change your application to another term, you must make your request in writing and another application fee may be required.

**GRADUATE ADMISSIONS**

For information regarding graduate application procedures and admissions, see the "Graduate Programs" 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, and 89705–89707.5, 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 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 appointment of a guardian for the minor, 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.

**Residence determination dates**

<table>
<thead>
<tr>
<th>Term</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>September 20</td>
</tr>
<tr>
<td>Winter</td>
<td>January 5</td>
</tr>
<tr>
<td>Spring</td>
<td>April 1</td>
</tr>
<tr>
<td>Summer</td>
<td>July 1</td>
</tr>
</tbody>
</table>

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
Admissions

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. Effective January 1, 1994, this exception continues until the military personnel has resided in the state the minimum time necessary to become a resident.

6. Dependent children of a parent 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.
<table>
<thead>
<tr>
<th>FEES</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXPENSES</td>
</tr>
<tr>
<td>and</td>
</tr>
<tr>
<td>FINANCIAL AID</td>
</tr>
</tbody>
</table>
FEES AND EXPENSES

STATE UNIVERSITY FEE
The State University Fee 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 per quarter at the lower rate. The higher rate is charged if the total units taken during the quarter exceeds six.

SCHEDULE OF FEES
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. Students who have already earned a degree equal to or higher than the one for which they are enrolled are charged Duplicate Degree Tuition, but do not have to pay the State University Fee.

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
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. The total fee paid per term will be determined by the number of units taken, including those in excess of fifteen.

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.

<table>
<thead>
<tr>
<th>0-6.0 units</th>
<th>more than 6 units</th>
</tr>
</thead>
<tbody>
<tr>
<td>State University Fee:</td>
<td></td>
</tr>
<tr>
<td>Undergraduates</td>
<td>$344.00</td>
</tr>
<tr>
<td>Graduates</td>
<td>360.00</td>
</tr>
<tr>
<td>Associated Students Fee</td>
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</tr>
<tr>
<td>Facility Fee</td>
<td>2.00</td>
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<tr>
<td>Instructionally Related Activities Fee</td>
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<td>Health Plan Fee</td>
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<tr>
<td>University Union Fee</td>
<td>56.00</td>
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<tr>
<td>Campus Services Card</td>
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<tr>
<td>Total registration fees per quarter:</td>
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</tr>
<tr>
<td>Undergraduates</td>
<td>$497.00</td>
</tr>
<tr>
<td>Graduates</td>
<td>513.00</td>
</tr>
</tbody>
</table>

* Fall quarter fee; other quarters may be slightly lower.

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

Tuition for Nonresident Students
Nonresident tuition (in addition to other fees charged all students) per quarter unit $164.00

Room and Board (On-Campus)
Room, annual license, double occupancy. Fees indicated do not include deposit.
| | |
| Academic year | $2,313.00 |
| Summer quarter | 771.00 |

Meals (approximate cost)
| | |
| 19 meals per week, academic year | $2,199.00 |
| 14 meals per week, academic year | 2,046.00 |

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
Check returned for any cause 10.00
Copy of student records, up to 4 pages ($0.25 each additional page) 1.00
Extension course fees (per quarter unit):
| Lecture and discussion | 70.00 |
| Activity | 85.00 |
| Laboratory | 110.00 |
| Administrative (contract) | 20.00 |
Failure to meet administratively required appointment or time limit 2.00 to 20.00
Instrument use fee (Music) 5.00
Library fees for use of audio-visual equipment see schedule in library
Special examination fee (per examination) cost to 25.00
Sponsored Student Fee (per quarter) 250.00
Thesis binding fee 15.00
Second copy if required by department 7.50
Transcript of academic record (cost varies with number ordered) 4.00

DUPLICATE DEGREE TUITION
The California State University is required by law to charge duplicate degree tuition of $100 per quarter unit up to a maximum of $1,500 per quarter to any student who has earned a degree equivalent to or higher than the degree awarded by the program in which the student is enrolled or who has earned a baccalaureate or postbaccalaureate degree and is enrolled without a declared degree objective.
The following categories are exempted from Duplicate Degree Tuition:

1. A dislocated worker as certified by a state agency in accordance with Title 3 of the Federal Job Training Partnership Act.

2. A displaced homemaker as defined in accordance with the Higher Education Act of 1965, as amended (20 USC 1001 et seq.)

3. A person who is an enrollee in any program leading to a credential or certificate that has been approved by the Commission on Teacher Credentialing.

4. A recipient of benefits under the Aid to Families with Dependent Children program, the Supplementary Security Income or State Supplementary Program, or a general assistance program.

5. A nonresident student except those for whom nonresident tuition has been waived.

6. A California resident who is sixty years of age or older.

7. Children and dependents of deceased or disabled veterans.

8. Children of deceased law enforcement or fire suppression prevention employees.

**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 42201 (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." Information concerning any aspect of the refund of fees may be obtained from the Academic Records Office or the University Cashier.

**DEBTS OWED TO THE UNIVERSITY**

Should a student or former student fail to pay a debt owed to the institution, the institution 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 institution may withhold permission to receive official transcripts of grades from any person owing a debt. If a student believes that he or she does not owe all or part of an unpaid obligation, the student should contact the campus business office. The business office, or another office on campus to which the student may be referred by the business office, will review the pertinent information, including information the student may wish to present, and will advise the student of its conclusions with respect to the debt.

**CREDIT CARDS**

VISA and Master Charge bank credit cards may be used for the purchase of meal tickets from the University Foundation, theatre tickets from the Cal Poly Theatre Box Office, health services 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 Student Body Fee was established at California Polytechnic State University, San Luis Obispo by student referendum on May 22, 1991. The same fee can be abolished by a similar two-thirds approval of students voting on a referendum called for by a petition signed by 10% of the regularly enrolled students (Education Code, Section 89300). The level of the fee is set by the Chancellor. An increase in the student body fee may be approved by the Chancellor only following a referendum on the fee increase approved by a majority of students voting. Student body fees support a variety of cultural and recreational programs, child care centers, and special student support programs.
FINANCIAL AID

Financial Aid Office
Administration Bldg. (01), Room 212
(805) 756-2927

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 Free Application for Federal Student Aid (FAFSA). 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 FAFSA with the processor is March 2.

TYPICAL STUDENT EXPENSES

Following are the typical expenses per quarter during the 1993-94 academic year for the average California resident student attending Cal Poly. Charges for room and board are payable in advance or in installments. Nonresident students should be prepared to pay additional tuition and fees. For the 1993-94 school year nonresident tuition was an extra $164 per unit. Duplicate degree tuition will be charged to students who have already earned a degree equivalent to or higher than the degree awarded by the program in which the student is enrolled. Duplicate degree tuition is $100 per unit. Students in this category must pay campus fees ($140) in addition to Duplicate Degree Tuition, but do not have to pay the State University Fee.

Please see the "Fees and Expenses" section 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:**

- Registration fees ........................................ 747
- Room and board with 14-meal ticket ................. 1,588
- Books and supplies (estimated) * ..................... 204
- Personal expenses and transportation ............... 697

**Estimated total per quarter** ...................................... $3,236

* Beginning engineering and architecture students should be prepared to pay up to $250 in their first quarter for books and supplies.

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 portfolio.

Generally, a student must have at least an over-all 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. A reference form is included as part of the application, and it 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. To determine financial need, the FAFSA must also be filed. For
priority consideration for financial aid programs and Cal Poly scholarships, the FAFSA should be mailed to the processor by March 2.

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 while receiving the scholarship (extended education, concurrent enrollment and other college units are excluded). Some scholarships require that recipients 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.

Students not selected will be notified during the summer. However, applications will remain active for the academic year. Should a scholarship become available, a current applicant in good standing may be considered.

SCHOLARSHIPS

General Scholarships
Alumni Honor Scholarships
R. W. Andrews Scholarships
Paul and Barbara Boberg Scholarship
Lulu Grumbles Bumphrey Scholarships
Cal Poly State University Memorial Scholarships
Cal Poly Women's Club Scholarship
Cal Poly Alumni—Peninsula/South Bay Chapter Scholarships
Cal Poly East Bay Alumni Chapter Scholarship
Cal Poly Parents' Association Scholarships
California Rural Rehabilitation Scholarships
Felix Camacho-Betteravia Farms Scholarships
Central California Women's Conference Scholarship
Herbert E. Collins Scholarships
Maurice E. Coulter Scholarship
CSU Graduate Equity Fellowships
Educational Equity Scholarships
Pat Elliot Memorial Award
Ford/EEOC Scholarships
Ralph V. Fullwiler Scholarships
Green and Gold Barbecue Scholarship
Jennifer Jess Hemstreet Memorial Scholarship
Regnar Hessellund Scholarships
Michelle Ann Jacobson Memorial Scholarship
Land Outstanding Service Award
Ian McMillan Memorial in Environmental Activism Scholarship
Julian A. McPhee Award
Modesto Alumni Boosters Scholarships
Morro Bay Woman's Club Scholarship
National Pro-Am Youth Fund Scholarships
PEF Packaging Professionals Scholarship
Phi Kappa Phi Award
Rose Parade Float Award
Army-ROTC
L. Diane Ryan Scholarship
Helen V. Sandercock Scholarships
William and Adelaide Sandercock Scholarships
Sheila and Yosef Tiber Scholarships
William B. Turner Scholarships
J. W. Van Dyke Memorial Scholarships
Ralph R. Wilmar Rodeo Queen Scholarship
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
Harold C. Bradshaw Scholarship
Herbert Hopkins Burlingham and Ruth Hembree Burlingham Scholarship
California Agri-Fair Scholarships
California Association of Nurserymen-Peninsula Chapter Scholarship
California Cattlewomen Scholarship
California Congress of Parents, Teachers and Students (PTA) Scholarship
California Creamery Operators Association Scholarship
California Dairy Industries Association Scholarship
California League of Food Processors Scholarship
California State Grange Scholarships
William, Joseph and Charles Cattaneo Scholarship
CIBA-Geigy Scholarship for Minorities in Agriculture
Carl A. Cilker Scholarship
William H. Cilker Scholarship
Claire Davis Clark Scholarship
Concord Farm Bureau Scholarship
Sandra Crabtree Memorial Scholarship
Rosario Curletti Scholarships
Dr. Arnold Dean Scholarships
General Dillingham Produce Industry Scholarships
Kenneth H. Easter Scholarship
Environmental Industries, Inc. Scholarship
Paul Etchechury Memorial Scholarship
Gerald H. Fairbairn Scholarship
Woody Frey Scholarship
J. Cordner Gibson Scholarship
Ray Hansen Memorial Scholarship
William Randolph Hearst Foundation Scholarships
William (Ben) and Helen Holman Alumni Scholarship
Harold G. Hull Graduate Assistantships
International Agriculture Fellowships
Corwin M. Johnson Scholarship
Richard F. Johnson Scholarship
Corwin M. Johnson Scholarship
Ted and Dottie Kasinak Scholarship
Kings River Prune and Apricot Scholarships
Knight Brothers Scholarships
Knudsen Foundation Scholarships
E. C. Loomis and Son Scholarship
Los Angeles County Fair Association Scholarship
Lucky Stores Scholarships
Chester O. McCorkle, Sr. Memorial Scholarship
Dr. Ole Meland Scholarship
Lou Merrill Scholarship
James F. Merson Memorial Scholarship
NAMAA/West 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
Dante Righetti Scholarship
Rodeo Boosters Achievement Award
Rodeo Club Scholarships
Burton Douglas Salisbury Memorial
Jean Eddy Sander Rodeo Queen Award
Fred and Marian Sandercock Scholarships
San Luis Obispo Lions Club/ Food Industries Scholarship
Vard M. and Mildred Shepard Memorial Scholarship
Oben J. (Ben) Simonson Scholarship
Louis H. and Stella S. Soares Achievement Award
Herman M. Sperber Memorial Scholarship
Stardust Jersey Farm Scholarship
Sunwest Foods Scholarship
Harmon M. Toone Scholarship
Eric C. Twist Memorial Scholarships
War Veterans Scholarship
Richard A. (Alex) Wilson, Jr. Memorial Scholarship
Leopold Edward Wrasse Scholarship

Architecture and Environmental Design
Stephen O. Anderson Memorial Scholarship
Beavers Heavy Construction Scholarship
Bechtel Corporation Scholarships
Robert Bein, William Frost & Associates—Sean Rogers Memorial Scholarship
Douglas W. Butzbach Memorial Scholarship
Don Chapin Company Scholarship
City and Regional Planning Scholarships
Richard Lee Fisher Memorial Scholarship
Thor Gulbrand, AIA Memorial Scholarship
D. Stewart Kerr Scholarship
Don and Caryl Koberg Architecture History 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 Assistantships
Robert Itifumi Odo Memorial Scholarship
Oltmans Construction Company Scholarship
Professional Architects Scholarship
Frederick Peter Young Scholarships

Business
Andersen Consulting Accounting Scholarship
Andersen Consulting Outstanding Junior Management Award
Mickie Burris Award
California Congress of Parents, Students and Teachers (PTA) Scholarship
Central Coast Controllers' Association Scholarship
Clorox Company Scholarship
Daryl Damon Memorial Scholarship
Milton Drandell Memorial Award
Ernst & Young Scholarship
Frank and Norma Exter Scholarship
Industrial Technology Society Scholarships
KPMG Peat Marwick Scholarship
Jeffrey W. Land University and Community Service Scholarship
James R. Landreth, Vice President for Business Affairs Emeritus Scholarship
John S. and Janice B. Maher Scholarships
Merrill Lynch FMA Student Award
Northrop Ventura Management Club Scholarship
Price Waterhouse Scholarship
Larry Ratner Scholarship
Touche Ross Scholarship
Leopold E. Wrasse Scholarship

Engineering
Alcoa Foundation Scholarships
Adele and Aldo Alessio Scholarships
American Institute of Aeronautics and Astronautics, Vandenberg Section Scholarships
American Society of Heating, Refrigeration and Air-Conditioning Engineers Scholarsips (ASHRAE)
San Jose Chapter
Southern California Chapter
Andersen Consulting Outstanding Junior Awards in Aeronautical Engineering
Computer Science
Mechanical Engineering
Andersen Consulting Outstanding Junior in Industrial Engineering Scholarship
Association of Old Crows Scholarship
Bechtel Corporation Scholarships
Boeing Company Scholarships
Don Chapin Company Scholarship
Chevron USA Inc. Scholarships
Allan R. Davis Scholarship
Environmental Research Foundation Award
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 Industries Scholarships
Mechanical Engineering Scholarship
Dragoslav M. Masic Scholarship
George and Tonny Murray Scholarship
National Action Council for Minorities in Engineering Scholarships
Northrop Scholarships
Frank E. Pilling, Sr. Scholarship
Roy N. Poage Memorial Scholarships
Raychem Scholarships
Raytheon Company Scholarships
Doral Sandlin Aircraft Design Award
Siemens Pacesetter Scholarship
Shell Western E & P Minority Development Scholarship
Society of Manufacturing Engineers Student Chapter–Leo E. Rogers Memorial Scholarships
Jack and Alice Spaulding Mechanical Engineering Scholarship
Gregory Stines Memorial Scholarship
Morris P. Taylor Memorial Scholarship
Toyota Scholars Program Scholarship
Unocal Scholarships
Dutch and Gladys Van Harreveld Scholarships
Varian Scholarships
Andrew Wacht Scholarship
Charles (Chuck) Peter White Scholarship
Charles Wiswell Scholarship
Ziatech Corporation Scholarship

Liberal Arts

Cal Poly Band Scholarship
John Bayliss Broadcast Scholarships
Harold P. and Rosalie Davidson Award
James M. Duenow Scholarship
Christopher Fair Scholarship
Jay Garner Memorial Scholarship
Ann and Gordon Getty Scholarship
Graphic Communication Scholarship
Gravure Scholarship
Elizabeth Hanlon Parks Memorial Scholarship
Robert S. Harmon Scholarship
Jim Hayes Journalism Scholarship
Mary Lou Hughes English Excellence Scholarship
Evelyn V. Johnson Scholarship
Janet Lee Memorial Award
Darren E. Loyd Photography Scholarship
John H. Lynn Political Science Award
John S. and Janice B. Maher Scholarships
Lucian Morrison Memorial Scholarship
Music Department Memorial Award
Music Faculty Scholarship
Willard "Pete" Pederson Scholarship
Quebecor Printing Scholarship
Ronald V. Ratcliffe Award
Larry Ratner Scholarship
Beatrice A. Rice Scholarship
Eve Strong Memorial Scholarship
Tag and Label Manufacturer's Institute Scholarship
Lloyd Tevis Award
Jeri Ewy Thiel Memorial Scholarships
Guy Thomas Memorial Scholarship
Vocal Studies Scholarship
Carolyn and Larry Voss Music Scholarship
Ralph and Florence Welles Award
Ralph R. Wilmar Classical Piano Scholarship

Science and Mathematics

Andersen Consulting–Kappa Mu Epsilon Scholarship
Applegarth Biology Scholarships
Beta Beta Beta Biological Society Scholarships
Biological Sciences Scholarships
CAHPERD Scholarship in Honor of Robert A. Mott
Chemistry Faculty Scholarship
Clyde P. Fisher Memorial Scholarship
Volmar A. and Viola I. Folsom Scholarships
Jerry Lee Frederick Memorial Scholarship
Hatfield Memorial Award
Robert E. Holmquist Memorial Scholarship
John David Jackman Memorial Scholarship
W. Boyd Judd Scholarship
David Keeling Scholarship
Katrina J. Killgore Memorial Scholarship
David Kittredge Memorial Scholarship
KME Founders Award
George C. Laumann Scholarship
E. H. "Woody" Lehman Memorial– Natural History Scholarship
Barbara Lee Lincoln Memorial Award
Marine Biology Scholarship
Margaret McCormack Scholarship
Microbiology Scholarship
Robert Mott Memorial Scholarship
Mu Delta Phi Scholarship
Sarah Perryman Memorial Award
Robert and Elva Rodin Botanical Scholarship
Sierra Vista Hospital Volunteers Auxiliary Scholarships
Mary E. Smith Memorial Marine Biology Award
Ralph M. Warten Memorial Scholarship
Harold J. Watson Memorial Scholarship
Ralph E. Weston Memorial Award
Kevin Wright Memorial Scholarship

University Center for Teacher Education

California Retired Teachers Association - Laura E. Settle Scholarship
Calista Cheek Affirmative Action Scholarship
Michael and Josephine Cappellotti Scholarship
Teacher Diversity Scholarship

Athletics

Jon Robert Andrews Memorial Scholarship
Mickie Burris Award
Charles Daum Memorial Scholarship
Hall of Fame Scholarships
Berdy Harr Memorial Scholarship
Musselman Wrestling Scholarships
Mustang Booster Athletic Scholarship

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.

Currently, Cal Poly students are the beneficiaries of well over a million dollars of outside scholarship assistance each year.
LOANS

Loans are for educational purposes only, with definite provisions for repayment. There are four types: Federal Perkins Loans, Federal Parent Loans (PLUS), Federal 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.

Federal Perkins Loans

The Federal Perkins 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 FAFSA which must be submitted by March 2 for the upcoming school year.

Federal Parent Loans (PLUS)

Federal Parent Loans (PLUS) enable parents to obtain annually adjusted variable interest loans (not to exceed ten percent) for educational costs through banks and other lending institutions. A PLUS loan goes into repayment when the loan is made. To apply, contact the Financial Aid Office.

Federal Stafford Loan

The Federal Stafford Loan program was established to make loans to students through lending institutions such as banks and credit unions. 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 FAFSA must be on file in order to determine need. Stafford Student Loan applications are available from the Financial Aid Office.

Federal Unsubsidized Stafford Loan

Students who are ineligible for some or all of a subsidized Federal Stafford Loan may borrow using the Unsubsidized Stafford Loan program. With the exception of demonstrated financial need, borrowers must meet all eligibility criteria of the regular Stafford Loan program. Interest payments begin immediately after the loan is disbursed or the borrower may add the interest to the amount owed. The Federal Supplemental Loan for Students (SLS) program has been discontinued for the 1994-95 school year and beyond; accordingly, an additional amount of Unsubsidized Stafford Loan, above the normal Stafford limit, may be available to independent students and to dependent students whose parents are denied a PLUS Loan.

University Emergency Student Loans

This program was designed to assist students in coping with unanticipated educationally-related financial emergencies. 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. Interest rates charged on the unpaid balance during the repayment period range from four to ten percent depending on donor requirements. Accrual usually begins after the specified due date, graduation, or withdrawal from the university. 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 $300 may be borrowed during one quarter. Repayment is usually 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 any unpaid balance remaining after the agreed upon due date.

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 Aspensen 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
California Retired Teachers' Association Loan Fund
W. B. Camp Loan Fund
C.A.R.S.E.S. Loan Fund
Logan S. Carter Loan Fund
Margaret Chase Memorial Loan Fund
Herbert E. Collins Loan Fund
Thomas J. Comer Memorial Loan Fund
Cooperative Education Loan Fund
Harlan Diedrichsen Memorial Loan Fund
Esther Biaggini Dugan Loan Fund
Environmental Protection Agency Loan Fund
1960 Football Team Memorial Loan Fund
Independent Order of Foresters Loan Fund
Anita M. Hathaway Loan Fund
John Holley Memorial Loan Fund
Ralph Hoover Loan Fund
Horsehoeing and Animal Husbandry Loan Fund
Lydia Humphrey Memorial 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
Robert W. and Hazel W. Lutz 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 Schlmeyer Memorial Loan Fund
Sears Roebuck Loan Fund
Norma Sullivan Memorial Loan Fund
Telegram-Tribune Loan Fund
Todd Farm Loan Fund

GRANTS

Federal Pell Grant
This is a program designed to help undergraduates pay for their education after high school. The amount a student is eligible for depends on their Expected Family Contribution, 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 the FAFSA may apply for the Pell grant at the same time.

Federal Supplemental Educational Opportunity Grant Program
The Federal Supplemental Educational Opportunity Grant Program (SEOG) is a 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 FAFSA to the processor by March 2 for the upcoming school year.

Federal Work-Study Program
The Federal Work-Study Program (FWS) is a need-based 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 FWS 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 FAFSA to the processor by March 2 for the upcoming school year.

Cal Grant A
This program awards money to middle- and low-income undergraduates. New awards are limited to students having freshman, sophomore or junior status. To apply to become a new winner of this grant, complete a FAFSA and a GPA Verification Form by March 2 for the upcoming school year. Renewal applicants must send the completed FAFSA by March 2.

Cal Grant B
This program assists high-potential undergraduates from disadvantaged/low-income backgrounds. To apply to become a new winner of this grant, complete a FAFSA and a GPA Verification Form by March 2 for the upcoming year. Renewal applicants must send the completed FAFSA by March 2.

State Educational Opportunity Program Grant (SEOP)
The SEOP grant is designed to assist students who have been admitted to the university through the Educational Opportunity Program (EOP). Undergraduate EOP students are considered for this grant when they file the FAFSA for the upcoming school year by March 2.

State University Grant (SUG)
This state-funded program has been implemented to provide grants to offset the increased State University Fee. SUG is available to undergraduate and graduate students who are California residents and show financial need. To apply, file the FAFSA by March 2 for the upcoming 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
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 whether you are prepared for college work and, if not, to counsel you how to strengthen your preparation. You might be exempted from one or both of the tests if you 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 non-exempt undergraduates prior to placement in appropriate university English coursework. Exemptions from the test are given only to 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 (taken prior to October 1989);
  - a score of 25 or above on the ACT English Test (taken October 1989 or later);
  - a score of 600 or above on the College Board Achievement Test in English Composition with essay;
  - 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, before the end of the second quarter of enrollment 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 succeed in 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 the requirements. The materials also may be obtained from the Test Office or the Writing Skills Program Office.

ENTRY LEVEL MATHEMATICS (ELM) EXAM

The ELM examination tests for entry level mathematics skills acquired through three years of rigorous college preparatory mathematics coursework (normally Algebra I, Algebra II, and Geometry). All new undergraduate students must take the test or be exempted from it prior to placement in appropriate university mathematics coursework. Specific policies regarding retesting and placement will be determined by the campus. Exemptions from the test are given only to those students who can present proof of one of the following:

- a score of 3 or above on the College Board Advanced Placement mathematics examination (AB or BC);
- a score of 560 or above on the mathematics section of the Scholastic Aptitude Test (SAT-Math);
- a score of 24 or above on the American College Test (ACT) Mathematics Test (taken prior to October 1989);
- a score of 25 or above on the enhanced ACT Mathematics Test (taken October 1989 and later);
- a score of 560 or above on the College Board Mathematics Achievement Test, Level 1 or Level 2;
- for transfer students, completion and transfer to the CSU of a college course that satisfies the General Education-Breadth requirement or the Intersegmental General Education Transfer Curriculum requirement in Quantitative Reasoning, provided such course was completed with a grade of C or better.

Failure to take the ELM, as required, before the end of the second quarter of enrollment may 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. Failure to satisfactorily complete the ELM requirement by the end of the first year will lead to administrative probation and possible disqualification from the university.

At Cal Poly, ELM examination scores are valid for a period of two years. Students who do not pass a baccalaureate level course within two years of passing the ELM examination are required to retake the ELM examination before enrolling in such a course. The results of the ELM test will not affect admissions eligibility.

* 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.
Information bulletins and registration materials for the ELM will be mailed to all students subject to the requirements. The materials may be obtained from the Test Office, and the Mathematics Department.

**CAL POLY MATHEMATICS PLACEMENT EXAMINATION**

The Cal Poly Mathematics Placement Examination (MAPE) is a series of diagnostic examinations used by the Mathematics Department to place students in the appropriate mathematics course. The Pre-calculus MAPE measures competence in skills of math analysis and trigonometry. Students who have satisfied the ELM requirement and who anticipate taking either Finite Mathematics or Calculus (MATH 124, 131, 141 or 221) are expected to take the Pre-calculus MAPE during the two-quarter period preceding enrollment. Exemptions from the MAPE are given only to those students who have passed a prerequisite course at Cal Poly.

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

**EVALUATION OF TRANSFER CREDIT**

The Office of Academic Records will evaluate previous college work as it relates to the requirements at Cal Poly, SLO. Each student seeking a degree will be issued an Evaluation of Transfer Credit statement which will serve as a basis for determining the remaining requirements for the student's specific degree objective. Semester units transferred to the University will be converted to quarter units by multiplying the semester units by one and one-half.

Evaluation of Transfer Credit statements are completed automatically as students are admitted. It is important that new transfer students review their previous college work in terms of the degree and credential requirements outlined in the catalog to make a tentative selection of courses for their first quarter of enrollment. Students should consult a faculty advisor in their major department or the appropriate Advising Center for assistance in the selection of courses.

The evaluation remains valid as long as the student matriculates for the term specified, pursues the objective declared, and remains in continuous attendance.

While students may follow the specific catalog year academic requirements on which their Evaluation of Transfer Credit is based, they will be responsible for complying with changes in other regulations, policies, and procedures which may appear in subsequent catalogs.

**Credit for Community College Courses**

Course credit earned in accredited community colleges will be evaluated by the Office of Academic Records in accordance with the following provisions:

1. Community college credit is allowed up to a maximum of 105 quarter units (70 semester units). Credits and grades earned above the maximum allowable may be used only to satisfy subject and grade point requirements but they may not be applied toward the total units required for graduation from the University.

2. No upper division credit may be allowed for community college work.

Cal Poly and California Community Colleges have written articulation agreements relative to the equivalency of courses; students planning to transfer to Cal Poly should consult their community college counselors if they have questions about transfer courses.

General Education-Breadth certifications will be accepted from California institutions from which the students transfer. The certification determines the completion of lower division General Education-Breadth Requirements. Students must still complete twelve upper division General Education and Breadth units and twelve General Education and Breadth units in residence for graduation.

**OTHER ACADEMIC CREDIT**

**Advanced Placement**

Cal Poly grants credit toward its undergraduate degrees for successful completion of Advanced Placement Program examinations 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 Office of Academic Records.

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 do 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 Office of Academic Records.

STUDENT CLASSIFICATION

Undergraduate students are assigned classification level according to the number of quarter units earned:

**Lower Division**
- Freshman ............... fewer than 45 units
- Sophomore ............. 45 to 89 units

**Upper Division**
- Junior .................... 90 to 134 units
- Senior .................... 135 or more units
General Requirements – Bachelor's Degree

**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.)

**GENERAL GRADUATION REQUIREMENTS**

There are eight general requirements which all students must meet in order to earn the bachelor's degree from Cal Poly. Students must be formally admitted and must matriculate in order to earn a degree. The more students understand their progress toward meeting these requirements and relate them to the many programs available, the better the 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 lists major courses, support courses, general education and breadth courses and electives. The department may have a flow chart which shows in detail the recommended sequence of courses leading to your degree.

Students are responsible for meeting all requirements, although assistance is available from departmental faculty advisers, school advising centers, and the Evaluations Office. Students should plan their degree programs carefully and review them frequently with their academic advisers. 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
   - Bachelor of Landscape Architecture ..................... 236 units

   For the Bachelor of Arts, a minimum of 18 major units must be in upper division courses and 60 units overall must be upper division. For the Bachelor of Science degrees, a minimum of 27 major units must be in upper division courses and 60 units overall must be upper division.

2. **Grade Point Average (GPA)**
   
   Students must earn at least a 2.0 GPA in all Higher Education units attempted (all college-level work), in Cal Poly cumulative units attempted, and in the major (the courses listed as major courses in the curriculum display). For a definition of GPA and quality points and hours, please refer to Grading.

3. **U. S. Cultural Pluralism (USCP) Requirement**
   
   Students must complete the USCP requirement as indicated in the USCP section of this catalog (see page 76).

4. **General Education and Breadth (GEB) Courses**
   
   Students must complete the GEB requirements as indicated in the degree program and shown in the GEB section of this catalog (see page 77).

5. **Graduation Writing Requirement (GWR)**
   
   Students must demonstrate competency in writing skills as described below.

6. **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. Students must satisfactorily complete a senior project in order to receive any bachelor's degree.

7. **Academic Residence Requirements**
   
   Students 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. However, a maximum of 36 quarter units of extension credit may be counted toward the bachelor's degree.

8. Evaluation for Graduation

Students should request a graduation evaluation from the Office of Academic Records approximately three quarters prior to their 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 in which all requirements have been met. Diplomas may be ordered through El Corral Bookstore, but the order will not be fulfilled until all degree requirements have been completed. The diploma will be mailed approximately four months after the degree has been awarded.

If a student breaks attendance prior to completion of degree requirements, he or she may be required to re-enroll and may be held to catalog requirements in effect at that time.

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 300-level courses approved for GWR credit are listed in the Class Schedule under Graduation Writing Requirement.

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

CURRICULUM SUBSTITUTION

Although a curriculum is specified for each major, under certain conditions a student may be permitted some deviation from the established curriculum. Substitutions involving General Education and Breadth courses must be approved through the department offering the GEB course. Forms are available at the Office of Academic Records. See the major department office for substitutions involving major or support courses.

CHANGE OF MAJOR

Students who feel they have selected an inappropriate major for their interests and abilities should consult their adviser and a Counselor at Career Services (756-2501) 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. Once approved, students will automatically receive a re-evaluation of completed requirements for the new major from the Office of Academic Records.

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

DOUBLE MAJORS

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

A student may be granted a bachelor's degree with two majors if the complete requirements of both major curricula are satisfied at the same time.

However, 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. The fact that the requirements of another program have been completed will be noted on the transcript.

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
General Requirements for the Bachelor's Degree 75

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.

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 student knowledge in an area which lies outside of the major field of study. At least half of the units must be from upper-division courses (300- or 400-level) and at least half of the units 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 college offering the minor.

<table>
<thead>
<tr>
<th>Minors</th>
<th>Department/College</th>
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<tr>
<td>Agribusiness</td>
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<td>Anthropology/Geography</td>
<td>Social Sciences</td>
</tr>
<tr>
<td>Art</td>
<td>Art and Design</td>
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<td>Biotechnology</td>
<td>Science and Mathematics</td>
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<td>Business</td>
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<td>Computer Science</td>
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<td>Dance</td>
<td>Theatre and Dance</td>
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<td>Economics</td>
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<td>English</td>
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<td>Ethnic Studies</td>
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<tr>
<td>Food Science</td>
<td>Food Science and Nutrition</td>
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<td>French</td>
<td>Foreign Languages &amp; Literatures</td>
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<tr>
<td>German</td>
<td>Foreign Languages &amp; Literatures</td>
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<td>Gerontology</td>
<td>Psychology and Human Development</td>
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<td>Graphic Communication</td>
<td>Graphic Communication</td>
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<td>History</td>
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<td>Integrative Technology</td>
<td>Industrial Technology</td>
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<td>International Relations</td>
<td>Political Science</td>
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<td>Linguistics</td>
<td>English</td>
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<td>Mathematics</td>
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<td>Music</td>
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<td>Nutritional Science</td>
<td>Food Science and Nutrition</td>
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<td>Packaging</td>
<td>Industrial Technology</td>
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<td>Philosophy</td>
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<td>Plant Protection</td>
<td>Crop Science</td>
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<td>Poultry Management</td>
<td>Animal Science</td>
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<td>Psychology</td>
<td>Psychology and Human Development</td>
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<td>Political Science</td>
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<td>Foreign Languages &amp; Literatures</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</td>
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<td>Values, Technology and Society</td>
<td>Liberal Arts</td>
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<tr>
<td>Water Science</td>
<td>Agriculture</td>
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<tr>
<td>Women's Studies</td>
<td>Liberal Arts</td>
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COMMENCEMENT

Students completing all degree requirements in the Winter, Spring or Summer term are eligible to participate in the Spring Commencement. Students completing degree requirements in the Fall term are eligible for Fall commencement.
U.S. Cultural Pluralism Requirement

U.S. Cultural Pluralism (USCP) courses fulfill the following criteria:

1. Emphasis on one or more of these four U.S. Cultures: Asian American, African American, Hispanic American, American Indian;

2. Attention to general issues of gender, diversity, equity, ethnocentrism, and ethnicity; and the relationships to problems facing contemporary society, especially those resulting from racism, discrimination and cultural conflict;

3. Application of rigorous pedagogical, scholarly methods and standards as evidenced in substantive exams, reports, papers, and projects; and

4. Attention to critical thinking skills which will allow students to address cultural, racial, and gender issues in a sensitive and responsible manner and to evaluate their own attitudes and those of others.

Students are required to complete one USCP course. This course will also fulfill a requirement for Major, Support, General Education and Breadth (GEB), or Free Elective category.

The following courses fulfill the U.S. Cultural Pluralism requirement. Additional courses are under consideration and students should consult the current Class Schedule or their academic adviser for an up-to-date list.

AGB 401 Managing Cultural Diversity in Agricultural Labor Relations (4)
ENGL 345 Women Writers (4) (GEB C.3.)
ENGL 346 Ethnic American Literature (4) (GEB C.3.)
ES 114 Racism in American Culture
ES 210 U.S. Cultural Heritage
ES 230 Chicano/a Literature
ES 320 American Cultural Images
ES 325 African American Women's Experiences
HIST 325 Comparative History of American Minorities (3)
HIST 328 American Indian History (3)
HIST 329 American Indian Thought (3)
HIST 331 Afro-American History (3)
HIST 435 American Women's History since 1870 (3)
JOUR 290 Multicultural Journalism (3)
PHIL 335 Social Ethics (3) (GEB C3)
POLS 303 Minority Group Politics (3)
POLS 323 Civil Rights in America (4)
SOC 316 American Ethnic Minorities (3)
SPAN 340 Chicano/a Authors (4) (GEB C3)
WS 301 Introduction to Women's Studies (3)
General Education and Breadth Requirements

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 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 approved 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 (3)  
   SPC 202 Principles of Speech Communication (3)  
   **GEB A.3.**

4. **Select one:** ENGL 215 Writing: Argumentation (4)  
   ENGL 218 Professional 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**  
   **GEB B.1.**

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

   (a) **Physical Sciences**  
   **GEB B.1.a.**

   Courses may be selected as follows:

   - ASTR Any lower division course
   - CHEM Any lower division course except 106, 200, 252, 253
   - GEOL Any 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). A student using PSC 205 for GEB credit also must take at least one other course in area B.1.a.
   - 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 337, PHYS 363.
General Education and Breadth

GEB B.1.b. DISTRIBUTION AREA C

Courses may be selected as follows:
BACT Any lower division course
BIO Any lower division course except 100 and 253.
A student using BIO 205 for GEB credit also must take at least one other course in area B.1.b.
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 & 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 217 Statistical Methods (4)
STAT 251 Statistical Inference for Management I (4)
STAT 321 Statistical Analysis I (4)
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 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)

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 Music Appreciation (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 Dance History (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 338 Shakespeare in London (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 353 Modern Drama in London (4)
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 361 Modernism (4)
HUM 362 Postmodernism (4)
HUM 402 Values and Technology (4)
HUM 361 Humanities in World Cultures (3)
HUM 362 Postmodernism (4)
HUM 402 Values and Technology (3)
MU 221 Jazz Styles (3)
MU 324 Music and Society (3)
PHIL 311 Greek Philosophy (3)
PHIL 312 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 Continental Philosophy: Montaigne to Leibniz (3)
PHIL 332 History of Ethics (3)
PHIL 333 Political Philosophy (3)
PHIL 334 Jurisprudence (3)
PHIL 335 Social Ethics (3)
PHIL 337 Professional Ethics (3)
PHIL 339 Biomedical Ethics (3)
PHIL 340 Environmental Ethics (3)
PHIL 342 Philosophy of Religion (3)
PHIL 351 Traditional Theories of Aesthetics (3)
PHIL 352 Contemporary Theories of Aesthetics (3)
PHIL 411 Metaphysics (3)
POLS 334 Jurisprudence (3)
RELS 304 Judaism (3)
RELS 305 Jewish Studies (3)
RELS 306 Hinduism (3)
RELS 307 Buddhism (3)
RELS 308 Islam (3)
SPAN 305 Significant Writers in Spanish (4)
SPAN 306 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: GEB D.1.
   - HIST 204 The History of American Ideas and Institutions (3)
   - POLS 210 American and California Government (3)

2. HIST 315 Modern World History (3) GEB D.2.

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: GEB D.4.a.
   - ANT 201 Cultural Anthropology (3)
   - GEOG 150 Human Geography (3)
   - SOC 105 Introduction to Sociology (3)

   Group b: GEB D.4.b.
   Courses offered by the student's major department cannot be counted as satisfying the requirements of this group.
   - ANT 360 Human Cultural Adaptation (3)
   - BUS 404 Governmental and Social Influences on Business (4)
   - ECON 304 Comparative Economic Systems (3)
   - ECON 325 Underdevelopment and Economic Growth (3)
   - GEOG 308 Global Geography (3)
   - POLS 370 Contemporary Global Political Issues (3)
   - POLS 371 World Food Politics (3)
   - SOC 309 The World System and Its Problems (3)
   - SOC 315 Race and Ethnic Relations (3)
   - WS 411 Women, Race and Class (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: GEB E.1.
   - PSY 201 General Psychology (3)
   - PSY 202 General Psychology (3)

2. Select one: GEB E.2.
   - BIO 220 Physiology and Biological Adaptation (4)
   - FSN 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

   **GEB F.1.**
   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: MS-DOS (3)
   CSC 111 Introduction to Computer Applications for the Sciences (3)
   CSC 113 Computers and Computer Applications: Macintosh (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)
   GRC 277 Computer Applications in Desktop Publishing (3)

2. Select at least one course from the following: **GEB F.2.**

   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)
   CRP 211 Introduction to Urbanization (3)
   CRP 212 Introduction to Urban Planning (3)
   CRSC 230 Agronomic Crop Production (4)
   CSC 302 Computers and Society (3)
   DSCI 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)
   FNR 101 Natural Resources Management and Society (3)
   FNR 201 Forest Resources (3)
   FNR 202 Environmental Management (3)
   FRSC 230 California Fruit Growing (4)
   IME 319 Human Factors Engineering (3)
   IT 125 Industrial Wood Processes (3)
   IT 141 Plastics Processes and Applications (1)
   IT 301 Current Technological Issues (3)
   LA 201 Survey of Landscape Architecture (2)
   LA 311 History of Landscape Architecture (3)
   LA 321 Concepts in Environmental Decision Making (3)
   ME 221 Solar Energy (3)
   OH 230 Ornamental Gardening (3)
   SS 121 Introductory Soils (4)
   VGSC 230 Introduction to Vegetable Science (4)

Students in the Colleges of Agriculture, Architecture and Environmental Design, and Engineering and the Department of 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

CAPTURE 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.

ENROLLMENT STATUS
Full-time undergraduate students are those enrolled in 12 or more units of coursework in any regular quarter. Half-time undergraduate students are those enrolled in 6 to 11 units, and part-time undergraduate students are those enrolled for less than 6 units. Verification of enrolled units is based on enrollment status at the time of the verification request. Full-time status for graduate students is defined in the "Graduate Studies" section of this catalog.

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 Office of Academic Records. Maximum load requirements may be waived only on presentation of evidence of ability to carry successfully such a group of courses.

ADD/DROP
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 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.

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 and Psychological Services 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.

HEALTH SCREENING

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 admission 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. 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

A grade may be changed for the purpose of correcting clerical or administrative error, or to correct an error in the calculation or recording of a grade. A change of grade shall not occur as a result of additional work performed or re-examination beyond the established course requirements.

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.

Transcripts are the official record of academic history. Once a degree has been posted, subsequent revision and alteration of any transcript entry is permitted only for correction of proven error as certified by the appropriate academic dean and the Registrar.

GRADING SYMBOLS

<table>
<thead>
<tr>
<th>Academic Grading Symbols Earned</th>
<th>Quality Points Earned</th>
</tr>
</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>
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<tr>
<td>C+     Acceptable Attainment of Course Objectives</td>
<td>2.3</td>
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<tr>
<td>C      Acceptable Attainment of Course Objectives</td>
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<td>C-     Acceptable Attainment of Course Objectives</td>
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<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>
<td>0.0</td>
</tr>
<tr>
<td>CR     Credit</td>
<td>-</td>
</tr>
<tr>
<td>NC     No Credit</td>
<td>-</td>
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Administrative Grading Symbols

<table>
<thead>
<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></td>
</tr>
<tr>
<td>SP    Satisfactory Progress</td>
<td></td>
</tr>
<tr>
<td>RD    Report Delayed</td>
<td></td>
</tr>
<tr>
<td>W     Withdrew</td>
<td></td>
</tr>
</tbody>
</table>

* If a 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.

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 elect the Credit/No Credit grading option at the time of registration. This request can be made through the third week 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.)

ADMINISTRATIVE GRADING SYMBOLS

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. Courses enrolled for audit grades are not considered when determining enrollment status.

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 an F 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.

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. This adjustment will be made automatically at the end of the term in which the course is repeated. A repeat petition is required for the following reasons only:
   - the course was originally taken before Fall 1987
   - the course was originally taken at another institution
   - the course has changed prefix or number

For the situations listed above, the repeat petition must be turned into the Office of Academic Records by the end of the seventh week of 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 / RENEWAL

Withdrawals from Courses

The W grading symbol 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 Office of Academic Records. 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 initiate a request for an "Official Withdrawal" with the Registrar and to complete required exit procedures. The request must specify reasons for leaving the institution. The date of the withdrawal will be established according to the guidelines contained in the institutional policies governing term withdrawals 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.

Withdrawal from Previous Terms

The student may petition to withdraw from a previous term if the request is submitted within one calendar year following the end of the term. The petition will be reviewed by the Committee for Retroactive Withdrawal. For more information, contact the Registrar's Office.

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 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 AND DISQUALIFICATION**

The quality of academic performance is 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 Programs section.

I. Academic Probation:

An undergraduate student is automatically placed on academic probation when the grade point average drops below 2.0 (C). The grade point average applies to the current term, the Cal Poly cumulative, or the higher education cumulative. All of these are provided on the student grade form.

II. Academic Disqualification:

A. An undergraduate student on academic probation for two consecutive terms is subject to academic disqualification.

B. An undergraduate student on academic probation is subject to disqualification when:

1. As a freshman or sophomore student (less than 90 quarter units of college credit completed) the student is 22.5 or more quality points below a 2.00 (C) in all units attempted (higher education GPA) or in all units attempted at Cal Poly (Cal Poly cumulative GPA).

2. As a junior student (90 to 134 quarter units of college credit completed) the student is 13.5 or more quality points below a 2.00 (C) in all units attempted (higher education GPA) or in all units attempted at Cal Poly (Cal Poly cumulative GPA).

3. As a senior student (135 or more quarter units of college credit completed) the student is 9 or more quality points below a 2.00 (C) in all units attempted (higher education GPA) or in all units attempted at Cal Poly (Cal Poly cumulative GPA).

C. In addition to the above disqualification standards applicable to students on probation, the President may designate a campus official to act to disqualify an individual not on probation when the following circumstances exist:

1. At the end of any term, the student has fewer cumulative grade points than cumulative units attempted, and

2. The cumulative grade point deficiency is so great that in view of the student's overall educational record, it seems unlikely that the deficiency will be removed within a reasonable period.

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 by the student's school dean 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 and represent the office or represent the university or the Associated Students, Incorporated, in any official capacity.

STUDENT GRIEVANCE PROCEDURES

Academic procedures are handled through the academic division of the university. The process of review includes the department, dean, and academic vice president, whose decision is final. Typical academic procedures include transfer from one program to another, admissions, records, application of credit, program requirements, and academic standing. Matters reviewed by the Office of Students Affairs can be found in the section on Campus Student Relations and Judicial Affairs, and as noted below.

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. 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, Academic Senate Office, 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. Associations in such a community are 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.

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. Procedural Due Process is inherent and assured in all Judicial Proceedings.
PREHISTORIC DNA
Achieving a scientific first, biology professor Raul Cano and student Hendrik Poinar have cloned strands of genetic material from prehistoric insects entombed in amber. The insects have been extinct for millions of years and the pair discovered that the insect DNA is viable. The research began as Hendrik's Cal Poly senior project with Dr. Cano as adviser, and together their results have gained world-wide attention. At Cal Poly since 1974, Cano says his first love is teaching. Photo by Marty Sconduto, Art and Design, 1994.
MASTER'S DEGREE PROGRAMS

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

Cal Poly offers studies leading to advanced degrees through the existing instructional departments. Graduate and undergraduate instruction share laboratories and other academic resources.

University policy governing graduate study emphasizes the need for students to demonstrate maturity, responsibility and scholarly integrity. 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 and 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 advisers, 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, college and departmental procedures and requirements.

APPLICATION FOR ADMISSION

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 and official transcripts should be sent directly to the Admissions Office at Cal Poly.

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 alternate 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 to submit separate applications (including fees) to each.

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. Transcripts must be official and sent directly from the issuing institution in a sealed envelope. 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).
All master's and credential candidates need to submit the following documents to the Office of Admissions to establish their admission portfolio:

- Application for graduate admission
- $55 application fee
- Official transcripts from all schools attended

Master's and credential candidates may file an application for admission at any time. In order to be considered for admission in the "targeted" quarter, the portfolio must be completed by the dates listed below. Students may request to have incomplete portfolios roll forward to the next available quarter by submitting another $55 application fee.

FILE COMPLETION DATES

Graduate coordinators may select advanced file completion dates. Students should check with their departments for appropriate filing periods.

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Master's</th>
<th>Credential</th>
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</thead>
<tbody>
<tr>
<td>Summer</td>
<td>April 1</td>
<td>April 1</td>
</tr>
<tr>
<td>Fall</td>
<td>July 1</td>
<td>May 15</td>
</tr>
<tr>
<td>Winter</td>
<td>Nov. 1</td>
<td>Oct. 15</td>
</tr>
<tr>
<td>Spring</td>
<td>March 1</td>
<td>Dec. 15</td>
</tr>
</tbody>
</table>

All completed portfolios are forwarded to the graduate coordinators for admission recommendations. The coordinators may request additional documentation to determine eligibility. The documentation may include letters of reference, GRE or GMAT scores, or writing samples.

GRADUATE AND POSTBACCALAUREATE ADMISSION REQUIREMENTS

Admission Requirements

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 as follows:

- **General Requirements** – The general requirements for admission to graduate and postbaccalaureate studies at a California State University campus are in accordance with university regulations as well as Title 5, chapter 1, subchapter 3 of the California Code of Regulations.

Specifically, a student shall:

1. have completed a four-year college course of study and hold an acceptable baccalaureate degree from an institution accredited by a regional accrediting association, or shall have completed equivalent academic preparation as determined by appropriate campus authorities;

2. be in good academic standing at the last college or university attended;

3. have attained a grade point average of at least 2.5 (A = 4.0) in the last 60 semester (90 quarter) units attempted; and

4. satisfactorily meet the professional, personal, scholastic, and other standards for graduate study, including qualifying examinations, as appropriate campus authorities may prescribe. In unusual circumstances, a campus may make exceptions to these criteria.

If candidates meet the minimum requirements for graduate and postbaccalaureate studies, they will be considered for admission in one of four categories:

- **Postbaccalaureate Unclassified** – To enroll in courses for professional or personal growth, a candidate must be admitted as a postbaccalaureate unclassified student. By meeting the general requirements, the candidate is eligible for admission as a postbaccalaureate unclassified student. Some departments may restrict enrollment of unclassified students because of heavy enrollment pressure.

Admission in this status does not constitute admission to, or assurance of consideration for admission to, any graduate degree or credential program. Admission requires approval from the Dean of Research and Graduate Programs.

- **Postbaccalaureate Classified** – Candidates who wish to enroll in a credential or certificate program will be required to satisfy additional professional, personal, scholastic, and other standards, including qualifying examinations, prescribed by the campus.

- **Graduate Conditionally Classified** – Candidates may be admitted to a graduate degree program in this category if, in the opinion of appropriate campus authority, deficiencies can be remedied by additional preparation.

- **Graduate Classified** – To pursue a graduate degree, candidates will be required to fulfill all of the professional, personal, scholastic, and other standards, including qualifying examinations, prescribed by the campus.

*Provisional Postbaccalaureate* – Applicants who are completing undergraduate degree requirements and plan to graduate the term preceding post-baccalaureate enrollment, and therefore cannot provide proof of a degree, may be admitted on a "provisional" basis. Provisional admission requires that you provide an official transcript verifying that your degree was awarded for a term that precedes your enrollment as a graduate student.

If your transcript is not received by the Admissions Office prior to the first day of what would be your second quarter,
or if your degree was not awarded for a preceding term, you
will be required to reapply for a subsequent quarter. You
may only be accepted as a provisional postbaccalaureate
student once. A second application and fee to a
postbaccalaureate program will not be accepted or processed
until an official transcript is provided showing that your
undergraduate degree has been awarded.

Unless proof of an undergraduate degree is provided by the
registration date for your second quarter, you will lose your
registration priority. Your undergraduate degree must be
awarded at least one quarter prior to the quarter that you
enter a postbaccalaureate program at Cal Poly or your
provisional acceptance is no longer valid.

Under special circumstances graduate coordinators may
recommend admission of applicants who do not meet
eligibility requirements. The Dean of Graduate Programs will
act on the request for graduate admission.

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 57.

INTERNATIONAL (FOREIGN) STUDENT
ADMISSION REQUIREMENTS

International master's and credential candidates must file an
application for admission with the Office of Admission. For
this purpose, "foreign students" include those who hold U.S.
visas as students, exchange visitors, or in other non-
immigrant classifications. The application may be filed at any
time, but in order to be considered for admission in the
targeted quarter the portfolio must be completed by the dates
listed below. Students may request to have incomplete
portfolios roll forward to the next available quarter by
submitting another $55 application fee.

International Student File Completion Dates

Summer ............................................ April 1
Fall .................................................... June 1
Winter ............................................. October 1
Spring .............................................. February 1

All graduate master's and credential candidates need to
submit the following documents to establish their admission
portfolio:

- Application form
- $55 application fee
- Official transcripts from all schools attended showing
coursework. All official documents must be accompanied
by a certified English translation from:
  - Institute for International Education (IIE)
  - AMIDEAST
  - Saudi Arabian Education Mission
  - United States Embassy or Consulate

- Two letters of recommendation from instructors,
  professors or professional references
- Confidential financial statement
- Certificate of Health
- International Educational Background form
- TWE (Test of Written English) with a score of 4.5 or better
- TOEFL (Test of English as a Foreign Language) with score
  of 550 or more.

The Office of Admissions will complete an initial portfolio
review that will include verification of an equivalent
B.A./B.S. degree, a determination of the appropriate level of
study and a narrative evaluation of all work completed.
Copies will be included in the candidate's file.

The Office of Admissions will notify all candidates of the
documents needed to complete their portfolio. Graduate
coordinators may require additional documentation on any
candidate to assist them in determining that candidate's
eligibility.

International candidates for graduate study can receive either
conditional or classified admission. The graduate
coordinators will make all recommendations for conditional
and classified admissions to the graduate program to the
Director of Admissions.

HEALTH SCREENING

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 admission require-
ment, 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 82 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 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 all of the 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.

**GENERAL POLICIES GOVERNING GRADUATE STUDIES**

**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.

**Academic Disqualification**

A graduate or postbaccalaureate student shall be subject to disqualification if while on probation the student fails to achieve a sufficient grade point average 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.

**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 grade point average. 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

Soon after enrollment students should contact 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 the culminating experience for the master's degree and assesses the student's ability to integrate knowledge, 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 and Credit/No Credit Grading

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 on page 83.

Credit by Exam for Coursework

See page 72.

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 the culminating experience required by the specific program to be granted a graduate degree.

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 Programs Office for review and final approval.

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. No fewer than one-half of the units required for the degree shall be in courses organized primarily for graduate students (500 level). 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.

Only 400- and 500-level courses are allowed in the 45 units of an approved graduate plan of study. In those programs where specific courses below the 400-level may be essential for a student's success, the student may be conditionally accepted to the program contingent upon completing those courses. Courses below the 400-level may 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 accepted for the master's degree. Regular extension courses may not be used to satisfy the residence requirement, but grades earned in these courses count in calculation of the student's grade point average if they are part of the formal study plan.
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.

No more than 12 quarter units of summer session shall be granted credit if taken prior to the submission of a formal program of study. Summer session 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 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.

Full-Time Graduate Student Status

A full-time graduate student is defined as one taking 8 or more 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

Satisfaction of the GPA requirement for the conferral of the master's degree requires a GPA of 3.0 or more in the courses taken in the formal study plan and a GPA of 3.0 or more in all units attempted subsequent to admission to the program for which the degree is awarded. The base for calculation of the overall grade point average includes graduate courses taken through extension and credential courses. 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 Petition for Special Consideration obtained for the Graduate Programs Office, students may request up to 9 units of graduate credit when the courses are not required for the baccalaureate degree.

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 those graduating in their major in that academic year 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 74.

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. If Option 4 is used, students must begin graduate coursework within seven years from the date the GWR was satisfied or the student will be required to fulfill the requirement using one of the other options. 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 absence 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 and Psychological Services 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 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.

8. Neither leave will be extended beyond the two-year limitation for any reason.

9. 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.

10. Students are eligible to obtain two Educational Leaves during their careers at Cal Poly, including graduate school.

11. Students who take educational leaves are still required to complete their graduate degrees within the specified time limit.

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.

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 and the Graduate Programs Office for procedures.

Residence Courses

See "Formal Study Plan."

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 before the deadline dates listed below. The application fee must accompany the application for readmission.

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.

Application Deadlines for Returning Students

Summer Quarter ........................................ April 1
Fall Quarter ............................................... July 1
Winter Quarter ........................................... October 1
Spring Quarter ........................................... March 1

Second Master's Degree

A student can earn only one master's degree in any one of the graduate programs 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 report 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 or project committee: 1) that the graduate student have a thesis or project 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 or project committee comprising at least three permanent full-time faculty members; 3) that two of these members, one of which will be the chair, be from the student's department.

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. Guidelines to be followed in preparing final copy for filing with the university can be obtained from the Graduate Programs Office.

A copy of the thesis or project report must be received and reviewed by the Thesis Editor in the Graduate Programs Office. Upon completion of any required corrections, a copy ready for binding is filed with the Graduate Programs Office for submission to the University Library. These steps must be completed before the degree will be awarded.

Time Limit for Degree

The time allowed to complete coursework in the formal study plan is seven years. The university, at its option, and in exceptional cases, may extend the time frame. Students who wish to extend the seven year limit must file a graduate student petition for special consideration explaining the reasons why the extension is necessary, what courses are requested for inclusion in the study plan (that are over 7 years old at the proposed time of graduation), and what evidence is offered to support claims of currency in that coursework.
DAIRY SCIENCE
INSTRUCTIONAL CENTER
A state-of-the-art dairy production facility, with current automation and computer technology for milk production, completed summer 1993. Students are employed on a part-time basis to work in both the production and processing areas. Students: Rich Silacci and Wendy Gansberg. Photos by Doug Allen.
College of Agriculture

Agricultural Sciences Bldg. (11), Room 211
(805) 756-2161

Joseph Jen, Dean
Walter Mark, Associate Dean
Phillip M. Doub, Director of Farm Systems
Joseph E. Sabol, Director of Outreach Services

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<th>Department/Location</th>
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<td></td>
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<tr>
<td>Agricultural Education</td>
<td>Agricultural Science: BS</td>
</tr>
<tr>
<td>Agricultural Engineering</td>
<td>Agricultural Engineering: BS</td>
</tr>
<tr>
<td></td>
<td>Agricultural Systems</td>
</tr>
<tr>
<td></td>
<td>Management: BS</td>
</tr>
<tr>
<td>Animal Science</td>
<td>Animal Science: BS</td>
</tr>
<tr>
<td></td>
<td>Poultry Management: Minor</td>
</tr>
<tr>
<td>Crop Science</td>
<td>Crop Science: BS</td>
</tr>
<tr>
<td></td>
<td>Fruit Science: BS</td>
</tr>
<tr>
<td></td>
<td>Plant Protection Science: BS, Minor</td>
</tr>
<tr>
<td>Dairy Science</td>
<td>Dairy Science: BS</td>
</tr>
<tr>
<td>Food Science and Nutrition</td>
<td>Food Science: BS, Minor</td>
</tr>
<tr>
<td></td>
<td>Nutritional Science: BS, Minor</td>
</tr>
<tr>
<td>Natural Resources Management</td>
<td>Forestry and Natural Resources: BS</td>
</tr>
<tr>
<td></td>
<td>Recreation Administration: BS</td>
</tr>
<tr>
<td>Ornamental Horticulture</td>
<td>Ornamental Horticulture: BS</td>
</tr>
<tr>
<td>Soil Science</td>
<td>Soil Science: BS</td>
</tr>
</tbody>
</table>

The College of Agriculture offers programs reflecting the growing diversity of choices available and skills required in modern agriculture and its related professions.

Students take courses in their major field beginning with their first quarter of enrollment. This early exposure to their major provides them with knowledge of immediate interest to supplement that gained in other coursework in basic sciences, mathematics and the 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, private industry, governmental agencies, and nonprofit organizations provide excellent opportunities for student internships during 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 43 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 College 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.

The Agriculture 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 Master of Business Administration degree with an Agribusiness Specialization is offered by the College of Business in conjunction with the Agribusiness Department.

FACILITIES

The College 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, and greenhouses. The college facilities also include several microcomputer 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.

The College of Agriculture also operates the 3,200 acre Swanton Pacific Ranch in Santa Cruz County which has been generously donated by Al Smith, alumnus of the Crop Science Department. This unit provides students with an opportunity to live and work on a commercial farm with forestry, cattle and crop production activities.
All of these facilities are for student use. They provide students with unique 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 College 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 College 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 College 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 Science 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 pilot 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, extensive turf plots, 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 production.

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.

**WATER SCIENCE MINOR**

The Water Science Minor emphasizes one of two areas of study: irrigation or watershed management. In California, 85% of the developed water is used for irrigation. Irrigation water use and management have tremendous impacts upon ground water quality, power usage, crop yields, surface water supplies and quality, drainage problems, and water availability for transfer to urban uses. For students interested in environment and water, the Water Science minor provides marketable skills.

**Units**

**Basic Core** ........................................................... 11

AE 340 Irrigation Water Management (4)
SS 121 Introductory Soil Science (4)
FNR 408 Water Resource Law and Policy (3)

**Select one emphasis area** ........................................... 13-16

**Irrigation Emphasis** (13)
AE 237 Engineering Surveying (2)
A minimum of 11 units chosen from the following:
AE 331 Irrigation Theory (3)
AE 405 Chemigation (1)
AE 435 Drainage (3)
AE 440 Agricultural Irrigation Systems (4)
AE 492 Pumps and Pump Drivers (3)

**Watershed Management Emphasis** (16)
FNR 304 Ecology of Resource Areas (4)
FNR 440 Watershed Management (3)
FNR 441 Forest and Range Hydrology (3)
FNR 442 Watershed Protection (2)
SS 440 Forest and Range Soils (4)

24-27
Master of Science Degree in Agriculture

Programs

M.S. Agriculture
  with Specializations in:
  Agricultural Engineering Technology
  Dairy Products Technology
  Food Science and Nutrition
  General Agriculture
  International Agricultural Development
  Soil Science

General Characteristics

Graduate studies in the College 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 college 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, forest and natural resources, or water resources. Applicants must select a specialization appropriate for their area of emphasis. The specializations are Agricultural Engineering Technology, Dairy Products Technology, Food Science and Nutrition, General Agriculture, International Agricultural Development, and Soil Science.

When to Apply

Application filing periods are given on page 90 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 .............................................July 1
Winter Quarter .......................................November 1
Spring Quarter .......................................March 1
Summer Quarter .....................................April 1

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 90). 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 College of Agriculture graduate program includes the following specializations: Agricultural Engineering Technology, Dairy Products 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 college. Although the program offers several specializations, there is a single degree; students may not earn more than one Master of Science degree in the College 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 College of Agriculture 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 college'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 prior to advancement to candidacy. 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, forest and resources, and water resources.

M.S. AGRICULTURE, SPECIALIZATION IN AGRICULTURAL ENGINEERING TECHNOLOGY

Units

Core Courses .................................................. 12
AG 599 Thesis (6)
FSN 581 Graduate Seminar (3)
SS 501 Research Planning (3)

Required in the specialization .................................. 9
AE 521, AE 522, AE 533

Restricted electives ........................................... 18
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.

Electives .................................................. 6
400-500 level courses approved by the student's graduate committee.

M.S. AGRICULTURE, SPECIALIZATION IN DAIRY PRODUCTS TECHNOLOGY

Units

Core Courses .................................................. 12
AG 599 Thesis (6)
FSN 581 Graduate Seminar (3)
SS 501 Research Planning (3)

Required in the specialization .................................. 12
DSCI 401 Physical and Chemical Properties of Dairy Products (3)
DSCI 402 Quality Assurance of Dairy Products (3)
DSCI 433 Dairy Plant Management and Equipment (3)
DSCI 522 Bioseparation Processes Dairy Tech (3)

Restricted electives ........................................... 21
AE 500 Individual Study (1-6)
AE 521 Engineering of Agricultural Systems (4)
AE 522 Instrumentation Control/Microprocessors (4)
CHEM 528 Nutritional Biochemistry (3)
FSN 501 Lipid Metabolism and Nutrition (3)
STAT 512 Statistical Methods (4)

M.S. AGRICULTURE, SPECIALIZATION IN FOOD SCIENCE AND NUTRITION

Units

Core Courses .................................................. 12
FSN 599 Thesis (6)
FSN 581 Graduate Seminar (3)
SS 501 Research Planning (3)

Required in the specialization .................................. 12
AG 500 Individual Study (3–6)
FSN 410 Nutritional Aspects of Food Processing (3)
FSN 501 Lipid Metabolism and Nutrition (3)
STAT 512 Statistical Methods (4)

Approved electives ........................................... 12
AE 425 Computer Controls in Agriculture (3)
AE 521 Engineering of Agricultural Systems (4)
AE 522 Instrumentation Control/Microprocessors (4)
BIO 431 Physiology I: General (4)
CHEM 435 Food Analysis (4)
CHEM 436 Agricultural Chemicals (4)
CHEM 439 Instrument Analysis (5)
CHEM 528 Nutritional Biochemistry (3)
EDUC 555 Counseling and Communication(4)
FSN 407 Food Composition Science (4)
FSN 409 Sensory Evaluation of Food (4)
FSN 431 Advanced Muscle Food Science (3)
FSN 437 Advanced Food Processing (4)
PE 451 Nutrition for Fitness and Sport (3)

Electives (400–500 level courses) .................................. 9
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)

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 College of Agriculture (3)

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

For agricultural educators:
Any approved 400- and 500-level agriculture courses. No less than 11 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 are required to complete one year of successful teaching or graduate level internship prior to the final examination.

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/AF 521 (3/4)
SS 453 Tropical 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.

46

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.

Core courses ................................................................. 12

SS 501 Research Planning (3)
SS 581 Graduate Seminar in Soil Science (3)
SS 599 Thesis (6)

Required in the specialization ........................................... 9

SS 508 Landscape Management for Erosion Control (3)
SS 522 Advanced Soil Fertility (3)
SS 582 Advanced Land Management (3)

Electives ........................................................................... 24

400-500 level courses approved by the student's graduate committee. At least 6 units of electives must be from outside of the College of Agriculture.

45

MBA, SPECIALIZATION IN AGribUSINESS

The College 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 the College of Business). Information and application materials may be obtained by writing to the MBA Coordinator, College of Business.

MS ENGINEERING, SPECIALIZATION IN WATER ENGINEERING

The College of Engineering and the Agricultural Engineering Department jointly offer the Water Engineering Specialization under the MS Engineering. Please see College of Engineering section of this catalog for more information.
AGRICULTURE BLDG. (10), ROOM 210
(805) 756-5000
(805) 756-5040 (FAX)

Faculty

Department Head, M. LeRoy Davis

Robert E. McCorkle
Stephen D. McGary
Nancy C. Ochs
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

Agribusiness Minor

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.  

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 management and 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 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.

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 nonprofit 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.
## B.S. AGRICULTURAL BUSINESS

For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser.

### MAJOR COURSES

* Courses satisfy General Education and Breadth requirements

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>AGB 101</td>
<td>Introduction to Agribusiness and Agricultural Economics</td>
<td>4</td>
</tr>
<tr>
<td>AGB 201</td>
<td>Agribusiness Sales and Service</td>
<td>3</td>
</tr>
<tr>
<td>AGB 212</td>
<td>Agricultural Economics</td>
<td>3</td>
</tr>
<tr>
<td>AGB 213</td>
<td>Agricultural Economic Analysis</td>
<td>4</td>
</tr>
<tr>
<td>AGB 301</td>
<td>Agricultural Marketing</td>
<td>3</td>
</tr>
<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>
</tr>
<tr>
<td>AGB 401</td>
<td>Agribusiness Labor Relations and Personnel Management</td>
<td>4</td>
</tr>
<tr>
<td>AGB 460</td>
<td>Research Methodology in Agribusiness</td>
<td>2</td>
</tr>
<tr>
<td>AGB 461, AGB 462</td>
<td>Senior Project</td>
<td>2/2</td>
</tr>
<tr>
<td>AG 250</td>
<td>Computer Applications Agriculture (f. 1.)*</td>
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<tr>
<td>Concentration courses (see below)</td>
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### SUPPORT COURSES

* Courses satisfy General Education and Breadth requirements

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>ACTG 211</td>
<td>Financial Accounting for Nonbusiness Majors</td>
<td>4</td>
</tr>
<tr>
<td>BUS 207</td>
<td>Business Law</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 or Life science elective (B.1.)</td>
<td>4</td>
</tr>
<tr>
<td>ECON 222</td>
<td>Macroeconomics (D.3.)*</td>
<td>4</td>
</tr>
<tr>
<td>MATH 118</td>
<td>Pre-Calculus Algebra or MATH 221</td>
<td>4</td>
</tr>
<tr>
<td>MATH 121</td>
<td>Calculus for Business and Economics (B.2.)*</td>
<td>4</td>
</tr>
<tr>
<td>STAT 211</td>
<td>Introductory Soil Science</td>
<td>4</td>
</tr>
<tr>
<td>STAT 212</td>
<td>Statistical Methods</td>
<td>3</td>
</tr>
<tr>
<td>ASCI 231</td>
<td>or PM 230, or DSCI 230/231</td>
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</tr>
<tr>
<td>FRSC 131/230 or CRSC 131/230 or VGSC 230 or OH 121</td>
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<tr>
<td>AE 340/FSN 230/CRSC 311</td>
<td>4</td>
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</tr>
<tr>
<td>Restricted electives</td>
<td>15/16</td>
<td></td>
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</tbody>
</table>

12 to 16 units are to be selected in Agriculture with prefixes other than AGB, AGED, REC, MSC. Of these units, 6 to 8 units must be selected from the following courses: AE 340, 440; ASCI 304, 329, 401; CRSC 221, 311, 405, 431, 441; DSCI 301, 330; FSN 333; OH 340, 341, 342; SS 221, 433; VS 203, 312. Students may also select CHEM 326. 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 201, FSN 201, etc.) and Special Problems (i.e., CRSC 200, FSN 400, etc.).

### GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 9 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

#### Area A:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 114</td>
<td>(A.1.)</td>
<td>14</td>
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<tr>
<td>ENGL 125/PHIL 125/SPC 125</td>
<td>(A.2.)</td>
<td>12</td>
</tr>
<tr>
<td>SPC 201/SPC 202</td>
<td>(A.3.)</td>
<td>15</td>
</tr>
<tr>
<td>ENGL 215/ENGL 218</td>
<td>(A.4.)</td>
<td>12</td>
</tr>
</tbody>
</table>

#### Area B:

A minimum of 18 units is required; 15 of the units are in Support

- Physical science (B.1.a.)* see Support Courses
- Life science elective with lab (B.1.b.)
- Life/physical science (B.1.)* see Support Courses
- Mathematics/Statistics (B.2.)* see Support Courses

#### Area C:

Area C: .................................................... 18

- PHIL 230/PHIL 231 (C.1.)
- Critical reading electives (C.1.)
- Fine and performing arts elective (C.2.)
- Literature, philosophy, arts elective (300–400 level) (C.3)
- Arts and humanities elective (Area C)

#### Area D:

A minimum of 18 units is required; 4 of the units are in Support

- HIST 204 (D.1.), POLS 210 (D.1.)
- HIST 215 (D.2.)
- Economics (D.3.)* see Support Courses
- ANT 201/GEOG 150/SOC 105 (D.4.a.)
- ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.)

#### Area E:

A minimum of 3 units is required; 3 of the units are in Major

- PSY 201/PSY 202 (E.1.)
- BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)

#### Area F:

A minimum of 76 units is required; 22 of the units are in Major and Support

#### Total:

A minimum of 76 units is required; 22 of the units are in Major and Support

### ELECTIVES: .................................................... 9

121

1 AGB 212 is the prerequisite for ECON 222 for AGB majors, not ECON 221.

2 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.
### Agribusiness Concentrations (select one)

**Agribusiness Finance and Appraisal Concentration**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGB 322 Principles of Farm Management</td>
<td>4</td>
</tr>
<tr>
<td>AGB 324 Agricultural Property Management and Sales</td>
<td>4</td>
</tr>
<tr>
<td>AGB 326 Farm Appraisal</td>
<td>4</td>
</tr>
<tr>
<td>AGB 331 Farm Accounting</td>
<td>4</td>
</tr>
<tr>
<td>AGB 410 Management Practices in Agricultural Lending</td>
<td>4</td>
</tr>
<tr>
<td>ECON 337 Money, Banking, and Credit</td>
<td>4</td>
</tr>
<tr>
<td>Adviser approved electives (300–400) in AGB or College of Business</td>
<td>6</td>
</tr>
</tbody>
</table>

**Agribusiness Marketing Concentration**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGB 318 Agricultural Trade Policies</td>
<td>3</td>
</tr>
<tr>
<td>AGB 323 Agribusiness Managerial Accounting</td>
<td>4</td>
</tr>
<tr>
<td>AGB 405 Agribusiness Marketing Research Methods</td>
<td>3</td>
</tr>
<tr>
<td>AGB 406 Agribusiness Marketing Planning</td>
<td>4</td>
</tr>
<tr>
<td>AGB 421 Agribusiness Operations Analysis or AGB 433 Agricultural Price Analysis</td>
<td>4/3</td>
</tr>
<tr>
<td>AGB 450 Agribusiness Strategy Formulation</td>
<td>4</td>
</tr>
<tr>
<td>MKTG 301 Principles of Marketing</td>
<td>4</td>
</tr>
<tr>
<td>Adviser approved electives (300–400) in AGB or College of Business</td>
<td>4/5</td>
</tr>
</tbody>
</table>

**Agribusiness Policy Concentration**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGB 302 Agricultural Associations and Cooperatives</td>
<td>3</td>
</tr>
<tr>
<td>AGB 315 Land Economics</td>
<td>3</td>
</tr>
<tr>
<td>AGB 317/AGB 409/HIST 305/GEOG 315</td>
<td>3</td>
</tr>
<tr>
<td>AGB 318 Agricultural Trade Policies</td>
<td>3</td>
</tr>
<tr>
<td>AGB 323 Agribusiness Managerial Accounting</td>
<td>4</td>
</tr>
<tr>
<td>AGB 412 Advanced Agricultural Policy</td>
<td>4</td>
</tr>
<tr>
<td>AGB 421 Agribusiness Operations Analysis or AGB 433 Agricultural Price Analysis</td>
<td>4/3</td>
</tr>
<tr>
<td>Adviser approved electives (300–400) in AGB or College of Business</td>
<td>6/7</td>
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</table>

**Farm and Ranch Management Concentration**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGB 321 Farm Records</td>
<td>4</td>
</tr>
<tr>
<td>AE 321 Agricultural Safety</td>
<td>3</td>
</tr>
<tr>
<td>(may count as Ag Production elective)</td>
<td></td>
</tr>
<tr>
<td>AGB 322 Principles of Farm Management</td>
<td>4</td>
</tr>
<tr>
<td>AGB 331 Farm Accounting</td>
<td>4</td>
</tr>
<tr>
<td>AGB 433 Agricultural Price Analysis</td>
<td>3</td>
</tr>
<tr>
<td>AGB 435 Linear Programming in Agriculture</td>
<td>3</td>
</tr>
<tr>
<td>AGB 456/457/458 Crop/Livestock/Dairy Management Problems</td>
<td>4</td>
</tr>
<tr>
<td>Adviser approved electives (300–400) in AGB or College of Business</td>
<td>5</td>
</tr>
</tbody>
</table>

### Recommended Sequence: Major and Support Courses

The following is a guide for scheduling Major and Support Courses. By following this sequence, students should meet prerequisites for Major coursework. Courses are not always offered during the quarter indicated. Please consult with your academic adviser and the current Class Schedule.

<table>
<thead>
<tr>
<th></th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGB 101</td>
<td>CHEM 121</td>
<td>Life Sci w/lab or CHEM 122</td>
<td></td>
</tr>
<tr>
<td>MATH 118/221</td>
<td>AGB 201</td>
<td>BUS 207</td>
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<tr>
<td>AG 250</td>
<td>ACTG 211</td>
<td>AGB 212</td>
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<table>
<thead>
<tr>
<th></th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
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</thead>
<tbody>
<tr>
<td>S 121</td>
<td>STAT 212</td>
<td>ECON 222</td>
<td></td>
</tr>
<tr>
<td>STAT 211</td>
<td>AGB 301</td>
<td>AGB 312</td>
<td></td>
</tr>
<tr>
<td>AGB 213</td>
<td>AGB 310</td>
<td>AGB conc. course</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGB elective</td>
<td>AGB elective</td>
<td>AGB elective</td>
<td></td>
</tr>
<tr>
<td>AGB/COB elective</td>
<td>AGB conc. course</td>
<td>AGB/COB elective</td>
<td></td>
</tr>
<tr>
<td>AGB conc. course</td>
<td>AGB conc. course</td>
<td>AGB conc. course</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGB 401</td>
<td>AG elective</td>
<td>AGB 462</td>
<td></td>
</tr>
<tr>
<td>AGB 460</td>
<td>AGB 461</td>
<td>AG elective</td>
<td></td>
</tr>
<tr>
<td>AGB conc. course</td>
<td>AGB conc. course</td>
<td>AG elective</td>
<td></td>
</tr>
</tbody>
</table>

### AGRIBUSINESS MINOR

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 College of Agriculture this opportunity. Interested students must apply for acceptance into the minor through the Agribusiness Department.

#### Required courses

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

#### Three courses in area of emphasis

To be selected by the student and approved in advance by the Agribusiness Department Minor Coordinator.

In addition, students obtain more specialized training in either Agribusiness Marketing, Agribusiness Production Management, Agricultural Finance, Agricultural Policy, or in a pre-approved flex-minor curriculum. See the Agribusiness Minor Coordinator for details.
AGRICULTURAL EDUCATION DEPARTMENT

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

Faculty

Department Head, Glen R. Casey
Robert A. Flores  Sarah S. Lord
William C. Kellogg  Joseph E. Sabol

Programs

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

The primary function of the Agricultural Education Department is to provide for the preparation of teachers of agriculture and home economics for the public secondary schools of California. Specialized pre-professional and professional courses are offered for undergraduate and graduate students. In addition, the Agricultural Science major provides for professional preparation in agricultural communication. In association with the Brock Center for Agricultural Communications, selected interdisciplinary courses in Journalism, Graphic Communications, and Speech Communications make up the Agricultural Communications career area.

The department offers a Bachelor of Science degree in Agricultural Science with the choice of one of the concentrations listed above and 32 units of adviser approved electives which may be selected in career areas of teaching agriculture, agricultural communications or teaching home economics. The teaching credential preparation program provides for early field experience and professional education coursework in the undergraduate curriculum. Agricultural communications preparation includes a breadth and depth in agriculture, foundations in journalism and an industry internship. The Brock Center for Agricultural Communication provides students with the opportunity for professional preparation in agricultural communication.

Students interested in teaching agriculture may receive a B.S. 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.

Student teaching is a vital part of the graduate program for agriculture majors. Candidates must complete a minimum of 45 quarter units of postgraduate coursework necessary for the "clear" teaching credential. For more information see Teaching Credential Programs.

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 College of Agriculture or in the Agricultural Education Department.

CURRICULAR CONCENTRATIONS

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

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

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

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

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

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

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

For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser.

A minimum of 60 units of upper division (300-400 level) coursework is required.

### MAJOR COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGED 202</td>
<td>Introduction to Agricultural Education</td>
<td>2</td>
</tr>
<tr>
<td>AGED 404</td>
<td>Agricultural Leadership</td>
<td>2</td>
</tr>
<tr>
<td>AGED 438</td>
<td>Instructional Processes in Agricultural Education</td>
<td>3</td>
</tr>
<tr>
<td>AGED 461</td>
<td>Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>AGED 462</td>
<td>Senior Project</td>
<td>3</td>
</tr>
<tr>
<td>AE 121</td>
<td>Agricultural Mechanics</td>
<td>2</td>
</tr>
<tr>
<td>ASM 141</td>
<td>Agricultural Machinery Safety</td>
<td>3</td>
</tr>
<tr>
<td>AE 340</td>
<td>Irrigation Water Management</td>
<td>4</td>
</tr>
<tr>
<td>AGB 201</td>
<td>Agribusiness Sales and Service</td>
<td>3</td>
</tr>
<tr>
<td>AGB 301</td>
<td>Agricultural Marketing</td>
<td>3</td>
</tr>
<tr>
<td>AGB 321</td>
<td>Farm Records</td>
<td>4</td>
</tr>
<tr>
<td>ASCI 231</td>
<td>General Animal Science</td>
<td>3</td>
</tr>
<tr>
<td>CRSC 230</td>
<td>Agronomic Crop Production</td>
<td>4</td>
</tr>
<tr>
<td>DSCI 230</td>
<td>General Dairy Husbandry</td>
<td>4</td>
</tr>
<tr>
<td>FRSC 230</td>
<td>California Fruit Growing or VGSC 230</td>
<td>4</td>
</tr>
<tr>
<td>OH 230</td>
<td>Ornamental Gardening</td>
<td>3</td>
</tr>
<tr>
<td>PM 230</td>
<td>Poultry Industry Survey</td>
<td>3</td>
</tr>
<tr>
<td>SS 121</td>
<td>Introductory Soil Science</td>
<td>4</td>
</tr>
<tr>
<td>Concentration courses (see below)</td>
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<td>22</td>
</tr>
</tbody>
</table>

### SUPPORT COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<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>CHEM 121</td>
<td>General Chemistry (B.1.a.)*</td>
<td>4</td>
</tr>
<tr>
<td>MATH 118</td>
<td>Pre-Calculus Algebra (B.2.)*</td>
<td>4</td>
</tr>
<tr>
<td>ZOO 131</td>
<td>General Zoology</td>
<td>4</td>
</tr>
<tr>
<td><em>Life or physical science elective (B.1.)</em></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Adviser approved restricted electives</td>
<td></td>
<td>32</td>
</tr>
</tbody>
</table>

20-24 units must be 300-400 level depending on concentration. May be selected from teaching agriculture, agricultural communication, or teaching home economics.

### GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 9 units must be at the 300-400 level. Additional GEB courses are listed under Support Courses.

Area A: .......................................................... 14
- ENGL 114 (A.1.)
- ENGL 125/PHIL 125/SPC 125 (A.2.)
- SPC 201/SPC 202 (A.3.)
- ENGL 215/ENGL 218 (A.4.)

Area B: ................................................................ 3
- A minimum of 18 units is required; 15 of the units are in Support
- Life or Physical science (B.1.a.)* see Support Courses
- Fine and performing arts elective (C.2.)
- Literature, philosophy, arts elective (300-400 level) (C.3.)
- Arts and humanities elective (Area C)

Area D: .......................................................... 18
- HIST 204 (D.1.), POLS 210 (D.1.)
- HIST 315 (D.2.)
- ECON 201/ECON 211/ECON 222 (D.3.)
- ANT 201/GEOG 150/SOC 105 (D.4.a.)
- ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300-400 level) (D.4.b.)

Area E: ................................................................ 5
- PSY 201/PSY 202 (E.1.)
- BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)

Area F: ................................................................... 0
- A minimum of 3 units is required; 3 of the units are in Support
- (F.1.)* see Support Courses

Total*: ................................................................ 58
- A minimum of 76 units is required; 19 of the units are in Support

### ELECTIVES

- .......................................................... 8

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<table>
<thead>
<tr>
<th>TOTAL UNITS</th>
<th>198</th>
</tr>
</thead>
</table>

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*Courses satisfy General Education and Breadth requirements
**CONCENTRATIONS (select one)**

### Agricultural Mechanics Concentration
- AE 133 Agricultural Drafting ................................ 3
- AE 237 Engineering Surveying ................................ 2
- AE 321 Agricultural Safety .................................. 3
- ASM 203 Agricultural Systems Analysis .................... 3
- IME 155 Industrial Welding Technology .................... 1
- AE electives (7 units at 300–400 level) .................... 10

### Agricultural Products and Processing Concentration
- DSCI 231 General Dairy Manufacturing .................... 4
- FSN 211 Muscle Food Science ................................ 3
- FSN 212 Meat Grading and Evaluation ..................... 2
- VGSC 421 Postharvest Tech. Horticultural Crops ....... 4
- DSCI/FSN electives (6 units at 300–400 level) ......... 9

### Agricultural Resources Management Concentration
- CONS 120 Fisheries and Wildlife Management .......... 3
- CONS 207 Resource Survey .................................. 3
- FNR 101 Natural Resources Management and Society .... 3
- FNR 304 Ecology of Resource Areas ...................... 4
- FNR electives (6 units at 300–400 level) .................. 9

### Agricultural Supplies and Services Concentration
- AGB 101 Introduction to Agribusiness and Agricultural Economics ........................................... 4
- AGB 302 Agricultural Associations and Cooperatives .... 3
- AGB 310 Agribusiness Credit and Finance ................. 3
- AGB 406 Agribusiness Marketing Planning ............... 4
- AGB electives .................................................. 8

### Animal Production Concentration
- ASCI 220 Introduction to Animal Nutrition and Feeding ......................................................... 4
- ASCI 226 Livestock Evaluation ................................ 3
- ASCI 476 Issues in Animal Agriculture ................... 3
- DSCI 330 Artificial Insemination ............................ 3
- ASCI/DSCI/PM electives (4 units at 300–400 level) ...... 9

### Ornamental Horticulture Concentration
- OH 123 Landscape Installation and Maintenance ....... 2
- OH 124 Plant Propagation ................................... 4
- OH 125 Florist Practices .................................... 3
- OH 324 Foliage Plant Culture ................................ 4
- OH electives (6 units at 300–400 level) .................... 9

### Plant Production Concentration
- CRSC 230/FRSC 230/VGSC 230 (Select course not taken in major column) ........................................ 4
- CRSC 221 Weed Science ..................................... 4
- CRSC 311 Insect Pest Management ........................ 4
- SS 221 Fertilizers ........................................... 4
- CRSC/FRSC/VGSC electives (300–400 level) ............. 6
AGRICULTURAL ENGINEERING DEPARTMENT

Agricultural Engineering Bldg. (08), Room 101  
(805) 756-2378  
(805) 756-2626 (FAX)

Faculty

Department Head, Edgar J. Carnegie

James Bermann  
Rollin D. Strohman  
Charles M. Burt  
Robert E. Walker  
Richard A. Cavaletto  
Douglas W. Williams  
L. Joe Glass  
James B. Zetsche, Jr.  
Robin R. Grinnell  
Mark A. Zohns  
M. Stephen Kaminaka

Programs

B.S. Agricultural Engineering

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

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 water delivery unit with multiple pumping systems and operational canals, a field for evaluation of various irrigation systems including an operating linear move and land for experience in the mechanical production of farm products and safe 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 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.

AGRICULTURAL SYSTEMS MANAGEMENT MAJOR

This major gives the student broad agricultural training with a business and management emphasis in eight systems areas. These areas are: plant production, livestock production, food and fiber processing, environmental information management, water/irrigation, and processing and manufacturing. The systems approach in these specialized areas, coupled with interdisciplinary experiences are designed to foster management expertise based upon a core curriculum consisting of 32 units in technology. Some 27 units in business oriented courses serve to provide a firm foundation for the career electives.

Employment opportunities are available in sales and service of equipment and machinery, management and production of animals and crops, processing of food and fiber, management of water/irrigation facilities and equipment in concert with professional engineers, and manufacturing of agricultural mechanization machinery and equipment designed by engineers.

Cal Poly offers a Master of Science degree in Agriculture with a specialization in Agricultural Engineering Technology, a closely related field.
B.S. AGRICULTURAL ENGINEERING

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser. Courses are displayed by year.

<table>
<thead>
<tr>
<th>Units</th>
<th>Junior</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>AE 312 Hydraulics</td>
</tr>
<tr>
<td>3</td>
<td>AE 326 Energy Systems for Agriculture</td>
</tr>
<tr>
<td>3</td>
<td>AE 328 Measurements and Computer Interfacing</td>
</tr>
<tr>
<td>3</td>
<td>AE 331 Irrigation Theory</td>
</tr>
<tr>
<td>3</td>
<td>AE 403 Agricultural Systems Engineering</td>
</tr>
<tr>
<td>3</td>
<td>AE 430 Finite Element Analysis</td>
</tr>
<tr>
<td>3</td>
<td>CE 204 Strength of Materials</td>
</tr>
<tr>
<td>54</td>
<td>CE 205, CE 206 Strength of Materials and Laboratory</td>
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<tr>
<td>2,1</td>
<td>EE 311 Electrical Circuit Theory</td>
</tr>
<tr>
<td>1</td>
<td>EE 351 Electric Circuits Laboratory</td>
</tr>
<tr>
<td>3</td>
<td>IE 314 Engineering Economics</td>
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<tr>
<td>3</td>
<td>ME 302 Thermodynamics</td>
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<tr>
<td>3</td>
<td>STAT 321 Statistical Analysis</td>
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<td>BIO 220 Physiology and Biological Adaptation</td>
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<td>POLS 210 American and California Government (D.1)</td>
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<th>Units</th>
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<tr>
<td>4</td>
<td>AE 414 Irrigation Engineering</td>
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<td>AE 415 Hydrology</td>
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<td>ANT 201/GEOG 150/SOC 105 (D.4.a)</td>
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<td>HIST 204 History of American Ideals and Institutions (D.1)</td>
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<td>PSY 201/PSY 202 General Psychology (E.1)</td>
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1 To be selected in accordance with the General Education-Breadth requirements. (Please see page 77 of this catalog.)

---

Freshman

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<thead>
<tr>
<th>Units</th>
<th>AE 128 Introduction to Fundamentals of Agricultural Technology</th>
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<tr>
<td>4</td>
<td>AE 143 Power and Machinery</td>
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<td>AE 237 Engineering Surveying I</td>
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<td>ETME 141 Applied Descriptive Geometry</td>
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<td>1</td>
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<td>ETMP 144 Manufacturing Processes: Machining I</td>
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<td>SS 121 Introductory Soil Science</td>
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<td>CSC 251 Digital Computer Applications (F.1)</td>
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<td>ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2)</td>
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Sophomore

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<tr>
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<td>4</td>
<td>AE 236 Principles of Irrigation</td>
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<td>MATH 241 Calculus IV</td>
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<td>ME 212 Engineering Dynamics</td>
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1 To be selected in accordance with the General Education-Breadth requirements. (Please see page 77 of this catalog.)
# B.S. AGRICULTURAL ENGINEERING

Courses are displayed by Major, Support, General Education and Breadth, and Electives.

## MAJOR COURSES

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<tr>
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<td>AE 143</td>
<td>Power and Machinery</td>
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<td>AE 151</td>
<td>CAD for Agricultural Engineering</td>
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<td>AE 232</td>
<td>Agricultural Structures Planning</td>
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<td>AE 236</td>
<td>Principles of Irrigation</td>
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<td>AE 237</td>
<td>Engineering Surveying I</td>
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<td>AE 312</td>
<td>Hydraulics</td>
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<td>AE 326</td>
<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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<td>AE 403</td>
<td>Agricultural Systems Engineering</td>
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<td>AE 414</td>
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<td>AE 430</td>
<td>Finite Element Analysis</td>
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## SUPPORT COURSES

* = Courses satisfy General Education and Breadth requirements.

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<td>CE 204</td>
<td>Strength of Materials</td>
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<td>Strength of Materials and Lab</td>
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<td>CHEM 124</td>
<td>General Chemistry (B.1.a.)*</td>
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<td>CHEM 125</td>
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<td>CSC 118/CSC 204/CSC 251 (F.1.)*</td>
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<td>Applied Descriptive Geometry</td>
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<td>IME 142</td>
<td>Engineering Drawing I</td>
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<td>IME 142</td>
<td>Manufacturing Processes: Materials Joining</td>
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<td>Manufacturing Processes: Material Removal</td>
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<td>Calculus I (B.2.)*</td>
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<td>Engineering Dynamics</td>
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<td>ME 302</td>
<td>Thermodynamics</td>
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<td>PHYS 133</td>
<td>General Physics</td>
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<td>SS 121</td>
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<td>STAT 321</td>
<td>Statistical Analysis I</td>
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## GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 9 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

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<th>Area</th>
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<td>ENGL 218 (A.4.)</td>
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<td>A minimum of 18 units is required; 18 of the units are in Support</td>
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<td>Physical science (B.1.a.)* see Support Courses</td>
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<td>Life science (B.1.b.)* see Support Courses</td>
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<td>Mathematics (B.2.)* see Support Courses</td>
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<td>PHIL 230/PHIL 231 (C.1.)</td>
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<td>Area D</td>
<td>HIST 204 (D.1.), POLS 210 (D.1.)</td>
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<td>Area E</td>
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<td>PSY 201/PSY 202 (E.1.) (E.2.)* see Support Courses</td>
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<td>Area F</td>
<td>A minimum of 2 units is required; 2 of the units are in Support (F.1.)* see Support Courses</td>
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Total: A minimum of 76 units is required; 23 of the units are in Support.

## ELECTIVES

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</table>
# B.S. AGRICULTURAL SYSTEMS MANAGEMENT

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser. Courses are displayed by year.

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<th>Freshman</th>
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<tbody>
<tr>
<td>AE 128 Introduction to Fundamentals of Agricultural Technology</td>
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<tr>
<td>AE 133 Agricultural Drafting</td>
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<tr>
<td>ASM 141 Agricultural Machinery Safety</td>
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<td>ASM 142 Agricultural Power and Machinery Management</td>
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<td>SS 121 Introductory Soil Science</td>
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<td>CHEM 121 General Chemistry (B.1.a.)</td>
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<td>ENGL 114 Writing: Exposition (A.1.)</td>
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<td>ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.)</td>
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<td>ASM 203 Agricultural Systems Analysis</td>
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<td>ACTG 211 Financial Accounting for Nonbusiness Majors</td>
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<td>AG 250/CSC 110/CSC 120 (F.1.)</td>
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<td>AGB 212 Agricultural Economics</td>
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<td>BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.)</td>
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<td>SPC 201 Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
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<td>Animal or plant production elective</td>
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<tbody>
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<td>ASM 324 Principles of Agricultural Electrification</td>
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<td>ASM 325 Agricultural Energy Systems</td>
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<td>AE 321 Agricultural Safety</td>
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<td>AE 340 Irrigation Water Management</td>
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<td>AGB 310 Agricultural Credit and Finance</td>
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<tbody>
<tr>
<td>AE 402 Agricultural Materials Science</td>
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<tr>
<td>AE 425 Computer Controls for Agriculture</td>
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<td>ASM 432 Agricultural Buildings</td>
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<tr>
<td>ASM 463 Undergraduate Seminar</td>
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<td>1 Senior project 461, 462</td>
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<td>AGB 401 Managing Cultural Diversity in Agricultural Labor Relations</td>
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<td>HIST 315 Modern World History (D.2.)</td>
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<td>2 Fine and performing arts elective</td>
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1. Senior project to be taken in emphasis area.
2. To be selected in accordance with the General Education-Breadth requirements. (Please see page 77 of this catalog.)
## B.S. AGRICULTURAL SYSTEMS MANAGEMENT

Courses are displayed by Major, Support, General Education and Breadth, and Electives. 60 units must be 300-400 level.

**Units**

### MAJOR COURSES

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASM 141</td>
<td>Agricultural Machinery Safety</td>
<td>3</td>
</tr>
<tr>
<td>ASM 142</td>
<td>Agricultural Power and Machinery Management</td>
<td>4</td>
</tr>
<tr>
<td>ASM 203</td>
<td>Agricultural Systems Analysis</td>
<td>3</td>
</tr>
<tr>
<td>ASM 324</td>
<td>Principles of Agricultural Electrification</td>
<td>4</td>
</tr>
<tr>
<td>ASM 325</td>
<td>Agricultural Energy Systems</td>
<td>3</td>
</tr>
<tr>
<td>AE 340</td>
<td>Irrigation Water Management</td>
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</tr>
<tr>
<td>ASM 402</td>
<td>Agricultural Materials</td>
<td>3</td>
</tr>
<tr>
<td>AE 425</td>
<td>Computer Controls for Agriculture</td>
<td>3</td>
</tr>
<tr>
<td>ASM 432</td>
<td>Agricultural Buildings</td>
<td>4</td>
</tr>
<tr>
<td>ASM 463</td>
<td>Undergraduate Seminar</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Senior Project 461, 462</td>
<td>2,3</td>
</tr>
</tbody>
</table>

Adviser approved electives 19

May be selected from the following emphasis areas: plant production, livestock production, food processing, environment information management, water/irrigation, agricultural waste management, process and manufacturing, or teaching agriculture.

### SUPPORT COURSES

* = Courses satisfy General Education and Breadth requirements.

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE 128</td>
<td>Introduction to Fundamentals of Agricultural Technology</td>
<td>3</td>
</tr>
<tr>
<td>AE 133</td>
<td>Agricultural Drafting</td>
<td>3</td>
</tr>
<tr>
<td>AE 321</td>
<td>Agricultural Safety</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 211</td>
<td>Financial Accounting for Nonbusiness Majors</td>
<td>4</td>
</tr>
<tr>
<td>AG 250</td>
<td>Computer Application in Agriculture (F.1.)*</td>
<td>3</td>
</tr>
<tr>
<td>AGB 212</td>
<td>Agricultural Economics</td>
<td>3</td>
</tr>
<tr>
<td>AGB 301</td>
<td>Agricultural Marketing</td>
<td>3</td>
</tr>
<tr>
<td>AGB 310</td>
<td>Agricultural Credit and Finance</td>
<td>3</td>
</tr>
<tr>
<td>AGB 401</td>
<td>Agribusiness Labor Relations and Personnel Management</td>
<td>4</td>
</tr>
<tr>
<td>BIO 220</td>
<td>Physiology and Biological Adaptation (B.1.b., E.2)*</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>
</tr>
<tr>
<td>MATH 118</td>
<td>Pre-Calculus Algebra (B.2.)*</td>
<td>4</td>
</tr>
<tr>
<td>MATH 119</td>
<td>Pre-Calculus Trigonometry</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 104</td>
<td>Introduction to Physics (B.1.a.)*</td>
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</tr>
<tr>
<td>SS 121</td>
<td>Introductory Soil Science</td>
<td>4</td>
</tr>
</tbody>
</table>

Units selected by the student and approved in advance by the Agribusiness Department Minor Coordinator 10

Animal or plant production course 3

### GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 9 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

<table>
<thead>
<tr>
<th>Area</th>
<th>Courses</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>ENGL 114 (A.1.)</td>
<td>14</td>
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<tr>
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<td>ENGL 125/PHIL 125/SPC 125 (A.2.)</td>
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<tr>
<td></td>
<td>SPC 201/SPC 202 (A.3.)</td>
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<td>ENGL 218 (A.4.)</td>
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</tr>
<tr>
<td>B</td>
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<tr>
<td></td>
<td>A minimum of 18 units is required; 18 of the units are in Support:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physical science (B.1.a.)* see Support Courses</td>
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</tr>
<tr>
<td></td>
<td>Life science (B.1.b.)* see Support Courses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mathematics (B.2.)* see Support Courses</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>PHIL 230/PHIL 231 (C.1.)</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Critical reading electives (C.1.)</td>
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<tr>
<td></td>
<td>Fine and performing arts elective (C.2.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Literature, philosophy, arts elective (300–400 level) (C.3.)</td>
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<tr>
<td>D</td>
<td>Arts and humanities elective (Area C)</td>
<td>18</td>
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<tr>
<td></td>
<td>HIST 204 (D.1.), POLS 210 (D.1.)</td>
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</tr>
<tr>
<td></td>
<td>HIST 315 (D.2.)</td>
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<tr>
<td></td>
<td>ECON 201/211/222 (D.3.)</td>
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<tr>
<td></td>
<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
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<tr>
<td></td>
<td>ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)</td>
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<tr>
<td>E</td>
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<td>3</td>
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<tr>
<td></td>
<td>A minimum of 5 units is required; 2 of the units are in Support:</td>
<td></td>
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<tr>
<td></td>
<td>PSY 201/PSY 202 (E.1.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(E.2.)* see Support Courses</td>
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<tr>
<td>F</td>
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<tr>
<td></td>
<td>A minimum of 3 units is required; 3 of the units are in Support: (F.1.)* see Support Courses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>53</td>
</tr>
</tbody>
</table>

A minimum of 76 units is required; 23 of the units are in Support.

### ELECTIVES

9

Total 187

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1 Senior project may be taken in emphasis areas.
ANIMAL SCIENCE DEPARTMENT

Agriculture Bldg. (10), Room 101
(805) 756-2419

Faculty

Interim Department Head, Phillip M. Doub

Gene A. Armstrong
M. Steven Daugherty
James R. Flanagan
Michael H. Hall
Roger M. Hunt
Michael W. Lund
Roland K. Pautz

William E. Plummer
Robert T. Rutherford
Kenneth C. Scotto
Dale A. Smith
Robert Spiller
Clifford A. Stokes

Programs

B.S. Animal Science

Poultry Management Minor

The Bachelor of Science degree in Animal Science prepares students for many career opportunities. The major coursework combines theory and practical applications for all of the species common to the livestock and poultry industries. In consultation with their faculty advisers, students select electives according to the student's career goals. The adviser approved electives are designed to provide students with curriculum flexibility and choice. Students may select coursework in one of the following areas: livestock production, poultry management, agribusiness, meats/muscle science, teaching agriculture, agricultural communication, resource management, and pre-veterinary/graduate school.

In addition, the department offers a wide assortment of extracurricular activities including four different student clubs and a nationally competitive livestock judging team. Students also are involved in organizing and conducting special meetings, seminars and field days sponsored by the department.

The department maintains herds or flocks of beef cattle, sheep, swine, horses and poultry. Some of the nation's most noted bloodlines can be found within the registered breeds on campus, including some which have arrived via embryo transfer and artificial insemination. By actively participating in the management of the herds and flocks, students simulate the larger scale operations of the industry. The enterprise project system is another valuable experience for students.

In addition, the department has an active role in the developing management of the Swanton-Pacific Ranch in Davenport, California. The Animal Science Department is taking the lead on development of environmentally sound resource management practices including intensive controlled grazing, multiple species grazing and using the grazing animal as a tool to enhance the total environment of the ranch.

POULTRY MANAGEMENT MINOR

The Poultry Management minor 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.

Units

Required courses ........................................... 20
PM 230 Poultry Industry Survey (3)
PM 240 Poultry Business Management (3)
PM 250 Poultry Processing (3)
PM 330 Poultry Production Management (4)
PM 340 Poultry Anatomy, Physiology and Diseases (4)
PM 350 Applied Poultry Feeding and Nutrition (3)

Electives .................................................... 8
To be chosen from:
ACTG 211; AG 339; AGB 310; ENGL 310;
MKTG 301; FSN 331, 333, 336, 431;
PM 290/490, 360

8
B.S. ANIMAL SCIENCE

Courses are displayed by Major, Support, General Education and Breadth, and Electives. 60 units must be 300-400 level.

MAJOR COURSES
ASCI 101 Introduction to the Animal Sciences .......... 2
ASCI 141 Market Beef Production....................... 4
ASCI 142 Swine Science............................... 4
ASCI 143 Systems of Sheep Production............... 4
ASCI 144 Equine Science.............................. 3
ASCI 220 Intro. Animal Nutrition and Feeding........ 4
ASCI 304 Animal Breeding................................ 3
ASCI 401 Reproductive Physiology...................... 4
ASCI 420 Animal Nutrition or ASCI 421 Animal Nutrition (Pre-Veterinary/Graduate Students)........... 3
ASCI 461 Senior Project.................................. 2
ASCI 462 Senior Project.................................. 2
ASCI 463 Undergraduate Seminar....................... 2
ASCI 476 Issues in Animal Agriculture............... 3
FSN 211 Meats............................................ 3
PM 230 Poultry Industry Survey....................... 3
VS 123 Anatomy and Physiology.......................... 3
Select two of the following: ASCI 311, 312, 313, 314; PM 320, 340.......................... 6
Adviser approved electives............................. 35
19 units must be 300-400 level. May be selected from: livestock production, poultry management, agribusiness, meats/muscle science, teaching agriculture, agricultural communication, resource management, and pre-veterinary/graduate school.

SUPPORT COURSES
* = Courses satisfy General Education and Breadth requirements.
BIO 151 Introduction to Biology or BIO 101 General Biology and BIO 105 General Biology Laboratory (B.1.a.)*.......................... 4
BIO 303 Genetics (B.1.b.)*............................... 3
CHEM 121/127 General Chemistry (B.1.a.)*........... 4
CHEM 122/128 General Chemistry....................... 4
CHEM 316 Organic Chemistry or CHEM 326 Survey of Organic Chemistry............... 4

90

Area B: ..................................................... 6
A minimum of 18 units is required; 12 of the units are in Support Physical and life sciences (B.1.a., B.1.b.)* see Support Courses Mathematics elective (B.2.) Mathematics or statistics elective (B.2.)
Area C: .................................................... 18
PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300–400 level) (C.3.) Arts and humanities elective (Area C)
Area D: ................................................... 18
HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/211/222 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)
Area E: ....................................................... 5
PSY 201/PSY 202 (E.1.) BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)
Area F: ....................................................... 3
Computer literacy elective (F.1.)
Total.................................................................. 64
A minimum of 76 units is required; 12 of the units are in Support

ELECTIVES.................................................. 13

186

GENERAL EDUCATION AND BREADTH
Please see page 77 for selection of GEB electives. At least 9 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.
Area A: ....................................................... 14
ENGL 114 (A.1.)
ENGL 125/PHIL 125/SPC 125 (A.2.)
SPC 201/SPC 202 (A.3.)
ENGL 215 or 218 (A.4.)
CROP SCIENCE DEPARTMENT

Agricultural Sciences Bldg. (11), Room 229
(805) 756-1237

Faculty

Department Head, George G. Gowgani

Edgar H. Beyer
J. Wyatt Brown
Lark P. Carter
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
Brenda S. Smith
David L. Warfield
Jo Ann C. Wheatley

Programs

B.S. Crop Science
B.S. Fruit Science
B.S. Plant Protection Science

Plant Protection Minor

Three major curricula leading to the Bachelor of Science degree are offered by the Crop Science Department and are designed to prepare students for many career opportunities. In consultation with faculty advisers, students majoring in Crop Science or Fruit Science select electives according to their career goals. These adviser-approved electives are designed to provide students with curriculum flexibility and choice. Students may select coursework in one of the following areas: crop production management, orchard and vineyard management, postharvest technology-marketing, crop science/vegetable science, pomology, enology, crop ecology, agricultural chemistry, applied biotechnology, and agricultural communications.

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 400 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, a pesticide application and rinsate recycling system, and specialized laboratory equipment for the study of various crops. Field trips supplement instruction for crops not common to the San Luis Obispo area.

The Crop Science Department has an active role in the management of the Swanton-Pacific Ranch in Davenport, California. Students are able to intern on this working ranch while concurrently taking university courses offered from the San Luis Obispo campus through distance-learning technology. The ranch offers experiences in managing crops, livestock, forests and range land.

The department supports extra- and co-curricular activities for its students. These include two student clubs and a team which competes in national crops-judging contests.

CROP SCIENCE MAJOR

The Crop Science major qualifies graduates for private or corporate crop production and management, sales and service, positions with commercial pest control firms, government regulatory agencies, and agriculturally related organizations, and as agronomists and horticulturists with government or industry.

FRUIT SCIENCE MAJOR

The Fruit Science major qualifies graduates for orchard or vineyard management or for related employment 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.

PLANT PROTECTION SCIENCE MAJOR

Plant Protection Science is a multi-faceted discipline requiring knowledge of pest and beneficial organism biology as well as an understanding of crop production principles, ecology, biotechnology, pesticide toxicology, and environmental science. Plant protection specialists work with crop producers, the ornamental and turf industry, forestry, and livestock producers to reduce pest problems. As environmental regulations increase, employment opportunities grow for people holding professional licenses. The major prepares students to pass all categories of the California Pest Control Advisors License exam.
B.S. CROP SCIENCE

Courses are displayed by Major, Support, General Education and Breadth, and Electives. 60 units must be 300-400 level.

MAJOR COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<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>Cereal Grain Production</td>
<td>4</td>
</tr>
<tr>
<td>CRSC 133</td>
<td>Row Crop Production</td>
<td>4</td>
</tr>
<tr>
<td>CRSC 202</td>
<td>Enterprise Project</td>
<td>3</td>
</tr>
<tr>
<td>CRSC 221</td>
<td>Weed Science</td>
<td>4</td>
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<tr>
<td>CRSC 304</td>
<td>Plant Improvement</td>
<td>4</td>
</tr>
<tr>
<td>CRSC 311</td>
<td>Insect Pest Management</td>
<td>4</td>
</tr>
<tr>
<td>CRSC 411</td>
<td>Experimental Techniques and Analysis</td>
<td></td>
</tr>
<tr>
<td>CRSC 445</td>
<td>Cropping Systems</td>
<td></td>
</tr>
<tr>
<td>CRSC 461</td>
<td>Senior Project</td>
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<tr>
<td>CRSC 462</td>
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<tr>
<td>CRSC 463</td>
<td>Undergraduate Seminar</td>
<td>2</td>
</tr>
<tr>
<td>VGSC 232</td>
<td>California Vegetable Production</td>
<td>4</td>
</tr>
</tbody>
</table>

Select either agronomy or vegetable production..... 12

**Agronomy:**

- CRSC 231 Commercial Seed Production and Conditioning (4)
- CRSC 330 Advanced Forage Crop Production (4)
- CRSC 421 Oil and Fiber Crops (4)

**Vegetable Production:**

- CRSC 333 Greenhouse Vegetable Production (4)
- VGSC 232 Advanced Vegetable Science (4)
- VGSC 424 Vegetable Crop Management (4)

SUPPORT COURSES * = Courses satisfy GEB.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>BIO 303</td>
<td>Genetics (B.1.b.)*</td>
<td>3</td>
</tr>
<tr>
<td>BOT 121</td>
<td>General Botany (B.1.b.)*</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 121</td>
<td>General Chemistry (B.1.a.)*</td>
<td>4</td>
</tr>
<tr>
<td>FRSC 230</td>
<td>California Fruit Growing</td>
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</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>
</tr>
<tr>
<td>SS 121</td>
<td>Introductory Soil Science</td>
<td>4</td>
</tr>
</tbody>
</table>

Adviser-approved electives..... 36

Must include at least 8 units of BIO/BOT/CHM electives. 12-16 units must be 300-400 level. Areas may include agricultural chemistry, agricultural communications, applied biotechnology, crop ecology, production management, post-harvest technology/marketing, crop science/vegetable science. May not include Enterprise Projects.

SUPPORT COURSES * = Courses satisfy GEB.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 303</td>
<td>Genetics (B.1.b.)*</td>
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<td>BOT 121</td>
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<td>FRSC 230</td>
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<td>MATH 118</td>
<td>Pre-Calculus Algebra (B.2.)*</td>
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<td>SS 121</td>
<td>Introductory Soil Science</td>
<td>4</td>
</tr>
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Adviser-approved electives..... 36

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GENERAL EDUCATION AND BREADTH

<table>
<thead>
<tr>
<th>Area</th>
<th>Courses</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>ENGL 114 (A.1.)</td>
</tr>
<tr>
<td></td>
<td>ENGL 125/PHIL 125/SPC 125 (A.2.)</td>
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<td></td>
<td>SPC 201/SPC 202 (A.3.)</td>
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<tr>
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<td>ENGL 215 or 218 (A.4.)</td>
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</table>

Recommended Sequence: Major and Support Courses

The following is a guide for scheduling Major and Support Courses. By following this sequence, students should meet prerequisites for Major coursework. Courses are not always offered during the quarter indicated. Please consult with your academic adviser and the current Class Schedule.

<table>
<thead>
<tr>
<th>Year</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Year</td>
<td>CRSC 101</td>
<td>CRSC 132</td>
<td>CRSC 133</td>
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<tr>
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<td>CRSC 131</td>
<td>MATH 118</td>
<td>SS 121</td>
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<td>BOT 121</td>
<td>CHEM 121</td>
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<td>2nd Year</td>
<td>CRSC 221</td>
<td>FRSC 230</td>
<td>VGSC 232</td>
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<td>BIO/BOT/CHM</td>
<td>STAT 211</td>
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<td>elective</td>
<td>elective</td>
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<tr>
<td>3rd Year</td>
<td>CRSC/VGSC 202</td>
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<td>CRSC 462</td>
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<td>CRSC 463</td>
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<tr>
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<td>CRSC 333 or</td>
<td>CRSC 421</td>
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<tr>
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<td>CRSC 421</td>
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</table>

Total: 189 units

A minimum of 76 units is required, 18 of the units are in Support.

Electives: 9 units

Area B: 18 units

A minimum of 18 units is required; 18 of the units are in Support.

Physical sciences (B.1.a.)* see Support Courses

Life sciences (B.1.b.)* see Support Courses

Mathematics/statistics (B.2.)* see Support Courses

Phil 230/PHIL 231 (C.1.)

Critical reading electives (C.1.)

Fine and performing arts elective (C.2.)

Lit, phil, arts elective (300-400 level) (C.3.)

Arts and humanities elective (Area C)

Area D: 18 units

HIST 204 (D.1.), POLS 210 (D.1.)

HIST 315 (D.2.)

ECON 201/211/222 (D.3.)

ANT 201/GEOG 150/SOC 105 (D.4.a.)

ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300-400 level) (D.4.b.)

Area E: 5 units

PSY 201/PSY 202 (E.1.)

BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)

Area F: 3 units

AG 250 (F.1.)

Total: 58 units

A minimum of 76 units is required, 18 of the units are in Support.

Electives: 9 units
B.S. FRUIT SCIENCE
Courses are displayed by Major, Support, General Education and Breadth, and Electives. 60 units must be 300-400 level.

MAJOR COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRSC 101</td>
<td>Orientation to Crop Science</td>
<td>1</td>
</tr>
<tr>
<td>CRSC 221</td>
<td>Weed Science</td>
<td>4</td>
</tr>
<tr>
<td>CRSC 311</td>
<td>Insect Pest Management</td>
<td>4</td>
</tr>
<tr>
<td>CRSC 411</td>
<td>Experimental Techniques and Analysis</td>
<td>4</td>
</tr>
<tr>
<td>CRSC/FRSC 422</td>
<td>Tropical Crop, Fruit &amp; Nut Production</td>
<td>4</td>
</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>FRSC 131</td>
<td>Pomology</td>
<td>4</td>
</tr>
<tr>
<td>FRSC 132</td>
<td>Pomology</td>
<td>4</td>
</tr>
<tr>
<td>FRSC 133</td>
<td>Pomology</td>
<td>4</td>
</tr>
<tr>
<td>FRSC 202</td>
<td>Enterprise Project</td>
<td>6</td>
</tr>
<tr>
<td>FRSC 231</td>
<td>Viticulture</td>
<td>4</td>
</tr>
<tr>
<td>FRSC 331</td>
<td>Advanced Viticulture</td>
<td>4</td>
</tr>
<tr>
<td>FRSC 332</td>
<td>Fruit Plant Propagation</td>
<td>4</td>
</tr>
<tr>
<td>FRSC 342</td>
<td>Citrus and Avocado Fruit Production</td>
<td>4</td>
</tr>
<tr>
<td>FRSC/VGSC 421</td>
<td>Postharvest Technology of Horticultural Crops</td>
<td>4</td>
</tr>
<tr>
<td>FRSC 436</td>
<td>Advanced Production Problems</td>
<td>4</td>
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SUPPORT COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>BIO 303 Genetcs (B.1.b.)*</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BOT 121 General Botany (B.1.b.)*</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CHEM 121 General Chemistry (B.1.a.)*</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CRSC 230 Agronomic Crop Production or VGSC 230 Introduction to Vegetable Science</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>MATH 118 Pre-Calculus Algebra (B.2.)*</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>STAT 211 Elementary Probability and Statistics (B.2.)*</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>SS 121 Introductory Soil Science</td>
<td>4</td>
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<tr>
<td>Adviser-approved electives</td>
<td>31</td>
<td></td>
</tr>
</tbody>
</table>

Must include at least 8 units of BIO/BOT/CHEM electives. 8 units must be 300-400 level. Areas may include agricultural chemistry, agricultural communications, applied biotechnology, crop ecology, enology, orchard and vineyard management, pomology, postharvest technology, marketing. May not include Enterprise Projects.

GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 9 units must be at the 300-400 level. Additional GEB courses are listed under Support Courses.

Area A: 14

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>ENGL 114</td>
<td>(A.1.)</td>
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<tr>
<td>ENGL 125/PHIL 125/SPC 125</td>
<td>(A.2.)</td>
</tr>
<tr>
<td>SPC 201/SPC 202</td>
<td>(A.3.)</td>
</tr>
<tr>
<td>ENGL 215 or 218</td>
<td>(A.4.)</td>
</tr>
</tbody>
</table>

Area B: 0

A minimum of 18 units is required; 18 of the units are in Support.

Physical sciences (B.1.a.)* see Support Courses
Life sciences (B.1.b.)* see Support Courses
Mathematics/statistics (B.2.)* see Support Courses

Area C: 18

PHIL 230/PHIL 231 (C.1.)
Critical reading electives (C.1.)
Fine and performing arts elective (C.2.)
Lit, phil, arts elective (300-400 level) (C.3.)
Arts and humanities elective (Area C)

Area D: 18

HIST 204 (D.1.), POLS 210 (D.1.)
HIST 315 (D.2.)
ECON 201/211/222 (D.3.)
ANT 201/GEOG 150/SOC 105 (D.4.a.)
ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300-400 level) (D.4.b.)

Area E: 5

PSY 201/PSY 202 (E.1.)
BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)

Area F: AG 250 (F.1.)

Total: 58

A minimum of 76 units is required, 18 units are in Support

ELECTIVES: 9

Recommended Sequence: Major and Support Courses

The following is a guide for scheduling Major and Support Courses. By following this sequence, students should meet prerequisites for Major coursework. Courses are not always offered during the quarter indicated. Please consult with your academic adviser and the current Class Schedule.

<table>
<thead>
<tr>
<th>Semester</th>
<th>1st Year</th>
<th>2nd Year</th>
<th>3rd Year</th>
<th>4th Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>FRSC 131</td>
<td>FRSC 231</td>
<td>FRSC 421</td>
<td>CRSC 230</td>
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<tr>
<td>Winter</td>
<td>FRSC 132</td>
<td>FRSC 331</td>
<td>FRSC 422</td>
<td>VGSC 230</td>
</tr>
<tr>
<td>Spring</td>
<td>FRSC 133</td>
<td>FRSC 342</td>
<td>FRSC 332</td>
<td>CRSC 462</td>
</tr>
<tr>
<td>Fall</td>
<td>CRSC 101</td>
<td>CRSC 202</td>
<td>CRSC 461</td>
<td>CRSC 230</td>
</tr>
<tr>
<td>Winter</td>
<td>MATH 118</td>
<td>STAT 211</td>
<td>CRSC 463</td>
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<tr>
<td>Spring</td>
<td>CHEM 112</td>
<td>CRSC 411</td>
<td>CRSC 311</td>
<td>CRSC 463</td>
</tr>
</tbody>
</table>
B.S. PLANT PROTECTION SCIENCE

Courses are displayed by Major, Support, General Education and Breadth, and Electives. 60 units must be 300-400 level.

MAJOR COURSES

<table>
<thead>
<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>CRSC/FRSC/ VGSC 202</td>
<td>Enterprise Project</td>
<td>3</td>
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<tr>
<td>CRSC 221</td>
<td>Weed Science</td>
<td>4</td>
</tr>
<tr>
<td>CRSC 304</td>
<td>Plant Improvement</td>
<td>4</td>
</tr>
<tr>
<td>CRSC 311</td>
<td>Insect Pest Management</td>
<td>4</td>
</tr>
<tr>
<td>CRSC 410</td>
<td>Crop Physiology</td>
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<td>Experimental Techniques and Analysis</td>
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<td>Senior Project</td>
<td>3</td>
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<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>
</tbody>
</table>

Production Courses. Select one of the following sequences.

- CRSC 131, 132, 133; FRSC 230
- FRSC 131, 132, 133; CRSC/VGSC 230
- FRSC 131, 231, 342; CRSC/VGSC 230

Advanced Plant Protection electives to be selected from: CRSC 327, 405, 431, 441... 12

SUPPORT COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>BIO 303</td>
<td>Genetics (B.1.b.)*</td>
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<tr>
<td>BIO 325</td>
<td>General Ecology (B.1.b.)*</td>
<td>4</td>
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<tr>
<td>BOT 121</td>
<td>General Botany (B.1.b.)*</td>
<td>4</td>
</tr>
<tr>
<td>BOT 323</td>
<td>Plant Pathology</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>
</tr>
<tr>
<td>CHEM 326</td>
<td>Survey of Organic Chemistry (B.1.a.)</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 328</td>
<td>Biochemistry</td>
<td>4</td>
</tr>
<tr>
<td>MATH 118</td>
<td>Pre-Calculus Algebra (B.2.)*</td>
<td>4</td>
</tr>
<tr>
<td>MATH 116 &amp; 117 will substitute)</td>
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<td></td>
</tr>
<tr>
<td>SS 121</td>
<td>Introductory Soil Science</td>
<td>4</td>
</tr>
<tr>
<td>STAT 211</td>
<td>Elementary Probability and Statistics (B.2)*</td>
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</tr>
<tr>
<td>ZOO 131</td>
<td>General Zoology</td>
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<tr>
<td>ZOO 335</td>
<td>General Entomology</td>
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<tr>
<td>Adviser approved electives</td>
<td>9</td>
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</tr>
</tbody>
</table>

GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 9 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

Area A: 14

ENGL 114 (A.1.)

ENGL 125/PHIL 125/SPC 125 (A.2.)

SPC 201/SPC 202 (A.3.)

ENGL 215 or 218 (A.4.)

Area B: 0

A minimum of 18 units is required; 18 of the units are in Support

Physical sciences (B.1.a.)* see Support Courses

Life sciences (B.1.b.)* see Support Courses

Mathematics/statistics (B.2.)* see Support Courses

Area C: 18

PHIL 230/PHIL 231 (C.1.)

Critical reading electives (C.1.)

Fine and performing arts elective (C.2.)

Lit, phil, arts elective (300–400 level) (C.3.)

Arts and humanities elective (Area C)

Area D: 18

HIST 204 (D.1.), POLS 210 (D.1.)

HIST 315 (D.2.)

ECON 201/211/222 (D.3.)

ANT 201/GEOG 150/SOC 105 (D.4.a.)

ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)

Area E: 5

PSY 201/PSY 202 (E.1.)

BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)

Area F: AG 250 (F.1.)

Total: 58

A minimum of 76 units is required; 18 of the units are in Support

ELECTIVES: 9

Recommended Sequence: Major and Support Courses

The following is a guide for scheduling Major and Support Courses. By following this sequence, students should meet prerequisites for Major coursework. Courses are not always offered during the quarter indicated. Please consult with your academic adviser and the current Class Schedule.

<table>
<thead>
<tr>
<th>Quarter</th>
<th>1st Year</th>
<th>2nd Year</th>
<th>3rd Year</th>
<th>4th Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>CRSC 101</td>
<td>Production Course</td>
<td>CRSC 221</td>
<td>CRSC 411</td>
</tr>
<tr>
<td>Winter</td>
<td>Production Course</td>
<td>Production Course</td>
<td>BOT 323</td>
<td>BIO 303</td>
</tr>
<tr>
<td>Spring</td>
<td>Production Course</td>
<td>Production Course</td>
<td>CRSC 304</td>
<td>CRSC 461</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Spring</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Area E: 5

PSY 201/PSY 202 (E.1.)

BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)

Area F: AG 250 (F.1.)

Total: 58

A minimum of 76 units is required; 18 of the units are in Support

ELECTIVES: 9

Recommended Sequence: Major and Support Courses

The following is a guide for scheduling Major and Support Courses. By following this sequence, students should meet prerequisites for Major coursework. Courses are not always offered during the quarter indicated. Please consult with your academic adviser and the current Class Schedule.

<table>
<thead>
<tr>
<th>Quarter</th>
<th>1st Year</th>
<th>2nd Year</th>
<th>3rd Year</th>
<th>4th Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>CRSC 101</td>
<td>Production Course</td>
<td>CRSC 221</td>
<td>CRSC 411</td>
</tr>
<tr>
<td>Winter</td>
<td>Production Course</td>
<td>Production Course</td>
<td>BOT 323</td>
<td>BIO 303</td>
</tr>
<tr>
<td>Spring</td>
<td>Production Course</td>
<td>Production Course</td>
<td>CRSC 304</td>
<td>CRSC 461</td>
</tr>
</tbody>
</table>
PLANT PROTECTION MINOR

This program emphasizes both plant protection and plant production. Within the plant protection field of study, the student will be exposed to a broad range of pest management subjects including entomology, plant pathology, and weed control. Within the production area the student may emphasize fruit production, crop production, ornamental horticulture, or natural resource management.

**Required courses** ................................................................. 12

- Courses used to fulfill requirements of the major cannot also be counted for the minor. Advanced versions of the following courses may be substituted by production majors.
- BOT 323 Plant Pathology or BOT 324 Ornamental and Forest Pathology (4)
- CRSC 221 Weed Control (4)
- CRSC 311 Insect Pest Management (4)

**Courses in area of emphasis** ............................................... 16

For purposes of this minor, plant production majors include Crop Science, Fruit Science, Forestry and Natural Resources (Forestry Concentration) and Ornamental Horticulture majors. Students must select an Emphasis I or Emphasis II based on their major.

**I. Emphasis for Plant Production Majors** (minimum of 16 units)

- Select four of the following:
  - BOT 322 Plant Physiology (4)
  - BOT 325 Plant Nematology (4)
  - BOT 431 Advanced Plant Pathology (4)
  - CRSC 327 Vertebrate Pest Management (4)
  - CRSC 405 Advanced Weed Science (4)
  - CRSC 410 Crop Physiology (4)
  - CRSC 431 Advanced Insect Pest Management (4)
  - CRSC 441 Biological Control of Insects (4)
  - FNR 303 Forest Protection (5)
  - ZOO 335 General Entomology (4)

OR:

**II. Emphasis for Non-Plant Production Majors**

- (minimum of 16 units)
  - A. Select one of the groups below (12 units):
    - CRSC 131 Introduction to Crop Science (4)
    - CRSC 132 Cereal Grain Production (4)
    - CRSC 421 Oil and Fiber Crops (4)
    - FRSC 131 Pomology (4)
    - FRSC 231 Viticulture (4)
    - FRSC 342 Citrus and Avocado Fruit Production (4)
  - CRSC 131 Introduction to Crop Science (4)
  - VGSC 232 California Vegetable Production (4)
  - VGSC 423 Advanced Vegetable Science (4)

- OH 121 Fundamentals Ornamental Horticulture I (4)
- OH 124 Plant Propagation, Fundamentals III (4) or OH 243 Turf Management (4)
- OH 324 Foliage Plant Culture (4) or OH 424 Nursery Crop Production (4)
- FNR 201 Forest Resources (3)
- FNR 204 Resource Fire Control (2)
- FNR 208 Dendrology (4)
- FNR 305 Forest Harvesting (3)

AND

- B. Select one course from Section I: Plant Production Majors (4 units)

**Total units for the minor:** .................................................. 28
DAIRY SCIENCE DEPARTMENT

Agriculture Bldg. (10), Room 140
(805) 756-2560

Faculty

Department Head, Edwin H. Jaster
Leslie S. Ferreira
William T. Gillis
Stanley L. Henderson
Gary D. Reif

Dairy Products Technology Center:

Phillip S. Tong, Director
Nana Y. Farkye

Program

B.S. Dairy Science

The Bachelor of Science degree in Dairy Science is designed to prepare students for employment in the various phases of the dairy industry, as well as related fields. All students within the major take a common core of courses and, with adviser approval, select additional courses in an area of interest, which may include: dairy farm or plant management, processing technology, agriculture communication, management, preparation for graduate school, and agriculture teaching.

Excellent facilities are provided for students. 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 well-equipped with modern processing equipment. Students are employed on a part-time basis to work in both the production and processing areas. A student dairy herd 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.

The Dairy Products Technology Center (DPTC) focuses on multidisciplinary dairy foods research and training activities designed to support the dairy industry and consumers of dairy products. Current research areas are: cheese chemistry and technology, bioseparation processes, and new product and process development. The Center has state-of-the-art research and development facilities. Students may conduct dairy foods related research projects under the guidance of DPTC faculty. Opportunities also exist to work on joint projects with the University of California-Davis.

GRADUATE PROGRAM

Cal Poly offers a Master of Science degree in Agriculture with a specialization in Dairy Products Technology. Please refer to the M.S. Agriculture section of the College of Agriculture.
## B.S. DAIRY SCIENCE

Courses are displayed by Major, Support, General Education and Breadth, and Electives. 60 units must be 300-400 level.

### MAJOR COURSES

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>DSCI 100</td>
<td>Enterprise Project or AG 339 Internship in Agriculture</td>
<td>2</td>
</tr>
<tr>
<td>DSCI 101</td>
<td>Dairy Feeds and Feeding</td>
<td>4</td>
</tr>
<tr>
<td>DSCI 121</td>
<td>Elements of Dairying</td>
<td>4</td>
</tr>
<tr>
<td>DSCI 134</td>
<td>Intro. to Dairy Products Technology</td>
<td>4</td>
</tr>
<tr>
<td>DSCI 202</td>
<td>Dairy Product Marketing Programs</td>
<td>3</td>
</tr>
<tr>
<td>DSCI 222</td>
<td>Commercial Dairy Herd Management</td>
<td>4</td>
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<tr>
<td>DSCI 223</td>
<td>Frozen Dairy Foods or DSCI 321 Lactation Physiology</td>
<td>3</td>
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<td>DSCI 233</td>
<td>Milk Processing and Marketing</td>
<td>4</td>
</tr>
<tr>
<td>DSCI 234</td>
<td>Dairy Foods Evaluation</td>
<td>3</td>
</tr>
<tr>
<td>DSCI 301</td>
<td>Advanced Dairy Cattle Feeding or DSCI 326 Fermented Dairy Foods</td>
<td>3</td>
</tr>
<tr>
<td>DSCI 330</td>
<td>Artificial Insemination or DSCI 331 Concentration and Fractionation of Dairy Fluids</td>
<td>3</td>
</tr>
<tr>
<td>DSCI 332</td>
<td>Dairy Inspection</td>
<td>3</td>
</tr>
<tr>
<td>DSCI 334</td>
<td>Technology of Cheese Manufacture or DSCI 432 Advanced Dairy Herd Management</td>
<td>4</td>
</tr>
<tr>
<td>DSCI 461</td>
<td>Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>DSCI 462</td>
<td>Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>DSCI 463</td>
<td>Undergraduate Seminar</td>
<td>2</td>
</tr>
<tr>
<td>AGB 101</td>
<td>Introduction to Agribusiness and Agricultural Economics</td>
<td>4</td>
</tr>
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<td>AGB 212</td>
<td>Agricultural Economics</td>
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### SUPPORT COURSES

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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>* = Courses satisfy General Education and Breadth requirements</td>
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<tr>
<td>BACT 221</td>
<td>General Bacteriology</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>
<td>4</td>
</tr>
<tr>
<td>BIO 101</td>
<td>General Biology and BIO 105 General Biology Laboratory or BIO 151 Introduction to Biology (B.1.b.)</td>
<td>4/5</td>
</tr>
</tbody>
</table>

Adviser approved electives: At least 24 units must be 300-400 level. May be selected from one of the following areas: dairy management, dairy industry, agriculture communications, pre-grad, pre-vet, agriculture education, dairy products technology, dairy processing pre-graduate.

### GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 9 units must be at the 300-400 level. Additional GEB courses are listed under Support Courses.

#### Area A:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>ENGL 114</td>
<td>(A.1.)</td>
<td>1</td>
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<tr>
<td>ENGL 125/PHIL 125/SPC 125</td>
<td>(A.2.)</td>
<td>1</td>
</tr>
<tr>
<td>SPC 201/SPC 202</td>
<td>(A.3.)</td>
<td>1</td>
</tr>
<tr>
<td>ENGL 215 or 218</td>
<td>(A.4.)</td>
<td>1</td>
</tr>
</tbody>
</table>

Area B: 6

A minimum of 18 units is required; 12 of the units are in Support

Physical science (B.1.a.)* see Support Courses
Life science (B.1.b.)* see Support Courses
Mathematics elective (B.2.)
Mathematics or statistics elective (B.2.)

#### Area C:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHIL 230/PHIL 231</td>
<td>(C.1.)</td>
<td>1</td>
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</tbody>
</table>

Critical reading electives (C.1.)
Fine and performing arts elective (C.2.)
Literature, philosophy, arts elective (300-400 level) (C.3.)

Arts and humanities elective (Area C)

#### Area D:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>HIST 204/D.1.</td>
<td>POLS 210/D.1.</td>
<td>1</td>
</tr>
<tr>
<td>HIST 315</td>
<td>(D.2.)</td>
<td>1</td>
</tr>
<tr>
<td>ECON 201/211</td>
<td>(D.3.)</td>
<td>2</td>
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<tr>
<td>ANT/BUS/ECON/GEOG/POLS/SOC/WS elective</td>
<td>(300-400 level) (D.4.b.)</td>
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#### Area E:

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<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>PSY 201/PSY 202</td>
<td>(E.1.)</td>
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<tr>
<td>BIO 220/FSN 210/PE 250/PSY 304/REC 100</td>
<td>(E.2.)</td>
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#### Area F:

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<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>Computer literacy elective (F.1.)</td>
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</table>

**Total** 64

**A minimum of 76 units is required; 12 of the units are in Support**

### ELECTIVES

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electives</td>
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<td>8</td>
</tr>
</tbody>
</table>

**Total** 186
FOOD SCIENCE AND NUTRITION DEPARTMENT

Agricultural Sciences Bldg. (11), Room 212
(805) 756-2660

Faculty

Department Head, Joseph Montecalvo, Jr.

Connie Breazeale
Sarah E. Burroughs
Madoka Dawson
Brian C. Hampson
Hany M. Khalil
Kathleen A. McBurney

Krishnakumar (Kris) S. Morey
O. Robert Noyes
Mary E. Pedersen
Robert D. Vance
Rudy A. Wooten

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. Please refer to the M.S. Agriculture section of the College of Agriculture.

Packaging Minor

For information regarding the Packaging Minor, please see the Industrial Technology Department.

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.

NUTRITIONAL SCIENCE MAJOR

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 didactic program in dietetics 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.
B.S. FOOD SCIENCE

Courses are displayed by Major, Support, General Education and Breadth, and Electives. 60 units must be 300-400 level.

MAJOR COURSES

* = Courses satisfy General Education and Breadth requirements.

FSN 101 Orientation to Food Science and Nutrition .................. 1
FSN 170 Introductory Food Science ........................................ 4
FSN 210 Nutrition (E.2.)* ................................................. 3
FSN 209 Procurement and Use of Muscle Foods or 211 Muscle Food Science ................................................. 3
FSN 217 Fundamentals of Food Processing Operations ..................... 4
FSN 301 Unit Processing Operations I ...................................... 4
FSN 302 Unit Processing Operations II ...................................... 4
FSN 331 Principles of Food Plant Sanitation ................................ 3
FSN 332 Statistical Quality Control ........................................ 3
FSN 333 Quality Assurance in Food Industries .......................... 4
FSN 336 Food Packaging .................................................... 3
FSN 338 Further Processing of Muscle Foods ................................ 3
FSN 339 Cereal Science and Processing .................................... 3
FSN 407 Food Composition Science ........................................ 4
FSN 409 Sensory Evaluation of Food ........................................ 4
FSN 431 Advanced Muscle Food Science .................................... 3
FSN 435 Food Engineering .................................................. 4
FSN 436 Food Laws and Regulations ....................................... 3
FSN 437 Advanced Food Processing ......................................... 4
FSN 461 Senior Project ..................................................... 3
FSN 462 Senior Project ..................................................... 3
FSN 463 Undergraduate Seminar ........................................... 2

SUPPORT COURSES

* = Courses satisfy General Education and Breadth requirements.

AG 250 Computer Applications in Agriculture (F.1.)* ........................ 3
BACT 221 General Bacteriology (B.1.b.)* .................................. 4
BACT 421 General Microbiology ............................................ 4
CHEM 121 General Chemistry (B.1.a.)* .................................... 4
CHEM 122 General Chemistry (B.1.a.)* .................................... 4
CHEM 326 Survey of Organic Chemistry ................................... 4
CHEM 328 Biochemistry .................................................... 4
CHEM 435 Food Analysis ................................................... 4
DSCI 231 General Dairy Manufacturing ..................................... 4
MATH 118 Pre-Calculus Algebra (B.2.)* .................................... 4
PHYS 104 Introductory Physics (B.1.a.)* ................................... 4
STAT 211 Elementary Probability and Statistics (B.2)* .................. 3
Animal science adviser approved elective .................................. 4
Business adviser approved elective ........................................ 3
Plant science adviser approved elective ................................... 4
Adviser approved electives ................................................ 7

GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 9 units must be at the 300-400 level. Additional GEB courses are listed under Major and Support courses.

Area A: .......................................................... 14
ENGL 114 (A.1.)
ENGL 125/PHIL 125/SPC 125 (A.2.)
SPC 201/SPC 202 (A.3.)
ENGL 215 or 218 (A.4.)
Area B ........................................................................ 0
A minimum of 18 units is required; 18 of the units are in Support
Physical science (B.1.a.)* see Support Courses
Life science (B.1.b.)* see Support Courses
Mathematics/statistics (B.2.)* see Support Courses
Area C ..................................................................... 18
PHIL 230/PHIL 231 (C.1.)
Critical reading electives (C.1.)
Fine and performing arts elective (C.2.)
Literature, philosophy, arts elective (300-400 level) (C.3.)
Arts and humanities elective (Area C)
Area D: ..................................................................... 18
HIST 204 (D.1.), POLS 210 (D.1.)
HIST 315 (D.2.)
ECON 201/211 (D.3.)
ANT 201/GEOG 150/SOC 105 (D.4.a.)
ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300-400 level) (D.4.b.)
Area E: .......................................................... 3
A minimum of 5 units is required; 2 of the units are in Major
PSY 201/PSY 202 (E.1.)
(E.2.)* see Major Courses
Area F: ........................................................................ 0
A minimum of 3 units are required, 3 of the units are in Support
Computer literacy (F.1.)* see Support Courses
Total ........................................................................ 53
A minimum of 76 units is required; 23 of the units are in Major and Support

ELECTIVES .................................................. 9

1 MATH 118 and 117 will substitute for MATH 116 and are taught at
a slower pace for those who need more review. MATH 117 will
satisfy GEB area B.2.
### B.S. Food Science

**Recommended Sequence: Major and Support Courses**
The following is a guide for scheduling Major and Support Courses. By following this sequence, students should meet prerequisites for Major coursework. Courses are not always offered during the quarter indicated. Please consult with your academic adviser and the current Class Schedule.

<table>
<thead>
<tr>
<th>1st Year</th>
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<tbody>
<tr>
<td>Fall</td>
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<td>FSN 101</td>
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<tr>
<td>PHYS 104</td>
<td>CHEM 122</td>
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<table>
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<tbody>
<tr>
<td>Fall</td>
<td>Winter</td>
</tr>
<tr>
<td>FSN 217</td>
<td>FSN 301</td>
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<tr>
<td>BACT 221</td>
<td>CHEM 328</td>
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<tr>
<td>CHEM 326</td>
<td>DSCI 231</td>
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<td>STAT 111</td>
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<tbody>
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<td>Fall</td>
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<td>FSN 332</td>
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<td>FSN 338</td>
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<tr>
<td>BACT 421</td>
<td>CHEM 435</td>
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<tr>
<td>Plant Sci Elec.</td>
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<table>
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<td>Winter</td>
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<td>FSN 409</td>
<td>FSN 435</td>
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<td>FSN 463</td>
<td>FSN 436</td>
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<td></td>
<td>FSN 461</td>
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<tr>
<td>Approved Elec.</td>
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</table>

### B.S. Nutritional Science

**Recommended Sequence: Major and Support Courses**
The following is a guide for scheduling Major and Support Courses. By following this sequence, students should meet prerequisites for Major coursework. Courses are not always offered during the quarter indicated. Please consult with your academic adviser and the current Class Schedule.

<table>
<thead>
<tr>
<th>1st Year</th>
<th>1st Year</th>
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<tbody>
<tr>
<td>Fall</td>
<td>Winter</td>
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<tr>
<td>FSN 101</td>
<td>FSN 121</td>
</tr>
<tr>
<td>FSN 210</td>
<td>MATH 118</td>
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<tr>
<td>SOC 105</td>
<td>CHEM 122</td>
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<table>
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<th>2nd Year</th>
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</thead>
<tbody>
<tr>
<td>Fall</td>
<td>Winter</td>
</tr>
<tr>
<td>FSN 209</td>
<td>FSN 326</td>
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<tr>
<td>MGT 206</td>
<td>STAT 211</td>
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<table>
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<tr>
<th>3rd Year</th>
<th>3rd Year</th>
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</thead>
<tbody>
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<td>Fall</td>
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<td>FSN 315</td>
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<tbody>
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<td>Fall</td>
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<td>FSN 415</td>
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<td>FSN 429</td>
<td>FSN 426</td>
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<td>FSN 463</td>
<td>FSN 430</td>
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<tr>
<td></td>
<td>BACT 421</td>
</tr>
</tbody>
</table>
B.S. NUTRITIONAL SCIENCE

Courses are displayed by Major, Support, General Education and Breadth, and Electives. 60 units must be 300-400 level.

Units

MAJOR COURSES
* = Courses satisfy General Education and Breadth requirements.

FSN 101 Orientation to Food Science and Nutrition .......... 1
FSN 121 Fundamentals of Food .................................. 4
FSN 209 Procurement and Use of Muscle Foods .......... 3
FSN 210 Nutrition (E.2.)* ........................................ 3
FSN 230 Elements of Food Processing ......................... 4
FSN 310 Maternal and Child Nutrition ......................... 4
FSN 315 Nutrition in Aging .................................... 3
FSN 321 Meal Management ..................................... 4
FSN 328 Advanced Nutrition I .................................. 3
FSN 329 Advanced Nutrition II ................................ 3
FSN 343 Institutional Foodservice I ......................... 3
FSN 344 Institutional Foodservice II ......................... 3
FSN 412 Experimental Nutrition ................................ 3
FSN 415 Methods of Teaching Nutrition ...................... 3
FSN 426 Food Systems Management .......................... 3
FSN 429 Diet Therapy I ....................................... 3
FSN 430 Diet Therapy II ....................................... 3
FSN 461 Senior Project ....................................... 3
FSN 463 Undergraduate Seminar ............................ 2

SUPPORT COURSES
* = Courses satisfy General Education and Breadth requirements.

ACTG 211 Financial Accounting for Nonbusiness Majors ................. 4
AG 250 Computer Application to Agriculture or 
CSC 110 Computers and Computer Applications: 
MS-DOS (F.1.)* ............................................. 3
ANT 201 Cultural Anthropology ................................ 3
BACT 221 General Bacteriology ................................ 4
BACT 421 Food Microbiology .................................. 4
CHEM 121 General Chemistry (B.1.a.)* ...................... 4
CHEM 122 General Chemistry (B.1.a.)* ...................... 4
CHEM 326 Survey of Organic Chemistry .................... 4
CHEM 328 Biochemistry ....................................... 4
ECON 201 Survey of Economics (D.3.)* ...................... 3
EDUC 305 Teaching and Learning Processes .................. 3
MATH 118 Pre-Calculus Algebra (B.2.)* ..................... 4
MGT 206 Principles of Purchasing ............................. 3
MGT 312 Organization and Management Theory ............. 4
MGT 314 Human Resources Management ..................... 4
SOC 105 Introduction to Sociology (D.4.a.)* .............. 3
STAT 211 Elementary Probability and Statistics (B.2)* .... 3
ZOO 131 General Zoology (B.1.b.)* ......................... 4
ZOO 237 Human Anatomy ...................................... 3
ZOO 331 Human Physiology I ................................. 3
ZOO 332 Human Physiology II ................................ 3

GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 9 units must be at the 300-400 level.

Area A: .......................................................... 14
ENGL 114 (A.1.)
ENGL 125/PHIL 125/SPC 125 (A.2.)
SPC 201/SPC 202 (A.3.)
ENGL 215/ENGL 218 (A.4.)

Area B: ........................................................... 0
A minimum of 18 units is required; 18 of the units are in Support
Physical science (B.1.a.)* see Support Courses
Life science (B.1.b.)* see Support Courses
Mathematics/statistics (B.2.)* see Support Courses

Area C: .......................................................... 18
PHIL 230/PHIL 231 (C.1.)
Critical reading electives (C.1.)
Fine and performing arts elective (C.2.)
Literature, philosophy, arts elective (300-400 level) (C.3.)
Arts and humanities elective (Area C)

Area D: .......................................................... 12
A minimum of 18 is required, 6 of the units are in Support
HIST 204 (D.1.), POLS 210 (D.1.)
HIST 315 (D.2.)
Economics (D.3.)* see Support Courses
ANT/GEOG/SOC (D.4.a.)* see Support Courses
ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300-400 level) (D.4.b.)

Area E: .......................................................... 3
A minimum of 5 units is required; 3 of the units are in Major
PSY 201/PSY 202 (E.1.)
(E.2.)* see Major Courses

Area F: .......................................................... 0
A minimum of 3 units is required; 3 of the units are in Support
Computer literacy (F.1.)* see Support Courses

Total .............................................................. 47
A minimum of 76 units is required; 29 of the units are in Major and Support

ELECTIVES ..................................................... 9

1 MATH 116 and 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.
FOOD SCIENCE MINOR

The Food Science minor is principally designed for students majoring in related academic disciplines who desire to seek employment in the food industry. Upon completion of this minor, students will have acquired the fundamental technical skills necessary to understand basic issues and concepts in food science such as food processing, food safety, quality assurance, and product development.

**Required core:** ........................................ 15-16
FSN 170 Introductory Food Science (4)
FSN 217 Fundamentals of Food Processing Operations (4)
FSN 230 Elements of Food Processing (4)
(NSCI majors wishing to complete FDSC minor to substitute 4 unit course from Emphasis area courses as FSN 230 is a required course in NSCI curriculum)
FSN 331 Principles of Food Plant Sanitation (3) or FSN 333 Quality Assurance in Food Industries (4)

**Emphasis area courses:** .................................. 11-12
Select courses (11-12 units) from the following list to complete the requirements for the minor

*Food Science and Technology*
FSN 101 Orientation to Food Science (1)
FSN 209 Procurement and Use of Muscle Foods (3)
FSN 211 Muscle Food Science (3)
FSN 212 Meat Grading and Evaluation (2)
FSN 332 Statistical Quality Control (3)
FSN 336 Food Packaging (3)
FSN 338 Further Processing of Muscle Foods (3)
FSN 339 Cereal Science and Processing (3)
FSN 407 Food Composition Science (4)
FSN 409 Sensory Evaluation of Food (4)
FSN 410 Nutritional Aspects of Food Processing (4)
FSN 431 Advanced Muscle Food Science (3)
FSN 436 Food Laws and Regulations (3)
DSCI 231 General Dairy Manufacturing (4)
CHEM 435 Food Analysis (4)
BACT 421 Food Microbiology (4)
PM 330 Poultry Processing (3)

27

NUTRITIONAL SCIENCE MINOR

The Nutritional Science minor is designed for students majoring in academic disciplines such as Chemistry, Biochemistry, Biological Sciences, and Physical Education. By completing this minor, students will enhance their academic qualifications in terms of employment or for admission to medical or dental schools or to graduate programs in allied health.

**Required core:** ........................................ 15
FSN 210 Nutrition (3) (E.2)
FSN 310 Maternal and Child Nutrition (3)
FSN 315 Nutrition in Aging (3)
FSN 328 Advanced Nutrition I (3)
FSN 329 Advanced Nutrition II (3)

**Emphasis area courses:** .................................. 12
Select courses (12 units) from the following list to complete the requirements for the minor.

*Clinical Nutrition*
FSN 412 Experimental Nutrition (2)
FSN 429 Diet Therapy I (3)
FSN 430 Diet Therapy II (3)
CHEM 335 Clinical Chemistry (3)
CHEM 377 Chemistry of Drugs and Poisons (3)
PSY 317 Psychology of Stress (3)

*Food Service Management*
FSN 331 Principles of Food Plant Sanitation (3)
FSN 343 Institutional Foodservice I (3)
FSN 426 Food Systems Management (3)
FSN Institutional Foodservice II (3)
FSN 436 Food Laws and Regulations (3)

*Community Nutrition*
FSN 415 Methods of Teaching Nutrition (3)
FSN 416 Community Nutrition (3)
ED 305 Teaching and Learning Processes (3)
POLS 371 World Food Politics (3)
PSY 317 Psychology of Stress (3)

*Sports Nutrition*
FSN 412 Experimental Nutrition (2)
BIO 330 Biology of Aging (3)
CHEM 335 Clinical Chemistry (3)
CHEM 377 Chemistry of Drugs and Poisons (3)
PE 303 Physiology of Exercise (4)
PE 451 Nutrition for Fitness and Sport (3)
PSY 304 Physiological Psychology (3)
Faculty

Department Head, Major John E. Bachmann

Captain Nicholas Spiriodigiozzi
Captain Brian Page

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 Officers' Training Corps) Advanced Course (25 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 $165 a month for one weekend drill and approximately $190 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 to 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 June 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 $700 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.

---

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)
MSC 212 Basic Camp (1-7)
MSC 213 Mountaineering (2)
MSC 215 Leadership Management Seminar (2)
MSC 225 Advanced Survival Techniques (2)
MSC 226 Advanced Orienteering (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)
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)
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.
NATURAL RESOURCES MANAGEMENT DEPARTMENT

Agricultural Sciences Bldg. (11), Room 217
(805) 756-2702

Faculty

Department Head, Norman H. Pillsbury

Brian C. Dietterick
John H. Harris
Lynn M. Jamieson
Timothy G. O'Keefe
Douglas D. Piirto

Timothy R. Plumb
Carolyn B. Shank
Michael J. Swiderski
Richard P. Thompson
James R. Vilkits

Programs

B.S. Forestry and Natural Resources
with Concentrations in:
- Environmental Management
- Forest Resources--Management
- Forest Resources--Urban Forestry
- Forest Resources--Watershed, Chaparral, and Fire Management
- Parks and Forest Recreation

B.S. Recreation Administration
Students may select Adviser Approved Electives or a Concentration in:
- Commercial/Tourism Management
- Parks and Forest Recreation

FORESTRY AND NATURAL RESOURCES MAJOR

The Bachelor of Science degree program in Forestry and Natural Resources prepares students for important careers in the protection, management, and development of our forest and natural resources. Students may elect to emphasize forest and land management disciplines, such as recreation management; urban forestry; environmental management; watershed, chaparral and fire management; hardwood management; wildlife biology.

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 an internship or cooperative education course. 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 plantations, 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 3200 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 the M.S. Agriculture section.

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

Concentrations prepare students for entry into the profession of forestry and natural resources. 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 individualized studies in such areas as 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.

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. An emphasis in forest hydrology is possible with adviser approved substitutions.

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 Wildlife Biology concentration offered by the Biological Sciences Department is available to Forestry and Natural Resources majors and prepares students for employment in the fish and wildlife areas of law enforcement, management, and production. FNR majors following this concentration will meet the Wildlife Society's certification education requirements or the certification requirements of the American Fisheries Society based on choice of restricted electives. Prerequisite courses in zoology are required of students entering this concentration. Students in the Wildlife Biology 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.

Recommended Sequence: Major and Support Courses

The following is a guide for scheduling Major and Support Courses. By following this sequence, students should meet prerequisites for Major coursework. Courses are not always offered during the quarter indicated. Please consult with your academic adviser and the current Class Schedule.

<table>
<thead>
<tr>
<th>1st Year</th>
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<tbody>
<tr>
<td>Fall</td>
<td>Winter</td>
<td>Spring</td>
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<tr>
<td>FNR 140</td>
<td>BOT 121</td>
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<td>SS 121</td>
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<tr>
<td>FNR 208</td>
<td>AG 250/CSC 113</td>
<td>FNR 204/342</td>
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<tr>
<td>AE 237</td>
<td>STAT 211</td>
<td>STAT 212</td>
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<tr>
<td>BOT 223</td>
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<tr>
<td>or CHEM 122</td>
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<td>or CHEM 326</td>
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<td>or ZOO 131</td>
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<td>or PHYS 104/121</td>
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<tr>
<td>FNR 302</td>
<td>FNR 303</td>
<td>FNR 318</td>
</tr>
<tr>
<td>FNR 304</td>
<td>FNR 316</td>
<td>ASCI 331/CONS 120</td>
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<tr>
<td>STAT 313 or College Calculus</td>
<td>AE 345</td>
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<tr>
<td>FNR 314</td>
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<tr>
<th>4th Year</th>
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<td>FNR 442</td>
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<tr>
<td>FNR 440</td>
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</table>
B.S. FORESTRY AND NATURAL RESOURCES

Courses are displayed by Major, Support, Concentration, General Education and Breadth, and Electives. 60 units must be 300-400 level.

MAJOR COURSES

FNR 112 Parks and Outdoor Recreation .................. 3
FNR 140 Career Development and Planning in Natural Resources Management.................. 1
FNR 201 Forest Resources .................. 3
FNR 204 Resource Fire Control or FNR 342 Fire Ecology .................. 2
FNR 208 Dendrology .................. 4
FNR 302 Natural Resources Policy .................. 3
FNR 303 Forest Protection .................. 5
FNR 304 Ecology of Resource Areas .................. 4
FNR 305 Forest Harvesting .................. 3
FNR 314 Forest Mensuration .................. 5
FNR 316 Growth and Yield .................. 3
FNR/LA 318 Appl. GIS Natural Resources .................. 2
FNR 401 Natural Resource Economics .................. 3
FNR 403 Environmental Impact Analysis .................. 3
FNR 406 Natural Resources Administration .................. 2
FNR 407 Silviculture and Vegetation Management .................. 4
FNR 415 Forest and Natural Resources Valuation .................. 3
FNR 418 Integrated Forest Resources Management .................. 4
FNR 440 Watershed Management .................. 3
FNR 442 Watershed Protection .................. 2
FNR 461 Senior Project .................. 3
AE 237 Engineering Surveying I .................. 2
ASCI 331/CONS 120 .................. 2
SS 121 Introductory Soil Science .................. 4

SUPPORT COURSES  * = Courses satisfy GEB
AE 345 Aerial Photograph. & Remote Sensing .................. 3
AG 250 Computer Application to Agriculture or CSC 113 Computers and Computer Applications: Macintosh (F.1.) .................. 3
BOT 121 General Botany (B.1.b.)* .................. 4
CHEM 121 General Chemistry (B.1.a.)* .................. 4
ECON 201 Survey of Economics (D.3.)* .................. 3
ENGL 218 Professional Writing: Argumentation and Reports (A.4.)* .................. 4
MATH 120 Pre-Calculus Algebra and Trig. (B.2.)* .................. 4
STAT 211 Elem. Probability and Statistics (B.2.)* .................. 3
STAT 212 Statistical Methods .................. 3
STAT 313 or College calculus .................. 3
Adviser approved science course sequence (B.1.a. or B.1.b.) (BOT 223, BOT 326/BOT 333 or CHEM 122 CHEM 326 or ZOO 131, PHYS 104/PHYS 121) .................. 8
Concentration courses (see below) .................. 26

TOTAL MAJOR CREDIT .................. 73

GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 9 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

Area A: ................................................. 10
A minimum of 14 units is required; 4 of the units are in Support
ENGL 114 (A.1.)
ENGL 125/PHIL 125/SPC 125 (A.2.)
SPC 201/SPC 202 (A.3.)
(A.4.)* see Support Courses

Area B: ................................................. 0
A minimum of 18 units is required; 18 of the units are in Support
Physical science (B.1.a.)* see Support Courses
Life science (B.1.b.)* see Support Courses
Mathematics/statistics (B.2.)* see Support Courses

Area C: ................................................. 18
PHIL 230/PHIL 231 (C.1.)
Critical reading electives (C.1.)
Fine and performing arts elective (C.2.)
Lit, phil, arts elective (300–400 level) (C.3.)
Arts and humanities elective (Area C)

Area D: ................................................. 15
A minimum of 18 units is required; 3 of the units are in Support
HIST 204 (D.1.), POLS 210 (D.1.)
HIST 315 (D.2.)
Economics (D.3.)* see Support Courses
ANT 201/GEOG 150/SOC 105 (D.4.a.)
ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)

Area E: ................................................. 5
PSY 201/PSY 202 (E.1.)
BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)

Area F: ................................................. 0
A minimum of 3 units is required; 3 of the units are in Support
F.1. *see Support Courses

TOTAL ................................................. 48
A minimum of 76 units is required; 28 units are in Support

ELECTIVES ................................................. 8

1 MATH 118 and 119 will substitute for MATH 120 and are taught at a slower pace for those who need more review. Also, MATH 116 and 117 will substitute for MATH 118 for those people who need extra review.
### Natural Resources Management

#### CONCENTRATIONS (Select one)

**Environmental Management Concentration**

- FNR 339/FNR 400 ........................................ 4
- FNR 404 Environmental Law .................................. 3
- FNR 408 Water Resource Law and Policy ............ 3
- CRP 212 Introduction to Urban Planning .......... 3
- ENVE 330 Environmental Quality Control .......... 3
- SS 433 Land Use Planning ................................ 3
- Restricted electives with prior written approval of adviser ........................................ 7

**Forest Resources--Management Concentration**

- FNR 332/FNR 434/FNR 438 .............................. 4
- FNR 333 Hardwood Management .................. 3
- FNR 220/339/AG 485 (prior written approval required) .................. 4
- FNR 342 Fire Ecology or FNR 204 Resource Fire Control ........................................ 2/3
- Restricted electives with prior written approval of adviser ........................................ 12/13

**Forest Resources--Urban Forestry Concentration**

- FNR 325 Woodlot and Christmas Tree Mgt. ........ 3
- FNR 333 Hardwood Management .................. 3
- FNR 350 Urban Forestry ................................ 3
- FNR 450 Community Forestry .......................... 3
- Restricted electives with prior written approval of adviser ........................................ 14

**Forest Resources--Watershed, Chaparral, and Fire Management Concentration**

- FNR 204 Resource Fire Control or FNR 342 Fire Ecology .................. 2/3
- FNR 250 Survey & Mgt. of Mediter. Ecosystems ........ 2
- FNR 340 Resource Fire Management .................. 2
- FNR 345 Chaparral Management .................. 3
- FNR 441 Forest and Range Hydrology .................. 3
- SS 440 Forest and Range Soils .................. 4
- Restricted electives with prior written approval of adviser ........................................ 9/10

**Parks and Forest Recreation Concentration**

- FNR 220/339/AG 485 (prior written approval required) .................. 4
- FNR 311 Environmental Interpretation .................. 4
- LA 363 Rec. Open Space Planning & Design .................. 3
- REC 210 Introduction to Program Design .................. 4
- Restricted electives with prior written approval of adviser ........................................ 11

---

1 Students cannot take a course as part of the core and as part of a concentration.
RECREATION ADMINISTRATION

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, non-profit, private, and commercial leisure service organizations. Students may pursue a concentration in commercial/tourism management, parks and forest recreation or a course of study in program management that includes: special events, early childhood education, senior adult programming, aquatics and recreational sports, and cultural arts. In addition, leisure education courses provide university students with leisure lifestyle management skills. The major is accredited by the National Recreation and Park Association/American Association of Leisure and Recreation Council on Accreditation.

The major includes a 400 hour required internship (one quarter) in a leisure service organization. Graduates qualify for diverse positions as recreation supervisors, park and recreation administrators, travel and tourism specialists, environmental education instructors, theme park managers, private recreation club managers, employee services and recreation specialists, chamber of commerce specialists, convention and visitor bureau program directors, meeting specialists and special event planners.

Recreation Administration graduates are employed in settings located in and out of the United States planning, organizing, implementing and evaluating leisure services to residents, tourists, and target participants. Sound administrative management skills learned in the program and through practical and research applications allow for career progress into executive management within leisure service industry.

Students have access to the department's field laboratories and also develop competencies in a myriad of external sites to include ropes course leadership laboratories, environmental education centers, leisure business and recreation departments. Students operate major special events and programs and conduct leisure research in required and elective coursework.

In addition to major requirements, the curriculum provides a full range of general education and support courses designed to fully educate and prepare students for a global society where bilingual language, arts, cultural diversity and international understanding are developed. Those interested in graduate study may pursue a Master of Science degree in General Agriculture with special emphasis in Park, Recreation and Tourism Management.

CURRICULAR CONCENTRATIONS

Commercial/Tourism Management

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, public/private entrepreneurship, joint commercial-public ventures, and small business opportunities. Specific focus on agrotourism, leisure industry entrepreneurship; relates leisure services management to economic development.

Parks and Forest Recreation

Students in Recreation Administration may choose this concentration previously described in the Forestry and Natural Resources major. This concentration prepares students to enter park and recreation departments at the local, county/regional, state and federal levels.

B.S. RECREATION ADMINISTRATION

Courses are displayed by Major, Support, Concentration, General Education and Breadth, and Electives. 60 units must be 300-400 level.

MAJOR COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>REC 101</td>
<td>Intro. to Recreation and Leisure Services</td>
<td>3</td>
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<tr>
<td>REC 105</td>
<td>Recreation Leadership</td>
<td>3</td>
</tr>
<tr>
<td>REC 110</td>
<td>Career Development and Planning in Recreation Administration</td>
<td>3</td>
</tr>
<tr>
<td>REC 210</td>
<td>Introduction to Program Design</td>
<td>4</td>
</tr>
<tr>
<td>REC 252</td>
<td>Leisure and Special Populations</td>
<td>3</td>
</tr>
<tr>
<td>REC 310</td>
<td>Program Administration in Leisure Services</td>
<td>4</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>Human Dimension of Leisure</td>
<td>3</td>
</tr>
<tr>
<td>REC 424</td>
<td>Financing Recreation and Leisure Services</td>
<td>4</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>
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<tr>
<td>REC 462</td>
<td>Senior Project</td>
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<td>REC 465</td>
<td>Internship</td>
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<tr>
<td>FNR 410</td>
<td>Recreation and Tourism Management</td>
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<tr>
<td>MGT 314</td>
<td>Human Resources Management</td>
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</table>

Concentration courses (see below) or adviser approved electives | 28 |

78

SUPPORT COURSES

* = Courses satisfy General Education and Breadth requirements.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>ACTG 211</td>
<td>Financial Accounting for Nonbusiness Majors</td>
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<tr>
<td>BOT 121</td>
<td>General Botany (B.1.b.)</td>
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</tr>
<tr>
<td>CSC 113</td>
<td>Computers and Computing</td>
<td>3</td>
</tr>
<tr>
<td>AG 250</td>
<td>Computer Applications (F.1.)</td>
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</tr>
<tr>
<td>ENGL 310</td>
<td>Corporate Communications</td>
<td>4</td>
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<tr>
<td>GEOG 308</td>
<td>Global Geography (D.4.b.)</td>
<td>3</td>
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<tr>
<td>JOUR 312</td>
<td>Introduction to Public Relations</td>
<td>4</td>
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<tr>
<td>MATH 118</td>
<td>Pre-Calculus Algebra</td>
<td>4</td>
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<tr>
<td>SOC 333</td>
<td>Social Research Methods</td>
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<tr>
<td>PSY 329</td>
<td>Research Methods in Psychology and Human Development</td>
<td>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>FNR 300/CSC 110/120/410/STAT 212</td>
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<tr>
<td>Foreign language</td>
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39
**GENERAL EDUCATION AND BREADTH**

Please see page 77 for selection of GEB electives. At least 9 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

<table>
<thead>
<tr>
<th>Area A</th>
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<tbody>
<tr>
<td>ENGL 114 (A.1.)</td>
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<td>ENGL 125/PHIL 125/SPC 125 (A.2.)</td>
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<td>SPC 201/202 (A.3.)</td>
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<td>ENGL 215/218 (A.4.)</td>
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<tr>
<td>Physical and life science electives (B.1.)</td>
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<tr>
<td>Life science (B.1.b.)* see Support Courses</td>
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<tr>
<td>Mathematics (B.2.)* see Support Courses</td>
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<tr>
<td>Statistics (B.2.)* see Support Courses</td>
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<td>PHIL 230/PHIL 231 (C.1.)</td>
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<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 elective (300–400 level) (C.3.)</td>
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<tr>
<td>Arts and humanities elective (Area C)</td>
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<tr>
<td>HIST 204 (D.1.), POLS 210 (D.1.)</td>
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<tr>
<td>HIST 315 (D.2.)</td>
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<tr>
<td>ECON 221 (D.3.)</td>
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<tr>
<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
<td></td>
</tr>
<tr>
<td>(D.4.b.)*see Support Courses</td>
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<table>
<thead>
<tr>
<th>Area E</th>
<th>5</th>
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<tbody>
<tr>
<td>PSY 201/202 (E.1.)</td>
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<tr>
<td>BIO 220/FSN 210/PE 250/PSY 304 (E.2.)</td>
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<table>
<thead>
<tr>
<th>Area F</th>
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<tbody>
<tr>
<td>A minimum of 3 units is required; 3 of the units are in Support</td>
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<td>(F.1.)* see Support Courses</td>
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</table>

Total .......................... 59

<table>
<thead>
<tr>
<th>Electives</th>
<th>10</th>
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</table>

A minimum of 76 units is required; 17 units are in Support

---

**CONCENTRATION OR ADVISER APPROVED ELECTIVES**

Select either a concentration or adviser approved electives.

**Commercial/Tourism Management Concentration**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>REC 314 Travel and Tourism Planning</td>
<td>4</td>
</tr>
<tr>
<td>REC 317 Convention and Meeting Management</td>
<td>3</td>
</tr>
<tr>
<td>REC 464 Organization and Development of Commercial Leisure Services</td>
<td>4</td>
</tr>
<tr>
<td>Restricted electives</td>
<td>17</td>
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</table>

**Parks and Forest Recreation Concentration**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>FNR 112 Parks and Outdoor Recreation</td>
<td>3</td>
</tr>
<tr>
<td>FNR 208 Dendrology</td>
<td>4</td>
</tr>
<tr>
<td>FNR 311 Environmental Interpretation</td>
<td>4</td>
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<tr>
<td>REC 302 Environmental Education</td>
<td>3</td>
</tr>
<tr>
<td>Restricted electives</td>
<td>14</td>
</tr>
</tbody>
</table>

**Adviser Approved Electives** .......................... 28

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**Recommended Sequence: Major and Support Courses**

The following is a guide for scheduling Major and Support Courses. By following this sequence, students should meet prerequisites for Major coursework. Courses are not always offered during the quarter indicated. Please consult with your academic adviser and the current Class Schedule.

<table>
<thead>
<tr>
<th>1st Year</th>
<th>2nd Year</th>
<th>3rd Year</th>
<th>4th Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
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<td>Spring</td>
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<tr>
<td>REC 101</td>
<td>REC 110</td>
<td>MATH 118</td>
<td>REC 210</td>
</tr>
<tr>
<td>REC 105</td>
<td>CSC 113/AG 250</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ACTG 211</td>
</tr>
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<td></td>
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<td></td>
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</table>

<table>
<thead>
<tr>
<th>1st Year</th>
<th>2nd Year</th>
<th>3rd Year</th>
<th>4th Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>Winter</td>
<td>Spring</td>
<td>Fall</td>
</tr>
<tr>
<td>REC 324</td>
<td>REC 310</td>
<td>REC 327</td>
<td>REC 460</td>
</tr>
<tr>
<td>REC 317</td>
<td>SOC 333/PSY 329</td>
<td>FNR 410/OH 337/LA 363</td>
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</tr>
<tr>
<td>ENGL 310</td>
<td>MGT 314</td>
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<td>JOUR 312</td>
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<th>2nd Year</th>
<th>3rd Year</th>
<th>4th Year</th>
</tr>
</thead>
<tbody>
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<td>Fall</td>
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<td>Fall</td>
</tr>
<tr>
<td>Foreign Language</td>
<td>REC 424</td>
<td>REC 465</td>
<td></td>
</tr>
</tbody>
</table>

---
ORNAMENTAL HORTICULTURE DEPARTMENT

Agricultural Sciences Bldg. (11), Room 244
(805) 756-2279 FAX (805) 756-2869

Faculty

Interim Department Head, Stephen F. Angley
Patricia H. Breckenridge  Daniel E. Lassanske
James A. D'Albro           William E. Noble
Thomas E. Eltzroth        Virginia R. Walter
David W. Hannings         Michael D. Zohns

Program

B.S. Ornamental Horticulture

The Bachelor of Science degree in Ornamental Horticulture offers the student a comprehensive preparation for attractive positions in the nursery, greenhouse, landscape, and floriculture 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 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, landscape contractors, designers, landscape management professionals, extension agents, agricultural commissioners, consultants, and park and golf course superintendents.

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 plant shop. Also included are 35,000 square feet of greenhouses; 7,500 square feet of shadehouses; and an extensive field container growing area. The department also has several modern, well-equipped laboratories including: Tissue Culture, Landscape Industries with CAD, Floriculture, 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.

The curriculum is well grounded in the sciences and, through the flexibility of 28 units of adviser-approved electives, students can tailor coursework to meet their individual needs. Areas of interest include: landscape management, landscape technologies and implementation, floriculture production and management, nursery production and management, retail horticulture, turf production and management, horticultural communications, horticultural biotechnology, post-harvest physiology and technology, and teaching agriculture. Students may also choose to complete a minor in Agribusiness or Plant Protection.
B.S. ORNAMENTAL HORTICULTURE
Courses are displayed by Major, Support, Concentration, General Education and Breadth, and Electives. 60 units must be 300-400 level.

MAJOR COURSES

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>OH 110 Orientation to Environmental Horticultural Science</td>
<td>1</td>
</tr>
<tr>
<td>OH 121 Fundamentals Environmental Horticulture I</td>
<td>4</td>
</tr>
<tr>
<td>OH 122 Fundamentals Environmental Horticulture II</td>
<td>4</td>
</tr>
<tr>
<td>OH 123 Landscape Installation and Maintenance</td>
<td>2</td>
</tr>
<tr>
<td>OH 124 Plant Propagation</td>
<td>4</td>
</tr>
<tr>
<td>OH 126 Environmental Horticulture Construction</td>
<td>2</td>
</tr>
<tr>
<td>OH 200/210/401</td>
<td>2</td>
</tr>
<tr>
<td>OH 221 Water Issues and Delivery Systems</td>
<td>3</td>
</tr>
<tr>
<td>OH 222 Abiotic Plant Problems</td>
<td>3</td>
</tr>
<tr>
<td>OH 231, OH 232 Plant Materials</td>
<td>4,4</td>
</tr>
<tr>
<td>OH 427 Diseases &amp; Pest Control Sys. Ornam. Plants</td>
<td>4</td>
</tr>
<tr>
<td>OH 461 Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>OH 462 Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>OH 463 Senior Seminar</td>
<td>1</td>
</tr>
<tr>
<td>Adviser approved electives. 18 units 300-400 level</td>
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</tbody>
</table>

SUPPORT COURSES * = Courses satisfy GEB

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>ACTG 211 Financial Accounting for Nonbusiness Majors</td>
<td>4</td>
</tr>
<tr>
<td>BIO 302/PHYS 104/PSC 101</td>
<td>3/4</td>
</tr>
<tr>
<td>BOT 121 General Botany (B.1.b.)*</td>
<td>4</td>
</tr>
<tr>
<td>BOT 322 Introductory Plant Physiology (B.1.b.)*</td>
<td>4</td>
</tr>
<tr>
<td>BOT 324 Ornamental and Forest Pathology</td>
<td>4</td>
</tr>
<tr>
<td>BUS 201/207 Business Law Survey</td>
<td>3/4</td>
</tr>
<tr>
<td>CHEM 121 General Chemistry (B.1.a.)*</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 122 General Chemistry (B.1.a.)*</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 326 Survey of Organic Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CSC 110 Computers &amp; Computer Appl.: MS-DOS or AG 250 Computer Appl. to Agriculture (F.1.)*</td>
<td>3</td>
</tr>
<tr>
<td>CRSC 311 Insect Pest Management</td>
<td>4</td>
</tr>
<tr>
<td>MATH 118 Pre-Calculus Algebra (or MATH 116 &amp; MATH 117)</td>
<td>4</td>
</tr>
<tr>
<td>SPAN 111 Elementary Hispanic Language and Culture</td>
<td>4</td>
</tr>
<tr>
<td>SS 121 Introductory Soil Science</td>
<td>4</td>
</tr>
<tr>
<td>SS 221 Fertilizers</td>
<td>4</td>
</tr>
<tr>
<td>STAT 130 Intro. to Statistical Reasoning or STAT 211 Elementary Probability and Statistics</td>
<td>3</td>
</tr>
</tbody>
</table>

GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 9 units must be at the 300-400 level. Additional GEB courses are listed under Support Courses.

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 114 (A.1.)</td>
<td>14</td>
</tr>
<tr>
<td>ENGL 125/PHIL 125/SPC 125 (A.2.)</td>
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<tr>
<td>SPC 201/SPC 202 (A.3.)</td>
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</tr>
<tr>
<td>ENGL 215/ENGL 218 (A.4.)</td>
<td></td>
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</tbody>
</table>

Area B ............................................................................. 0
A minimum of 18 units is required; 18 of the units are in Support
Physical science (B.1.a.)* see Support Courses Life science (B.1.b.)* see Support Courses Mathematics/statistics (B.2.)* see Support Courses
Area C: ............................................................................. 18
PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300-400 level) (C.3.)
Area E: ............................................................................. 5
Area F: ............................................................................. 0
A minimum of 3 units is required; 3 of the units are in Support
Area D: ............................................................................. 18
HIST 204 (D.1.), POLS 210 (D.1.)
HIST 315 (D.2.)
ECON 201/ECON 211 (D.3.)
ANT 201/GEOG 150/SOC 105(D.4.a.)
ANT/BUS/ECON/GEOG/POLS/SOC (300-400 level) (D.4.b.)
Area E: ............................................................................. 5
Area F: ............................................................................. 0
A minimum of 3 units is required; 3 of the units are in Support
Electives ............................................................................. 9/7

Recommended Sequence: Major and Support Courses
The following is a guide for scheduling Major and Support Courses. By following this sequence, students should meet prerequisites for Major coursework. Courses are not always offered during the quarter indicated. Please consult with your academic adviser and the current Class Schedule.

<table>
<thead>
<tr>
<th>1st Year</th>
<th>2nd Year</th>
<th>3rd Year</th>
<th>4th Year</th>
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</thead>
<tbody>
<tr>
<td>Fall</td>
<td>Winter</td>
<td>Spring</td>
<td>Fall</td>
</tr>
<tr>
<td>OH 110</td>
<td>OH 122</td>
<td>OH 124</td>
<td>OH 221</td>
</tr>
<tr>
<td>OH 121</td>
<td>OH 123</td>
<td>OH 126</td>
<td>BOT 121</td>
</tr>
<tr>
<td>CHEM 121</td>
<td>CHEM 122</td>
<td>SS 121</td>
<td>ENT 220/CRSC 311</td>
</tr>
</tbody>
</table>
Faculty
Department Head, Terry L. Smith
Gaston Amedee
Delmar D. Dingus
Brent G. Hallock
Royce L. Lambert

Programs
B.S. Soil Science
with Concentrations in:
- Environmental Management
- Environmental Science and Technology
- Land Resources

Three-fourths of the world's food 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 great 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 commonly 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. Each of these opportunities, combined with a friendly, helping atmosphere, provide students a college experience that is highly personal as well as rewarding. Students also are encouraged to investigate opportunities for international education. Please see the Study Abroad program section of this catalog.

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 College of Agriculture. All of the facilities, equipment and land, which allow practical application of classroom knowledge, are for student use.

Our undergraduate soil science 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 the M.S. Agriculture section.

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.
B.S. SOIL SCIENCE

For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser.

### MAJOR COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>SS 110</td>
<td>Orientation in Soil Science</td>
<td>1</td>
</tr>
<tr>
<td>SS 121</td>
<td>Introductory Soil Science</td>
<td>4</td>
</tr>
<tr>
<td>SS 202</td>
<td>Soil and Water Conservation</td>
<td>3</td>
</tr>
<tr>
<td>SS 221</td>
<td>Fertilizers and Plant Nutrition</td>
<td>4</td>
</tr>
<tr>
<td>SS 223</td>
<td>Rocks and Minerals</td>
<td>4</td>
</tr>
<tr>
<td>SS 312</td>
<td>Agricultural Climatology</td>
<td>3</td>
</tr>
<tr>
<td>SS 321</td>
<td>Soil Morphology</td>
<td>4</td>
</tr>
<tr>
<td>SS 322</td>
<td>Soil Fertility</td>
<td>4</td>
</tr>
<tr>
<td>SS 422</td>
<td>Soil Microbiology</td>
<td>3</td>
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<tr>
<td>SS 423</td>
<td>Soil and Water Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>SS 431</td>
<td>Soil Resource Inventory</td>
<td>3</td>
</tr>
<tr>
<td>SS 432</td>
<td>Soil Physics</td>
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<td>SS 461</td>
<td>Soils Senior Project</td>
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<td>SS 462</td>
<td>Soils Senior Project</td>
<td>3</td>
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<tr>
<td>SS 463</td>
<td>Undergraduate Soils Seminar</td>
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<tr>
<td>BOT 121</td>
<td>General Botany (B.1.b.)*</td>
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<tr>
<td>GEOL 201</td>
<td>Physical Geology</td>
<td>3</td>
</tr>
<tr>
<td>Concentration courses (see below)</td>
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### SUPPORT COURSES

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>AE 340/AE 415/AE 435/AE 440</td>
<td>Computer Application to Agriculture</td>
<td>3</td>
</tr>
<tr>
<td>AG 250</td>
<td>Intro. to Computer Applications (F.1.)*</td>
<td>3</td>
</tr>
<tr>
<td>BACT 224</td>
<td>General Microbiology (B.1.b.)*</td>
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<tr>
<td>BACT/BIO/BOT restricted elective (300–400)</td>
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</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>
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<tr>
<td>CHEM 129</td>
<td>General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 328</td>
<td>Survey of Biochemistry</td>
<td>4</td>
</tr>
</tbody>
</table>

1. MATH 118 Pre-Calculus Algebra or MATH 131 Technical Calculus (B.2.)* | 4     |
2. MATH 119 Pre-Calculus Trigonometry or MATH 132 Technical Calculus (B.2.)* | 3     |
3. PHYS 121 College Physics (B.1.a.)* | 4     |

### GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 9 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

<table>
<thead>
<tr>
<th>Area A</th>
<th></th>
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<tbody>
<tr>
<td>ENGL 114 (A.1.)</td>
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<tr>
<td>ENGL 125/PHIL 125/SPC 125 (A.2.)</td>
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<td>ENGL 215/ENGL 218 (A.4.)</td>
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<tr>
<td>Area B</td>
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</tr>
<tr>
<td>A minimum of 18 units is required; 18 of the units are in Support</td>
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</tr>
<tr>
<td>Physical science (B.1.a.)* see Support Courses</td>
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</tr>
<tr>
<td>Life science (B.1.b.)* see Support Courses</td>
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<tr>
<td>Mathematics/statistics (B.2.)* see Support Courses</td>
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<tr>
<td>Area C</td>
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<tr>
<td>PHIL 230/PHIL 231 (C.1.)</td>
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<tr>
<td>Critical reading electives (C.1.)</td>
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</tr>
<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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<tr>
<td>Arts and humanities elective (Area C)</td>
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<tr>
<td>Area D</td>
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<tr>
<td>HIST 204 (D.1.), POLS 210 (D.1.)</td>
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<tr>
<td>HIST 315 (D.2.)</td>
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</tr>
<tr>
<td>ECON 201/ECON 211 (D.3.)</td>
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<tr>
<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
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<tr>
<td>ANT/BUS/ECON/GEOG/POLS/SOC (300–400 level) (D.4.b.)</td>
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<tr>
<td>Area E</td>
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<tr>
<td>PSY 201/PSY 202 General Psychology (E.1.)</td>
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<tr>
<td>BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area F</td>
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<tr>
<td>A minimum of 3 units is required; 3 of the units are in Support</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer literacy (F.1.) *see Support Course</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>55</td>
</tr>
<tr>
<td>A minimum of 76 units is required; 21 units are in Support</td>
<td></td>
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</tr>
</tbody>
</table>

### ELECTIVES

| | | 10 |

1 Students in the Environmental Science and Technology concentration take MATH 131 and MATH 132.
### CONCENTRATIONS (select one):

#### Land Resources Concentration

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
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<tbody>
<tr>
<td>CHEM 326</td>
<td>Survey of Organic Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CRSC 311</td>
<td>Insect Pest Management</td>
<td>4</td>
</tr>
<tr>
<td>CRSC 411</td>
<td>Experimental Techniques and Analysis</td>
<td>4</td>
</tr>
<tr>
<td>STAT 211</td>
<td>Elem. Probability and Statistics</td>
<td>3</td>
</tr>
</tbody>
</table>

Additional courses selected from approved list, with at least four courses from College of Agriculture. These units may be selected to apply toward an approved minor. 

---

#### Environmental Management Concentration

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 326</td>
<td>Survey of Organic Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CRP 212</td>
<td>Introduction to Urban Planning</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 330</td>
<td>Environmental Quality Control</td>
<td>3</td>
</tr>
<tr>
<td>FNR 403</td>
<td>Environmental Impact Analysis</td>
<td>3</td>
</tr>
<tr>
<td>FNR 405</td>
<td>Applied Resource Analysis</td>
<td>4</td>
</tr>
<tr>
<td>FNR 404</td>
<td>Environmental Law or FNR 408 Water Resource Law and Policy</td>
<td>3</td>
</tr>
<tr>
<td>SS 339</td>
<td>Soil Science Internship</td>
<td>3</td>
</tr>
<tr>
<td>SS 400</td>
<td>Special Problems Advanced Undergrads</td>
<td>3</td>
</tr>
<tr>
<td>Select 2:</td>
<td>CRSC 411/STAT 211/STAT 212</td>
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#### Environmental Science and Technology Concentration

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>CHEM 316</td>
<td>Organic Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 317</td>
<td>Organic Chemistry</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 318</td>
<td>Organic Chemistry</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 331</td>
<td>Quantitative Analysis I</td>
<td>5</td>
</tr>
<tr>
<td>ENVE 434</td>
<td>Water Quality Measurements</td>
<td>2</td>
</tr>
<tr>
<td>ENVE 436</td>
<td>Introduction to Hazardous Waste Management or ENVE 439 Solid Waste Management</td>
<td>3</td>
</tr>
<tr>
<td>MATH 133</td>
<td>Technical Calculus</td>
<td>4</td>
</tr>
<tr>
<td>STAT 321</td>
<td>Statistical Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>STAT 322</td>
<td>Statistical Analysis II</td>
<td>4</td>
</tr>
</tbody>
</table>

Select from the following: BOT 322, CHEM 341, CSC 251, STAT 324, ZOO 131 or other faculty approved courses. 

---
DESIGN VILLAGE

Every spring, architecture and design students from across the west participate in Cal Poly's Design Village. For this 3-day, hands-on event students design and create portable structures in response to the annual theme, site conditions, and the functional requirement to house the designers. Students participate in workshops and attend lectures that relate to the conference theme. The conference concludes with judging of the students' structures by a select group of architects.

College of ARCHITECTURE and ENVIRONMENTAL DESIGN

ELECTRONIC DESIGN STUDIO

Architecture professor Joe Amanzio assists students in the Electronic Design Studio. All designs are developed electronically through presentation.
Departments are members of their respective professional associations: 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.

The college's Design Institute is available for students and faculty to pursue advanced professional and interprofessional studies as applied investigations and community service. The Institute has several research and service units including: Barrier-Free Design, Computer-Aided Design, 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 college 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 college property and will be returned only at the discretion of the instructor.
ARCHITECTURAL ENGINEERING DEPARTMENT

Engineering West (21), Room 110
(805) 756-1314

Faculty

Department Head, John W. Edmisten
Mark Berrio
Michael R. Botwin
Jacob Feldman
Hong Ting Liu
Satwant S. Rihal

Program

B.S. Architectural Engineering

The 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 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 architectural engineering, civil engineering, structural engineering, structural mechanics, and foundation engineering.

B.S. ARCHITECTURAL ENGINEERING

Courses are displayed by Major, Support, General Education and Breadth, and Electives.

Units

MAJOR COURSES

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
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</thead>
<tbody>
<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 223</td>
<td>Mechanics of Structural Members II and ARCE 224</td>
<td>Mechanics of Structural Members Lab</td>
</tr>
<tr>
<td>ARCE 227</td>
<td>Structural Analysis I</td>
<td>2</td>
</tr>
<tr>
<td>ARCE 302</td>
<td>Structural Analysis II</td>
<td>3</td>
</tr>
<tr>
<td>ARCE 303</td>
<td>Steel Design</td>
<td>3</td>
</tr>
<tr>
<td>ARCE 304</td>
<td>Timber Design</td>
<td>3</td>
</tr>
<tr>
<td>ARCE 305</td>
<td>Masonry Design</td>
<td>2</td>
</tr>
<tr>
<td>ARCE 306</td>
<td>Matrix Analysis of Structures</td>
<td>3</td>
</tr>
<tr>
<td>ARCE 325</td>
<td>Dynamics</td>
<td>4</td>
</tr>
<tr>
<td>ARCE 351, 352, 353</td>
<td>Structural Computing Analysis I, II, III</td>
<td>1,1,1</td>
</tr>
<tr>
<td>ARCE 371</td>
<td>Structural Systems Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>ARCE 372</td>
<td>Steel Structures Design Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>ARCE 403</td>
<td>Advanced Steel Structures Laboratory or ARCE 447</td>
<td>Advanced Reinforced Concrete Lab</td>
</tr>
<tr>
<td>ARCE 421</td>
<td>Soil Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>ARCE 422</td>
<td>Foundation Design and ARCE 444</td>
<td>Reinforced Concrete Lab</td>
</tr>
<tr>
<td>ARCE 445</td>
<td>Prestressed Concrete Design Laboratory or ARCE 446</td>
<td>Advanced Structural Systems Lab</td>
</tr>
<tr>
<td>ARCE 451</td>
<td>Timber and Masonry Structures Design Lab</td>
<td>3</td>
</tr>
<tr>
<td>ARCE 452</td>
<td>Concrete Structures Design Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>ARCE 453</td>
<td>Senior Project Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>ARCE 457</td>
<td>Structural CAD for Building Design</td>
<td>2</td>
</tr>
<tr>
<td>ARCE 481</td>
<td>Structural Models Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>ARCE 483</td>
<td>Seismic Analysis and Design</td>
<td>4</td>
</tr>
<tr>
<td>Approved technical electives</td>
<td></td>
<td>4</td>
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</tbody>
</table>

74

SUPPORT COURSES

* = Courses satisfy General Education and Breadth requirements.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>ARCH 106</td>
<td>Materials of Construction</td>
<td>3</td>
</tr>
<tr>
<td>ARCH 111</td>
<td>Introduction to Drawing and Perspective</td>
<td>3</td>
</tr>
<tr>
<td>ARCH 221, 222</td>
<td>Architectural Design Basics</td>
<td>3,3</td>
</tr>
<tr>
<td>ARCH 231</td>
<td>Architectural Practice</td>
<td>3</td>
</tr>
<tr>
<td>ARCH 317/318/319</td>
<td>(C.3.)*</td>
<td>3,3</td>
</tr>
<tr>
<td>CHEM 124</td>
<td>General Chemistry (B.1.a.)*</td>
<td>4</td>
</tr>
<tr>
<td>CM 433</td>
<td>Economic Analysis for Engineers</td>
<td>2</td>
</tr>
<tr>
<td>CSC 251</td>
<td>Digital Computer Applications (F.1.)*</td>
<td>2</td>
</tr>
</tbody>
</table>
CSC 331 Numerical Linear Analysis ............ 3
EDES 101 Introduction to Architecture and 
Environmental Design ..................... 2
EDES 113 Graphic Analysis and Communication 
Skills for Designers ....................... 3
EE 201 Electrical Circuit Theory .................. 3
GEOL 201 Physical Geology (B.1.a.)* .... 3
MATH 141 Calculus I (B.2.)* .................. 4
MATH 142 Calculus II (B.2.)* .................. 4
MATH 143 Calculus III ....................... 4
MATH 241 Calculus IV ...................... 4
MATH 242 Differential Equations ............ 4
MATH 318/STAT 211/GEOL 205 .......... 3
ME 302 Thermodynamics ................... 3
ME 341 Fluid Mechanics ................... 3
PHYS 131 General Physics (B.1.a.)* ........ 4
PHYS 132, 133 General Physics ............ 4,4

GENERAL EDUCATION AND BREADTH
Please see page 77 for selection of GEB electives. At 
least 9 units must be at the 300–400 level. Additional 
GEB courses are listed under Support Courses.
Area A: ........................................ 14
ENGL 114 (A.1.)
ENGL 125/PHIL 125/SPC 125 (A.2.)
SPC 201/SPC 202 (A.3.)
ENGL 215/ENGL 218 (A.4.)
Area B: ........................................ 3
A minimum of 18 units is required; 15 of the units 
are in Support
Physical science (B.1.a.) * see Support Courses
Life sciences elective (B.1.b.)
Mathematics/statistics (B.2.) * see Support Courses
Area C: ........................................ 12
A minimum of 18 units is required; 6 of the units 
are in Support
PHIL 230/PHIL 231 (C.1.)
Critical reading electives (C.1.)
Fine and performing arts elective (C.2.)
Literature, philosophy, arts (C.3.) * see Support 
Courses
Area C * see Support Courses
Area D: ........................................ 18
HIST 204 (D.1.), POLS 210 (D.1.)
HIST 315 (D.2.)
ECON 201/211/222 (D.3.)
ANT 201/GEOG 150/SOC 105 (D.4.a.)
ANT/ BUS/ECON/GEOG/POLS/SOC WS elective 
(300–400 level) (D.4.b.)
Area E: ........................................ 5
PSY 201/PSY 202 (E.1.)
BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)

Area F ................................................................ 0
A minimum of 2 units is required; 2 of the units are 
in Support
Computer literacy (F.1.) *see Support Courses
Total ................................................................ 52
A minimum of 76 units is required; 24 of the units 
are in Support
ELECTIVES ........................................ 0

210

Recommended Sequence: Major and Support Courses
The following is a guide for scheduling Major and Support Courses. By following this sequence, students should meet 
prerequisites for Major coursework. Courses are not always 
offered during the quarter indicated. Please consult with 
your academic adviser and the current Class Schedule.

<table>
<thead>
<tr>
<th>1st Year</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
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</thead>
<tbody>
<tr>
<td>ARCH 111</td>
<td>ARCH 106</td>
<td>EDES 113</td>
<td></td>
</tr>
<tr>
<td>EDES 101</td>
<td>MATH 142</td>
<td>MATH 143</td>
<td></td>
</tr>
<tr>
<td>MATH 141</td>
<td>PHYS 131</td>
<td>PHYS 132</td>
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<table>
<thead>
<tr>
<th>2nd Year</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
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</thead>
<tbody>
<tr>
<td>ARCE 221</td>
<td>ARCE 222</td>
<td>ARCE 223</td>
<td></td>
</tr>
<tr>
<td>ARCH 221</td>
<td>ARCE 222</td>
<td>ARCE 224</td>
<td></td>
</tr>
<tr>
<td>MATH 241</td>
<td>MATH 242</td>
<td>ARCE 227</td>
<td></td>
</tr>
<tr>
<td>PHYS 133</td>
<td>CSC 251</td>
<td>ARCE 351</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ARCH 231</td>
<td></td>
</tr>
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<table>
<thead>
<tr>
<th>3rd Year</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
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</thead>
<tbody>
<tr>
<td>ARCE 302</td>
<td>ARCE 303</td>
<td>ARCE 304</td>
<td></td>
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<tr>
<td>ARCE 371</td>
<td>ARCE 306</td>
<td>ARCE 372</td>
<td></td>
</tr>
<tr>
<td>ARCE 421</td>
<td>ARCE 325</td>
<td>ARCE 422</td>
<td></td>
</tr>
<tr>
<td>CSC 331</td>
<td>ARCE 352</td>
<td>ARCE 305</td>
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<table>
<thead>
<tr>
<th>4th Year</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARCE 444</td>
<td>ARCE 452</td>
<td>ARCE 453</td>
<td></td>
</tr>
<tr>
<td>ARCE 451</td>
<td>ARCE 403 or 447</td>
<td>ARCE 445 or 446</td>
<td></td>
</tr>
<tr>
<td>ARCE 483</td>
<td>ARCE 481</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARCE 353</td>
<td>CM 433</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
ARCHITECTURE DEPARTMENT

Architecture and Environmental Design Bldg. (05), Room 212A
(805) 756-1316 FAX (805) 756-1500

Faculty

Director, Administrative Affairs, James R. Bagnall
Director, Academic Affairs, Allan R. Cooper

Joseph C. Amanzio
Sharad D. Atre
Ronald E. Batterson
William R. Benedict
David A. Brodie
Arthur J. Chapman
M. Polly Cooper
M. Bilgi Denel
Serim Denel
Donna P. Duerk
Merrill C. Gaines
Bradford C. Grant
Donald P. Grant
Terry C. Hargrave
John E. Harrigan, Jr.
George Haslil
Patrick D. Hill

Laura V. Joines
George K. Ikenoyama
Brian B. Kesner
Kenneth M. Kohlen
Sandra D. Lakeman
John H. Lange
Larry H. Loh
David Lord
Margot McDonald
Sandra D. Miller
Daniel L. Panetta
Jens G. Pohl
Charles W. Quinlan
Howard Weisenthal
Donald S. Woolard
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.

Most states require that an individual intending to become an architect hold an accredited degree. There are two types of degrees that are accredited by the National Architectural Accrediting Board: (1) the Bachelor of Architecture, which requires a minimum of five years of study, and (2) the Master of Architecture, which requires a minimum of three years of study following an unrelated bachelor's degree or two years following a related preprofessional bachelor's degree. These professional degrees are structured to educate those who aspire to registration/licensure as architects.

The four-year, preprofessional degree, where offered, is not accredited by the NAAB. The preprofessional degree is useful for those wishing a foundation in the field of architecture, as preparation for either continued education in a professional degree program or for employment options in architecturally related areas.

OFF-CAMPUS ARCHITECTURE PROGRAMS

CSU International Programs for Architecture

There are two organized studio programs for Architecture majors, one in Copenhagen, Denmark, and one in Florence, Italy. The concept of the studio organization is similar to Cal Poly. Credit for major design courses, some professional electives, some general education courses and free electives are handled through approved overseas study centers. Architecture majors in their fourth year of study overseas are required to complete ARCH 407, Environmental Control Systems, and ARCH 441 and ARCH 442, Professional Practice, upon return to the Cal Poly campus.

Applications for the International Programs are due February 1 of each year. The applicants are notified prior to the beginning of Spring Quarter as to the results of the Screening Committee's recommendations.

London Study Program

The Architecture Department participates in the London Study Program. Students and faculty live in London and use it as the site of design problems and as the base location for field trips.

The London Study Program is offered in the Spring Quarter. It is possible to get credit for fourth year Design, Practice and GEB areas C and D. Arrangements can be made for special studies for technical elective credit. Orientation meetings are scheduled each Fall Quarter.

San Francisco Urban Design Internship Program

This exciting program offers fourth year students the opportunity to live and study in San Francisco for one quarter (Fall or Spring). Each class utilizes real projects with the participation of talented, award-winning architectural offices and urban designers to introduce students to urban design and architectural practice in one of the world's most urban cities.

Unique in its involvement of architectural students in public policy, this program won the American Institute of Architects Urban Design Award of Excellence in 1993. The two internships — architectural and urban design — provide the students with mentors, state-of-the-art knowledge, and access to outstanding architectural offices and professional resources. The case study methods is used to observe and analyze practice issues in the participating architectural firms.
Washington/Alexandria Center Consortium

The Washington/Alexandria Program is organized to offer a challenging and stimulating one-year option focusing on architecture. The Center functions as an extension of the College of Architecture of Virginia Polytechnic Institute and State University (VPI) in the Washington DC Metropolitan Area. This is a unique home for the Architectural Consortium, which is comprised of five universities including Cal Poly.

The Center seeks to explore and expand design pedagogues and design processes, establish collaboration with national and international institutions for new environmental strategies, and undertake demonstration projects seeking innovative architecture solutions. Orientation meetings are scheduled each Winter Quarter.

BACHELOR OF ARCHITECTURE

Courses are displayed by Major, Support, General Education and Breadth, and Electives.

<table>
<thead>
<tr>
<th>MAJOR COURSES</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARCH 101 Survey of Architectural Education and Practice</td>
<td>2</td>
</tr>
<tr>
<td>ARCH 106 Materials of Construction</td>
<td>3</td>
</tr>
<tr>
<td>ARCH 111 Introduction to Drawing and Perspective</td>
<td>3</td>
</tr>
<tr>
<td>ARCH 112 Basic Graphics</td>
<td>3</td>
</tr>
<tr>
<td>ARCH 113 Graphics Analysis and Communication Skills</td>
<td>3</td>
</tr>
<tr>
<td>ARCH 207 Environmental Control Systems I</td>
<td>4</td>
</tr>
<tr>
<td>ARCH 231 Architectural Practice and Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>ARCH 250 Computer Applications (F.1.)</td>
<td>3</td>
</tr>
<tr>
<td>ARCH 251, 252, 253 Architectural Design Fundamentals I, II, III</td>
<td>5,5,5</td>
</tr>
<tr>
<td>ARCH 307 Environmental Control Systems II</td>
<td>4</td>
</tr>
<tr>
<td>ARCH 317, 318, 319 History of Architecture</td>
<td>3,3,3</td>
</tr>
<tr>
<td>ARCH 341, 342 Architectural Practice</td>
<td>4,4</td>
</tr>
<tr>
<td>ARCH 351, 352, 353 Architectural Design</td>
<td>5,5,5</td>
</tr>
<tr>
<td>ARCH 407 Environmental Control Systems III</td>
<td>4</td>
</tr>
<tr>
<td>ARCH 420 Seminar in Architectural History</td>
<td>3</td>
</tr>
<tr>
<td>ARCH 441, 442 Professional Practice</td>
<td>3,3</td>
</tr>
<tr>
<td>ARCH 451, 452, 453 Architectural Design</td>
<td>5,5,5</td>
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<tr>
<td>ARCH 481 Senior Architectural Design Thesis Project</td>
<td>5,5,5</td>
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<tr>
<td>ARCH 491 Design Project</td>
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</table>

<table>
<thead>
<tr>
<th>SUPPORT COURSES</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>* = Courses satisfy General Education and Breadth requirements.</td>
<td></td>
</tr>
<tr>
<td>ARCE 221 Elementary Structures</td>
<td>3</td>
</tr>
<tr>
<td>ARCE 222 Mechanics of Structural Members I</td>
<td>3</td>
</tr>
<tr>
<td>ARCE 226 Structural Systems for Architects</td>
<td>3</td>
</tr>
<tr>
<td>ARCE 321 Timber Design</td>
<td>3</td>
</tr>
<tr>
<td>ARCE 322 Steel Design</td>
<td>3</td>
</tr>
<tr>
<td>ARCE 323 Concrete and Masonry Design</td>
<td>3</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>ELECTIVES</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDES 101 Introduction to Architecture and Environmental Design</td>
<td>2</td>
</tr>
<tr>
<td>MATH 141 Calculus I (B.2.)*</td>
<td>4</td>
</tr>
<tr>
<td>MATH 142 Calculus II (B.2.)*</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>Upper division electives</td>
<td>9</td>
</tr>
<tr>
<td>CAED prefix professional electives</td>
<td>9</td>
</tr>
<tr>
<td>Environment-behavior adviser approved elective</td>
<td>3</td>
</tr>
<tr>
<td>Urban context adviser approved elective</td>
<td>3</td>
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</tbody>
</table>

GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 9 units must be at the 300-400 level. Additional GEB courses are listed under Support courses.

<table>
<thead>
<tr>
<th>AREA</th>
<th>UNITS</th>
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<tbody>
<tr>
<td>A</td>
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</tr>
<tr>
<td>ENGL 114 (A.1.)</td>
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<tr>
<td>ENGL 125/PHIL 125/SPC 125 (A.2.)</td>
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<tr>
<td>SPC 201/SPC 202 (A.3.)</td>
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<tr>
<td>ENGL 215/ENGL 218 (A.4.)</td>
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<tr>
<td>Area B</td>
<td>2</td>
</tr>
<tr>
<td>A minimum of 18 units is required; 16 of the units are in Support</td>
<td></td>
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<tr>
<td>Physical science (B.1.a.)*</td>
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<tr>
<td>Life sciences elective (B.1.b.)</td>
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</tr>
<tr>
<td>Mathematics/statistics (B.2.)*</td>
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</tr>
<tr>
<td>Area C</td>
<td>18</td>
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<tr>
<td>PHIL 230/PHIL 231 (C.1.)</td>
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<tr>
<td>Critical reading electives (C.1.)</td>
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</tr>
<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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<tr>
<td>Arts and humanities elective (Area C)</td>
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</tr>
<tr>
<td>Area D</td>
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<tr>
<td>HIST 204 (D.1.), POLS 210 (D.1.)</td>
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<tr>
<td>HIST 315 (D.2.)</td>
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<tr>
<td>ECON 201/211/222 (D.3.)</td>
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<tr>
<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
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<tr>
<td>ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300-400 level) (D.4.b.)</td>
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<td>Area E</td>
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<td>PSY 201/PSY 202 (E.1.)</td>
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<tr>
<td>BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)</td>
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<td>Area F</td>
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<td>A minimum of 3 units is required; 3 of the units are in Major</td>
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<tr>
<td>Computer literacy (F.1.)*</td>
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<tr>
<td>Total</td>
<td>57</td>
</tr>
<tr>
<td>A minimum of 76 units is required; 19 of the units are in Support</td>
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</tr>
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</table>

ELECTIVES | 9

TOTAL | 246
Recommended Sequence: Major and Support Courses

The following is a guide for scheduling Major and Support Courses. By following this sequence, students should meet prerequisites for Major coursework. Courses are not always offered during the quarter indicated. Please consult with your academic adviser and the current Class Schedule.

### 1st Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDES 101</td>
<td>ARCH 106</td>
<td>ARCH 101</td>
</tr>
<tr>
<td>ARCH 111</td>
<td>ARCH 112</td>
<td>ARCH 113</td>
</tr>
<tr>
<td>MATH 141</td>
<td>MATH 142</td>
<td>PHYS 132</td>
</tr>
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</table>

### 2nd Year

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>ARCH 250</td>
<td>ARCH 231</td>
<td>ARCH 207</td>
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<tr>
<td>ARCH 251</td>
<td>ARCH 252</td>
<td>ARCH 253</td>
</tr>
<tr>
<td>ARCE 221</td>
<td>ARCE 222</td>
<td>ARCE 226</td>
</tr>
</tbody>
</table>

### 3rd Year

<table>
<thead>
<tr>
<th>Fall</th>
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<th>Spring</th>
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</thead>
<tbody>
<tr>
<td>ARCH 341</td>
<td>ARCH 307</td>
<td>ARCH 342</td>
</tr>
<tr>
<td>ARCH 351</td>
<td>ARCH 352</td>
<td>ARCH 353</td>
</tr>
<tr>
<td>ARCH 317</td>
<td>ARCH 318</td>
<td>ARCE 323</td>
</tr>
<tr>
<td>ARCE 321</td>
<td>ARCE 322</td>
<td></td>
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</tbody>
</table>

### 4th Year

<table>
<thead>
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<th>Fall</th>
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<th>Spring</th>
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</thead>
<tbody>
<tr>
<td>ARCH 407</td>
<td>ARCH 441</td>
<td>ARCH 442</td>
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<tr>
<td>ARCH 451</td>
<td>ARCH 452</td>
<td>ARCH 453</td>
</tr>
<tr>
<td>ARCH 420</td>
<td>Electives</td>
<td>Prof Electives</td>
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<tr>
<td></td>
<td></td>
<td>Urban Context Electives</td>
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### 5th Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
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</thead>
<tbody>
<tr>
<td>ARCH 491</td>
<td>ARCH 481</td>
<td>ARCH 481</td>
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<tr>
<td>ARCH 481</td>
<td>CAED Prof Electives</td>
<td>CAED Prof Electives</td>
</tr>
<tr>
<td>Upper Div Free Electives</td>
<td>Upper Div Free Electives</td>
<td>Upper Div Free Electives</td>
</tr>
</tbody>
</table>

### ARCHITECTURAL MANAGEMENT TRACK

This program is available only to those students who are enrolled in Cal Poly's College of Architecture program. Students who fulfill all the requirements will first receive the Bachelor of Architecture and then the MBA. During the fifth year of the architecture program, students who have been admitted to this program are allowed to take GSB courses as outlined below. By April 15th of the 5th year, students must formally apply for admission to the MBA program. Acceptance to the MBA program is conditional upon the successful completion of the fifth year.

#### FIFTH YEAR ARCHITECTURE/FIRST YEAR MBA

<table>
<thead>
<tr>
<th>Units</th>
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<tbody>
<tr>
<td>Fall</td>
</tr>
<tr>
<td>1 ARCH 481 Design Lab (5)</td>
</tr>
<tr>
<td>GSB 511 Financial Accounting (4)</td>
</tr>
<tr>
<td>GSB 512 Quantitative Analysis (4)</td>
</tr>
<tr>
<td>GSB 513 Organizational Behavior (4)</td>
</tr>
<tr>
<td>Winter</td>
</tr>
<tr>
<td>1 ARCH 481 Design Lab (5)</td>
</tr>
<tr>
<td>GSB 521 Managerial Accounting (4)</td>
</tr>
<tr>
<td>GSB 522 Managerial Science (4)</td>
</tr>
<tr>
<td>GSB 523 Managerial Economics (4)</td>
</tr>
<tr>
<td>Spring</td>
</tr>
<tr>
<td>1 ARCH 481 Design Lab (5)</td>
</tr>
<tr>
<td>GSB 531 Managerial Finance (4)</td>
</tr>
<tr>
<td>GSB 532 Information Systems (4)</td>
</tr>
<tr>
<td>GSB 534 Production and Operations Management (4)</td>
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</tbody>
</table>

#### SIXTH YEAR ARCHITECTURE/SECOND YEAR MBA

<table>
<thead>
<tr>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>Fall</td>
</tr>
<tr>
<td>GSB 524 Marketing Management (4)</td>
</tr>
<tr>
<td>GSB electives (8)</td>
</tr>
<tr>
<td>GSB or ARCH elective (4)</td>
</tr>
<tr>
<td>Winter</td>
</tr>
<tr>
<td>GSB 514 Business, Government and Society (4)</td>
</tr>
<tr>
<td>GSB electives (8)</td>
</tr>
<tr>
<td>GSB or ARCH elective (4)</td>
</tr>
<tr>
<td>Spring</td>
</tr>
<tr>
<td>GSB 533 Aggregate Economics (4)</td>
</tr>
<tr>
<td>GSB 562 Business Strategy and Policy (4)</td>
</tr>
<tr>
<td>GSB electives (8)</td>
</tr>
</tbody>
</table>

1 Or adviser approved electives.
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

<table>
<thead>
<tr>
<th>Units</th>
</tr>
</thead>
</table>

Core Curriculum................................. 34
ARCH 519 Theory of Architecture (3)
ARCH 531 Habitability (3)
ARCH 551 Architectural Design (10)
ARCH 561 Advanced Design (9)
ARCH 598 Master's Design Project (9) or
ARCH 599 Master's Thesis (9) or
   A comprehensive examination with 9 additional units of approved graduate level coursework

Directed Electives.................................. 11
A minimum of 6 units of adviser approved elective courses will be included in a student's formal program of study.

45

For further information contact the Graduate Program Coordinator, Department of Architecture, College 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 DEPARTMENT

Dexter Bldg. (34), Room 251
(805) 756-1315

Faculty

Department Head, Linda C. Dalton

Linda L. Day  Joseph M. Kourakis
David T. Dubbink  Michael A. Smith-Heimer
William A. Howard  D. F. G. Williams

Programs

B.S. City and Regional Planning

M.C.R.P. Master of City and Regional Planning

M.C.R.P./M.S. Engineering
with Specialization in
Transportation Planning

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 degree programs 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 environmental planning.

B.S. CITY AND REGIONAL PLANNING

Courses are displayed by Major, Support, General Education and Breadth, and Electives.

<table>
<thead>
<tr>
<th>Units</th>
<th>MAJOR COURSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CRP 101 Introduction to the Profession of City and Regional Planning</td>
</tr>
<tr>
<td>3</td>
<td>CRP 111 Introduction to Drawing and Perspective</td>
</tr>
<tr>
<td>3</td>
<td>CRP 112 Basic Graphics</td>
</tr>
<tr>
<td>3,3</td>
<td>CRP 201, 202 Environmental Design Fundamentals</td>
</tr>
<tr>
<td>3</td>
<td>CRP 203 Applied Design and Planning Fundamentals</td>
</tr>
<tr>
<td>3</td>
<td>CRP 211 Introduction to Urbanization</td>
</tr>
<tr>
<td>3</td>
<td>CRP 212 Introduction to Urban Planning</td>
</tr>
<tr>
<td>3</td>
<td>CRP 213 Population and Housing Studies</td>
</tr>
<tr>
<td>3</td>
<td>CRP 214 Land Use and Transportation Studies</td>
</tr>
<tr>
<td>3</td>
<td>CRP 216 Computer Applications for Planning</td>
</tr>
<tr>
<td>3</td>
<td>CRP 314 Planning Theory</td>
</tr>
<tr>
<td>3</td>
<td>CRP 315 Economic and Fiscal Analysis for Planning</td>
</tr>
<tr>
<td>3</td>
<td>CRP 347, 348 Urban and Regional Design</td>
</tr>
<tr>
<td>4,4,4</td>
<td>CRP 351, 352, 353 Community Planning Lab</td>
</tr>
<tr>
<td>2</td>
<td>CRP 409 Planning Internship</td>
</tr>
<tr>
<td>4</td>
<td>CRP 420 Planning Law</td>
</tr>
<tr>
<td>3</td>
<td>CRP 430 Planning Administration</td>
</tr>
<tr>
<td>3</td>
<td>CRP 451, 452 Regional and Environmental Planning Lab</td>
</tr>
<tr>
<td>4,4</td>
<td>CRP 461, CRP 462 Senior Project</td>
</tr>
<tr>
<td>2</td>
<td>CRP 463 Undergraduate Seminar</td>
</tr>
<tr>
<td>13</td>
<td>Adviser approved electives</td>
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</tbody>
</table>

91

SUPPORT COURSES

* = Courses satisfy General Education and Breadth requirements

<table>
<thead>
<tr>
<th>Units</th>
<th>SUPPORT COURSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>CSC 110 Computers and Computer Applications (F.1.)*</td>
</tr>
<tr>
<td>3</td>
<td>ECON 211 Principles of Economics (D.3.)*</td>
</tr>
<tr>
<td>3</td>
<td>ECON 212 Principles of Economics</td>
</tr>
<tr>
<td>2</td>
<td>EDES 101 Introduction to Architecture and Environmental Design</td>
</tr>
<tr>
<td>4/3</td>
<td>FNR 304/CONS 311</td>
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<tr>
<td>3</td>
<td>GEOL 201 Physical Geology (B.1.a.)*</td>
</tr>
<tr>
<td>4</td>
<td>LA 213 Site and Terrain Analysis</td>
</tr>
<tr>
<td>4</td>
<td>MATH 118 Pre-Calculus Algebra (B.2.)*</td>
</tr>
<tr>
<td>4/3</td>
<td>MGT 317/POLS 441/PSY 302</td>
</tr>
<tr>
<td>4</td>
<td>POLS 401/403/405</td>
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<tr>
<td>3</td>
<td>STAT 211 Elementary Probability &amp; Statistics (B.2.)*</td>
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<tr>
<td>3</td>
<td>STAT 212 Statistical Methods (B.2.)*</td>
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</table>

40/38
GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 9 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

Area A: ............................................... 14
ENGL 114 (A.1.)
ENGL 125/PHIL 125/SPC 125 (A.2.)
SPC 201/SPC 202 (A.3.)
ENGL 218 (A.4.)

Area B: ............................................... 5
A minimum of 18 units is required; 13 of the units are in Support
Physical or life sciences elective (with lab) (B.1.)
Physical science (B.1.a.)* see Support Courses
Life science elective (B.1.b.)
Mathematics/statistics (B.2.)* see Support Courses

Area C: ............................................... 18
PHIL 230/PHIL 231 (C.1.)
Critical reading electives (C.1.)
Fine and performing arts elective (C.2.)
Literature, philosophy, arts elective (300–400 level) (C.3.)
Arts and humanities elective (Area C)

Area D: ............................................... 15
A minimum of 18 units is required; 3 of the units are in Support
HIST 204 (D.1.), POLS 210 (D.1.)
HIST 315 (D.2.)
Economics (D.3.)* see Support Courses
ANT 201/GEOG 150/SOC 105 (D.4.a.)
ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)

Area E: ............................................... 5
PSY 201/PSY 202 (E.1.)
BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)

Area F: ............................................... 0
A minimum of 3 units is required; 3 of the units are in Support
Computer literacy (F.1.)* see Support Courses

Total ............................................... 57
A minimum of 76 units is required; 19 of the units are in Support

ELECTIVES ............................................... 10–12

Recommended Sequence: Major and Support Courses

The following is a guide for scheduling Major and Support Courses. By following this sequence, students should meet prerequisites for Major coursework. Courses are not always offered during the quarter indicated. Please consult with your academic adviser and the current Class Schedule.

<table>
<thead>
<tr>
<th>1st Year</th>
<th>2nd Year</th>
<th>3rd Year</th>
<th>4th Year</th>
</tr>
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<tbody>
<tr>
<td><strong>Fall</strong></td>
<td><strong>Winter</strong></td>
<td><strong>Spring</strong></td>
<td><strong>Fall</strong></td>
</tr>
<tr>
<td>EDES 101</td>
<td>CRP 111</td>
<td>CRP 112</td>
<td>CRP 463</td>
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<tr>
<td>CRP 101</td>
<td>CRP 212</td>
<td>MATH 118</td>
<td>CRP 451</td>
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<td>GEOL 201</td>
<td>CRP 452</td>
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<tr>
<td><strong>2nd Year</strong></td>
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<td><strong>Fall</strong></td>
<td><strong>Winter</strong></td>
<td><strong>Spring</strong></td>
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<tr>
<td>CRP 201</td>
<td>CRP 202</td>
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<td>CRP 211</td>
<td>CRP 213</td>
<td>CRP 214</td>
<td>CRP electives</td>
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<td>STAT 212</td>
<td>CRP 216</td>
<td>POLS 401 or</td>
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<tr>
<td>ECON 211</td>
<td>ECON 212</td>
<td>FNR 304 or</td>
<td>403 or 405</td>
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<td>LA 213</td>
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<tr>
<td><strong>3rd Year</strong></td>
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<tr>
<td><strong>Fall</strong></td>
<td><strong>Winter</strong></td>
<td><strong>Spring</strong></td>
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<tr>
<td>CRP 347</td>
<td>CRP 314</td>
<td>CRP 348</td>
<td>CRP electives</td>
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<td>CRP 315</td>
<td>CRP 352</td>
<td>CRP 353</td>
<td>POLS 401 or</td>
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<td>CRP electives</td>
<td>403 or 405</td>
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<tr>
<td><strong>Summer:</strong> CRP 409</td>
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<td><strong>4th Year</strong></td>
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<tr>
<td><strong>Fall</strong></td>
<td><strong>Winter</strong></td>
<td><strong>Spring</strong></td>
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</tr>
<tr>
<td>CRP 463</td>
<td>CRP 461</td>
<td>CRP 462</td>
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<td>CRP 451</td>
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<td>CRP 420</td>
<td>CRP 430</td>
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<tr>
<td>MGT 317 or</td>
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<td></td>
<td></td>
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<tr>
<td>POLS 441 or</td>
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<td></td>
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</tr>
<tr>
<td>PSY 302</td>
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</tbody>
</table>
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 environmental planning, focused on natural systems and development impacts. In addition, the City and Regional Planning Department jointly offers the MCRP degree with the Master of Science in Engineering with a specialization in transportation planning (see page 187).

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 72 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 prerequisite coursework deficiencies may be admitted in other quarters. The degree culminates in a thesis (CRP 599), or synthesis course (CRP 597) and comprehensive exam.

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:

- STAT 211 Elementary Probability and Statistics
- CSC 110 Computers and Computer Applications

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 Record 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.

<table>
<thead>
<tr>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Courses........................................... 50/52</td>
</tr>
</tbody>
</table>

First Year

- CRP 501 Foundations of Cities and Planning (4)
- CRP 510 Planning Theory (4)
- CRP 513 Planning Research Methods (4)
- CRP 514 Computer Applications for MCRP (2)
- CRP 515 Presentation and Communication Techniques for Planners (3)
- CRP 516 Quantitative Methods in Planning (4)
- CRP 518 Policy Analysis for Planners (4)
- CRP 525 Plan Implementation (4)
- CRP 552 Community Planning Laboratory (4)

Second Year

- CRP 409 Planning Internship (2)
- CRP 420 Planning Law (4)
- CRP 530 Planning Agency Management (3)
- CRP 554 Regional Planning and Analysis (4)
- CRP 597 Policy, Planning, and Management (4) and comprehensive exam or CRP 599 Thesis/Project (6)

Emphasis Area (select one).............................. 15

**Urban Land Planning**

- CRP 520 Feasibility Studies in Planning (4)
- CRP 548 Principles of City Design (3)
- CRP 553 Project Planning Laboratory (4)

Urban electives (4)

**Environmental Planning**

- CRP 407 Environmental Law (3)
- CRP 545 Environmental Planning, Policies and Principles (4)

Environmental electives (8)

Adviser approved electives................................ 7/5

---

72
Joint MCRP/MS Engineering with Specialization in Transportation Planning

The Transportation Planning Specialization is a joint interdisciplinary program between the College of Engineering and the College of Architecture and Environmental Design. Participation in the program requires enrollment in both Colleges. Participants successfully completing the program will be awarded both the M.C.R.P. and the M.S. in Engineering, each with a Specialization in Transportation Planning.

The major objectives of this joint program are:

(a) To provide an interdisciplinary graduate program which combines elements of transportation planning with city and regional planning to address a need for professionals who have a command of both the technology of transportation planning and the place of transportation within the urban environment. The required master's project is intended to allow the students a period of directed study that will allow them to integrate their work and to apply this to special areas of their choosing.

(b) To provide planners with courses essential to understanding the technologies of transportation planning. To provide engineers with a broad background in urban studies and a knowledge of contemporary environmental issues.

(c) To take advantage of the backgrounds of program participants. The graduate students of both sponsoring departments include both mature professionals returning for advanced degrees and recent graduates with a diversity of specializations.

Prerequisites

Applicants must have satisfactorily completed courses that cover the following or equivalent subject areas:

- CE 221 Fundamentals of Transportation Engineering
- CE 381 Geotechnical Engineering or GEOL 201 Physical Geology
- CSC 251 Digital Computer Applications
- ECON 211 Principles of Economics
- ENGL 218 Professional Writing: Argumentation & Reports
- MATH 143 Calculus
- PHYS 131 General Physics
- SPC 201 Public Speaking
- STAT 321 Statistical Analysis I

Applicants for admission to the joint program with a specialization in Transportation Planning 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 results of the Graduate Record Examination (GRE) Aptitude Test to the Admissions Committee.
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 their understanding of and areas of interest in planning, career objectives, and educational objectives.

Applicants lacking prerequisites or other background requirements for classified standing may be admitted on a conditionally classified basis, depending on the results of an individual analysis of their applications.

Core Courses........................................................................... 68

- CE 523 Transportation System Planning (4)
- CE 528 Transportation Analysis or CE 525 Airport Planning and Design (4)
- CE 571 Selected Advanced Laboratory (3)
- CE 574 Computer Applications in C.E. (3)
- CE 591 Graduate Seminar (2)
- CE 599 or CRP 599 Project /Thesis (2,2,2)
- CRP 409 Planning Internship (2)
- CRP 420 Planning Law (4)
- CRP 435 Transportation Theory (3)
- CRP 501 Foundations of Cities and Planning (4)
- CRP 510 Planning Theory (4)
- CRP 513 Planning Research Methods (4)
- CRP 515 Presentation and Communication Techniques for Planners (3)
- CRP 516 Quantitative Methods in Planning (4)
- CRP 518 Policy Analysis for Planners(4)
- CRP 525 Plan Implementation (4)
- CRP 530 Planning Agency Management (3)
- CRP 552 Urban Planning Laboratory (4)
- CSC, MATH, STAT or other approved quantitative methods course (3)

Emphasis Area (select one of the following) ............ 14

Urban Land Planning Emphasis
- CRP 520 Feasibility Studies in Planning (4)
- CRP 548 Principles of City Design (3)
- CRP 553 Project Planning Laboratory (4)
- Urban Land Planning electives (3)

Regional and Environmental Planning Emphasis
- CRP 407 Environmental Law (3)
- CRP 545 Environmental Planning, Policies and Principles (4)
- Regional and Environmental Planning electives (7)

Approved CE/ENVE electives: ......................... 8

Electives may include: CE 422, 424, 522, 525, 527, 528, 529, 573; ENVE 411, 465
CONSTRUCTION MANAGEMENT DEPARTMENT

Engineering West (21), Room 116-A
(805) 756-1323

Faculty

Department Head, James A. Rodger
Harold A. Johnston    Matthias R. Wall

Program

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.

B.S. CONSTRUCTION MANAGEMENT

Courses are displayed by Major, Support, General Education and Breadth, and Electives.

MAJOR COURSES

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CM 321 Concrete Technology</td>
<td>3</td>
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<tr>
<td>CM 331 Construction Cost Control</td>
<td>3</td>
</tr>
<tr>
<td>CM 332 Cost Alternatives Evaluation</td>
<td>4</td>
</tr>
<tr>
<td>CM 333 Construction Contract Administration</td>
<td>3</td>
</tr>
<tr>
<td>CM 341 Residential and Light Commercial Construction Practices</td>
<td>3</td>
</tr>
<tr>
<td>CM 342 Commercial, Institutional and Industrial Construction Practices</td>
<td>3</td>
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<tr>
<td>CM 343 Earthwork and Civil Works Construction Practices</td>
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<td>CM 352, 353 Building Support System Construction Practices</td>
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<td>CM 364 Project Administration</td>
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<tr>
<td>CM 443 Principles of Construction Management</td>
<td>3</td>
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<tr>
<td>CM 444 Concrete Formwork and Temporary Structures</td>
<td>3</td>
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<tr>
<td>CM 445 Principles of Heavy Construction</td>
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<td>CM 452 Project Controls</td>
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<td>CM 453 Project Development</td>
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<td>CM 454 Building Estimating</td>
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<tr>
<td>CM 461 Senior Project</td>
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<tr>
<td>CM 462 Senior Project</td>
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<tr>
<td>ARCE 221 Elementary Structures</td>
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<td>ARCE 222 Mechanics of Structural Members I</td>
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<td>ARCE 226 Structural Systems for Architects</td>
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<tr>
<td>ARCH 106 Materials of Construction</td>
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<tr>
<td>ARCH 111 Introduction to Drawing and Perspective</td>
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<tr>
<td>EDES 311 Construction Contract Documents</td>
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SUPPORT COURSES

* = Courses satisfy General Education and Breadth requirements

<table>
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<th>Course</th>
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<tbody>
<tr>
<td>AE 237 Engineering Surveying</td>
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<td>ARCE 321 Timber Design</td>
<td>3</td>
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<tr>
<td>ARCE 322 Steel Design</td>
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<tr>
<td>ARCE 323 Concrete and Masonry Design</td>
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</tr>
<tr>
<td>ARCE 421 Soil Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 211 Financial Accounting for Nonbusiness Majors</td>
<td>4</td>
</tr>
<tr>
<td>BUS 201 Business Law Survey</td>
<td>3</td>
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<tr>
<td>CHEM 121 General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CRP 212 Introduction to Urban Planning</td>
<td>3</td>
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</tbody>
</table>

Total Units: 78
Recommended Sequence: Major and Support Courses

The following is a guide for scheduling Major and Support Courses. By following this sequence, students should meet prerequisites for Major coursework. Courses are not always offered during the quarter indicated. Please consult with your academic adviser and the current Class Schedule.

<table>
<thead>
<tr>
<th>Area</th>
<th>1st Year</th>
<th>2nd Year</th>
<th>3rd Year</th>
<th>4th Year</th>
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<td>Fall</td>
<td>Winter</td>
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<td>EDES 101</td>
<td>ARCH 106</td>
<td>ARCH 111</td>
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<td>MATH 141</td>
<td>MATH 142</td>
<td>PHYS 132</td>
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<td>ENGL 310</td>
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<td>ARCE 421</td>
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<td>CM 452</td>
<td>CM 462</td>
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<tr>
<td></td>
<td>CM 461</td>
<td>300 Level MGT or FIN</td>
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</tr>
</tbody>
</table>

**ELECTIVES**

- **198 Units Required**
LANDSCAPE ARCHITECTURE DEPARTMENT

Dexter Bldg.(34), Room 251
(805) 756-1319

Faculty

Department Head, Walter D. Bremer
Brian A. Aviles
Gary C. Dwyer
Omar Faruque
Alice C. Loh

Roger J. Osbaldeston
Gerald L. Smith
Dale A. Sutliff
Walter M. Tryon

Programs

Bachelor of Landscape Architecture
with Concentrations in:
Environmental Design
Recreation and Open Space
Regional Landscape Assessment

The profession of landscape architecture is primarily involved with the design, planning, and protection of the natural and developed environments. The 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. 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 advanced studies.

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.

Curricular Concentrations

Environmental Design

Allows for in-depth study of various foci within the landscape architecture discipline, including current and future design explorations and thinking, design/build, environmental art, design theory, professional practice, etc. Design studios are

Recreation and Open Space

Allows for in-depth study of the roles, relationships, methods and directions of planning and design for recreation and open spaces in various settings and scales, from specific sites to communities, cities and regional systems. Design studios are structured to permit research and application of the concentration focus.

Regional Landscape Assessment

Allows for in-depth study of current and emerging methods for environmental assessment and planning using computer applications and other complementary technologies and approaches. Design studios are structured to permit research and application of the concentration focus.
# BACHELOR OF LANDSCAPE ARCHITECTURE

Courses are displayed by Major, Support, Concentration, General Education and Breadth, and Electives.

## MAJOR COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA 110</td>
<td>Graphic Communication for Landscape Architects</td>
<td>3</td>
</tr>
<tr>
<td>LA 111</td>
<td>Three Dimensional Graphics for Landscape Architects</td>
<td>4</td>
</tr>
<tr>
<td>LA 114</td>
<td>Landscape Analysis and Planning</td>
<td>4</td>
</tr>
<tr>
<td>LA 201</td>
<td>Survey of Landscape Architecture</td>
<td>2</td>
</tr>
<tr>
<td>LA 231</td>
<td>Landscape Architecture Construction</td>
<td>3</td>
</tr>
<tr>
<td>LA 251</td>
<td>Fundamentals of Design and Planning in Landscape Architecture</td>
<td>4</td>
</tr>
<tr>
<td>LA 252</td>
<td>Fundamentals of Site Planning and Design</td>
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<tr>
<td>LA 253</td>
<td>Applied Design and Planning Fundamentals</td>
<td>5</td>
</tr>
<tr>
<td>LA 300</td>
<td>Internship</td>
<td>3</td>
</tr>
<tr>
<td>LA 310</td>
<td>Introduction to Computing in Landscape Architecture</td>
<td>2</td>
</tr>
<tr>
<td>LA 311</td>
<td>History of Landscape Architecture</td>
<td>3</td>
</tr>
<tr>
<td>LA 320</td>
<td>Design Theory for Landscape Architects</td>
<td>3</td>
</tr>
<tr>
<td>LA 321</td>
<td>Concepts in Environmental Decision Making</td>
<td>3</td>
</tr>
<tr>
<td>LA 323</td>
<td>History of Twentieth Century Landscape Architecture</td>
<td>3</td>
</tr>
<tr>
<td>LA 351</td>
<td>Design for Landscape Architects</td>
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<tr>
<td>LA 352</td>
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<td>LA 353</td>
<td>Design for Landscape Architects</td>
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<tr>
<td>LA 441, 442</td>
<td>Professional Practice I, II</td>
<td>2, 2</td>
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<td>LA 451</td>
<td>Regional Landscape Assessment</td>
<td>6</td>
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<tr>
<td>LA 452</td>
<td>Urban Design for Landscape Architects</td>
<td>5</td>
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<tr>
<td>LA 454, 455, 456</td>
<td>Design for Landscape Architects .. 4, 4, 4</td>
<td>6</td>
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<tr>
<td>LA 461</td>
<td>Senior Design Project</td>
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<tr>
<td>LA 464</td>
<td>Senior Seminar</td>
<td>1, 1, 1</td>
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<tr>
<td>LA elective</td>
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<tr>
<td>Concentration courses (see below)</td>
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<td>18</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>118</td>
</tr>
</tbody>
</table>

## SUPPORT COURSES

* = Courses satisfy General Education and Breadth requirements.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>AE 237</td>
<td>Engineering Surveying</td>
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</tr>
<tr>
<td>AE 337</td>
<td>Landscape Irrigation</td>
<td>3</td>
</tr>
<tr>
<td>ARCE 311</td>
<td>Structures for Landscape Architects</td>
<td>3</td>
</tr>
<tr>
<td>ARCH 317</td>
<td>History of Architecture (C.3.)*</td>
<td>3</td>
</tr>
<tr>
<td>BIO 128</td>
<td>Natural History: Animal Communities (B.1.)^</td>
<td>3</td>
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<tr>
<td>BOT 121</td>
<td>General Botany (B.1.b.)*</td>
<td>4</td>
</tr>
<tr>
<td>BOT 238</td>
<td>Native Plant Materials</td>
<td>3</td>
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<tr>
<td>CM 325</td>
<td>Construction Management Practice</td>
<td>3</td>
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<tr>
<td>CRP 212</td>
<td>Introduction to Urban Planning</td>
<td>3</td>
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<td>EDES 101</td>
<td>Introduction to Architecture and Environmental Design</td>
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<tr>
<td>MATH 120</td>
<td>Pre-Calculus Algebra and Trig. (B.2.)*</td>
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<td>OH 231</td>
<td>Plant Materials</td>
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<td>OH 232</td>
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<td>SS 121</td>
<td>Introductory Soil Science</td>
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<tr>
<td>STAT 211</td>
<td>Elementary Probability &amp; Statistics (B.2.)*</td>
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</tr>
</tbody>
</table>

## GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 9 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

**Area A:**
- ENGL 114 (A.1.)
- ENGL 125/PHIL 125/SPC 125 (A.2.)
- SPC 201/SPC 202 (A.3.)
- ENGL 215/ENGL 218 (A.4.)

**Area B:**
- A minimum of 18 units is required; 15 of the units are in Support
- Physical science elective (B.1.a.)
- Life science (B.1.b)\* see Support Courses
- Mathematics/statistics (B.2)\* see Support Courses

**Area C:**
- A minimum of 18 units is required; 3 of the units are in Support
- Arts and humanities elective (Area C)

**Area D:**
- HIST 204 (D.1.), POLS 210 (D.1.)
- HIST 315 (D.2.)
- ECON 201/211 (D.3.)
- ANT 201/GEOG 150/SOC 105 (D.4.a.)
- ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)

**Area E:**
- PSY 201/PSY 202 (E.1.)
- BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)

**Area F:**
- Computer literacy elective (F.1.)

**Total:**
- A minimum of 76 units is required; 18 of the units are in Support

## ELECTIVES

- 11

**Total:**

157
CONCENTRATIONS (select one)

Environmental Design
LIB 301 Library Resources and Literature Searches  ...  1
LA 483 Special Studies in Architecture  ...  12
Adviser approved electives  ...  5

Recreation and Open Space
LA 363 Recreation and Open Space Planning and Design  ...  3
LA 411 Regional Landscape History  ...  3
LA 481 Visual Resource Management Methods  ...  3
LA 482 Evaluation Methods in Environmental Design  ...  3
Adviser approved electives  ...  6

Regional Landscape Assessment
LA 411 Regional Landscape History  ...  3
LA 481 Visual Resource Management Methods  ...  3
LA 482 Evaluation Methods in Environmental Design  ...  3
CRP 404/FNR 404 Environmental Law  ...  3
Adviser approved electives  ...  6

Recommended Sequence: Major and Support Courses

The following is a guide for scheduling Major and Support Courses. By following this sequence, students should meet prerequisites for Major coursework. Courses are not always offered during the quarter indicated. Please consult with your academic adviser and the current Class Schedule.

<table>
<thead>
<tr>
<th>1st Year</th>
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<tbody>
<tr>
<td>Fall</td>
</tr>
<tr>
<td>LA 110</td>
</tr>
<tr>
<td>EDES 101</td>
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<td>BOT 121</td>
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<table>
<thead>
<tr>
<th>2nd Year</th>
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<td>Fall</td>
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<td>LA 201</td>
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<td>LA 311</td>
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<td>AE 237</td>
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<td>AL 411</td>
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<th>4th Year</th>
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<td>LA 441</td>
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<td>LA 464</td>
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<td>LA 454</td>
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</tbody>
</table>

Major concentration | Major concentration | Major concentration
Major concentration | Major concentration | Major concentration
BUSINESS BUILDING
The new Business Building was completed in February 1993. The College's Dean, department offices, and faculty are located here. The building also includes "state-of-the-art" lecture rooms and computer labs.
Photo by Doug Allen.
College of Business

Business Bldg. (03), Room 455
(805) 756-2704

Allen Haile, Dean

<table>
<thead>
<tr>
<th>Department/Location</th>
<th>Program:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Business: Minor</td>
</tr>
<tr>
<td></td>
<td>Business Administration: MBA</td>
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<tr>
<td></td>
<td>Engineering Management: MBA/MS</td>
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<tr>
<td></td>
<td>Business Administration: BS</td>
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<tr>
<td></td>
<td>Economics: BS, Minor</td>
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<tr>
<td></td>
<td>Industrial Technology: BS</td>
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<td></td>
<td>Industrial and Technical Studies: MS</td>
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<tr>
<td></td>
<td>Integrative Technology: Minor</td>
</tr>
<tr>
<td></td>
<td>Packaging: Minor</td>
</tr>
</tbody>
</table>

The mission of the College of Business at Cal Poly is to create a dynamic educational environment, which inspires students to think effectively, take responsible action, and make a positive impact on business and society. We strive for excellence in teaching and in the development, refinement, application, and dissemination of knowledge.

Guiding Principles

- Above all else, we base our actions upon their positive impact on the human condition.
- We act with integrity.
- We aim to continuously improve our understanding of the learning process in order to consistently provide educational programs of the highest quality.
- We are committed to maintaining the highest quality undergraduate program, while continually exploring further opportunities to deliver education of exceptional quality to students throughout their lives.
- We endeavor to develop lifelong competencies rather than mastery of specific information.
- We subscribe to the philosophy of learning by doing. "One must learn by doing the thing; for though you think you know it you have no certainty, until you try." (Sophocles, 445 B.C.)

As a college in a polytechnic university, we seek to develop and use our special competencies in current and emerging technologies.

We enrich our programs by drawing from and contributing to the sciences and the humanities.

We encourage interdisciplinary teamwork and promote interaction among academia, business, industry, government, and society.

We value individual strengths, creativity, and inventiveness and believe that individuals will contribute to the realization of our mission in different ways.

We value service to students, the university, the community, and to academic and professional associations.

The B.S. degree program in Business Administration and the Master of Business Administration are accredited by the American Assembly of Collegiate Schools of Business. The B.S. degree program in Industrial Technology is accredited by the National Association of Industrial Technology. The objective of accreditation is to foster high quality in educational programs.

The college is organized into five departments: Accounting, Business Administration, Economics, Industrial Technology and Management. This organizational structure allows for traditional programs of study in each of the functional fields of business and economics, and also allows for ease of coordination in the offering of programs that require study from a cross-section of these disciplines. A pre-law advisement service is available to all university students.

The college's educational philosophy follows the Cal Poly tradition—that of enlisting maximum student involvement in the learning process through case analysis, special projects, internships, computer simulations and other learn-by-doing exercises. The college has state-of-the-art computer 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 curricula include general education requirements and specialized studies in the student's major field. Optional areas of concentration within each major enable the student to select the program most closely suited to the chosen career field.
CURRICULUM FOR 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 224 Financial Accounting (5)
- BUS 207 Business Law (4)
- ECON 221 Microeconomics (4)
- ECON 222 Macroeconomics (D.3.) (4)
- MATH 124 Finite Mathematics (B.2.) (3)
- 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.

1 ACTG 211 Financial Accounting for Nonbusiness Majors or ACTG 224 Financial Accounting ........... 4/5
2 ACTG 225 Managerial Accounting ......................... 4
1 BUS 207 Business Law ..................................... 4
2 FIN 342 Financial Management ................................. 4
2 MGT 312/MGT 314/MGT 317 ................................. 4
2 MIS 321 Management Information Systems or MGT 301 Production and Operations Management .......................................... 4
2 MKTG 301 Principles of Marketing ............................. 4

28/29

1 These courses will have been taken prior to admission to the Business Minor, but will count as part of the Business Minor.
**General Characteristics**

The Cal Poly MBA program is designed to prepare students to enter successful management positions of high responsibility. The program is based on the recognition that future business leaders must function in an environment (a) that places more emphasis on technology, (b) that is facing more globalization in markets and organizations, and (c) that is placing increased importance on societal factors such as pollution, equal rights, ethical behavior and corporate citizenship. The primary objectives of the MBA program are:

- To provide students with a broad-based understanding of fundamental concepts, principles and practices in multiple business disciplines;
- To instill in students an integrated understanding of business dynamics for effective responses to the changing global business environment;
- To help the students acquire skills in formulating, analyzing and implementing significant business decisions; and
- To develop in students the skills that are necessary to work with other people in effective organizations in a changing global environment.

**Prerequisites**

With the exception of prior background in quantitative analysis, there are no specific prerequisite courses for the MBA program. See the MBA curriculum for details.

**Admission to the MBA Program:**

Admission to the MBA program is based upon:

a) Successful completion of an accredited undergraduate program of study;

b) The student's undergraduate record, with particular emphasis placed on performance during the last 90 units (or equivalent);

c) Achievement on the Graduate Management Admission Test (GMAT); and
d) Prior work experience.

For more information on the MBA Program and for application materials specific to the program, please contact the office of Graduate Programs, College of Business.

**Program of Study**

The MBA program entails a two-year program of graduate work. The first year of the program offers students an integrated understanding of concepts and tools of the various business disciplines. The courses offered contain material that is commonly referred to as the core of business knowledge. The first year provides a collaborative learning environment in which future business managers can acquire basic knowledge and skills in all business disciplines. Ethical and international business issues are specifically addressed in many courses.

The second year of the program consists primarily of elective courses. This structure is based on the belief that people learn best when their past experiences and training can be made an integral part of the learning process. Various sequences of elective courses are offered to allow students to specialize in particular fields. Students are also permitted to develop their own sequences of elective courses. Because the intent is to provide the training and education necessary for the MBA graduate to be successful, the second year elective sequences undergo continuous review for currency and relevance. Satisfactory completion of a comprehensive examination (incorporated into GSB 562) is a requirement of the MBA program.

**FIRST YEAR**

<table>
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<tr>
<th>Units</th>
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<tr>
<th>Fall</th>
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<tbody>
<tr>
<td>GSB 511 Financial Accounting (4)</td>
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<tr>
<td>GSB 512 Quantitative Analysis (4)</td>
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<td>GSB 513 Organization Behavior (4)</td>
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<td>GSB 521 Managerial Accounting (4)</td>
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<td>GSB 522 Management Science (4)</td>
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<td>GSB 523 Managerial Economics (4)</td>
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<td>GSB 514 Business, Government and Society (4)</td>
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<tr>
<td>GSB 531 Managerial Finance (4)</td>
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<td>GSB 532 Information Systems (4)</td>
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<td>GSB 533 Aggregate Economics (4)</td>
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<td>GSB 534 Production and Operations Mgmt. (4)</td>
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<td>GSB Electives (16)</td>
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<tr>
<td>GSB 562 Business Strategy and Policy (4)</td>
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<tr>
<td>GSB Electives (12)</td>
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| 96 |
MBA, SPECIALIZATION IN AGRIBUSINESS

This specialization is offered in conjunction with the Agribusiness Department, College of Agriculture. It requires the completion of six graduate courses taught by the Agribusiness Department. These courses are taken in lieu of 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.

FIRST YEAR

Students are encouraged to challenge first-year GSB courses based on their previous work.

Fall ........................................................ 16
GBS 511 Financial Accounting (4)
GBS 512 Quantitative Analysis (4)
GBS 513 Organization Behavior (4)
AGB 514 Agribusiness Managerial Leadership and Communication (4)

Winter ................................................... 16
GBS 521 Managerial Accounting (4)
GBS 522 Management Science (4)
GBS 523 Managerial Economics (4)
GBS 514 Business, Government and Society (4)

Spring ................................................................ 16
GBS 531 Managerial Finance (4)
GBS 532 Information Systems (4)
GBS 533 Aggregate Economics (4)
GBS 534 Production and Operations Mgmt. (4)

SECOND YEAR

Students must select from: GBS 578, BUS 490, ECN 401, MKTG 401, or AGB 563 to satisfy one of the following four-unit GSB electives.

As a policy, students will not be permitted to take more than two classes at the 400-level.

Fall ........................................................ 16
GBS 524 Marketing Management (4)
AGB 543 Ag. Policy and Program Analysis (4)
GBS electives (8)

Winter ........................................................ 16
AGB 554 Managing Price Risk in Agribusiness (4)
AG 539 Graduate Internship in Agriculture (4)
AGB 555 Technological and Economic Change in Agribusiness (4)
GBS elective (4)

Spring ........................................................ 16
GBS 562 Business Strategy and Policy (4)
AGB 563 International Agricultural Trade and Market Development (4)
GBS electives (8)

ARCHITECTURAL MANAGEMENT TRACK

This program is available only to those students who are enrolled in Cal Poly's College of Architecture program. Students who fulfill all the requirements will first receive the Bachelor of Architecture and then the MBA. During the fifth year of the architecture program, students who have been admitted to this program are allowed to take GSB courses as outlined below. By April 15th of the 5th year, students must formally apply for admission to the MBA program. Acceptance to the MBA program is conditional upon the successful completion of the fifth year.

FIFTH YEAR ARCHITECTURE/FIRST YEAR MBA

Fall.............................................................. 17
1 ARCH 481 Design Lab (5)
    GBS 511 Financial Accounting (4)
    GBS 512 Quantitative Analysis (4)
    GBS 513 Organization Behavior (4)

Winter .......................................................... 17
1 ARCH 481 Design Lab (5)
    GBS 521 Managerial Accounting (4)
    GBS 522 Managerial Science (4)
    GBS 523 Managerial Economics (4)

Spring ........................................................... 17
1 ARCH 481 Design Lab (5)
    GBS 531 Managerial Finance (4)
    GBS 532 Information Systems (4)
    GBS 534 Production and Operations Management (4)

SIXTH YEAR ARCHITECTURE/SECOND YEAR MBA

Fall........................................................................... 16
    GBS 524 Marketing Management (4)
    GBS electives (8)
    GBS or ARCH elective (4)

Winter ...................................................................... 16
    GBS 514 Business, Government and Society (4)
    GBS electives (8)
    GBS or ARCH elective (4)

Spring ...................................................................... 16
    GBS 533 Aggregate Economics (4)
    GBS 562 Business Strategy and Policy (4)
    GBS electives (8)

1 Or adviser approved electives.
Joint M.B.A./M.S. Engineering
with 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 College of Engineering (Industrial Engineering Department) and the College of Business. Students are required to have a prerequisite degree in engineering, computer science, or similar technical degree to be admitted to both the College of Engineering and the College 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**

Students are encouraged to challenge any of the following first-year GSB courses based on previous work.

**Fall** ............................................. 15-16
GSB 511 Financial Accounting (4)
GSB 513 Organization Behavior (4)
GSB 524 Marketing Management (4)
1 Technical Elective (3-4)

**Winter** .................................. 16
GSB 521 Managerial Accounting (4)
GSB 522 Management Science (4)
GSB 523 Managerial Economics (4)
IME 557 Technological Assessment and Planning (4)

**Spring** .................................................. 16
GSB 531 Managerial Finance (4)
GSB 532 Information Systems (4)
GSB 533 Aggregate Economics (4)
GSB 534 Production and Operations Management (4)

**Summer** ........................................ 8
GSB 598 Graduate Internship in Business (8)

**SECOND YEAR**

Students must select from GSB 578, GSB 587, BUS 490, ECON 401, or MKTG 401 to satisfy one of the following four-unit GSB electives.

**Fall** ........................................ 13-15
IME 545 Advanced Topics in Simulation (3)
1 GSB elective or technical elective (3-4)
1 GSB elective (4)
1 Technical elective (3-4)

**Winter** .................................. 16
GSB 514 Business Government and Society (4)
IME 555 Computer Integrated Manufacturing (4)
IME 558 Engineering Decision Making (4)
1 GSB elective (4)

**Spring** ........................................... 15-16
IME 562 Business Strategy and Policy (4)
IME 556 Technological Project Management (4)
1 GSB elective (4)
1 Technical Elective (3-4)

**Summer** .................................. 8
1 GSB electives (4) (4)

Minimum total units required 107

1 Technical electives to be selected with College of Engineering adviser's approval. GSB electives to be selected with College of Business adviser's approval.
ACCOUNTING DEPARTMENT

Business Bldg. (03), Room 403
(805) 756-1384

Faculty

Department Head, John C. Robison

James A. Anderson  Janice L. Carr
Charles T. Andrews  Douglas C. Cerf
Mary Beth Armstrong  M. Zafar Iqbal
Lawrence E. Baur, Jr.  Earl C. Keller
William C. Boynton  Charles R. (Tad) Miller

Program

B.S. Business Administration
   with Concentration in:
      Accounting

The primary objectives of the Accounting Department are to:
1) provide students within the College of Business with the
   ability to understand and interpret accounting information
   that is relevant to business decisions; 2) prepare students for
   careers as professional accountants; and 3) provide students
   from other colleges 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. The
concentration builds on the principles of financial and
managerial accounting coursework (ACTG 224 and ACTG
225) 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 cost accounting, micro-
computer applications, and taxation.
## B.S. BUSINESS ADMINISTRATION

Courses are displayed by Major, Support, General Education and Breadth, and Electives.

### MAJOR COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>ACTG 224</td>
<td>Financial Accounting</td>
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<tr>
<td>ACTG 225</td>
<td>Managerial Accounting</td>
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<tr>
<td>ACTG 461</td>
<td>Senior Project</td>
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<tr>
<td>ACTG 462</td>
<td>Senior Project</td>
<td>3</td>
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<tr>
<td>BUS 207</td>
<td>Business Law</td>
<td>4</td>
</tr>
<tr>
<td>BUS 404</td>
<td>Government and Social Influences on Business</td>
<td>4</td>
</tr>
<tr>
<td>FIN 342</td>
<td>Financial Management</td>
<td>4</td>
</tr>
<tr>
<td>MGT 300</td>
<td>Production and Operations Management</td>
<td>4</td>
</tr>
<tr>
<td>MGT 317</td>
<td>Organizational Behavior</td>
<td>4</td>
</tr>
<tr>
<td>MGT 406</td>
<td>Business Strategy and Policy Seminar</td>
<td>4</td>
</tr>
<tr>
<td>MIS 321</td>
<td>Management Information Systems</td>
<td>4</td>
</tr>
<tr>
<td>MKTG 301</td>
<td>Principles of Marketing</td>
<td>4</td>
</tr>
</tbody>
</table>

**International Business**

Select one from: MGT 406, ACTG 453, BUS 490, MKTG 401, FIN 430 or ECON 401

### SUPPORT COURSES

* = Courses satisfy General Education and Breadth requirements.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>CSC 120</td>
<td>Principles of Business Data Processing (F.1.)</td>
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<tr>
<td>ECON 221</td>
<td>Microeconomics</td>
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<td>ECON 222</td>
<td>Macroeconomics (D.3.)</td>
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<tr>
<td>ECON elective (300–400 level)</td>
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<tr>
<td>MATH 124</td>
<td>Finite Mathematics (B.2.)</td>
<td>3</td>
</tr>
<tr>
<td>MATH 221</td>
<td>Calculus for Business and Economics (B.2.)</td>
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</tr>
<tr>
<td>STAT 251</td>
<td>Statistical Inference for Mgmt. I (B.2.)</td>
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<tr>
<td>STAT 252</td>
<td>Statistical Inference for Mgmt. II</td>
<td>4</td>
</tr>
</tbody>
</table>

### GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 12 units must be at the 300–400 level.

**Area A:**

ENGL 114 (A.1.)
ENGL 125/PHIL 125/SPC 125 (A.2.)
SPC 201/SPC 202 (A.3.)
ENGL 215/ENGL 218 (A.4.)

**Area B:**

A minimum of 18 units is required; 11 of the units are in Support

Physical and life sciences electives (one with lab) (B.1.)
Mathematics/statistics (B.2.)* see Support Courses

**Area C:**

PHIL 230/PHIL 231 (C.1.)
Critical reading electives (C.1.)
Fine and performing arts elective (C.2.)
Literature, philosophy, arts elective (300–400 level) (C.3.)
Arts and humanities elective (Area C)

**Area D:**

A minimum of 18 units is required; 4 of the units are in Support

HIST 204 (D.1.), POLS 210 (D.1.)
HIST 315 (D.2.)
Economics (D.3.)* see Support Courses

**Area E:**

ANT 201/GEOG 150/SOC 105 (D.4.a.)
ANT/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)

**Area F:**

PSY 201/PSY 202 (E.1.)
BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)

**Area G:**

A minimum of 6 units is required; 4 of the units are in Support

Computer literacy (F.1.)* see Support Courses

**Total:**

A minimum of 79 units is required; 19 of the units are in Support

**ELECTIVES:**

### Accounting Concentration

- ACTG 304 Tax Accounting | 4
- ACTG 321 Intermediate Accounting I | 4
- ACTG 322 Intermediate Accounting II | 4
- ACTG 323 Intermediate Accounting III | 4
- ACTG 446 Auditing | 4

Adviser approved electives | 8

**Total:**

186
BUSINESS ADMINISTRATION DEPARTMENT

Business Bldg. (03), Room 405
(805) 756-2822

Faculty

Department Head, John C. Rogers

Dan Bertozzi, Jr.       Lynn E. Metcalf
Norm A. Borin          Walter W. Perlick
Lee B. Burgunder       Kenneth D. Riener
Jeffrey E. Danes       Luc A. Soenen
John Dobson            Teresa Swartz
D. Jan Duffy           Harry S. Watkins
R. Krishnan            Alan M. Weatherford
John R. Lindvall

Programs

B.S. Business Administration

Students may select Adviser Approved Electives or a Concentration 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.

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 Business, Government and Society. The department also provides major staff support for the Master's degree program in Business Administration. See Master of Business Administration for details of this program.

CURRICULAR CONCENTRATIONS

Financial Management

This concentration provides both depth of exposure in finance as well as breadth of exposure to related fields for students interested in careers in finance. Students are exposed to specialized 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.

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, buyer behavior, and services marketing. 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.

Adviser Approved Electives

Students have the option of choosing one of the above mentioned concentrations or 27 units of adviser approved electives. Students select courses according to individual talents and interests.

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.
B.S. BUSINESS ADMINISTRATION

Courses are displayed by Major, Support, General Education and Breadth, and Electives.

### MAJOR COURSES

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</tr>
<tr>
<td>MIS 321</td>
<td>Management Information Systems</td>
<td>4</td>
</tr>
<tr>
<td>ECON 401</td>
<td>Microeconomics</td>
<td>4</td>
</tr>
<tr>
<td>MGT 406</td>
<td>Business Strategy and Policy Seminar</td>
<td>4</td>
</tr>
<tr>
<td>MGT 401</td>
<td>Management Information Systems</td>
<td>4</td>
</tr>
<tr>
<td>MGT 301</td>
<td>Principles of Marketing</td>
<td>4</td>
</tr>
</tbody>
</table>

### SUPPORT COURSES

* = Courses satisfy General Education and Breadth requirements.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSC 120</td>
<td>Principles of Business Data</td>
<td>4</td>
</tr>
<tr>
<td>ECON 221</td>
<td>Microeconomics</td>
<td>4</td>
</tr>
<tr>
<td>ECON 222</td>
<td>Macroeconomics</td>
<td>4</td>
</tr>
<tr>
<td>MATH 124</td>
<td>Finite Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>MATH 221</td>
<td>Calculus for Business and Economics</td>
<td>4</td>
</tr>
<tr>
<td>STAT 251</td>
<td>Statistical Inference for Mgmt. I</td>
<td>4</td>
</tr>
<tr>
<td>STAT 252</td>
<td>Statistical Inference for Mgmt. II</td>
<td>4</td>
</tr>
</tbody>
</table>

### GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

<table>
<thead>
<tr>
<th>Area A</th>
<th></th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 114</td>
<td>(A.1.)</td>
<td>14</td>
</tr>
<tr>
<td>ENGL 125</td>
<td>(A.2.)</td>
<td>12</td>
</tr>
<tr>
<td>SPC 201</td>
<td>(A.3.)</td>
<td>12</td>
</tr>
<tr>
<td>ENGL 215</td>
<td>(A.4.)</td>
<td>12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area B</th>
<th></th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A minimum of 18 units is required; 11 of the units are in Support</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical and life sciences electives (one with lab) (B.1.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mathematics/statistics (B.2.) * see Support Courses</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Electives

19 units

### CONCENTRATIONS OR ELECTIVES (select one)

#### Financial Management Concentration

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTG 321</td>
<td>Intermediate Accounting I</td>
<td>4</td>
</tr>
<tr>
<td>FIN 411</td>
<td>Security Analysis and Portfolio Management</td>
<td>12</td>
</tr>
<tr>
<td>FIN 430</td>
<td>International Business Finance Management</td>
<td>4</td>
</tr>
<tr>
<td>FIN 489</td>
<td>Case Studies in Finance</td>
<td>4</td>
</tr>
</tbody>
</table>

Adviser approved electives

### Marketing Management Concentration

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MKTG 302</td>
<td>Marketing Research I</td>
<td>4</td>
</tr>
<tr>
<td>MKTG 303</td>
<td>Buyer Behavior</td>
<td>4</td>
</tr>
<tr>
<td>MKTG 406</td>
<td>Marketing Management</td>
<td>4</td>
</tr>
</tbody>
</table>

Electives selected from

MKTG 305, 401, 402, 404, 405, 412, 450, 470

Adviser approved electives

### Adviser Approved Electives

Adviser may authorize deviations from specific concentration requirements in order to achieve student career goals.
Faculty

Department Head, Artemis Papakyriazis

George L. Beardsley, Jr. Walter F. Rice
Phillip Fanchon Alden F. Shiers
Timothy W. Kersten Daniel J. Villegas
Michael L. Marlow Daniel P. Williamson
Panagiotis Papakyriazis

Programs

B.S. Economics
Students may select Adviser Approved Electives or a Concentration in:
Business and Industrial Economics
International Trade and Development
Quantitative Economics

Economics Minor

The Economics Department has two broad purposes: it serves all colleges 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 Department supports the concept of international education and encourages its students to investigate opportunities for overseas study.

The Economics degree program will prepare students for employment in the private and public sectors of both the domestic and international levels 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 College of Business or the Political Science or Social Sciences departments in lieu of the economics concentrations described below, provided appropriate prerequisites are satisfied. Students may also choose to select Adviser Approved Electives in place of a concentration.

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.

Adviser Approved Electives

Students have the option of choosing one of the above mentioned concentrations or 24 units of adviser approved electives. Students can study the interrelationships among different disciplines. The world is rapidly changing and the technological and sociological prototypes might not be applicable any longer. Evolution in science and technology is changing the social and economic structure and the student is encouraged to explore these changes. Students select courses according to individual talents and interests.
# B.S. ECONOMICS

Courses are displayed by Major, Support, General Education and Breadth, and Electives.

## MAJOR COURSES

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTG 224 Financial Accounting</td>
<td>5</td>
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<tr>
<td>ACTG 225 Managerial Accounting</td>
<td>4</td>
</tr>
<tr>
<td>ECON 221 Microeconomics</td>
<td>4</td>
</tr>
<tr>
<td>ECON 222 Macroeconomics (D.3.) *</td>
<td>4</td>
</tr>
<tr>
<td>ECON 311, ECON 312 Intermediate Microeconomics</td>
<td></td>
</tr>
<tr>
<td>ECON 313 Intermediate Macroeconomics</td>
<td>4,4</td>
</tr>
<tr>
<td>ECON 314 Monetary and Fiscal Policies</td>
<td>4</td>
</tr>
<tr>
<td>ECON 337 Money, Banking and Credit</td>
<td>4</td>
</tr>
<tr>
<td>ECON 338 Stochastic Modeling in Decision Making Systems</td>
<td>4</td>
</tr>
<tr>
<td>ECON 417 Development of Economic Analysis</td>
<td>4</td>
</tr>
<tr>
<td>ECON 460 Undergraduate Seminar</td>
<td>2</td>
</tr>
<tr>
<td>ECON 461 Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>ECON 462 Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>MATH 221 Calculus for Business and Economics (B.2.) *</td>
<td>4</td>
</tr>
<tr>
<td>MATH 222 Math Analysis for Economics and Business (B.2.) *</td>
<td>4</td>
</tr>
<tr>
<td>Restricted electives to be selected from: ECON 105, 304, 306, 323, 324, 325, 339, 401, 402, 403, 410, 413, 431, 432, 433, 434</td>
<td>12</td>
</tr>
<tr>
<td>Concentration courses or adviser approved electives</td>
<td>24</td>
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</tbody>
</table>

## SUPPORT COURSES

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUS 207 Business Law</td>
<td>4</td>
</tr>
<tr>
<td>CSC 120 Principles of Business Data Processing (F.1) *</td>
<td>4</td>
</tr>
<tr>
<td>MATH 124 Finite Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>STAT 251 Statistical Inference for Management I (B.2.) *</td>
<td>4</td>
</tr>
<tr>
<td>STAT 252 Statistical Inference for Management II</td>
<td>4</td>
</tr>
</tbody>
</table>

## GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 12 units must be at the 300–400 level.

Additional GEB courses are listed under Major and Support courses.

## Area A:
- ENGL 114 (A.1.)
- ENGL 125/PHIL 125/SPC 125 (A.2.)
- SPC 201/SPC 202 (A.3.)
- ENGL 215/ENGL 218 (A.4.)

A minimum of 18 units is required; 12 of the units are in Support.

Physical and life sciences electives (one with lab) Mathematics/statistics * see Major and Support Courses

## Area B:
- PHIL 230/PHIL 231 (C.1.)
- Critical reading electives (C.1.)
- Fine and performing arts elective (C.2.)
- Literature, philosophy, arts elective (300–400 level) (C.3.)
- Arts and humanities elective (Area C)

## Area D:
- HIST 204 (D.1.), POLS 210 (D.1.)
- HIST 315 (D.2.)
- Economics (D.3.) *see Major Courses
- ANT 201/GEOG 150/SOC 103 (D.4.a.)
- ANT/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)

## Area E:
- PSY 201/PSY 202 (E.1.)
- BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)

## Area F:
- Computer literacy (F.1.) *see Support Courses
- Technology elective (F.2.)

A minimum of 79 units is required; 20 of the units are in Support.

## ELECTIVES:

A minimum of 13 units is required from:

## CONCENTRATIONS OR ADVISER APPROVED ELECTIVES

(select one)

### Business and Industrial Economics Concentration

- ECON 306 Applied Forecasting
- ECON 403 Industrial Organization
- ECON 413 Labor Economics
- MGT 312 Organization and Management Theory or
- MIS 318 Modeling Systems
- Adviser approved electives

A minimum of 24 units is required; 4 of the units are in Support.
International Trade and Development Concentration
ECON 325 Underdevelopment and Economic Growth. 4
ECON 401 International Trade 4
ECON 402 International Monetary Economics 4
Foreign language 4
Adviser approved electives 8
To be selected from upper division courses in ECON, FIN, MGT, MKTG, or any other discipline with approval of adviser.

Quantitative Economics Concentration
ECON 306 Applied Forecasting 4
ECON 339 Econometrics 4
MIS 318 Modeling Systems 4
Adviser approved electives 12

Adviser Approved Electives
Students select courses with adviser approval 24

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. For more information, contact the Economics Department.

Units
Required courses 17
ECON 105 Personal and Consumer Economics (4)
ECON 211 Principles of Economics (D.3.) (3)
ECON 212 Macroeconomics (3)
ECON 304 Comparative Economic Systems (D.4.b.) (3)
ECON 337 Money, Banking and Credit (4)
Approved electives (choose any two courses) 7-8
ECON 323 Economic History of the Advanced World (4)
ECON 324 American Economic History (4)
ECON 325 Underdevelopment and Economic Growth (D.4.b.) (3)
ECON 431 Environmental Economics (4)
ECON 432 Economics of Energy and Resources (4)
ECON 401 International Trade (4)
ECON 413 Labor Economics (4)

24-25

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

Business Bldg. (03), Room 413
(805) 756-2676

Faculty

Department Head, Fred P. Abitia
Gerald E. Cunico
Larry W. Gay
Roger L. Keep
Lynn S. Mosher

James L. Murphy
Anthony J. Randazzo
Nelson L. Smith III

Programs

B.S. Industrial Technology
M.A. Industrial and Technical Studies

Integrative Technology Minor
Packaging Minor

The Industrial Technology Department offers the Bachelor of Science in Industrial Technology and the 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 prepares graduates for employment in a broad range of professional positions in Industrial Management. Industrial Technology graduates are generalists prepared to help employers make better decisions about investing in or managing technologies that can add value to materials, processes, products and services.

This major emphasizes preparation for industrial 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 and construction management, industrial training, or packaging is provided through the selection of appropriate electives.

INTEGRATIVE TECHNOLOGY MINOR

This minor is an interdisciplinary program which is sponsored by three departments: Industrial and Manufacturing Engineering, Industrial Technology, and Psychology and Human Development. Students learn about the technical, social and business issues related to the use of new technology and how the technology is integrated into corporate operations. The minor appeals to students who are majoring in nontechnical disciplines.

For more information, please consult with Dr. Dan Levi, Psychology and Human Development Department.

Units

Required courses .................................................. 17
IME 157 Electronic Manufacturing (3)
IME 234 Robotics Assembly (2)
IME 214 Production Control (2)
IME 319 Human Factors Engineering (3)
IT 303 Industrial Quality Control Management (4)
PSY 494 Psychology of Technological Change (3)

Management electives (select one) ........................... 3–4
MGT 311 Industrial Management (4)
MGT 313 Industrial Relations (3)
MGT 314 Human Resources Management (4)

Humanities electives (select one) ......................... 3
HIST 306 History of American Technology (3)
HIST 384 Labor and Work in American History (3)
HUM 402 Values and Technology (3)

Social and Behavioral Sciences electives
(select one) .................................................. 3–4
BUS 404 Government and Social Influence on Business (4)
PSY 302 Behavior in Organizations (3)
SPC 213 Organizational Communication (4)

26–28
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.

**Required core** .......................................................... 19

- CHEM 121 General Chemistry (B.1.a.) (4)
- FSN 336 Food Packaging (3)
- IT 327 Plastics Technology (4)
- IT 330 Fundamentals of Packaging (4)
- PHYS 104 Introductory Physics (B.1.a.) (4) or PHYS 121 College Physics (B.1.a.) (4)

**Adviser approved electives** ........................................... 9-11

Select three courses from the following list. Two courses must be 300–400 level to be selected with adviser's approval.

- FSN 217 Fundamentals of Food Processing Operations (4)
- FSN 230 Elements of Food Processing (4)
- FSN 332 Statistical Quality Control (3)
- GRC 437 Consumer Packaging (3)
- IT 334 Materials Handling and Packaging (3)
- IT 408 Protective Packaging (3)
- IT 409 Machinery for Packaging (3)
- IT 435 Package Development Management (3)

**SUPPORT COURSES**

* = Courses satisfy General Education and Breadth requirements.

1 MATH 120 Pre-Calculus Algebra and Trigonometry (B.2.)* ........................................ 5
MATH 131 Technical Calculus ........................................ 4
PHYS 121 College Physics (B.1.a.)* .......................................... 4
PHYS 122 College Physics ........................................ 4
CHEM 121 General Chemistry (B.1.a.)* .......................................... 4
ECON 201 Survey of Economics (D.3.)* .......................................... 3
STAT 211 Elementary Probability and Statistics (B.2.)* ....................... 3

**B.S. INDUSTRIAL TECHNOLOGY**

For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser.

**Units**

- **MAJOR COURSES**
  - IT 126 Industrial Materials and Processes ....................... 4
  - IT 137, IT 138 Introduction to Industrial Electricity .......... 4,4
  - IT 150 Mechanical Energy ............................................. 4
  - IT 212 Introduction to Industrial and Technical Management .................. 4
  - IT 232 Introduction to C.A.D. and Other Computer Applications .................. 4
  - IT 303 Industrial Quality Control Management .................. 4
  - IT 313 Industrial Cost Control ........................................ 4
  - IT 320 Applied Metal and Ceramics Processes .................. 4
  - IT 327 Plastics Technology ............................................ 4
  - IT 330 Fundamentals of Packaging .................................... 4
  - IT 332 Industrial Electrical and Electronic Systems ............ 4
  - IT 345 Applied Production Management .................................... 4
  - IT 402 Technical and Management Presentations .................. 4
  - IT 406 Industrial Management and Supervision .................. 4
  - IT 410 Industrial Planning ............................................ 4
  - IT 411 Industrial Safety and Health Management .................. 4
  - IT 432 Energy Management ............................................ 4
  - IT 461 Senior Project .................................................. 3
  - MGT 301 Production and Operations Management .................. 4

**Adviser approved electives** ........................................... 13

**TOTAL** ........................................................................ 92

**TOTAL** ........................................................................ 28-30
**GENERAL EDUCATION AND BREADTH**

Please see page 77 for selection of GEB electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Major and Support courses.

### Area A: ........................................... 14
- ENGL 114 (A.1.)
- ENGL 125/PHIL 125/SPC 125 (A.2.)
- SPC 201/SPC 202 (A.3.)
- ENGL 215/ENGL 218 (A.4.)

### Area B: ........................................... 3
A minimum of 18 units is required; 15 of the units are in Support
- Physical science (B.1.a.)* see Support Courses
- Life sciences elective (B.1.b)
- Mathematics/statistics * see Support Courses

### Area C: ........................................... 18
- PHIL 230/PHIL 231 (C.1.)
- Critical reading electives (C.1.)
- Fine and performing arts elective (C.2.)
- Literature, philosophy, arts elective (300–400 level) (C.3.)
- Arts and humanities elective (Area C)

### Area D: ........................................... 15
A minimum of 18 units is required; 3 of the units are in Support
- HIST 204 (D.1.), POLS 210 (D.1.)
- HIST 315 (D.2.)
- Economics (D.3.) *see Support Courses
- ANT 201/GEOG 150/SOC 105 (D.4.a.)
- ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)

### Area E: ........................................... 5
- PSY 201/PSY 202 (E.1.)
- BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)

### Area F: ........................................... 3
- Computer literacy (F.1.)

Total ........................................... 58
A minimum of 76 units is required; 18 of the units are in Support

**Electives** ........................................... 9

---

1 MATH 116 and MATH 117 or MATH 118 and MATH 119 may be used in lieu of MATH 120.
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 technical businesses and industry.

The curriculum translates a contemporary body of context derived from the business-industrial-technological segment of society into awareness, understandings, experiences and competencies.

Prerequisites

Admission as a graduate student in this program requires a 2.8 minimum grade point average in the last 90 quarter units of coursework attempted or equivalent. 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.

Non-technical baccalaureate degree students will be required to enroll in 15 quarter units of approved technical courses or provide documentation of appropriate experiences. Courses must be successfully completed prior to submittal of a Formal Study Plan. Refer to the Graduate Studies section of the catalog for additional requirements.

Admission Status

If the student meets the general requirements for graduate studies, the student will be considered for admission in one of two categories:

- Graduate classified - the student fully meets all department and university requirements.
- Graduate conditionally classified - the student may be admitted to the degree program if in the opinion of appropriate university authority, the student can remedy deficiencies by completing additional requirements.

For information pertaining to specific requirements for admission, graduate classified or graduate conditionally classified, the student should communicate with 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 courses commencing in any quarter of each year, and is designed for students who have a baccalaureate degree in Industrial Technology, 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. Students who choose the option of the comprehensive examination must take the examination within one year of completing the last Industrial Technology graduate course on the Formal Study Plan. Failure to do so will necessitate that the student complete a thesis or project to fulfill the requirement of the degree.

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.

400-level courses used as part of a graduate program will include an extra written or oral assignment.

A student shall complete all requirements for the degree within a seven-year period.

CURRICULUM FOR M.A. INDUSTRIAL AND TECHNICAL STUDIES

<table>
<thead>
<tr>
<th>Required Courses</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT 505 Graduate Seminar (3)</td>
<td>26</td>
</tr>
<tr>
<td>IT 515 Historical and Philosophical Perspective of American Industry (3)</td>
<td></td>
</tr>
<tr>
<td>IT 520 Organization and Administration of Industrial and Technical Environments (3)</td>
<td></td>
</tr>
<tr>
<td>IT 521 Training in Industrial and Technical Systems (3)</td>
<td></td>
</tr>
<tr>
<td>IT 522 Facility Planning (3)</td>
<td></td>
</tr>
<tr>
<td>IT 527 Technical Trends and Issues (3)</td>
<td></td>
</tr>
<tr>
<td>IT 580 Graduate Research in Industrial and Technical Systems (3)</td>
<td></td>
</tr>
<tr>
<td>IT 599 Industrial and Technical Studies Thesis or Project (5)</td>
<td></td>
</tr>
</tbody>
</table>

Professional technical electives ................. 19
Elective courses at the 400-500 level chosen with approval of the Graduate Coordinator

45

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

1 The student may be permitted a nonthesis/project option by accomplishing all of the following steps: 1) Obtaining approval of the department Graduate Coordinator. 2) Substituting 5 units of 500-level coursework which support the degree and are approved in advance by the department Graduate Coordinator. IT 500 Individual Study (1-6) is recommended. 3) Passing a comprehensive written examination covering the graduate program.
MANAGEMENT DEPARTMENT

Business Bldg. (03), Room 409
(805) 756-1301

Faculty

Department Head, A. B. (Rami) Shani

Joseph Biggs
Rebecca Ellis
Barry Floyd
Colette Frayne
J. Michael Geringer
Ray M. Haynes

Eldon Y. Li
David A. Peach
Rolf E. Rogers
James Sena
Michael Stebbins

Programs

B.S. Business Administration

Students may select Adviser Approved Electives or a Concentration in:

- Human Resources Management
- International Business Management
- Management
- Management Information Systems
- 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 a concentration in Human Resources Management, International Business Management, Management, Management Information Systems, or 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.

Adviser Approved Electives

Students have the option of choosing one of the above mentioned concentrations or 31 units of adviser approved electives. Students select courses according to individual talents and interests.
## B.S. BUSINESS ADMINISTRATION

Courses are displayed by Major, Support, General Education and Breadth, and Electives.

### MAJOR COURSES

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTG 224 Financial Accounting</td>
<td>5</td>
</tr>
<tr>
<td>ACTG 225 Managerial Accounting</td>
<td>4</td>
</tr>
<tr>
<td>BUS 207 Business Law</td>
<td>4</td>
</tr>
<tr>
<td>BUS 404 Government and Social Influences on Business</td>
<td>4</td>
</tr>
<tr>
<td>FIN 342 Financial Management</td>
<td>4</td>
</tr>
<tr>
<td>MGT 301 Production and Operations Management</td>
<td>4</td>
</tr>
<tr>
<td>MGT 317 Organizational Behavior</td>
<td>4</td>
</tr>
</tbody>
</table>

**International business**

Select one from: BUS 490, ECON 401, FIN 430, MGT 406, MKTG 401

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MGT 414 Business Strategy and Policy Seminar</td>
<td>4</td>
</tr>
<tr>
<td>MGT 461 Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>MGT 462 Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>MIS 321 Management Information Systems</td>
<td>4</td>
</tr>
<tr>
<td>MKTG 301 Principles of Marketing</td>
<td>4</td>
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</table>

Concentration courses or adviser approved electives

<table>
<thead>
<tr>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>27-34</td>
</tr>
</tbody>
</table>

### SUPPORT COURSES

* = Courses satisfy General Education and Breadth requirements.

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSC 120 Principles of Business Data</td>
<td>4</td>
</tr>
<tr>
<td>ECON 221 Microeconomics</td>
<td>4</td>
</tr>
<tr>
<td>ECON 222 Macroeconomics (D.3.)*</td>
<td>4</td>
</tr>
<tr>
<td>ECON elective (300–400 level)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 124 Finite Mathematics (B.2.)*</td>
<td>3</td>
</tr>
<tr>
<td>MATH 221 Calculus for Business and Economics (B.2.)*</td>
<td>4</td>
</tr>
<tr>
<td>STAT 251 Statistical Inference for Mgmt. I (B.2.)*</td>
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</tr>
<tr>
<td>STAT 252 Statistical Inference for Mgmt. II</td>
<td>4</td>
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</tbody>
</table>

**Area B:**

A minimum of 18 units is required; 11 of the units are in Support
Physical and life sciences (one with lab) (B.1.)
Mathematics/statistics (B.2.) * see Support Courses

### GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 12 units must be at the 300–400 level.
Additional GEB courses are listed under Support Courses.

**Area A:**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ENGL 114 (A.1.)</td>
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</tr>
<tr>
<td>ENGL 123/PHIL 125/SPC 125 (A.2.)</td>
<td></td>
</tr>
<tr>
<td>SPC 201/SPC 202 (A.3.)</td>
<td></td>
</tr>
<tr>
<td>ENGL 215/ENGL 218 (A.4.)</td>
<td></td>
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</tbody>
</table>

**Area C:**

PHIL 230/PHIL 231 (C.1.)
Critical reading electives (C.1.)
Fine and performing arts elective (C.2.)
Literature, philosophy, arts elective (300–400 level) (C.3.)
Arts and humanities elective (Area C)

**Area D:**

A minimum of 18 units is required; 4 of the units are in Support
HIST 204 (D.1.), POLS 210 (D.1.)
HIST 315 (D.2.)
Economics (D.3.)* see Support Courses
ANT 201/GEOG 150/SOC 105 (D.4.a.)
ANT/ECON/GEOG/POLS/SOC elective (300–400 level) (D.4.b.)

**Area E:**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>PSY 201/PSY 202 (E.1.)</td>
<td>5</td>
</tr>
<tr>
<td>BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)</td>
<td>2</td>
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</tbody>
</table>

**Area F:**

A minimum of 6 units is required; 4 of the units are in Support
Computer literacy (F.1.)* see Support Courses
Technology elective (F.2.)

**Total:**

A minimum of 79 units is required; 19 of the units are in Support

### ELECTIVES

**12-19**

### CONCENTRATIONS OR ADVISER APPROVED ELECTIVES

**select one**

**Human Resources Management Concentration**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>MGT 310 History of Management, Labor and Capitalism in the U.S.</td>
<td>4</td>
</tr>
<tr>
<td>MGT 314 Human Resources Management</td>
<td>4</td>
</tr>
<tr>
<td>MGT 410 Compensation</td>
<td>4</td>
</tr>
<tr>
<td>MGT 415 Advanced Personnel Management</td>
<td>4</td>
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<tr>
<td>Adviser approved electives</td>
<td>16</td>
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</table>
### International Business Management Concentration

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECON 401</td>
<td>International Trade</td>
<td>4</td>
</tr>
<tr>
<td>ECON 402</td>
<td>or International Monetary Economics</td>
<td>4</td>
</tr>
<tr>
<td>FIN 430</td>
<td>International Business Finance</td>
<td>4</td>
</tr>
<tr>
<td>MGT 332</td>
<td>International Cross Cultural Mgmt.</td>
<td>4</td>
</tr>
<tr>
<td>MGT 314</td>
<td>Human Resources Management</td>
<td>4</td>
</tr>
<tr>
<td>MGT 489</td>
<td>Adv. Seminar in International Mgmt.</td>
<td>4</td>
</tr>
<tr>
<td>MKTG 401</td>
<td>International Marketing</td>
<td>4</td>
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<tr>
<td>Adviser approved electives</td>
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Total: 31 credits

### Management Concentration

<table>
<thead>
<tr>
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<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>MGT 314</td>
<td>Human Resources Management</td>
<td>4</td>
</tr>
<tr>
<td>MGT 331</td>
<td>Organization Design and Analysis</td>
<td>4</td>
</tr>
<tr>
<td>MGT 332</td>
<td>International Cross Cultural Management</td>
<td>4</td>
</tr>
<tr>
<td>MGT 488</td>
<td>Small Business Management</td>
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<tr>
<td>Adviser approved electives</td>
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<td>15</td>
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Total: 31 credits

### Management Information Systems Concentration

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<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CSC 118</td>
<td>Fundamentals of Computer Science I</td>
<td>4</td>
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<tr>
<td>CSC 218</td>
<td>Fundamentals of Computer Science II</td>
<td>3</td>
</tr>
<tr>
<td>CSC 203</td>
<td>COBOL Programming</td>
<td>3</td>
</tr>
<tr>
<td>CSC 345</td>
<td>Data Structures</td>
<td>3</td>
</tr>
<tr>
<td>MGT 314</td>
<td>Human Resources Management</td>
<td>4</td>
</tr>
<tr>
<td>MIS 412</td>
<td>Information Management and Database Systems</td>
<td>4</td>
</tr>
<tr>
<td>MIS 422</td>
<td>Information Systems Analysis &amp; Design</td>
<td>4</td>
</tr>
<tr>
<td>MIS 432</td>
<td>Information Systems Design and Implementation</td>
<td>4</td>
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<tr>
<td>Adviser approved electives</td>
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</tbody>
</table>

Total: 34 credits

### Production and Operations Management Concentration

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ACTG 402</td>
<td>Advanced Cost Accounting</td>
<td>4</td>
</tr>
<tr>
<td>MGT 314</td>
<td>Human Resources Management</td>
<td>4</td>
</tr>
<tr>
<td>MGT 440</td>
<td>Service Operations Management</td>
<td>4</td>
</tr>
<tr>
<td>MGT 441</td>
<td>Operations Planning and Control</td>
<td>4</td>
</tr>
<tr>
<td>MGT 442</td>
<td>Purchasing and Materials Management</td>
<td>4</td>
</tr>
<tr>
<td>MGT 445</td>
<td>Advanced Operations Management</td>
<td>4</td>
</tr>
<tr>
<td>MGT 487</td>
<td>Seminar in Quality Management</td>
<td>4</td>
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<tr>
<td>Adviser approved electives</td>
<td></td>
<td>6</td>
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</tbody>
</table>

Total: 34 credits

Adviser approved electives               31

---

178 Management
SCANNING ELECTRON MICROSCOPE
Materials Engineering students Carl Nail and Lisa DiDonna use this equipment which has the capability of 20,000x magnification of surfaces. Photo by Doug Allen.

X-RAY DIFFRACTOMETER
Materials Engineering student Dale Claussen uses this equipment to study the crystal structure of metals, ceramics, polymers, and naturally-occurring minerals. Photo by Doug Allen.

ADVANCED ENGINEERING WORKSTATIONS
The Mechanical Engineering Department’s HP Advanced Engineering Workstations are available for student design projects. The stylus on the menu pad allows students to enter CAD commands to produce engineering drawings and analyses. Photo by Doug Allen.

College of
ENGINEERING
## College of Engineering

**Engineering Bldg. (13), Room 266**  
(805) 756-2131  

**Peter Y. Lee, Dean**  
**Paul E. Rainey, Associate Dean**  
**Daniel W. Walsh, Associate Dean**

<table>
<thead>
<tr>
<th>Department/Location:</th>
<th>Program:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering</td>
<td>Engineering: MS</td>
</tr>
<tr>
<td>Engineering/Business</td>
<td>Engineering Management, MBA/MS</td>
</tr>
<tr>
<td>Engineering/Architecture &amp; Environmental Design</td>
<td>Transportation Planning, MCRP/MS</td>
</tr>
<tr>
<td>College of Agriculture</td>
<td>Agricultural Engineering: BS*</td>
</tr>
<tr>
<td>Aeronautical Engineering</td>
<td>Aeronautical Engineering: BS, *MS</td>
</tr>
</tbody>
</table>
| Civil and Environmental Engineering | Civil Engineering: BS*  
Environmental Engineering: BS*  
Civil and Environmental Engineering: MS |
| Computer Engineering | Computer Engineering: BS |
| Computer Science    | Computer Science: BS, MS, Minor |
| Electronic and Electrical Engineering | Electrical Engineering: BS*, MS |
| Engineering Science | Engineering Science: BS |
| Industrial and Manufacturing Engineering | Industrial Engineering: BS*  
Manufacturing Engineering: BS  
Integrative Technology: Minor |
| Materials Engineering | Materials Engineering: BS* |
| Mechanical Engineering | Mechanical Engineering: BS* |

* Engineering programs accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

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.

The undergraduate engineering disciplines listed above provide the education for entry to the engineering profession and for continued academic work toward advanced degrees. Many of our graduates enter graduate programs at Cal Poly or other institutions. 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.

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 Bachelor of Science degree in Computer Science is designed in accordance with the model computer science curricula of the 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.

The master's degree programs in the College 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.

**ADVISING CENTER**  
Stacey Breitenbach, Director  
Computer Science (14), Room 240  
(805) 756-1461  

The College of Engineering Advising Center provides academic advising services to all majors within the College.
of Engineering in conjunction with each student's faculty adviser. The Advising Center is open five days a week, nine hours per day during the quarter.

Faculty Advisers are responsible for providing technical advice. Student course scheduling, course content questions, and career planning are usually done by the faculty advisers. Students seeking information about graduate schools, coop's, and future jobs should contact their faculty adviser. Faculty advisers are assigned by the student's department office upon acceptance into engineering.

The advising services provided by the Advising Center vary by major due to special requests by various department chairs, but the following is true for most majors:

The Advising Center is responsible for providing procedural advice. Academic and administrative progress of all engineering students is done within the Advising Center. Current academic and administrative probation policies are posted in the Advising Center's glass case. (New students should be aware that all engineering students are required to enroll and complete a minimum of two major and/or support courses per quarter with no more than one course per quarter that does not count toward their stated degree.) Most student-related forms (such as curriculum substitution forms, withdrawal forms, and change of major forms) are processed in the Advising Center. Depending on the form and the student's major, the director of the Advising Center has signature authority to sign for the adviser, department chair, and associate dean. Student course scheduling is done in the Advising Center for some engineering majors when time permits. The majority of the general education and breadth questions and interpretation of transfer credit are done in the Advising Center after the Evaluations Office has provided the initial evaluation.

The Advising Center maintains working folders on each student. These folders, in conjunction with SIS+ (which is the student computer accessed database used at Cal Poly), are used for general advising purposes that include: checking progress toward the student's major, monitoring the student's major grade point average, verifying satisfaction of the Graduation Writing Requirement, and pre-graduation completion checks. The Advising Center has past and present flowcharts and curriculum sheets for all engineering majors, major specific technical elective forms, EIT information packets, articulation agreements, and engineering-related pamphlets for student perusal. The Advising Center is able to answer most university, college, or department questions or refer the student to the correct office.

Transfer Students

Attention is directed to the following chart on recommended community college preparation for engineering and computer science 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.
### Recommended Community College Preparation for Engineering and Computer Science Curricula

<table>
<thead>
<tr>
<th>Recommended C.C. Preparation in Terms of Cal Poly Courses</th>
<th>Qtr. Units</th>
<th>Aero</th>
<th>AE</th>
<th>CE</th>
<th>CPE</th>
<th>CSC</th>
<th>EE</th>
<th>ESC</th>
<th>EnvE</th>
<th>IE</th>
<th>MfgE</th>
<th>MatE</th>
<th>ME</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maximum Transfer Units</strong></td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
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<tr>
<td><strong>Mathematics</strong></td>
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<td>MATH 141 Calculus I</td>
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<tr>
<td>MATH 142 Calculus II</td>
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<td>CHEM 125 General Chemistry</td>
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<td>CHEM 129 General Chemistry</td>
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<tr>
<td><strong>Engineering, Computer Science &amp; Supporting Courses</strong></td>
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<tr>
<td>Engineering Drafting</td>
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<td>Courses vary. See appropriate curriculum.</td>
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</table>

**Cal Poly Majors:**

Aero = Aeronautical Engineering  
AE = Agricultural Engineering  
CE = Civil Engineering  
CPE = Computer Engineering  
CSC = Computer Science  
EE = Electrical Engineering  
ESC = Engineering Science  
EnvE = Environmental Engineering  
IE = Industrial Engineering  
MfgE = Manufacturing Engineering  
MatE = Materials Engineering  
ME = Mechanical Engineering
Master of Science in Engineering

M.S. Engineering with Specializations in:
- Biochemical Engineering
- Industrial Engineering
- Materials Engineering
- Mechanical Engineering
- Water Engineering

Joint Programs:
- M.B.A./M.S. Engineering with a Specialization in Engineering Management
- M.C.R.P./M.S. Engineering with a Specialization in Transportation Planning

M.S. in Engineering

General Characteristics
The Master of Science degree 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;
- Allows graduates to maintain currency in their fields.

Prerequisites
For admission as a classified graduate student, an applicant should hold a bachelor's degree in engineering or a closely related physical science with a minimum grade point average of 2.5 in the last 90 quarter units (60 semester units) attempted. Applicants for graduate engineering programs are required to submit scores for the General 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.

Additional information may be obtained from the individual departments in the College of Engineering.

Program of Study
Graduate students must file a formal study plan with their adviser, department, college 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 23 of which must be at the 500 level) with a specialization in one of the following areas: Biochemical Engineering, Industrial Engineering, Materials Engineering, Mechanical Engineering, Water 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 23 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 Engineering Programs
In addition to the M.S. degree in Engineering, the college also offers several other graduate programs: M.S. Aeronautical Engineering, M.S. Civil and Environmental Engineering, M.S. Computer Science, and M.S. Electrical Engineering. Information regarding these programs is listed with the respective department.

Joint Programs
The College of Engineering offers two joint programs: in conjunction with the College of Business, the M.B.A./M.S. Engineering with a specialization in Engineering Management; and with the College of Architecture and Environmental Design (City and Regional Planning Department), the M.C.R.P./M.S. Engineering with a specialization in Transportation Planning. See below for information regarding these joint programs.
M.S. ENGINEERING WITH SPECIALIZATION IN BIOCHEMICAL ENGINEERING

Units

Core Courses ................................................................. 9
Analytical methods for engineering (6)
Advanced mathematics (3)

Required Courses in Specialization ............................... 28
ENGR 599 Design Project (Thesis) (2) (2) (5)
or
9 units of approved technical electives and written
comprehensive examination
Select 19 units from the following:
ME 541 Advanced Thermodynamics (4)
ME 552 Conductive Heat Transfer (3)
ME 553 Convective Heat Transfer (3)
ENGR 421 Mass Transfer Operations (3)
ENGR 581 Biochemical Engineering I (4)
ENGR 582 Biochemical Engineering II (4)
ENGR 583 Biochemical Engineering III (4)

Approved Electives .................................................... 8

45

M.S. ENGINEERING WITH SPECIALIZATION IN MECHANICAL ENGINEERING

Units

Core Courses ................................................................. 9
Analytical methods for engineering
Advanced mathematics

Required Courses in Specialization ............................... 27
ME 599 Design Project (Thesis) (2) (2) (5)
or
9 units of approved technical electives and written
comprehensive examination
Select 18 units 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 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

45
M.S. ENGINEERING WITH SPECIALIZATION IN WATER ENGINEERING

**Units**

**Core Courses** ................................................................. 9
To be selected with approval of the graduate committee
Analytical methods for engineering (6)
Advanced Mathematics

**Required Courses in Specialization** ..................26-27
ECON 410 Public Finance and Cost-Benefit Analysis (4)
AE 435/AE 414/AE 440
AE 533 Irrigation Project Design (4)
CE 533 Advanced Water Resources Engineering (3)
CE 573 Public Works Administration (3)
AE 599/CE 599 (Thesis - 9 units) or 9 units of coursework approved by committee, and written oral comprehensive exams.

**Approved Elective Courses** ........................................... 9-10
To be selected from the following list with committee’s approval:
AE 414 Irrigation Systems (4)
AE 437 Conservation Engineering (3)
AE 440 Agricultural Irrigation Systems (4)
AE 492 Pumps and Pump Drivers (3)
AE 531 Water Wells (3)
CE 434 Groundwater Hydraulics and Hydrology (3)
CE 440 Hydraulic Systems Engineering (3)
CM 533 Case Histories in Construction Management (3)
ENVE 438 Water and Wastewater Treatment Design (3)
ENVE 439 Solid Waste Management (3)
ENVE 535 Advanced Wastewater Treatment (3)
JOINT M.B.A./M.S. ENGINEERING
WITH 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 College of Engineering (Industrial and Manufacturing Engineering Department) and the College of Business. Students are required to have a prerequisite degree in engineering, computer science, or similar technical degree to be admitted to both the College of Engineering and the College 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
Students are encouraged to challenge any of the following first-year GSB courses based on previous work.

Fall ................................................................. 15-16
GSB 511 Financial Accounting (4)
GSB 513 Organization Behavior (4)
GSB 514 Business Government and Society (4)
1 Technical Elective (3-4)

Winter ............................................................ 16
GSB 521 Managerial Accounting (4)
GSB 522 Management Science (4)
GSB 523 Managerial Economics (4)
IME 557 Technological Assessment and Planning (4)

Spring ............................................................. 16
GSB 531 Managerial Finance (4)
GSB 532 Information Systems (4)
GSB 533 Aggregate Economics (4)
GSB 534 Production and Operations Management (4)

Summer .......................................................... 8
GSB 598 Graduate Internship in Business (8)

SECOND YEAR
Students must select from GSB 578, GSB 587, BUS 490, ECON 401, or MKTG 401 to satisfy one of the following four-unit GSB electives.

Fall ........................................................................ 13-15
IME 545 Advanced Topics in Simulation (3)
1 GSB elective or technical elective (3-4)
1 GSB elective (4)
1 Technical elective (3-4)

Winter ..................................................................... 16
GSB 524 Marketing Management (4)
IME 555 Computer Integrated Manufacturing (4)
IME 558 Engineering Decision Making (4)
1 GSB elective (4)

Spring ..................................................................... 15-16
GSB 562 Business Strategy and Policy (4)
IME 556 Technological Project Management (4)
1 GSB elective (4)
1 Technical Elective (3-4)

Summer ............................................................... 8
1 GSB electives (4) (4)

Minimum total units required 107

1 Technical electives to be selected with College of Engineering adviser's approval. GSB electives to be selected with College of Business adviser's approval.
JOINT MCRP/MS ENGINEERING
WITH SPECIALIZATION IN TRANSPORTATION PLANNING

The Transportation Planning Specialization is a joint interdisciplinary program between the College of Engineering and the College of Architecture and Environmental Design. Participation in the program requires enrollment in both Colleges. Participants successfully completing the program will be awarded both the M.C.R.P. and the M.S. in Engineering, each with a Specialization in Transportation Planning.

The major objectives of this joint program are:

(a) To provide an interdisciplinary graduate program which combines elements of transportation planning with city and regional planning to address a need for professionals who have a command of both the technology of transportation planning and the place of transportation within the urban environment. The required master's project is intended to allow the students a period of directed study that will allow them to integrate their work and to apply this to special areas of their choosing.

(b) To provide planners with courses essential to understanding the technologies of transportation planning. To provide engineers with a broad background in urban studies and a knowledge of contemporary environmental issues.

(c) To take advantage of the backgrounds of program participants. The graduate students of both sponsoring departments include both mature professionals returning for advanced degrees and recent graduates with a diversity of specializations.

Prerequisites

Applicants must have satisfactorily completed courses that cover the following or equivalent subject areas:

CE 221 Fundamentals of Transportation Engineering
CE 381 Geotechnical Engineering or GEOG 201 Physical Geology
CSC 251 Digital Computer Applications
ECON 211 Principles of Economics
ENGL 218 Professional Writing: Argumentation & Reports
MATH 143 Calculus
PHYS 131 General Physics
SPC 201 Public Speaking
STAT 321 Statistical Analysis

Applicants for admission to the joint program with a specialization in Transportation Planning 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 results of the Graduate Record Examination (GRE) Aptitude Test to the Admissions Committee.
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 their understanding of and areas of interest in planning, career objectives, and educational objectives.

Applicants lacking prerequisites or other background requirements for classified standing may be admitted on a conditionally classified basis, depending on the results of an individual analysis of their applications.

Core Courses ......................................................... 68

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tr>
<td>CE 523 Transportation System Planning (4)</td>
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<td>CE 528 Transportation Analysis</td>
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<td>CE 525 Airport Planning and Design (4)</td>
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<td>CE 571 Selected Advanced Laboratory (3)</td>
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<td>CE 574 Computer Applications in C.E. (3)</td>
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<td>CE 591 Graduate Seminar (2)</td>
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<td>CE 599 or CRP 599 Project/Thesis (2,2,2)</td>
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<td>CRP 409 Planning Internship (2)</td>
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<td>CRP 420 Planning Law (4)</td>
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<td>CRP 435 Transportation Theory (3)</td>
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<td>CRP 501 Foundations of Cities and Planning</td>
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<td>CRP 510 Planning Theory (4)</td>
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<td>CRP 513 Planning Research Methods (4)</td>
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<td>CRP 515 Presentation and Communication</td>
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<tr>
<td>Techniques for Planners (3)</td>
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<td>CRP 516 Quantitative Methods in Planning</td>
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<td>CRP 518 Policy Analysis for Planners (4)</td>
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<td>CRP 525 Plan Implementation (4)</td>
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<td>CRP 530 Planning Agency Management (3)</td>
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<tr>
<td>CRP 552 Urban Planning Laboratory (4)</td>
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<tr>
<td>CSC, MATH, STAT or other approved quantitative methods course (3)</td>
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Emphasis Area (select one of the following) .............. 14

Urban Land Planning Emphasis

CRP 520 Feasibility Studies in Planning (4)
CRP 548 Principles of City Design (3)
CRP 553 Project Planning Laboratory (4)
Urban Land Planning electives (4)

Regional and Environmental Planning Emphasis

CRP 407 Environmental Law (3)
CRP 545 Environmental Planning, Policies & Principles (4)
CRP 554 Regional Planning and Analysis (4)
Regional and Environmental Planning electives (3)

Approved CE/ENVE electives: .................................. 8

Electives may include: CE 422, 424, 522, 525, 527, 528, 529, 573; ENVE 411, 465

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Units
Faculty

Department Chair, Russell M. Cummings

Daniel J. Biezad
Jon A. Hoffmann
Faysal A. Kolkailah

Ruben Rojas-Oviedo
Jin Tso

American Helicopter Society, 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.

The department supports the concept of international education and encourages students to investigate opportunities for overseas study. For further information, see the Study Abroad programs.

Programs

B.S. Aeronautical Engineering

with Concentrations in:

- Aeronautics
- Astronautics

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.

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, stability and control, and propulsion systems.

The B.S. degree program 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 program there is constant interplay between theory and application. Opportunities are available for advanced elective work in the student's field of special interest.

There are laboratory facilities for fabrication, propulsion, structural test, aerodynamics, dynamics, flight simulation and flight test, and design.

There are three student chapters of the national societies—the American Institute of Aeronautics and Astronautics, the
B.S. AERONAUTICAL ENGINEERING

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser. Courses are displayed by year.

<table>
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<th>Units</th>
<th>Freshman</th>
<th>Sophomore</th>
<th>Junior</th>
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<tr>
<td></td>
<td>AERO 121 Aerospace Fundamentals</td>
<td>AERO 215 Aerospace Engineering Analysis I</td>
<td>AERO 301 Aerothermodynamics</td>
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<tr>
<td>1</td>
<td>ETME 141 Applied Descriptive Geometry</td>
<td>CE 204 Strength of Materials</td>
<td>AERO 302 Aerothermodynamics</td>
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<td>2</td>
<td>IME 122 Manufacturing Survey</td>
<td>CE 205, 206 Strength of Materials and Lab</td>
<td>AERO 303 Aerothermodynamics and</td>
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<tr>
<td>1</td>
<td>BIO 220 Physiology and Biological Adaptation</td>
<td>EE 201, 251 Electric Circuit Theory and Lab</td>
<td>AERO 304 Experi. Aerothermodynamics</td>
</tr>
<tr>
<td>4</td>
<td>CHEM 124 General Chemistry</td>
<td>MATH 211 Engineering Statics</td>
<td>AERO 306 Aerodynamics I</td>
</tr>
<tr>
<td>4</td>
<td>CSC 251 Digital Computer Applications (F.1.)</td>
<td>MATH 212 Engineering Dynamics</td>
<td>AERO 307 Wind Tunnel and Flight Test Laboratory</td>
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<td>2</td>
<td>ENGL 114 Writing: Exposition (A.1.)</td>
<td>PHYS 131 General Physics</td>
<td>AERO 315 Aerospace Engineering Analysis II</td>
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<td>4</td>
<td>ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.)</td>
<td>PHYS 132 General Physics</td>
<td>AERO 320 Fundamentals of Guidance and Control</td>
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<tr>
<td>3</td>
<td>ENGL 218 Professional Writing: Argumentation and Reports (A.4.)</td>
<td>PSY 201/PSY 202 General Psychology</td>
<td>AERO 330 Stress Analysis</td>
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<td>4</td>
<td>MATH 141 Calculus I (B.2.)</td>
<td>PHYS 133 General Physics</td>
<td>EE 321, 361 Electronics and Lab</td>
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<td>MATH 142 Calculus II (B.2.)</td>
<td>PHYS 134 Modern Physics</td>
<td>MATE 206 Materials Engineering</td>
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<tr>
<td>4</td>
<td>MATH 143 Calculus III</td>
<td>AERO 301 Aerothermodynamics</td>
<td>PHIL 230/PHIL 231 Philosophical Classics (C.1.)</td>
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<td>PHYS 131 General Physics (B.1.a.)</td>
<td>AERO 302 Aerothermodynamics</td>
<td>HIST 204 History of American Ideals and Institutions (D.1.)</td>
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<td>PHYS 132 General Physics</td>
<td>AERO 303 Aerothermodynamics</td>
<td>HIST 315 Modern World History (D.2.)</td>
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<td>AERO 306 Aerodynamics</td>
<td>EE 201/ENG 251 Electric Circuit Theory and Lab</td>
<td>POLS 210 American and California Government (D.1.)</td>
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<td>Fine and performing arts elective (C.2.)</td>
<td>MATH 241 Calculus IV</td>
<td>1 ANT/BUS/ECON/ECON/PHIL 231 Philosophical Classics (C.1.)</td>
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**Units:** 51

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<td></td>
<td>AERO 401 Propulsion Systems</td>
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<td>AERO 404 Gas Dynamics</td>
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<td>AERO 420 Stability and Control of Aerospace Vehicles</td>
<td>AERO 420 Stability and Control of Aerospace Vehicles</td>
<td>AERO 420 Stability and Control of Aerospace Vehicles</td>
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<td>AERO 430 Aerospace Structural Analysis</td>
<td>AERO 430 Aerospace Structural Analysis</td>
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<td>AERO 432 Experimental Stress Analysis</td>
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<td>AERO 461 Senior Project</td>
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<td>Required and elective courses to complete concentration</td>
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<td>210</td>
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**Units:** 210

1. To be selected in accordance with the General Education-Breadth and A.B.E.T. requirements. See adviser and page 77 of this catalog.
### B.S. AERONAUTICAL ENGINEERING

Courses are displayed by Major, Support, Concentration, General Education and Breadth, and Electives.

#### MAJOR COURSES

* = Courses satisfy General Education and Breadth requirements.

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<th>Course Title</th>
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<tr>
<td>AERO 215</td>
<td>Aerospace Engineering Analysis I</td>
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<td>AERO 301</td>
<td>Aerothermodynamics</td>
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<td>AERO 306</td>
<td>Aerodynamics I</td>
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<tr>
<td>AERO 307</td>
<td>Wind Tunnel and Flight Test Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>AERO 315</td>
<td>Aerospace Engineering Analysis II</td>
<td>3</td>
</tr>
<tr>
<td>AERO 320</td>
<td>Fundamentals of Guidance and Control</td>
<td>3</td>
</tr>
<tr>
<td>AERO 330</td>
<td>Stress Analysis</td>
<td>4</td>
</tr>
<tr>
<td>AERO 401</td>
<td>Propulsion Systems</td>
<td>3</td>
</tr>
<tr>
<td>AERO 404</td>
<td>Gas Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>AERO 420</td>
<td>Stability and Control of Aerospace Vehicles</td>
<td>4</td>
</tr>
<tr>
<td>AERO 430</td>
<td>Aerospace Structural Analysis</td>
<td>4</td>
</tr>
<tr>
<td>AERO 432</td>
<td>Experimental Stress Analysis</td>
<td>1</td>
</tr>
<tr>
<td>AERO 461</td>
<td>Senior Project</td>
<td>2</td>
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<tr>
<td>AERO 462</td>
<td>Senior Project</td>
<td>3</td>
</tr>
<tr>
<td>CE 204</td>
<td>Strength of Materials</td>
<td>3</td>
</tr>
<tr>
<td>CE 205, 206</td>
<td>Strength of Materials and Lab</td>
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<tr>
<td>EE 201, 251</td>
<td>Electric Circuit Theory and Lab</td>
<td>3,1</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</td>
<td>4</td>
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<tr>
<td>Concentration courses (see below)</td>
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<td><strong>Total</strong></td>
<td><strong>Units</strong></td>
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</table>

#### SUPPORT COURSES

* = Courses satisfy General Education and Breadth requirements.

<table>
<thead>
<tr>
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<th>Course Title</th>
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<tbody>
<tr>
<td>CHEM 124</td>
<td>General Chemistry (B.1.a.)*</td>
<td>4</td>
</tr>
<tr>
<td>CSC 251</td>
<td>Digital Computer Applications (F.1.)*</td>
<td>2</td>
</tr>
<tr>
<td>CSC 311</td>
<td>Numerical Engineering Analysis</td>
<td>4</td>
</tr>
<tr>
<td>EE 321, 361</td>
<td>Electronics and Lab</td>
<td>3,1</td>
</tr>
<tr>
<td>ETME 141</td>
<td>Applied Descriptive Geometry</td>
<td>2</td>
</tr>
<tr>
<td>IME 122</td>
<td>Manufacturing Survey</td>
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<tr>
<td>Manufacturing processes elective, to be selected from IME 141, 142, 143, or IT 141</td>
<td></td>
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<tr>
<td>MATE 206</td>
<td>Materials Engineering</td>
<td>3</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>
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</tr>
<tr>
<td>MATH 143</td>
<td>Calculus III</td>
<td>4</td>
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<tr>
<td>MATH 241</td>
<td>Calculus IV</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>
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<tr>
<td><strong>Total</strong></td>
<td><strong>Units</strong></td>
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</table>

#### GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 9 units must be at the 300–400 level. Additional GEB courses are listed under Major and Support courses.

**Area A**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 114</td>
<td>(A.1.)</td>
<td></td>
</tr>
<tr>
<td>ENGL 125/PHIL 125/SPC 125</td>
<td>(A.2.)</td>
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<tr>
<td>SPC 201/SPC 202</td>
<td>(A.3.)</td>
<td></td>
</tr>
<tr>
<td>ENGL 218</td>
<td>(A.4.)</td>
<td></td>
</tr>
<tr>
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<tr>
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**Area B**

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<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>BIO 220</td>
<td>recommended for B.1.b. and E.2.</td>
<td></td>
</tr>
<tr>
<td>Mathematics/statistics (B.2.)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
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**Area C**

<table>
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<tbody>
<tr>
<td>ENGL 114/PHIL 231</td>
<td>(C.1.)</td>
<td></td>
</tr>
<tr>
<td>Critical reading electives (C.1.)</td>
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<tr>
<td>Fine and performing arts elective (C.2.)</td>
<td></td>
<td></td>
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<tr>
<td>Literature, philosophy, arts elective (300–400 level) (C.3.)</td>
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<tr>
<td>Arts and humanities elective (Area C)</td>
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<td><strong>Total</strong></td>
<td><strong>Units</strong></td>
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**Area D**

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<thead>
<tr>
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<th>Units</th>
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<tbody>
<tr>
<td>HIST 204</td>
<td>(D.1.), POLS 210</td>
<td>(D.1.)</td>
</tr>
<tr>
<td>HIST 315</td>
<td>(D.2.)</td>
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</tr>
<tr>
<td>ECON 201/211/222</td>
<td>(D.3.)</td>
<td></td>
</tr>
<tr>
<td>ANT/BUS/GEOG/PHIL/POLS/SOC/WS elective</td>
<td>(300–400 level) (D.4.a.)</td>
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</tr>
<tr>
<td>ANT/BUS/ECON/PHIL/POLS/SOC/WS elective</td>
<td>(D.4.b.)</td>
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<td><strong>Units</strong></td>
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**Area E**

<table>
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<tbody>
<tr>
<td>PSY 201/PSY 202</td>
<td>(E.1.)</td>
<td></td>
</tr>
<tr>
<td>BIO 220/PSY 210/PSY 304/REC 100</td>
<td>(E.2.)</td>
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<tr>
<td>BIO 220 recommended for E.2. and B.1.b.</td>
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**Area F**

<table>
<thead>
<tr>
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<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>A minimum of 2 units is required; 2 of the units are in Support</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer literacy (F.1.)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>Units</strong></td>
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#### ELECTIVES

<table>
<thead>
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<tr>
<td><strong>Total</strong></td>
<td><strong>Units</strong></td>
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CONCENTRATIONS (select one)

Aeronautics Concentration

<table>
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<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>AERO 405 Aerodynamics II</td>
<td>3</td>
</tr>
<tr>
<td>AERO 443 Flight Vehicle Design</td>
<td>2</td>
</tr>
<tr>
<td>AERO 444 Flight Vehicle Design</td>
<td>4</td>
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<tr>
<td>AERO 445 Flight Vehicle Design</td>
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<tr>
<td>Aeronautics electives</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>25</strong></td>
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Astronautics Concentration

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>AERO 451 Orbital Mechanics I</td>
<td>3</td>
</tr>
<tr>
<td>AERO 447 Spacecraft Design</td>
<td>2</td>
</tr>
<tr>
<td>AERO 448 Spacecraft Design</td>
<td>4</td>
</tr>
<tr>
<td>AERO 449 Spacecraft Design</td>
<td>4</td>
</tr>
<tr>
<td>Astronautics electives</td>
<td>12</td>
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<tr>
<td><strong>Total</strong></td>
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</table>

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

M.S. AERONAUTICAL ENGINEERING

Required Courses .................................................. 25
AERO 520 Theoretical Aerodynamics (3)
AERO 522 Boundary Layer Theory (3)
AERO 535 Advanced Aerospace Structural Analysis (3)
AERO 540 Elements of Rocket Propulsion (3)
AERO 550 Analysis and Design of Flight Control Systems (3)
AERO 590 Graduate Seminar (1)
AERO 599 Design Project (Thesis) (2) (2) (5)

Adviser approved electives ........................................ 9

Advanced Mathematics/Analytical Methods for Engineers ........................................ 11
MATH 501, MATH 502 Methods of Applied Mathematics I and II (4) (4)
AERO 515 Continuum Mechanics (3)

Units

25

45
CIVIL AND ENVIRONMENTAL ENGINEERING DEPARTMENT

Engineering Bldg. (13), Room 263
(805) 756-2947

Faculty

Chair, Edward A. Nowatzki

Alypios E. Chatziioanou
Harold M. Cota
Jay S. DeNatale
Stephen L. M. Hockaday
Carl C. F. Hsieh
Robert J. Lang
Stuart E. Larsen

Kurt C. K. Lo
H. Mallareddy
Sara Moazzami
Robert E. Sennett
S. Somayaji
Edward C. Sullivan
Samuel A. Vigil

Programs

B.S. Civil Engineering
B.S. Environmental Engineering
M.S. Civil and Environmental Engineering

CIVIL ENGINEERING

The Board of Directors of the American Society of Civil Engineers has defined Civil Engineering as "...the profession in which a knowledge of the mathematical and physical 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 progressive well-being of mankind in creating, improving and protecting the environment, in providing facilities for community living, industry and transportation, and in providing structures for the use of mankind."

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, environmental 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.

The Society of Civil Engineers (SCE) student organization sponsors a variety of extracurricular professional development, community service, and social activities to supplement the formal academic program. SCE is made up of chartered student chapters of three different professional organizations: the American Public Works Association (APWA), the American Society of Civil Engineers (ASCE), and the Institute of Transportation Engineers (ITE). SCE is recognized as one of the nation's premiere student chapters.

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, water resources and geotechnical engineering. The problem-oriented approach to instruction, in modern well-equipped laboratories, provides an excellent opportunity to gain understanding and experience. The program 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 Environment 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.
B.S. CIVIL ENGINEERING

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic advisers. Obtain flow chart at department office. Courses listed below are grouped by year.

### Freshman

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>CE 111, CE 112</td>
<td>1,2</td>
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<tr>
<td>CHEM 124</td>
<td>4</td>
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<tr>
<td>CHEM 125</td>
<td>4</td>
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<tr>
<td>ENGL 114 Writing: Exposition</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 125/PHIL 125/SOC 125</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 218 Professional Writing and Reports</td>
<td>4</td>
</tr>
<tr>
<td>CSC 141 Applied Descriptive Geometry</td>
<td>2</td>
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<tr>
<td>MATH 141 Calculus I</td>
<td>4</td>
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<tr>
<td>MATH 142 Calculus II</td>
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<tr>
<td>MATH 143 Calculus III</td>
<td>4</td>
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<tr>
<td>PHYS 131 General Physics</td>
<td>4</td>
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<td>PHYS 132 General Physics</td>
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<td>CSC 251 Digital Computer Applications or CSC 204 C and UNIX</td>
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<td>Critical reading elective (C.1.)</td>
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<tr>
<td>ANT 201/GEOG 150/SOC 105</td>
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### Sophomore

<table>
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<th>Course</th>
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<tbody>
<tr>
<td>CE 204 Strength of Materials</td>
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<tr>
<td>CE 205, 206 Strength of Materials and Lab</td>
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<tr>
<td>CE 221 Fundamentals of Transportation Engineering</td>
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<tr>
<td>CE 259 Civil Engineering Materials</td>
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<tr>
<td>AE 237 Engineering Surveying I</td>
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<tr>
<td>AE 238 Engineering Surveying II</td>
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<tr>
<td>EE 201 Electric Circuits Theory</td>
<td>3</td>
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<td>GEOL 201 Physical Geology</td>
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<td>MATE 206, MATE 241 Materials Engineering and Lab</td>
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<tr>
<td>MATH 241 Calculus IV</td>
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<td>MATH 242 Differential Equations</td>
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<tr>
<td>ME 211 Engineering Statics</td>
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<td>ME 212 Engineering Dynamics</td>
<td>3</td>
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<tr>
<td>ECON 201 Principles of Economics</td>
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<td>PHYS 133 General Physics</td>
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<td>POLS 210 American and California Government</td>
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<tr>
<td>Critical reading elective (C.1.)</td>
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### Junior

<table>
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<tbody>
<tr>
<td>CE 336 Water Resources Engineering</td>
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<tr>
<td>CE 337 Hydraulics Laboratory</td>
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<tr>
<td>CE 352, CE 353 Structural Analysis I and II</td>
<td>3,3</td>
</tr>
<tr>
<td>CE 355 Reinforced Concrete Design</td>
<td>3</td>
</tr>
<tr>
<td>CE 381 Geotechnical Engineering</td>
<td>4</td>
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<tr>
<td>ENVE 331 Introduction to Environmental Engineering</td>
<td>3</td>
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<tr>
<td>ME 302 Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>ME 341 Fluid Mechanics</td>
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<tr>
<td>CSC 331/CSC 332/IME 314</td>
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<tr>
<td>BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.)</td>
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<tr>
<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>
<td>PSY 201/PSY 202 General Psychology (E.1.)</td>
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<tr>
<td>ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300-400 level) (D.4.b.)</td>
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<tr>
<td>PHIL 230/PHIL 231 Philosophical Classics (C.1.)</td>
<td>3</td>
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<td>Fine and performing arts elective (C.2.)</td>
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### Senior

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<td>CE 453 Structural Steel Design</td>
<td>3</td>
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<tr>
<td>CE 407 Structural Dynamics</td>
<td>4</td>
</tr>
<tr>
<td>CE 421 Traffic Engineering or another 400-level transportation course</td>
<td>4</td>
</tr>
<tr>
<td>CE 440 Hydraulic Systems Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CE 454 Structural Design</td>
<td>4</td>
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<tr>
<td>CE 461 Senior Project</td>
<td>2</td>
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<tr>
<td>CE 462 Senior Project</td>
<td>2</td>
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<tr>
<td>CE 481 Analysis and Design of Shallow Foundations</td>
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<tr>
<td>ENVE 438 Water and Wastewater Treatment Design</td>
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<tr>
<td>SPC 201 Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</td>
<td>3</td>
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<tr>
<td>STAT 312 Statistical Methods for Engineers (B.2.)</td>
<td>3</td>
</tr>
<tr>
<td>Literature, philosophy, arts elective (300-400 level) (C.3.)</td>
<td>3</td>
</tr>
<tr>
<td>Adviser approved technical electives</td>
<td>12</td>
</tr>
</tbody>
</table>

---

1 To be selected in accordance with the General Education-Breadth and A.B.E.T. requirements. (Please see page 77 of this catalog.)
# B.S. CIVIL ENGINEERING

Courses are displayed by Major, Support, General Education and Breadth, and Electives.

## MAJOR COURSES

<table>
<thead>
<tr>
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<th>Course Title</th>
<th>Units</th>
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<tr>
<td>CE 111, CE 112</td>
<td>Civil Engineering Fundamentals I, II</td>
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<tr>
<td>CE 204</td>
<td>Strength of Materials</td>
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<td>CE 205, CE 206</td>
<td>Strength of Materials and Lab</td>
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<td>CE 221</td>
<td>Fundamentals of Transportation Engineering</td>
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<td>CE 259</td>
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<td>CE 336</td>
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<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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<tr>
<td>CE 355</td>
<td>Reinforced Concrete Design</td>
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<td>CE 381</td>
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<td>CE 407</td>
<td>Structural Dynamics</td>
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<td>CE 421</td>
<td>Traffic Engineering or another 400-level transportation course</td>
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<td>CE 440</td>
<td>Hydraulic Systems Engineering</td>
<td>3</td>
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<tr>
<td>CE 453</td>
<td>Structural Steel Design</td>
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<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 481</td>
<td>Analysis and Design of Shallow Foundations</td>
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<tr>
<td>Adviser approved technical electives</td>
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## SUPPORT COURSES

* = Courses satisfy General Education and Breadth requirements

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<td>Engineering Surveying I</td>
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<td>AE 238</td>
<td>Engineering Surveying II</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>CSC 251</td>
<td>Digital Computer Applications or CSC 204 C and UNIX (F.1.)*</td>
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<td>CSC 331/CSC 332/ME 314</td>
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<td>EE 201</td>
<td>Electric Circuits Theory</td>
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<td>ENVE 331</td>
<td>Introduction to Environmental Engineering</td>
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<td>ENVE 438</td>
<td>Water and Wastewater Treatment Design</td>
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<td>ETME 141</td>
<td>Applied Descriptive Geometry</td>
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<td>GEOL 201</td>
<td>Physical Geology</td>
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<td>MATE 206, MATE 241</td>
<td>Materials Engineering and Lab</td>
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<td>MATH 141</td>
<td>Calculus I (B.2.)*</td>
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<td>Calculus III</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>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</td>
<td>3</td>
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<td>ME 341</td>
<td>Fluid Mechanics</td>
<td>3</td>
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<tr>
<td>PHYS 131</td>
<td>General Physics (B.1.a.)*</td>
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</table>

- PHYS 132 General Physics ........................................ 4
- PHYS 133 General Physics ........................................ 4
- STAT 312 Statistical Methods for Engineers ................. 3

## GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 9 units must be at the 300–400 level. Additional GEB courses are listed under Major and Support courses.

### Area A:

- ENGL 114 (A.1.)
- ENGL 125/PHIL 125/SPC 125 (A.2.)
- SPC 201/SPC 202 (A.3.)
- ENGL 215/ENGL 218 (A.4.)
- ENGL 218 recommended

### Area B:

- A minimum of 18 units is required; 16 of the units are in Support
- Physical science (B.1.a.)* see Major and Support Courses
- Life science (B.1.b.)
  - BIO 220 recommended for B.1.b and E.2.
- Mathematics/statistics (B.2.)* see Support Courses

### Area C:

- PHIL 230/PHIL 231 (C.1.)
- Critical reading electives (C.1.)
- Fine and performing arts elective (C.2.)
- Literature, philosophy, arts elective (300–400 level) (C.3.)

- Arts and humanities elective (Area C)

### Area D:

- HIST 204 (D.1.), POLS 210 (D.1.)
- HIST 315 (D.2.)
- ECON 201/211/222 (D.3.)
- ECON 201 recommended.
- ANT 201/GEOG 150/SOC 105 (D.4.a.)
- ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)

### Area E:

- PSY 201/PSY 202 (E.1.)
- BIO 220 recommended for E.2. and B.1.b.

### Area F:

- A minimum of 2 units is required; 2 of the units are in Support
- Computer literacy (F.1.)* see Support Courses
- A minimum of 75 units is required; 18 of the units are in Support

## ELECTIVES

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<tr>
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<th>Units</th>
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<tbody>
<tr>
<td></td>
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<td>210</td>
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</table>
**B.S. ENVIRONMENTAL ENGINEERING**

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser. Obtain flow chart at department office. Courses listed below are grouped by year.

### Freshman

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>CE 112 Civil Engineering Fundamentals II.</td>
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<tr>
<td>ETME 141 Applied Descriptive Geometry</td>
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<tr>
<td>BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.)</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>
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<tr>
<td>CHEM 129 General Chemistry</td>
<td>4</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>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>PHYS 131 General Physics (B.1.a.)</td>
<td>4</td>
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<tr>
<td>PHYS 132 General Physics</td>
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<tr>
<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
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**Total Units:** 50

### Sophomore

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<tr>
<td>CE 204 Strength of Materials</td>
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</tr>
<tr>
<td>CE 205 Strength of Materials</td>
<td>3</td>
</tr>
<tr>
<td>CE 221 Fundamentals of Transportation Engineering</td>
<td>4</td>
</tr>
<tr>
<td>ME 211 Engineering Statics</td>
<td>3</td>
</tr>
<tr>
<td>ME 212 Engineering Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>ME 302 Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 326 Survey of Organic Chemistry</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>PHYS 133 General Physics</td>
<td>4</td>
</tr>
<tr>
<td>CSC 251 Digital Computer Applications or</td>
<td></td>
</tr>
<tr>
<td>CSC 204 C and UNIX (F.1.)</td>
<td>2</td>
</tr>
<tr>
<td>ECON 211 Principles of Economics (D.3.)</td>
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<tr>
<td>ENGL 218 Professional Writing: Argumentation and Reports (A.4.)</td>
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<tr>
<td>POLS 210 American and California</td>
<td>3</td>
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<tr>
<td>Government (D.1.)</td>
<td>3</td>
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<tr>
<td>STAT 312 Statistical Methods for Engineers (B.2.)</td>
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*Critical reading elective (C.1.): 3*

**Total Units:** 54

### Senior

<table>
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<th>Course</th>
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<tbody>
<tr>
<td>CE 434 Groundwater Hydraulics and Hydrology</td>
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</tr>
<tr>
<td>CE 440 Hydraulic Systems Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 411 Air Pollution Control</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 421 Mass Transfer Operations</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 434 Water Quality Measurements</td>
<td>2</td>
</tr>
<tr>
<td>ENVE 436 Introduction to Hazardous Waste Management</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 438 Water and Wastewater Treatment Design</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 439 Solid Waste Management</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 442 Advanced System Design</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 461, ENVE 462 Senior Project</td>
<td>2,2</td>
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<tr>
<td>HIST 315 Modern World History (D.2.)</td>
<td>3</td>
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<tr>
<td>ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300-400 level) (D.4.b.)</td>
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<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>
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<tr>
<td>Approved technical electives</td>
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</table>

**Total Units:** 210

1. To be selected in accordance with the General Education-Breadth requirements. (Please see page 77 of this catalog.)

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Civil Engineering, Environmental Engineering, and other subjects.
## B.S. ENVIRONMENTAL ENGINEERING

Courses are displayed by Major, Support, General Education and Breadth, and Electives.

### MAJOR COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>CE 112</td>
<td>Civil Engineering Fundamentals II</td>
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<tr>
<td>CE 204</td>
<td>Strength of Materials</td>
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<tr>
<td>CE 205</td>
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<td>2</td>
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<tr>
<td>CE 221</td>
<td>Fundamentals of Transportation Engineering</td>
<td>4</td>
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<tr>
<td>CE 336</td>
<td>Water Resources Engineering</td>
<td>4</td>
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<tr>
<td>CE 337</td>
<td>Hydraulics Laboratory</td>
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<tr>
<td>CE 381</td>
<td>Geotechnical Engineering</td>
<td>4</td>
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<tr>
<td>CE 434</td>
<td>Groundwater Hydraulics and Hydrology</td>
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<tr>
<td>CE 440</td>
<td>Hydraulic Systems Engineering</td>
<td>3</td>
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<tr>
<td>ENVE 304</td>
<td>Thermodynamics of Processes</td>
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<tr>
<td>ENVE 309</td>
<td>Noise and Vibration Control</td>
<td>3</td>
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<tr>
<td>ENVE 316</td>
<td>Automatic Process Control</td>
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<tr>
<td>ENVE 325</td>
<td>Environmental Air Quality</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>ENVE 411</td>
<td>Air Pollution Control</td>
<td>3</td>
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<td>ENVE 421</td>
<td>Mass Transfer Operations</td>
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<td>ENVE 426</td>
<td>Air Quality Measurements</td>
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<td>ENVE 434</td>
<td>Water Quality Measurements</td>
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<tr>
<td>ENVE 436</td>
<td>Introduction to Hazardous Waste Management</td>
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<tr>
<td>ENVE 438</td>
<td>Water and Wastewater Treatment Design</td>
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<td>ENVE 439</td>
<td>Solid Waste Management</td>
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<td>ENVE 442</td>
<td>Advanced System Design</td>
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<tr>
<td>ENVE 461, ENVE 462</td>
<td>Senior Project</td>
<td>2,2</td>
</tr>
<tr>
<td>Approved technical electives</td>
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### SUPPORT COURSES

* = Courses satisfy General Education and Breadth requirements.

<table>
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<tr>
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<th>Course Title</th>
<th>Units</th>
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<tbody>
<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>CHEM 129</td>
<td>General Chemistry</td>
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<tr>
<td>CHEM 326</td>
<td>Survey of Organic Chemistry</td>
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<td>CSC 251</td>
<td>Digital Computer Applications or CSC 204 C and UNIX (F.1.)*</td>
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<td>EE 201</td>
<td>Electric Circuit Theory</td>
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<td>ETME 141</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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<tr>
<td>ME 302</td>
<td>Thermodynamics</td>
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<tr>
<td>ME 313</td>
<td>Heat Transfer</td>
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<tr>
<td>ME 341</td>
<td>Fluid Mechanics</td>
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<tr>
<td>PHYS 131</td>
<td>General Physics (B.1.a.)*</td>
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<tr>
<td>PHYS 132</td>
<td>General Physics</td>
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<tr>
<td>STAT 312</td>
<td>Statistical Methods for Engineers</td>
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<tr>
<td>PHYS 133</td>
<td>General Physics</td>
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</table>

### GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 9 units must be at the 300–400 level. Additional GEB courses are listed under Major and Support courses.

Area A: ENGL 114 (A.1.)

Area B: A minimum of 18 units is required; 16 of the units are in Major and Support

Area C: Physical science (B.1.a.)* see Major and Support Courses

Area D: Critical reading electives (C.1.)

Area E: Computer literacy (F.1.)* see Support Courses

### ELECTIVES

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<thead>
<tr>
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<th>Units</th>
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<td>STAT 312</td>
<td>Statistical Methods for Engineers</td>
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<td>SPC 201/SPC 202 (A.3.)</td>
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<td>ENGL 215/ENGL 218 (A.4.) ENGL 218 recommended</td>
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<td>BIO 220 recommended for B.1.b and E.2.</td>
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<tr>
<td>Mathematics/statistics (B.2.)* see Support Courses</td>
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<tr>
<td>Area F: HIST 204 (D.1.), POLS 210 (D.1.)</td>
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<td>HIST 315 (D.2.)</td>
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<td>ECON 201/211/222 (D.3.) ECON 201 recommended</td>
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<tr>
<td>Area E: PSY 201/PSY 202 (E.1.)</td>
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<tr>
<td>BIO 220 recommended for E.2. and B.1.b.</td>
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</tr>
<tr>
<td>Computer literacy (F.1.)* see Support Courses</td>
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</tr>
<tr>
<td>Area E: A minimum of 75 units is required; 18 of the units are in Support</td>
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<tr>
<td>ELECTIVES</td>
<td></td>
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</tbody>
</table>
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, college 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 14 units as required;
b) a minimum of 22 units of adviser approved electives within the major;
c) a minimum of 9 units of adviser-approved electives outside the major;
d) at least 24 units of the 45 unit program at the 500 level; and
e) a comprehensive written examination (course work option) or an oral defense examination (thesis option).

Two program options are available for M.S. in Civil and Environmental Engineering students. The thesis option involves 36 units of adviser-approved coursework, 9 units of CE 599 thesis research/design, and an oral thesis defense examination administered by a panel of three faculty. The non-thesis option involves 45 units of adviser-approved coursework and a written comprehensive examination administered by a panel of three faculty. A student will have a maximum of three opportunities to pass this written comprehensive examination.
CURRICULUM FOR M.S. CIVIL AND ENVIRONMENTAL ENGINEERING

<table>
<thead>
<tr>
<th>Required Courses</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 574 Computer Applications in Civil Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CE 591 Graduate Seminar</td>
<td>2</td>
</tr>
<tr>
<td>CE 599/ENVE 599 Design Project (Thesis) or additional 9 units of adviser approved analysis and design electives within the major (non-thesis option) and Comprehensive Examination.</td>
<td>22</td>
</tr>
</tbody>
</table>

Adviser approved analysis and design CE and ENVE electives (to be selected from the following list after consultation with your academic adviser and the CE/ENVE graduate coordinator):

<table>
<thead>
<tr>
<th>Analysis and design CE and ENVE electives:</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 405 Advanced Strength of Materials</td>
</tr>
<tr>
<td>CE 407 Structural Dynamics</td>
</tr>
<tr>
<td>CE 421 Traffic Engineering</td>
</tr>
<tr>
<td>CE 422 Highway Geometrics and Design</td>
</tr>
<tr>
<td>CE 424 Public Transportation</td>
</tr>
<tr>
<td>CE 431 Coastal Hydraulics</td>
</tr>
<tr>
<td>CE 434 Ground Water Hydraulics and Hydrology</td>
</tr>
<tr>
<td>CE 440 Hydraulic Systems Engineering</td>
</tr>
<tr>
<td>CE 453 Structural Steel Design</td>
</tr>
<tr>
<td>CE 454 Structural Design</td>
</tr>
<tr>
<td>CE 481 Analysis &amp; Design of Shallow Foundations</td>
</tr>
<tr>
<td>CE 521 Airfield and Highway Pavement Design</td>
</tr>
<tr>
<td>CE 522 Advanced Transportation Design</td>
</tr>
<tr>
<td>CE 523 Transportation Systems Planning</td>
</tr>
<tr>
<td>CE 525 Airport Planning and Design</td>
</tr>
<tr>
<td>CE 527 Traffic Engineering - Operations and Controls</td>
</tr>
<tr>
<td>CE 528 Transportation Analysis</td>
</tr>
<tr>
<td>CE 529 Modeling and Simulation in Transportation</td>
</tr>
<tr>
<td>CE 533 Advanced Water Resources Engineering</td>
</tr>
<tr>
<td>CE 554 Matrix Analysis of Structures</td>
</tr>
<tr>
<td>CE 555 Advanced Civil Engineering Materials Laboratory</td>
</tr>
<tr>
<td>CE 558 Introduction to Finite Element Analysis</td>
</tr>
<tr>
<td>CE 559 Advanced Structural Design</td>
</tr>
<tr>
<td>CE 571 Selected Advanced Laboratory</td>
</tr>
<tr>
<td>CE 573 Public Works Administration</td>
</tr>
<tr>
<td>CE 581 Advanced Geotechnical Engineering</td>
</tr>
<tr>
<td>CE 582 Advanced Geotechnical Testing</td>
</tr>
<tr>
<td>CE 583 Soil Dynamics</td>
</tr>
<tr>
<td>CE 584 Lateral Support Systems</td>
</tr>
<tr>
<td>CE 585 Slope Stability Analysis</td>
</tr>
<tr>
<td>CE 587 Analysis and Design of Deep Foundations</td>
</tr>
</tbody>
</table>

CE 599 Design Project Thesis | 9 |
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 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 | 3 |
ENVE 551 Environmental Unit Operations | 4 |

Adviser approved analysis electives outside the major (to be selected after consultation with your academic adviser and the CE/ENVE Graduate Coordinator):
COMPUTER ENGINEERING PROGRAM

College of Engineering Advising Center,  
Computer Science Building (14), Room 240  
(805) 756-1461

Faculty

Director, James G. Harris

James L. Beug  
Joseph Grimes  
John Hsu  
C. Arthur MacCarley

Wayne E. McMorran  
S. Ronald Oliver  
Clinton A. Staley  
Daniel J. Stearns

Program

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 with an emphasis on integrating hardware and software systems.

The program offers a firm foundation in both electrical engineering and computer science. This balanced background allows the graduate to make intelligent decisions in the area of the definition and design of systems, hardware and software, and the trade-offs among these components of design.

This integrated approach will allow students 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 enables the graduate to apply these machines to such diverse fields as robotics and data acquisition. Twelve units of technical electives allow the student to specialize in an area of special interest to the student and of expertise of the faculty.

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. Students will be exposed to the wide variety of computing equipment that is available on the campus: microprocessor development systems, networks of personal computers and workstations, minicomputers, and mainframes.

Active student groups of interest to computer engineering majors include the Association for Computing Machinery, the IEEE Computer Society, and the IEEE Robotics Society.
### B.S. COMPUTER ENGINEERING

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser. Courses are displayed by year.

#### Freshman

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>EE 112</td>
<td>Electric Circuit Analysis I</td>
<td>2</td>
</tr>
<tr>
<td>CSC 118</td>
<td>Fundamentals of Computer Science I</td>
<td>4</td>
</tr>
<tr>
<td>CSC 218</td>
<td>Fundamentals of Computer Science II</td>
<td>3</td>
</tr>
<tr>
<td>CPE 219</td>
<td>259 Logic and Switching Circuits and Lab.</td>
<td>3.1</td>
</tr>
<tr>
<td>ANT 201</td>
<td>GEOG 150/SOC 105 (D.4.a.)</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 124</td>
<td>General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 114</td>
<td>Writing: Exposition</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 125</td>
<td>PHIL 125/SPC 125 Critical Thinking (A.2.)</td>
<td>3</td>
</tr>
<tr>
<td>MATH 141</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 142</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 131</td>
<td>General Physics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 133</td>
<td>General Physics</td>
<td>4</td>
</tr>
</tbody>
</table>

#### Sophomore

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPE 215</td>
<td>Computer Architecture I</td>
<td>4</td>
</tr>
<tr>
<td>CSC 245</td>
<td>Discrete Structures</td>
<td>3</td>
</tr>
<tr>
<td>CSC 345</td>
<td>Data Structures</td>
<td>3</td>
</tr>
<tr>
<td>EE 211, 241</td>
<td>Electric Circuit Analysis II and Lab</td>
<td>3.1</td>
</tr>
<tr>
<td>EE 212, 242</td>
<td>Electric Circuit Analysis III and Lab</td>
<td>3.1</td>
</tr>
<tr>
<td>EE 208, 248</td>
<td>Electronic Devices and Lab</td>
<td>3.1</td>
</tr>
<tr>
<td>MATH 241</td>
<td>Calculus IV</td>
<td>4</td>
</tr>
<tr>
<td>MATH 242</td>
<td>Differential Equations</td>
<td>4</td>
</tr>
<tr>
<td>MATH 317</td>
<td>Topics in Engineering Mathematics</td>
<td>4</td>
</tr>
<tr>
<td>ME 211</td>
<td>Engineering Statics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 132</td>
<td>General Physics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 211</td>
<td>Modern Physics</td>
<td>4</td>
</tr>
<tr>
<td>POLS 210</td>
<td>American and California Government (D.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 312</td>
<td>Statistical Methods for Engineers</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Junior

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>CSC 240</td>
<td>Programming Environments I</td>
<td>3</td>
</tr>
<tr>
<td>CPE 315</td>
<td>Computer Architecture II</td>
<td>4</td>
</tr>
<tr>
<td>CSC 351</td>
<td>Programming Languages I: Design</td>
<td>3</td>
</tr>
<tr>
<td>EE 301, 341</td>
<td>Linear Systems Analysis and Lab</td>
<td>3.1</td>
</tr>
<tr>
<td>EE 302, 342</td>
<td>Linear Control Systems and Lab</td>
<td>3.1</td>
</tr>
</tbody>
</table>

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

#### Senior

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPE 461</td>
<td>Senior Project</td>
<td>3</td>
</tr>
<tr>
<td>CPE 462</td>
<td>Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>CPE 463</td>
<td>Undergraduate Seminar</td>
<td>1</td>
</tr>
<tr>
<td>CPE 316</td>
<td>Computer Architecture III</td>
<td>4</td>
</tr>
<tr>
<td>CPE 404</td>
<td>Computer Networks</td>
<td>4</td>
</tr>
<tr>
<td>CSC 440</td>
<td>Software Engineering I</td>
<td>3</td>
</tr>
<tr>
<td>CSC 450</td>
<td>Programming Languages II: Description and Analysis</td>
<td>4</td>
</tr>
<tr>
<td>CSC 453</td>
<td>Introduction to Operating Systems</td>
<td>4</td>
</tr>
<tr>
<td>CPE 406</td>
<td>Microprocessor System Design Methodologies</td>
<td>3</td>
</tr>
<tr>
<td>CPE 446</td>
<td>Microprocessor Interfacing Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>HIST 315</td>
<td>Modern World History (D.2.)</td>
<td>3</td>
</tr>
<tr>
<td>PHIL 230</td>
<td>PHIL 231 Philosophical Classics (C.1.)</td>
<td>3</td>
</tr>
<tr>
<td>ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300-400 level) (D.4.b.)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Fine and performing arts elective (C.2.)</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>Adviser approved technical electives</td>
<td>6</td>
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</tr>
</tbody>
</table>

1 To be selected in accordance with the General Education-Breadth requirements. (Please see page 77 of this catalog.)
## B.S. COMPUTER ENGINEERING

Courses are displayed by Major, Support, General Education and Breadth, and Electives.

### MAJOR COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 112</td>
<td>Electric Circuit Analysis I</td>
<td>2</td>
</tr>
<tr>
<td>CSC 118</td>
<td>Fundamentals of Computer Science I (F.1)</td>
<td>4</td>
</tr>
<tr>
<td>EE 208, 248</td>
<td>Electronic Devices and Lab</td>
<td>3,1</td>
</tr>
<tr>
<td>EE 211, 241</td>
<td>Electric Circuit Analysis II and Lab</td>
<td>3,1</td>
</tr>
<tr>
<td>EE 212, 242</td>
<td>Electric Circuit Analysis III and Lab</td>
<td>3,1</td>
</tr>
<tr>
<td>CPE 215</td>
<td>Computer Architecture I</td>
<td>4</td>
</tr>
<tr>
<td>CSC 218</td>
<td>Fundamentals of Computer Science II</td>
<td>3</td>
</tr>
<tr>
<td>CPE 219, 259</td>
<td>Logic and Switching Circuits and Lab</td>
<td>3,1</td>
</tr>
<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>EE 301, 341</td>
<td>Linear Systems Analysis and Lab</td>
<td>3,1</td>
</tr>
<tr>
<td>EE 302, 342</td>
<td>Linear Control Systems and Lab</td>
<td>3,1</td>
</tr>
<tr>
<td>EE 307, 347</td>
<td>Digital Integrated Electronics and Lab</td>
<td>3,1</td>
</tr>
<tr>
<td>CPE 315</td>
<td>Computer Architecture II</td>
<td>4</td>
</tr>
<tr>
<td>CPE 316</td>
<td>Computer Architecture III</td>
<td>4</td>
</tr>
<tr>
<td>CPE 319, 359</td>
<td>Digital System Design and Lab</td>
<td>3,1</td>
</tr>
<tr>
<td>CSC 345</td>
<td>Data Structures</td>
<td>3</td>
</tr>
<tr>
<td>CSC 351</td>
<td>Programming Languages I: Design</td>
<td>3</td>
</tr>
<tr>
<td>CPE 404</td>
<td>Computer Networks</td>
<td>4</td>
</tr>
<tr>
<td>CPE 406</td>
<td>Microprocessor System Design</td>
<td>3</td>
</tr>
<tr>
<td>CSC 440</td>
<td>Software Engineering I</td>
<td>3</td>
</tr>
<tr>
<td>CPE 446</td>
<td>Microprocessor Interfacing Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>CSC 450</td>
<td>Programming Languages II: Description and Analysis</td>
<td>4</td>
</tr>
<tr>
<td>CSC 453</td>
<td>Introduction to Operating Systems</td>
<td>4</td>
</tr>
<tr>
<td>CPE 461</td>
<td>Senior Project</td>
<td>3</td>
</tr>
<tr>
<td>CPE 462</td>
<td>Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>CPE 463</td>
<td>Undergraduate Seminar</td>
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<tr>
<td>Adviser approved technical electives</td>
<td>12</td>
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</tr>
</tbody>
</table>

### SUPPORT COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 124</td>
<td>General Chemistry (B.1.a)</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</td>
<td>4</td>
</tr>
<tr>
<td>MATH 241</td>
<td>Calculus IV</td>
<td>4</td>
</tr>
<tr>
<td>MATH 242</td>
<td>Differential Equations</td>
<td>4</td>
</tr>
<tr>
<td>MATH 317</td>
<td>Topics in Engineering Mathematics</td>
<td>4</td>
</tr>
<tr>
<td>ME 211</td>
<td>Engineering Statics</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</td>
<td>4</td>
</tr>
</tbody>
</table>

**Units**

- MAJOR COURSES: 102
- SUPPORT COURSES: 102
- GENERAL EDUCATION AND BREADTH: 50
- ELECTIVES: 209

### GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 9 units must be at the 300-400 level. Additional GEB courses are listed under Major and Support Courses.

**Area A**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>ENGL 114</td>
<td>(A.1.)</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 125/PHIL 125/SPC 125 (A.2.)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>SPC 201/SPC 202 (A.3.)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>ENGL 215/216 (A.4.)</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

**Area B**

A minimum of 18 units is required; 16 of the units are in Support.

**Area C**

- Physical science (B.1.a.) see Support Courses
- Life science (B.1.b.)
  - BIO 220 recommended for B.1.a. and B.2.
- Mathematics/statistics* see Support Courses

**Area D**

- Critical reading electives (C.1.)
- Fine and performing arts elective (C.2.)
- Literature, philosophy, arts elective (300-400 level) (C.3.)
- Arts and humanities elective (Area C)

**Area E**

- Computer literacy (F.1.) see Major Courses

**Total**

A minimum of 75 units is required; 18 of the units are in Major and Support.
COMPUTER SCIENCE DEPARTMENT

Computer Science Advising Center,
Engineering East Bldg. (20), Room 215
(805) 756-1461

Faculty

Department Chair, James L. Beug

Emile E. Attala               Elmo A. Keller
Raymond E. Boche             Sham S. Luthra
Lois H. Brady                 Leonard D. Myers
W. Chris Buckalew            S. Ronald Oliver
Laurian M. Chirica           Cornel K. Pokorny
John B. Connelly             Clinton A. Staley
Charles H. Dana              Daniel J. Stearns
Gene Fisher                   Daniel F. Stubbs
Joseph E. Grimes             Patrick O. Wheatley
John Y. Hsu

Programs

B.S. Computer Science

B.S. Computer Engineering

M.S. Computer Science

Computer Science Minor

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 program 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.

Grades 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 mini-computers in a time-sharing environment as well as workstations, and a variety of micro-computers. 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 advanced workstations, mini- and micro-computers, and a parallel computer. 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 this program, please refer to Computer Engineering. This program is jointly administered by the Computer Science Department and the Electronic and Electrical Engineering Department.
# B.S. COMPUTER SCIENCE

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser. Courses are displayed by year.

<table>
<thead>
<tr>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>49</td>
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</table>

## Freshman

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>CSC 118 Fundamentals of Computer Science I (F.1.)</td>
<td>4</td>
</tr>
<tr>
<td>CSC 218 Fundamentals of Computer Science II</td>
<td>3</td>
</tr>
<tr>
<td>CSC 215 Computer Architecture I</td>
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<tr>
<td>CHEM 124 General Chemistry</td>
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<tr>
<td>EE 219, 259 Logic and Switching Circuits and Lab</td>
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<td>ENGL 114 Writing: Exposition (A.1.)</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 141 Calculus I</td>
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<tr>
<td>MATH 142 Calculus II (B.2.)</td>
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<tr>
<td>MATH 143 Calculus III</td>
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<td>SPC 201 Public Speaking or SPC 202 Principles of Speech Communication (A.3.)</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>CSC 240 Programming Environments I</td>
<td>3</td>
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<tr>
<td>CSC 245 Discrete Structures</td>
<td>3</td>
</tr>
<tr>
<td>CPE 315 Computer Architecture II</td>
<td>4</td>
</tr>
<tr>
<td>CSC 332 Numerical Analysis I or CSC 349 Theory and Analysis of Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>CSC 345 Data Structures</td>
<td>3</td>
</tr>
<tr>
<td>CSC 346 File Structures</td>
<td>3</td>
</tr>
<tr>
<td>2 MATH 206 Linear Algebra I</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 215 Writing: Argumentation or ENGL 218 Professional 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>
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<tr>
<td>PHYS 131 General Physics (B.1.a.)</td>
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<tr>
<td>PHYS 132 General Physics</td>
<td>4</td>
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<tr>
<td>PHYS 133 General Physics (B.1.a.)</td>
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<tr>
<td>POLS 210 American and California Govt. (D.1.)</td>
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<tr>
<td>1 Fine and performing arts elective (C.2.)</td>
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## Junior

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>CSC 347 Introduction to Database Systems</td>
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</tr>
<tr>
<td>CSC 351 Programming Languages I: Design</td>
<td>3</td>
</tr>
<tr>
<td>CSC 440 Software Engineering I</td>
<td>3</td>
</tr>
<tr>
<td>CSC 441 Software Engineering II</td>
<td>3</td>
</tr>
<tr>
<td>CSC 445 Theory of Computing I</td>
<td>3</td>
</tr>
<tr>
<td>CSC 453 Introduction to Operating Systems</td>
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<tr>
<td>BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.)</td>
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<tr>
<td>ECON 201/ECON 211/ECON 222 (D.3.)</td>
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<td>HIST 315 Modern World History (D.2.)</td>
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<tr>
<td>PHIL 230/PHIL 231 Philosophical Classics (C.1.)</td>
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<tr>
<td>STAT 321, STAT 322 Statistical Analysis I, II (B.2.)</td>
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<tr>
<td>1 Critical reading electives (C.1.)</td>
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## Senior

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>CSC 404 Computer Networks</td>
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<tr>
<td>CSC 450 Programming Languages II: Description and Analysis</td>
<td>4</td>
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<tr>
<td>CSC 451 Programming Languages III: Compiler Implementation</td>
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<tr>
<td>CSC 461 Senior Project</td>
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<td>CSC 462 Senior Project</td>
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<tr>
<td>CSC 463 Undergraduate Seminar</td>
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<td>PSY 201/PSY 202 General Psychology (E.1.)</td>
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<td>1 ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300-400 level) (D.4.b.)</td>
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<tr>
<td>1 Arts and humanities elective (Area C)</td>
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<tr>
<td>1 Literature, philosophy, arts electives (300-400 level) (C.3.)</td>
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<tr>
<td>Adviser approved technical electives</td>
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<td>Electives</td>
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<tr>
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<td>47</td>
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</tbody>
</table>

1 To be selected in accordance with the General Education-Breadth requirements. (Please see page 77 of this catalog.)

2 As an alternative to MATH 206, students may select MATH 241 and MATH 242 thereby decreasing free electives by 4 units.
## B.S. COMPUTER SCIENCE

Courses are displayed by Major, Support, General Education and Breadth, and Electives.

### MAJOR COURSES

* = Courses satisfy General Education and Breadth requirements.

<table>
<thead>
<tr>
<th>Course Code</th>
<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>
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<td>CSC 215</td>
<td>Computer Architecture I</td>
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<tr>
<td>CSC 218</td>
<td>Fundamentals of Computer Science II</td>
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<td>CSC 240</td>
<td>Programming Environments I</td>
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<td>CSC 245</td>
<td>Discrete Structures</td>
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<td>CPE 315</td>
<td>Computer Architecture II</td>
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<tr>
<td>CSC 332</td>
<td>Numerical Analysis I or</td>
<td></td>
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<tr>
<td></td>
<td>CSC 349 Theory and Analysis of Algorithms</td>
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<td>CSC 345</td>
<td>Data Structures</td>
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<tr>
<td>CSC 346</td>
<td>File Structures</td>
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<tr>
<td>CSC 347</td>
<td>Introduction to Database Systems</td>
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<tr>
<td>CSC 351</td>
<td>Programming Languages I: Design</td>
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<tr>
<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 441</td>
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<td>CSC 445</td>
<td>Theory of Computing I</td>
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<tr>
<td>CSC 450</td>
<td>Programming Languages II: Description</td>
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<td></td>
<td>and Analysis</td>
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<tr>
<td>CSC 451</td>
<td>Programming Languages III: Compiler</td>
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<tr>
<td></td>
<td>Implementation</td>
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<tr>
<td>CSC 453</td>
<td>Introduction to Operating Systems</td>
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<tr>
<td>CSC 461</td>
<td>Senior Project</td>
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<td>CSC 462</td>
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<tr>
<td>CSC 463</td>
<td>Undergraduate Seminar</td>
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<tr>
<td>EE 219</td>
<td>Logic and Switching Circuits</td>
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<td>EE 259</td>
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<tr>
<td>Adviser approved technical electives</td>
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### SUPPORT COURSES

* = Courses satisfy General Education and Breadth requirements.

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<td>MATH 141</td>
<td>Calculus I</td>
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<td>Calculus II (B.2.)*</td>
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<td>MATH 143</td>
<td>Calculus III</td>
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<td>1 MATH 206</td>
<td>Linear Algebra I</td>
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<tr>
<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>PHYS 133</td>
<td>General Physics (B.1.a.)*</td>
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<tr>
<td>STAT 321, STAT 322</td>
<td>Statistical Analysis I, II (B.2.)*</td>
<td>3, 4</td>
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### ELECTIVES

- 11

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1 As an alternative to MATH 206, students may select MATH 241 and MATH 242 thereby decreasing free electives by 4 units.

### GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 9 units must be at the 300–400 level. Additional GEB courses are listed under Major and Support Courses.

Area A: .......................................................... 14
- ENGL 114 (A.1.)
- ENGL 125/PHIL 125/SPC 125 (A.2.)
- SPC 201/SPC 202 (A.3.)
- ENGL 215/218 (A.4.)

Area B: .......................................................... 2
- A minimum of 18 units is required; 16 of the units are in Support
- Physical science (B.1.a.)* see Support Courses
- Life science (B.1.b.)
- BIO 220 recommended for B.1.b. and E.2.
- Mathematics/statistics* see Support Courses

Area C: .......................................................... 18
- PHIL 230/PHIL 231 (C.1.)
- Critical reading electives (C.1.)
- Fine and performing arts elective (C.2.)
- Literature, philosophy, arts elective (300–400 level) (C.3.)
- Arts and humanities elective (Area C)

Area D: .......................................................... 18
- HIST 204 (D.1.), POLS 210 (D.1.)
- HIST 315 (D.2.)
- ECON 201/211/222 (D.3.)
- ANT 201/GEOG 150/SOC 105 (D.4.a.)
- ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300-400 level) (D.4.b.)

Area E: .......................................................... 5
- PSY 201/PSY 202 (E.1.)
- BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)
- BIO 220 recommended for E.2. and B.1.b.

Area F: .......................................................... 0
- A minimum of 2 units is required; 2 of the units are in Major
- Computer literacy (F.1.)* see Major Courses

Total: ................................................................... 57
- A minimum of 75 units is required; 18 of the units are in Major and Support

---

1 As an alternative to MATH 206, students may select MATH 241 and MATH 242 thereby decreasing free electives by 4 units.
CURRICULUM FOR COMPUTER SCIENCE MINOR

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 several restricted elective courses.

Units

**Required courses** ................................. 13–14

- CSC 118 Fundamentals of Computer Science I (4)
- CSC 215 Computer Architecture I (4) or
  - CSC 240 Programming Environments I (3)
- CSC 218 Fundamentals of Computer Science II (3)
- CSC 345 Data Structures (3).
  (recommended prerequisite: MATH 124 or
   CSC 245)

**Tracks (select one)** ............................... 11–12

*Database and Application Development* (11)
  - CSC 347 Introduction to Database Systems (4)
  - CSC 440 Software Engineering I (3)
  - Upper-division restricted electives (4)

*Computer Architecture* (12)
  - EE 219 Logic and Switching Circuits (3)
  - EE 259 Logic and Switching Circuits Laboratory (1)
  - CPE 315 Computer Architecture II (4)
  - CPE 316 Computer Architecture III (4)

*Numerical Applications* (11)
  - CSC 332 Numerical Analysis I (3)
  - CSC 333 Numerical Analysis II (3)
  - Upper-division restricted electives (5)

*Analysis and Simulation of Systems* (11)
  - CSC 350 Discrete Dynamic Systems (3)
  - CSC 360 Continuous Dynamic Systems (3)
  - Upper-division restricted electives (5)

*Artificial Intelligence* (11)
  - CSC 420 Artificial Intelligence (4)
  - CSC 421 Knowledge Based Systems (4)
  - Upper-division restricted electives (3)

*Graphics* (12)
  - CSC 455 Computer Graphics I (4)
  - Upper-division restricted electives (8)

Total: 24-26
MASTER OF SCIENCE IN COMPUTER SCIENCE

The M.S. program in Computer Science offers students the opportunity to prepare for careers in several areas of specialization including: computer graphics, computer architecture, operating systems, programming languages, database systems, AI/expert systems, computer communication networks, modeling and simulation. The program is designed for maximum flexibility to allow the student to concentrate in one or more areas of study.

The department has a Computer Systems Laboratory (CSL) to provide a variety of computing resources for instructional and research purposes. The CSL has a SUN workstation cluster, a Hewlett Packard workstation cluster, a logic development lab, a distributed systems lab, a Sequent Balance 8000 multiprocessor system for parallel programming, and several graphics workstations, personal computers, and terminals. The University’s Academic Computing Services also provides a variety of microcomputer, workstation, and mainframe computing resources available to students.

Admission to the program requires a baccalaureate degree from an accredited institution and good standing at the last college attended. During the last 90 quarter hours of study, the student must have earned a minimum grade point average of 3.0 if the undergraduate degree is in Computer Science, or 3.25 for other degrees. The Graduate Record Exam (GRE) is required, with a minimum combined score of 1650 (verbal, quantitative, and analytical), and a minimum of 400 on verbal. Foreign applicants must have a minimum score of 550 on the TOEFL and 4.5 on the TWE. Women and underrepresented minorities are strongly encouraged to apply for admission.

Qualified students who do not have an undergraduate degree in Computer Science may be admitted as unclassified students. Unclassified students must complete the necessary undergraduate coursework to be admitted to candidacy. While fulfilling the undergraduate requirements, unclassified students retain official status as graduate students in the University.

Unclassified students may advance to candidacy by completing each of the following undergraduate courses with a "B" or better. These courses do not count toward the graduate degree:

- CPE 315 Computer Architecture II (4)
- CSC 345 Data Structures (3)
- CSC 346 File Structures (3)
- CSC 440 Software Engineering I (3)
- CSC 445 Theory of Computation I (3)
- CSC 453 Introduction to Operating Systems (4)

The department offers several graduate teaching assistantships. Preference is given to continuing graduate students and experienced teachers. Other grant, fellowship, scholarship and loan information can be obtained from the Financial Aid office.

Degree Requirements

The students must file a formal study plan with the Computer Science Department office no later than the end of the quarter in which they complete the first unit of coursework to be counted toward the degree. The formal study plan identifies specific courses to be taken to fulfill requirements of the M.S. degree. The formal study plan may be amended with approval of the graduate coordinator.

The M.S. degree requires at least 45 units beyond the undergraduate degree. Courses must be chosen according to the following requirements:

CURRICULUM FOR M.S. COMPUTER SCIENCE

<table>
<thead>
<tr>
<th>Core sequence of required courses:</th>
<th>15</th>
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<tbody>
<tr>
<td>CSC 501 Language and Translators (4)</td>
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<tr>
<td>CSC 502 Database Systems (4)</td>
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<td>CSC 503 Operating Systems (4)</td>
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<td>CSC 590 Graduate Seminar (3)</td>
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<tr>
<th>Select two courses from the following:</th>
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<td>CSC 504, 505, 506, 507, 517, 570</td>
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<tr>
<th>Thesis or project</th>
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<tbody>
<tr>
<td>CSC 599 Thesis/Project (2–3) (2–3)</td>
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</table>

<table>
<thead>
<tr>
<th>Electives to be selected with adviser's approval</th>
<th>17–16</th>
</tr>
</thead>
</table>

For further information or advisement students should communicate with the Graduate Coordinator of the Computer Science Department.
College of Engineering Advising Center, 
Computer Science Building (14), Room 240 
(805) 756-1461

ELECTRONIC AND ELECTRICAL ENGINEERING DEPARTMENT

Faculty

Department Chair, Saul Goldberg

Samuel O. Agbo                      Ahmad Nafisi
Jerome R. Breitenbach               Mahmood Nahvi
Michael M. Cirovic                  Ali O. Shaban
Samir K. Datta                      Cheng Sun
Eugene D. Fabricius                 Shyama C. Tandon
James G. Harris                     James H. W. Tseng
William F. Horton                   Gustav N. Wassel
Martin E. Kaliski                   Donley J. Winger
C. Arthur MacCarley                 Michael T. Wollman
Wayne E. McMorrnan                  Chuan-Sung Yeh
Shien-Yi Meng

Programs

B.S. Electrical Engineering
B.S. Computer Engineering
M.S. Electrical Engineering

The department offers the B.S. program in Electrical Engineering which is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, and the M.S. in Electrical Engineering.

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.

During their junior and senior years, students choose a block of courses in either Electronics (EL) or Power (EE). The Electronics (EL) block of courses deals with the development, design and application of circuits, devices and systems for communication, computers, controls, information processing and display, and system instrumentation. Senior elective courses in this area 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. The Power (EE) block of courses deals with industrial process control systems and with generation, distribution, control and utilization of electric power. Senior elective courses in this area 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.

With adviser approval, 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.

There are appropriate laboratories equipped to support the program. They provide not only hands-on instrumentation experience, but also design experience. Involvement in faculty research is possible for outstanding students. Research areas include computer-aided education, advanced electronics for automotive and transportation applications, signal and image processing, electric vehicles, computer architecture and software systems, electro-optics, and electric power quality.

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.

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.

The Department supports the concept of international education and encourages students to investigate opportunities for overseas study. For further information, see the Study Abroad programs.

COMPUTER ENGINEERING

For information regarding this program, please refer to Computer Engineering. This program is jointly offered by the Computer Science Department and the Electronic and Electrical Engineering Department.
**B.S. ELECTRICAL ENGINEERING**

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser. Courses are displayed by year.

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<thead>
<tr>
<th>Units</th>
<th>Freshman</th>
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<tbody>
<tr>
<td></td>
<td>EE 110 Orientation ........................................ 1</td>
</tr>
<tr>
<td></td>
<td>EE 112 Electric Circuit Analysis I ...................... 2</td>
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<td></td>
<td>IME 157 Electronic Manufacturing .......................... 3</td>
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<td>ANT 201/GEOG 150/SOC 105 (D.4.a.) ..................... 3</td>
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<td>CHEM 124 General Chemistry (B.1.a.) ..................... 4</td>
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<td>CHEM 125 General Chemistry ................................ 4</td>
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<td>CSC 204 C and UNIX (F.1.) .................................. 3</td>
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<td>ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .... 3</td>
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<td>ENGL 215 Writing: Argumentation or ENGL 218 Professional Writing: Argumentation and Reports (A.4.) .......... 4</td>
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<td>PHYS 131 General Physics (B.1.a.) ......................... 4</td>
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<td>PHYS 133 General Physics .................................... 4</td>
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<td>SPC 201 Public Speaking or SPC 202 Princ. of Speech Communication (A.3) ... 3</td>
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<td>EE 208, 248 Electronic Devices and Lab ................. 3,1</td>
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<td>EE 219, 259 Logic and Switching Circuits, and Lab .... 3,1</td>
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<td>MATH 241 Calculus IV ...................................... 4</td>
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<td>MATH 242 Differential Equations .......................... 4</td>
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<td>MATH 317 Topics in Engineering Math ..................... 4</td>
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<td>EE 302, 342 Linear Control Systems and Lab ............ 3,1</td>
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<td>EE 304 Random Signals and Noise ......................... 3</td>
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<td>EE 307, 347 Digital Integrated Electronics and Lab ... 3,1</td>
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<tr>
<td></td>
<td>EE 308, 348 Electronic Circuits and Lab ................. 3,1</td>
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<td>EE 309, 349 Integrated Electronic Circuits, Lab ....... 3,1</td>
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<td></td>
<td>EE 319 Digital System Design .............................. 3</td>
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<td>EE 325, 365 Energy Conversion Electromagnetics, Lab ... 3,1</td>
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<td>EE 328 Discrete Time Systems ................................ 3</td>
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<td>EE 334 Electromagnetic Fields I ......................... 3</td>
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<td></td>
<td>EE 359 Digital System Design Laboratory ................. 1</td>
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<td>BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.) ............... 4</td>
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<td>HIST 204 History of American Ideals and Institutions (D.1.) ................ 3</td>
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<td>Fine and performing arts elective (C.2.) ................ 3</td>
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### Senior

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<td>EE 463 Undergraduate Seminar .......................... 1</td>
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<td>ME 302 Thermodynamics .................................. 3</td>
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<td>HIST 315 Modern World History (D.2.) .................. 3</td>
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<td>ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300-400 level) (D.4.b.) .......... 3</td>
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<td>Critical reading electives (C.1.) ...................... 6</td>
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<td>Literature, philosophy, arts elective (300-400 level) (C.3.) .............. 3</td>
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<td>Electronic or Power restricted technical electives .... 7</td>
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<td>Approved technical electives ........................... 13</td>
</tr>
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<td></td>
<td>50</td>
</tr>
</tbody>
</table>

1 To be selected in accordance with the General Education-Breadth requirements. (Please see page 77 of this catalog.)

2 Select one block of courses, either EL or EE:
- Electronic (EL) Block: EE 313, EE 353, EE 401, EE 414
- Power (EE) Block: EE 303, EE 406, ME 341

3 A minimum of two senior design labs with EE prefix and two design lecture courses in the major is required. To be approved by major adviser.
### B.S. ELECTRICAL ENGINEERING

Courses are displayed by Major, Support and General Education and Breadth.

#### MAJOR COURSES

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>EE 110 Orientation</td>
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<td>EE 112 Electric Circuit Analysis I</td>
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<tr>
<td>EE 208, 248 Electronic Devices and Lab</td>
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<tr>
<td>EE 211, 241 Electric Circuit Analysis and Lab II</td>
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<tr>
<td>EE 212, 242 Electric Circuit Analysis and Lab III</td>
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<tr>
<td>EE 219, 259 Logic and Switching Circuits and Lab</td>
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</tr>
<tr>
<td>EE 301, 341 Linear Systems Analysis and Lab</td>
<td>3.1</td>
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<tr>
<td>EE 302, 342 Linear Control Systems and Lab</td>
<td>3.1</td>
</tr>
<tr>
<td>EE 304 Random Signals and Noise</td>
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<tr>
<td>EE 307, 347 Digital Integrated Electronics and Lab</td>
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<tr>
<td>EE 308, 348 Electronic Circuits and Lab</td>
<td>3.1</td>
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<tr>
<td>EE 309, 349 Integrated Electronic Circuits and Lab</td>
<td>3.1</td>
</tr>
<tr>
<td>EE 319, 359 Digital System Design and Lab</td>
<td>3.1</td>
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<tr>
<td>EE 325, 365 Energy Conversion Electromagnetics and Lab</td>
<td>3.1</td>
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<tr>
<td>EE 328 Discrete Time Systems</td>
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<tr>
<td>EE 334 Electromagnetic Fields I</td>
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<td>EE 461 Senior Project</td>
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<td>EE 462 Senior Project</td>
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<td>EE 463 Undergraduate Seminar</td>
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<tr>
<td>PHYS 133 General Physics</td>
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</table>

Electronic or Power restricted technical electives: 10 units

Select one block of courses, either EL or EE.

**Electronic (EL) Block**

- EE 313, 353 Signal Transmission and Lab (3,1)
- EE 401 Electromagnetic Fields I (3)
- EE 414 Intro. to Communication Systems (3)

**Power (EE) Block**

- EE 303 Power Transmission (3)
- EE 406 Power System Analysis I (4)
- ME 341 Fluid Mechanics (3)

Adviser approved technical electives: 13 units

Select a minimum of 2 senior design laboratories and 2 design with approval by major adviser.

#### SUPPORT COURSES

* = Courses satisfy General Education and Breadth requirements.

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>CH EM 124 General Chemistry (B.1.a.)*</td>
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<tr>
<td>CH EM 125 General Chemistry</td>
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<tr>
<td>CSC 204 C and UNIX (F.1.)*</td>
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<tr>
<td>IME 157 Electronic Manufacturing</td>
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<td>MATE 206 Materials Engineering</td>
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<tr>
<td>MATH 141 Calculus I (B.2.)*</td>
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</tr>
<tr>
<td>MATH 142 Calculus II (B.2.)*</td>
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<tr>
<td>MATH 143 Calculus III</td>
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<td>MATH 241 Calculus IV</td>
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<td>MATH 242 Differential Equations</td>
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<td>ME 212 Engineering Dynamics</td>
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<tr>
<td>ME 302 Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 131 General Physics (B.1.a.)*</td>
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<tr>
<td>PHYS 132 General Physics</td>
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<tr>
<td>PHYS 211 Modern Physics</td>
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<td>ME 211 Engineering Static</td>
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<td>ME 212 Engineering Dynamics</td>
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<tr>
<td>ME 302 Thermodynamics</td>
<td>3</td>
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<tr>
<td>PHYS 131 General Physics (B.1.a.)*</td>
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<tr>
<td>PHYS 132 General Physics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 211 Modern Physics</td>
<td>4</td>
</tr>
</tbody>
</table>

**GENERAL EDUCATION AND BREADTH**

Please see page 77 for selection of GEB electives. At least 9 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

**Area A:** ................................. 14
- ENGL 114 (A.1.)
- ENGL 125/PHIL 125/SPC 125 (A.2.)
- SPC 201/SPC 202 (A.3.)
- ENGL 215/218 (A.4.)

**Area B** ................................. 2
- A minimum of 18 units is required; 16 of the units are in Support
  - Physical science (B.1.a.)* see Support Courses
  - Life science (B.1.b.)
  - BIO 220 recommended for B.1.b. and E.2.
  - Mathematics/statistics (B.2.)* see Support Courses

**Area C:** .................................. 18
- PHIL 230/PHIL 231 (C.1.)
- Critical reading electives (C.1.)
- Fine and performing arts elective (C.2.)
- Literature, philosophy, arts elective (300–400 level) (C.3.)

**Area D:** .................................. 18
- HIST 204 (D.1.), POLS 210 (D.1.)
- HIST 315 (D.2.)
- ECON 201/211/222 (D.3.)
- ANT 201/GEOG 150/SOC 105 (D.4.a.)
- ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)

**Area E:** .................................. 5
- PSY 201/PSY 202 (E.1.)
- BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)
- BIO 220 recommended for E.2. and B.1.b.

**Area F:** .................................. 0
- A minimum of 2 units is required; 2 of the units are in Support
  - Computer literacy (F.1.)* see Support Courses

**Total** .................................. 57
- A minimum of 75 units is required; 18 of the units are in Support

**ELECTIVES** ................................ 0

**Units** .................................. 62
MASTER OF SCIENCE DEGREE IN ELECTRICAL ENGINEERING

General Characteristics

The Master of Science program in 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. Foreign applicants must have satisfactory scores on the TOEFL and TWE exams. 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, college 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 and the remainder at the 400 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 Electrical Engineering are:

a) core of 16 units;

b) a minimum of 12 units in major 500 level courses;

c) the remaining units 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 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.

M.S. Electrical Engineering

<table>
<thead>
<tr>
<th>Core Courses</th>
<th>Units</th>
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<tr>
<td>EE 525 Stochastic Processes for Engineers (4)</td>
<td>16</td>
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<tr>
<td>EE 563 Graduate Seminar (1) (1) (1)</td>
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<tr>
<td>EE 599 Design Project (Thesis) (2) (2) (5) or 9 units of major field graduate level courses and a comprehensive written examination</td>
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<tr>
<td>Major field graduate courses</td>
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<tr>
<td>EE 511 Electric Machine Theory (3)</td>
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<tr>
<td>EE 513 Control Systems Theory (4)</td>
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<td>EE 514 Digital and Nonlinear Control Systems Theory (4)</td>
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<td>EE 515 Discrete Time Filters (4)</td>
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<td>EE 517 Information Theory (4)</td>
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<tr>
<td>EE 518 Advanced Power System Analysis (3)</td>
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<td>EE 519 Power System Design (4)</td>
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<tr>
<td>EE 520 Solar-Photovoltaic Systems Design (3)</td>
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<tr>
<td>EE 521 Computer Systems (4)</td>
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<tr>
<td>EE 522 Microprocessor-Based Digital Sys. Des. (4)</td>
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<td>EE 523 Digital Systems Design (3)</td>
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<td>EE 524 Solid State Electronics (3)</td>
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<td>EE 526 Digital Communications (4)</td>
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<td>EE 527 Advanced Topics in Power Electronics (4)</td>
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<td>EE 528 Digital Image Processing (4)</td>
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<tr>
<td>EE 530 Electro-Optics Systems (4)</td>
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</table>

Approved technical electives (400-500 level) | 17 |

May be selected from the course list above and other adviser approved technical electives.

Not all courses listed are offered each academic year. Consult the EL/EE Department for current information on course offerings.
ENGINEERING SCIENCE

An Interdisciplinary Curriculum in Engineering Science and Emerging Technologies

Coordinator, Daniel W. Walsh
Engineering Bldg. (13), Room 266
(805) 756-2131

College of Engineering Advising Center
Engineering East Bldg. (20), Room 215
(805) 756-1461

Program

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. Also, it is designed for those students who wish to major in engineering but have not presently decided in which specific program their interest is centered. 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,
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 engineering science program focuses on synthesis, the integration of diverse elements to produce a single entity – an integral activity in the engineering profession. The Synthesis plan of study stresses integrated design, open-ended problem solving, experimentation, and manufacturing and construction. The program emphasizes phenomenological theory as well as analytical, experimental, and design skills – not in compartmentalized courses, but as a unified entity. The curriculum accents societal context, multidisciplinary teamwork and communication skills. It also emphasizes practical applications as well as principles. The laboratories in many of the courses are constantly evolving, so students benefit from a variety of state-of-the-art equipment.

This program is for directed, highly motivated students. The technical elective courses are selected to 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, and ocean engineering. Plans that are currently popular include biochemical engineering and synthesis.
B.S. ENGINEERING SCIENCE

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser. Courses are displayed by year.

Freshman

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<th>Course</th>
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<td>ENGR 111 Engineering Science II</td>
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<td>ENGR 112 Engineering Science III</td>
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<tr>
<td>BIO 220 Physiology and Biological Adaptation</td>
<td>4</td>
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<tr>
<td>CHEM 124 General Chemistry (B.1.a.)</td>
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<td>CHEM 125 General Chemistry</td>
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<tr>
<td>ENGL 114 Writing: Exposition (A.1.)</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 141 Calculus I (B.2.)</td>
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<td>PHYS 131 General Physics (B.1.a.)</td>
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<td>PHYS 132 General Physics</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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Sophomore

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<tr>
<td>CE 204 Strength of Materials</td>
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<td>EE 201 Electric Circuit Theory</td>
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<td>MATH 242 Differential Equations</td>
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<td>MATH 300–400 level elective</td>
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<td>ME 211 Engineering Statics</td>
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<td>ME 212 Engineering Dynamics</td>
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<td>PHYS 133 General Physics</td>
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<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
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<tr>
<td>CSC 118 Fundamentals of Computer Science or</td>
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<td>CSC 204 C and Unix (F.1.)</td>
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<tr>
<td>ECON 201 Survey of Economics or ECON 211 Principles of Economics (D.3.)</td>
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<tr>
<td>ENGL 218 Professional Writing: Argumentation and Reports (A.4.)</td>
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<td>HIST 204 History of American Ideals and Institutions (D.1.)</td>
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<td>Adviser approved technical electives</td>
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Junior

<table>
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<th>Course</th>
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<tbody>
<tr>
<td>IME 314 Engineering Economics</td>
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<td>ME 302 Thermodynamics</td>
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<td>ME 313 Heat Transfer</td>
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<td>MATE 206, 241 Materials Engineering and Lab</td>
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<tr>
<td>POLS 210 American and California Government (D.1.)</td>
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<tr>
<td>PSY 201/PSY 202 General Psychology (E.1.)</td>
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<td>1 Arts and humanities elective (Area C)</td>
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<td>1 Critical reading electives (C.1.)</td>
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<tr>
<td>Adviser approved technical electives</td>
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Senior

<table>
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<th>Course</th>
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<tbody>
<tr>
<td>ME 341 Fluid Mechanics</td>
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<tr>
<td>Senior Project (in appropriate engineering discipline)</td>
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<tr>
<td>HIST 315 Modern World History (D.2.)</td>
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<tr>
<td>PHIL 230/PHIL 231 Philosophical Classics (C.1.)</td>
<td>3</td>
</tr>
<tr>
<td>1 ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)</td>
<td>3</td>
</tr>
<tr>
<td>1 Fine and performing arts elective (C.2.)</td>
<td>3</td>
</tr>
<tr>
<td>1 Literature, philosophy, arts elective (300–400 level) (C.3.)</td>
<td>3</td>
</tr>
<tr>
<td>Adviser approved technical electives</td>
<td>18</td>
</tr>
<tr>
<td>Electives</td>
<td>9</td>
</tr>
</tbody>
</table>

Adviser approved technical electives

Unit requirements: 46/49/198

1 To be selected in accordance with the General Education-Breadth requirements. (Please see page 77 of this catalog.)
**B.S. ENGINEERING SCIENCE**

Courses are displayed by Major, Support, General Education and Breadth, and Electives. A minimum of 60 units at 300–400 level.

### MAJOR COURSES

* = Courses satisfy General Education and Breadth requirements.

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 204 Strength of Materials</td>
<td>3</td>
</tr>
<tr>
<td>CSC 118 Fundamentals of Computer Science or CSC 204 C and Unix (F.1.)*</td>
<td>3</td>
</tr>
<tr>
<td>EE 201 Electric Circuit Theory</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 110 Engineering Science I</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 111 Engineering Science II</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 112 Engineering Science III</td>
<td>3</td>
</tr>
<tr>
<td>IME 314 Engineering Economics</td>
<td>3</td>
</tr>
<tr>
<td>MATE 206, 241 Materials Engineering and Lab</td>
<td>3,1</td>
</tr>
<tr>
<td>ME 211 Engineering Statics</td>
<td>3</td>
</tr>
<tr>
<td>ME 212 Engineering Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>ME 302 Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>ME 313 Heat Transfer</td>
<td>3</td>
</tr>
<tr>
<td>ME 341 Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>Senior Project in appropriate engineering discipline</td>
<td>2,2</td>
</tr>
<tr>
<td>Adviser approved technical electives</td>
<td>40</td>
</tr>
<tr>
<td>(at least 11 units must be 300–400 level)</td>
<td>84</td>
</tr>
</tbody>
</table>

### SUPPORT COURSES

* = Courses satisfy General Education and Breadth requirements.

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 124 General Chemistry (B.1.a.)*</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 125 General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>MATH 141 Calculus I (B.2.)*</td>
<td>4</td>
</tr>
<tr>
<td>MATH 142 Calculus II (B.2.)*</td>
<td>4</td>
</tr>
<tr>
<td>MATH 143 Calculus III</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 300–400 level elective</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</td>
<td>4</td>
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<tr>
<td>PHYS 133 General Physics</td>
<td>4</td>
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<tr>
<td>Physical science elective</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>48</strong></td>
</tr>
</tbody>
</table>

### GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 9 units must be at the 300–400 level. Additional GEB courses are listed under Major and Support Courses.

**Area A:** ENGL 114 (A.1.)
- ENGL 125/PHIL 125/SPC 125 (A.2.)
- SPC 201/SPC 202 (A.3.)
- ENGL 215/218 (A.4.) ENGL 218 recommended

**Area B:** A minimum of 18 units is required; 16 of the units are in Support
- Physical science (B.1.a.)* see Support Courses
- Mathematics/statistics (B.2.)* see Support Courses

**Area C:**
- PHIL 230/PHIL 231 (C.1.)
- Critical reading electives (C.1.)
- Fine and performing arts elective (C.2.)
- Literature, philosophy, arts elective (300–400 level) (C.3.)
- Arts and humanities elective (Area C)

**Area D:**
- HIST 204 (D.1.), POLS 210 (D.1.)
- HIST 315 (D.2.)
- ECON 201/211/222 (D.3.)
- ANT 201/GEOG 150/SOC 105 (D.4.a.)
- ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)

**Area E:**
- PSY 201/PSY 202 (E.1.)
- BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)
- BIO 220 recommended for E.2. and B.1.b.

**Area F:**
- A minimum of 2 units is required; 2 of the units are in Support
- Computer literacy (F.1.)* see Major Courses

**Total:** A minimum of 75 units is required; 18 of the units are in Support

**ELECTIVES:**

**Total:** 198
Faculty

Department Chair, H. Jo Anne Freeman

Sema E. Alptekin
K. N. Balasubramanian
Kenneth L. Brown
J. Kent Butler
Archie D. Cheda
Mark A. Cooper
Anthony K. Mason

Unny Menon
A. Reza Pouraghabagher
Ahmad K. Seifoddini
Richard A. Strahl
Donald E. White
Tao H. Yang

Programs

B.S. Industrial Engineering

B.S. Manufacturing Engineering

Integrative Technology Minor

The department focuses on programs that integrate engineering with a real concern for people. Our students and faculty study topics that lead to satisfying and productive careers as well as strong preparation for graduate work in many fields. Programs reflect the traditional strengths of Cal Poly through close interaction between students and faculty in classroom, laboratory, and other activities. See the descriptions below for details of the various programs; course descriptions provide an understanding of the breadth and depth of our majors.

Department and university laboratories and computers are integrated into coursework from matriculation until graduation to investigate, test, and apply theoretical principles learned in the classroom.

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; APICS, the American Production and Inventory Control Society; SME, the Society of Manufacturing Engineers; AWS, the American Welding Society; and AFS, the American Foundry Society.

INDUSTRIAL ENGINEERING

Industrial Engineering is the profession concerned with solving engineering and management problems by applying scientific logic, systems methodology, 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 humans. Engineering methods and practical knowledge are used in formulating decision models for the optimum application of engineering and management principles.

Graduates can choose from a 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 Bachelor of Science program in Industrial Engineering is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

The program is oriented to provide graduates with the capability of producing results with a minimum of additional training. Health care industries, banks, retail chains, farms, airlines, mines, computer firms, as well as government and traditional manufacturing industries, employ graduates of this discipline. Graduates also are well prepared for successful graduate study.

MANUFACTURING ENGINEERING

Manufacturing engineering is the profession that applies engineering analysis and methods to the production of all manufactured goods and services. The manufacturing engineer works directly with the people, processes, and machines involved in manufacturing operations. Focus is on both development and sustained operation of manufacturing systems, including computer-aided methods, automation, numerical control, production tooling, and material handling, as well as the processes and ancillary support systems of modern manufacturing.

Graduates typically work more directly with the manufacturing processes than do industrial engineers. Emphasis is placed upon application of a basic knowledge of physics and materials. Knowledge of basic processes, tool design, and computer-aided manufacturing are applied directly to the problems of development and sustained operation of manufacturing operations.
The curriculum leading to the Bachelor of Science degree in Manufacturing Engineering is a new program and is not currently accredited. This program was developed with the intention to seek accreditation from the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology. Accreditation review is only done following the graduation of the first class of students in a new program. Graduates are prepared for job-entry at the professional level in the areas of CAD/CAM, process engineering, quality assurance, and production engineering. Graduates also are well prepared for successful graduate study.

INTEGRATIVE TECHNOLOGY MINOR

The Integrative Technology minor is an interdisciplinary program jointly sponsored by Industrial and Manufacturing 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 the Industrial Technology Department.

GRADUATE PROGRAMS

Cal Poly offers a Master of Science degree in Engineering with a specialization in Industrial Engineering, and also a joint MS/MBA Engineering with a specialization in Engineering Management. Please refer to the M.S. Engineering section of the College of Engineering or the MBA section of the College of Business.
## B.S. INDUSTRIAL ENGINEERING

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser. Courses are displayed by year.

### Freshman

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>IME 101 Introduction to Industrial and Manufacturing Engineering</td>
<td>1</td>
</tr>
<tr>
<td>IME 141 Manufacturing Processes: Net Shape</td>
<td>1</td>
</tr>
<tr>
<td>IME 223 Work Design and Measurement</td>
<td>4</td>
</tr>
<tr>
<td>IME 143 Manufacturing Processes: Material Removal</td>
<td>2</td>
</tr>
<tr>
<td>ETME 142 Engineering Drawing I</td>
<td>1</td>
</tr>
<tr>
<td>ETME 143 Engineering Drawing II</td>
<td>1</td>
</tr>
<tr>
<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
<td>3</td>
</tr>
<tr>
<td>BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.)</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 124 General Chemistry (B.1.a.)</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 125 General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CSC 204 C and UNIX (F.1.)</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>ENGL 218 Professional Writing: Argumentation and Reports (A.4.)</td>
<td>4</td>
</tr>
<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>
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<tr>
<td>PSY 201/PSY 202 General Psychology (E.1.)</td>
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<tr>
<td><strong>Units</strong></td>
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### Sophomore

<table>
<thead>
<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>IME 239 Industrial Costs and Controls</td>
<td>3</td>
</tr>
<tr>
<td>IME 251 Manufacturing Engineering Analysis</td>
<td>3</td>
</tr>
<tr>
<td>IME 314 Engineering Economics</td>
<td>3</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>ME 211 Engineering Statics</td>
<td>3</td>
</tr>
<tr>
<td>ME 212 Engineering Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>ECON 201/ECON 211/ECON 222 (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>PHYS 131 General Physics (B.1.a.)</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 132 General Physics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 133 General Physics</td>
<td>4</td>
</tr>
<tr>
<td>POLS 210 American and California Govt. (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>
</tr>
<tr>
<td><strong>Units</strong></td>
<td><strong>50</strong></td>
</tr>
</tbody>
</table>

### Junior

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>IME 301 Operations Research I</td>
<td>4</td>
</tr>
<tr>
<td>IME 305 Operations Research II</td>
<td>4</td>
</tr>
<tr>
<td>IME 312 Data Management and System Design</td>
<td>3</td>
</tr>
<tr>
<td>IME 319 Human Factors Engineering</td>
<td>3</td>
</tr>
<tr>
<td>IME 335 Computer-Aided Manufacturing I</td>
<td>4</td>
</tr>
<tr>
<td>IME 421 Manufacturing Organization</td>
<td>3</td>
</tr>
<tr>
<td>IME 426 Engineering Test Design and Analysis</td>
<td>4</td>
</tr>
<tr>
<td>CE 204 Strength of Materials or ME 341 Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>EE 201 Electric Circuits Theory</td>
<td>3</td>
</tr>
<tr>
<td>EE 321 Electronics</td>
<td>3</td>
</tr>
<tr>
<td>MATE 206 Materials Engineering or ME 302 Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>PHIL 230/PHIL 231 Philosophical Classics (C.1.)</td>
<td>3</td>
</tr>
<tr>
<td>STAT 321 Statistical Analysis I (B.2.)</td>
<td>3</td>
</tr>
<tr>
<td><strong>2 Adviser approved technical electives which must meet EAC-ABET requirements</strong></td>
<td><strong>10</strong></td>
</tr>
<tr>
<td><strong>Units</strong></td>
<td><strong>53</strong></td>
</tr>
</tbody>
</table>

### Senior

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>IME 410 Inventory Control Systems</td>
<td>4</td>
</tr>
<tr>
<td>IME 420 Simulation and Expert Systems</td>
<td>4</td>
</tr>
<tr>
<td>IME 429 Ergonomics Lab</td>
<td>1</td>
</tr>
<tr>
<td>IME 430 Quality Engineering</td>
<td>4</td>
</tr>
<tr>
<td>IME 441, 442 Engineering Supervision I, II</td>
<td>1,1</td>
</tr>
<tr>
<td>IME 443 Facilities Planning and Design</td>
<td>4</td>
</tr>
<tr>
<td>IME 461 Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>IME 462 Senior Project</td>
<td>3</td>
</tr>
<tr>
<td>IME 463 Undergraduate Seminar</td>
<td>2</td>
</tr>
<tr>
<td>HIST 315 Modern World History (D.2.)</td>
<td>3</td>
</tr>
<tr>
<td><strong>1 ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300-400 level) (D.4.b.)</strong></td>
<td><strong>3</strong></td>
</tr>
<tr>
<td><strong>1 Arts and humanities elective (Area C)</strong></td>
<td><strong>3</strong></td>
</tr>
<tr>
<td><strong>1 Critical reading elective (C.1.)</strong></td>
<td><strong>3</strong></td>
</tr>
<tr>
<td><strong>1 Fine and performing arts elective (C.2.)</strong></td>
<td><strong>3</strong></td>
</tr>
<tr>
<td><strong>1 Literature, philosophy, arts elective (300-400 level) (C.3.)</strong></td>
<td><strong>3</strong></td>
</tr>
<tr>
<td><strong>2 Adviser approved technical electives which must meet EAC-ABET requirements</strong></td>
<td><strong>9</strong></td>
</tr>
<tr>
<td><strong>Units</strong></td>
<td><strong>53</strong></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>210</strong></td>
</tr>
</tbody>
</table>

---

1. To be selected in accordance with the General Education-Breadth and A.B.E.T. requirements. (Please see page 77 of this catalog.)

2. Adviser approved technical electives which must meet EAC-ABET requirements: (IME 303, 356, 407, 408, 409, 411, 413, 416, 418, 433, 435, 437, 455, 456; CSC 420; MATH 306; PSY 494; or current listing)
## B.S. INDUSTRIAL ENGINEERING

For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser.

### MAJOR COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>IME 101</td>
<td>Intro. to Industrial and Manufacturing Engineering</td>
<td>1</td>
</tr>
<tr>
<td>IME 141</td>
<td>Manufacturing Processes: Net Shape</td>
<td>1</td>
</tr>
<tr>
<td>IME 143</td>
<td>Manufacturing Processes: Material Removal</td>
<td>2</td>
</tr>
<tr>
<td>IME 223</td>
<td>Work Design and Measurement</td>
<td>4</td>
</tr>
<tr>
<td>IME 239</td>
<td>Industrial Costs and Controls</td>
<td>3</td>
</tr>
<tr>
<td>IME 251</td>
<td>Manufacturing Engineering Analysis</td>
<td>3</td>
</tr>
<tr>
<td>IME 301</td>
<td>Operations Research I</td>
<td>4</td>
</tr>
<tr>
<td>IME 305</td>
<td>Operations Research II</td>
<td>4</td>
</tr>
<tr>
<td>IME 312</td>
<td>Data Management and System Design</td>
<td>3</td>
</tr>
<tr>
<td>IME 314</td>
<td>Engineering Economics</td>
<td>3</td>
</tr>
<tr>
<td>IME 319</td>
<td>Human Factors Engineering</td>
<td>3</td>
</tr>
<tr>
<td>IME 335</td>
<td>Computer-Aided Manufacturing I</td>
<td>4</td>
</tr>
<tr>
<td>IME 410</td>
<td>Inventory Control Systems</td>
<td>4</td>
</tr>
<tr>
<td>IME 420</td>
<td>Simulation and Expert Systems</td>
<td>4</td>
</tr>
<tr>
<td>IME 421</td>
<td>Manufacturing Organization</td>
<td>3</td>
</tr>
<tr>
<td>IME 426</td>
<td>Engineering Test Design and Analysis</td>
<td>4</td>
</tr>
<tr>
<td>IME 429</td>
<td>Ergonomics Lab</td>
<td>1</td>
</tr>
<tr>
<td>IME 430</td>
<td>Quality Engineering</td>
<td>4</td>
</tr>
<tr>
<td>IME 441</td>
<td>Engineering Supervision I, II</td>
<td>1,1</td>
</tr>
<tr>
<td>IME 443</td>
<td>Facilities Planning and Design</td>
<td>4</td>
</tr>
<tr>
<td>IME 461</td>
<td>Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>IME 462</td>
<td>Senior Project</td>
<td>3</td>
</tr>
<tr>
<td>IME 463</td>
<td>Undergraduate Seminar</td>
<td>2</td>
</tr>
<tr>
<td>IME 467</td>
<td>Advisor approved technical electives which meet EAC-ABET requirements:</td>
<td>19</td>
</tr>
<tr>
<td>IME 303</td>
<td>Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>IME 356</td>
<td>Calculus Ill</td>
<td>3</td>
</tr>
<tr>
<td>IME 407</td>
<td>Calculus II</td>
<td>4</td>
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<tr>
<td>IME 408</td>
<td>Calculus IV</td>
<td>4</td>
</tr>
<tr>
<td>IME 413</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>IME 435</td>
<td>Calculus</td>
<td>4</td>
</tr>
<tr>
<td>IME 437</td>
<td>Calculus</td>
<td>4</td>
</tr>
<tr>
<td>IME 455</td>
<td>Calculus</td>
<td>4</td>
</tr>
<tr>
<td>IME 456</td>
<td>Calculus</td>
<td>4</td>
</tr>
<tr>
<td>IME 401</td>
<td>Scientific Computing</td>
<td>3</td>
</tr>
<tr>
<td>IME 402</td>
<td>Computer Literacy</td>
<td>3</td>
</tr>
<tr>
<td>IME 403</td>
<td>Computer Aided Manufacturing</td>
<td>3</td>
</tr>
<tr>
<td>IME 404</td>
<td>Computer Aided Manufacturing</td>
<td>3</td>
</tr>
<tr>
<td>IME 405</td>
<td>Computer Aided Manufacturing</td>
<td>3</td>
</tr>
<tr>
<td>IME 406</td>
<td>Computer Aided Manufacturing</td>
<td>3</td>
</tr>
<tr>
<td>IME 407</td>
<td>Scientific Computing</td>
<td>3</td>
</tr>
<tr>
<td>IME 408</td>
<td>Scientific Computing</td>
<td>3</td>
</tr>
<tr>
<td>IME 413</td>
<td>Scientific Computing</td>
<td>3</td>
</tr>
</tbody>
</table>

### SUPPORT COURSES

* = Courses satisfy General Education and Breadth.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 204</td>
<td>Strength of Materials or</td>
<td>3</td>
</tr>
<tr>
<td>ME 341</td>
<td>Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 124</td>
<td>General Chemistry (B.1.a.)*</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 125</td>
<td>General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CSC 204</td>
<td>C and UNIX (F.1.)*</td>
<td>3</td>
</tr>
<tr>
<td>EE 201</td>
<td>Electric Circuits Theory</td>
<td>3</td>
</tr>
<tr>
<td>EE 210</td>
<td>Electronics</td>
<td>3</td>
</tr>
<tr>
<td>ETME 142</td>
<td>Engineering Drawing I</td>
<td>1</td>
</tr>
<tr>
<td>ETME 143</td>
<td>Engineering Drawing II</td>
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</tr>
<tr>
<td>MATH 141</td>
<td>Calculus I (B.2.)*</td>
<td>4</td>
</tr>
<tr>
<td>MATH 142</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 143</td>
<td>Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>MATH 241</td>
<td>Calculus IV</td>
<td>4</td>
</tr>
<tr>
<td>MATH 242</td>
<td>Differential Equations</td>
<td>4</td>
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<tr>
<td>ME 211</td>
<td>Engineering Static</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 302</td>
<td>Thermodynamics or MATE 206 Materials Engineering</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>
<td>4</td>
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<tr>
<td>PHYS 133</td>
<td>General Physics</td>
<td>4</td>
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<tr>
<td>STAT 321</td>
<td>Statistical Analysis I (B.2.)*</td>
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</tbody>
</table>

### GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 9 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

**Area A:**
- ENGL 114 (A.1.)
- ENGL 125/PHIL 125/SPC 125 (A.2.)
- SPC 201/SPC 202 (A.3.)
- ENGL 215/ENGL 218 (A.4.) ENGL 218 recommended

**Area B:**
- A minimum of 18 units is required; 16 of the units are in Support
- Physical Science (B.1.a.)* see Support Courses
- Life science (B.1.b.)
- BIO 220 recommended for B.1.b. and E.2.
- Mathematics/statistics (B.2.)* see Support Courses

**Area C:**
- PHIL 230/PHIL 231 (C.1.)
- Critical reading electives (C.1.)
- Fine and performing arts elective (C.2.)
- Literature, philosophy, arts elective (300–400 level) (C.3.)
- Arts and humanities elective (Area C)

**Area D:**
- HIST 204 (D.1.), POLS 210 (D.1.)
- HIST 315 (D.2.)
- ECON 201/211/222 (D.3.)
- ANT 201/GEOG 150/SOC 105 (D.4.a.)
- ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)

**Area E:**
- PSY 201/PSY 202 (E.1.)
- BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)
- BIO 220 recommended for E.2. and B.1.b.

**Area F:**
- A minimum of 2 units is required; 2 of the units are in Support
- Computer literacy (F.1.)* see Support Courses

**Total:**
- A minimum of 75 units is required; 18 of the units are in Support

### ELECTIVES

- 0 units
### B.S. MANUFACTURING ENGINEERING

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser. Courses are displayed by year.

#### Freshman

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>IME 101 Introduction to Industrial and Manufacturing Engineering</td>
<td>1</td>
</tr>
<tr>
<td>IME 141 Manufacturing Processes: Net Shape</td>
<td>1</td>
</tr>
<tr>
<td>IME 223 Work Design and Measurement</td>
<td>4</td>
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<tr>
<td>IME 142 Manufacturing Processes: Materials Joining</td>
<td>2</td>
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<td>IME 143 Manufacturing Processes: Material Removal</td>
<td>2</td>
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<tr>
<td>ETME 141 Descriptive Geometry</td>
<td>2</td>
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<tr>
<td>ETME 142 Engineering Drawing I</td>
<td>1</td>
</tr>
<tr>
<td>ETME 143 Engineering Drawing II</td>
<td>1</td>
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<tr>
<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
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<tr>
<td>CHEM 124 General Chemistry (B.1.a.)</td>
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<td>CHEM 125 General Chemistry</td>
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<td>CSC 204 C and UNIX (F.1.)</td>
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<td>ENGL 114 Writing: Exposition (A.1.)</td>
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<tr>
<td>ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.)</td>
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<td>MATH 141 Calculus I (B.2.)</td>
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<td>MATH 143 Calculus III</td>
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<tr>
<td>PHYS 131 General Physics (B.1.a.)</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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#### Sophomore

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>IME 239 Industrial Costs and Controls</td>
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<td>IME 241 Process Design I</td>
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<tr>
<td>IME 251 Manufacturing Engineering Analysis</td>
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<tr>
<td>CE 204 Strength of Materials</td>
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<tr>
<td>MATE 206 Materials Engineering</td>
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<tr>
<td>MATE 241 Materials Engineering Lab</td>
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<td>MATH 241 Calculus IV</td>
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<td>MATH 242 Differential Equations</td>
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<td>ME 211 Engineering Statics</td>
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<td>ME 212 Engineering Dynamics</td>
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<td>ECON 201/ECON 211/ECON 222 (D.3.)</td>
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<td>ENGL 218 Professional Writing: Argumentation and Reports (A.4.)</td>
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<tr>
<td>PHYS 132 General Physics</td>
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<td>PHYS 133 General Physics</td>
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<tr>
<td>STAT 321 Statistical Analysis I (B.2.)</td>
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#### Junior

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<thead>
<tr>
<th>Course</th>
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<tr>
<td>IME 314 Engineering Economics</td>
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<tr>
<td>IME 335 Computer-Aided Manufacturing I</td>
<td>4</td>
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<tr>
<td>IME 341 Tool Engineering I</td>
<td>4</td>
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<td>IME 342 Manufacturing Systems Integration</td>
<td>3</td>
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<tr>
<td>IME 356 Manufacturing Automation</td>
<td>4</td>
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<tr>
<td>CE 205, 206 Strength of Materials and Lab or</td>
<td>3</td>
</tr>
<tr>
<td>ME 341 Fluid Mechanics</td>
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<tr>
<td>EE 201 Electric Circuits Theory</td>
<td>3</td>
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<tr>
<td>EE 251 Electric Circuits Lab</td>
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<td>EE 321 Electronics</td>
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<td>ME 302 Thermodynamics</td>
<td>3</td>
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<td>ME 313 Heat Transfer</td>
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<tr>
<td>BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.)</td>
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<tr>
<td>HIST 204 History of American Ideals and Institutions (D.1.)</td>
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<tr>
<td>POLS 210 American and California Govt. (D.1.)</td>
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<tr>
<td>1 Critical reading elective (C.1.)</td>
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</tr>
<tr>
<td>2 Adviser approved technical electives which must meet EAC-ABET requirements</td>
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#### Senior

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>IME 418 Product-Process Design</td>
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<tr>
<td>IME 421 Manufacturing Organization</td>
<td>3</td>
</tr>
<tr>
<td>IME 426 Engineering Test Design and Analysis</td>
<td>4</td>
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<tr>
<td>IME 430 Quality Engineering</td>
<td>4</td>
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<tr>
<td>IME 455 Manufacturing Design and Implementation</td>
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<tr>
<td>IME 461 Senior Project</td>
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<tr>
<td>IME 462 Senior Project</td>
<td>3</td>
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<tr>
<td>IME 463 Undergraduate Seminar</td>
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<tr>
<td>HIST 315 Modern World History (D.2.)</td>
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<tr>
<td>PHIL 230/PHIL 231 Philosophical Classics (C.1.)</td>
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<tr>
<td>PSY 201/PSY 202 General Psychology (E.1.)</td>
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<tr>
<td>1 ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300-400 level) (D.4.b.) (BUS 404 recommended)</td>
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<tr>
<td>1 Arts and humanities elective (Area C)</td>
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<tr>
<td>1 Critical reading elective (C.1.)</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.) (PHIL 337 or HUM 402 recommended)</td>
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1 To be selected in accordance with the General Education-Breadth and A.B.E.T. requirements. (Please see page 77 of this catalog.)

2 Adviser approved technical electives which must meet EAC-ABET requirements: IME 242, 243, 301, 319, 336, 357, 361, 362, 363, 408, 410, 411, 429, 443, 456 or current listing.
## B.S. MANUFACTURING ENGINEERING

Courses are displayed by Major, Support, General Education and Breadth, and Electives.

### MAJOR COURSES

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<tr>
<th>Course Code</th>
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<th>Units</th>
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<tr>
<td>IME 101</td>
<td>Introduction to Industrial and Manufacturing Engineering</td>
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<td>IME 141</td>
<td>Manufacturing Processes: Net Shape</td>
<td>1</td>
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<tr>
<td>IME 142</td>
<td>Manufacturing Processes: Materials Joining</td>
<td>2</td>
</tr>
<tr>
<td>IME 143</td>
<td>Manufacturing Processes: Material Removal</td>
<td>2</td>
</tr>
<tr>
<td>IME 223</td>
<td>Work Design and Measurement</td>
<td>4</td>
</tr>
<tr>
<td>IME 239</td>
<td>Industrial Costs and Controls</td>
<td>3</td>
</tr>
<tr>
<td>IME 241</td>
<td>Process Design I</td>
<td>1</td>
</tr>
<tr>
<td>IME 251</td>
<td>Manufacturing Engineering Analysis</td>
<td>3</td>
</tr>
<tr>
<td>IME 314</td>
<td>Engineering Economics</td>
<td>3</td>
</tr>
<tr>
<td>IME 335</td>
<td>Computer-Aided Manufacturing I</td>
<td>4</td>
</tr>
<tr>
<td>IME 341</td>
<td>Tool Engineering I</td>
<td>4</td>
</tr>
<tr>
<td>IME 342</td>
<td>Manufacturing Systems Integration</td>
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<tr>
<td>IME 356</td>
<td>Manufacturing Automation</td>
<td>4</td>
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<tr>
<td>IME 418</td>
<td>Product-Process Design</td>
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<tr>
<td>IME 421</td>
<td>Manufacturing Organization</td>
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<tr>
<td>IME 426</td>
<td>Engineering Test Design and Analysis</td>
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<tr>
<td>IME 430</td>
<td>Quality Engineering</td>
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</tr>
<tr>
<td>IME 455</td>
<td>Manufacturing Design and Implementation</td>
<td>3</td>
</tr>
<tr>
<td>IME 461</td>
<td>Senior Project</td>
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</tr>
<tr>
<td>IME 462</td>
<td>Senior Project</td>
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</tr>
<tr>
<td>IME 463</td>
<td>Undergraduate Seminar</td>
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Adviser approved technical electives which must meet EAC-ABET requirements:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>IME 242, 243, 301, 319, 336, 357, 361, 362, 363, 408, 410, 411, 429, 443, 456 or current listing</td>
<td>12</td>
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</tbody>
</table>

### SUPPORT COURSES

* = Courses satisfy General Education and Breadth requirements.

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<tr>
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<th>Course Title</th>
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<tr>
<td>CE 204</td>
<td>Strength of Materials</td>
<td>3</td>
</tr>
<tr>
<td>CE 205, 206</td>
<td>Strength of Materials and Lab or</td>
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<td>ME 341</td>
<td>Fluid Mechanics</td>
<td>3</td>
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<tr>
<td>CHEM 124</td>
<td>General Chemistry (B.1.a.)*</td>
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<tr>
<td>CHEM 125</td>
<td>General Chemistry</td>
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<tr>
<td>CSC 204</td>
<td>C and UNIX (F.1.)*</td>
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<td>EE 201</td>
<td>Electric Circuits Theory</td>
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<td>EE 251</td>
<td>Electric Circuits Lab</td>
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<tr>
<td>EE 321</td>
<td>Electronics</td>
<td>3</td>
</tr>
<tr>
<td>ETME 141</td>
<td>Descriptive Geometry</td>
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<tr>
<td>ETME 142</td>
<td>Engineering Drawing I</td>
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</tr>
<tr>
<td>ETME 143</td>
<td>Engineering Drawing II</td>
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<tr>
<td>MATE 206</td>
<td>Materials Engineering</td>
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</tr>
<tr>
<td>MATE 241</td>
<td>Materials Engineering Lab</td>
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</tr>
<tr>
<td>MATH 141</td>
<td>Calculus I (B.2.)*</td>
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</tr>
<tr>
<td>MATH 142</td>
<td>Calculus II</td>
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<tr>
<td>MATH 143</td>
<td>Calculus III</td>
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<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 Static</td>
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<td>ME 212</td>
<td>Engineering Dynamics</td>
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<td>ME 302</td>
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<td>ME 313</td>
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<td>PHYS 132</td>
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<td>PHYS 133</td>
<td>General Physics</td>
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<tr>
<td>STAT 321</td>
<td>Statistical Analysis I</td>
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</tbody>
</table>

### GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 9 units must be at the 300-400 level. Additional GEB courses are listed under Support Courses.

#### Area A:

ENGL 114 (A.1.)
ENGL 125/PHIL 125/SPC 125 (A.2.)
SPC 201/SPC 202 (A.3.)
ENGL 215/ENGL 218 (A.4.)
ENGL 219 recommended

#### Area B:

A minimum of 18 units is required; 16 of the units are in Support
Physical Science (B.1.a.) see Support Courses
Life science (B.1.b.)
BIO 220 recommended for B.1.b. and E.2.
Mathematics/statistics (B.2.)* see Support Courses

#### Area C:

PHIL 230/PHIL 231 (C.1.)
Critical reading electives (C.1.)
Fine and performing arts elective (C.2.)
Literature, philosophy, arts elective (300-400 level)
(C.3.) PHIL 337/HUM 402 recommended.
Arts and humanities elective (Area C)

#### Area D:

HIST 204 (D.1.), POLS 210 (D.1.)
HIST 315 (D.2.)
ECON 201/211/222 (D.3.)
ANT 201/GEOG 150/SOC 105 (D.4.a.)
ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300-400 level) (D.4.b.) BUS 404 recommended.

#### Area E:

A minimum of 2 units is required; 2 of the units are in Support
Computer literacy (F.1.)* see Support Courses

#### Total:

A minimum of 75 units is required; 18 of the units are in Support

#### ELECTIVES:

0
Faculty

Department Head, Robert H. Heidersbach, Jr.

William D. Forgeng    Paul E. Rainey
Blair London          Linda S. Vanasupa
Anny Morrobel-Sosa    Daniel W. Walsh

Program

B.S. 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.

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 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 program is accredited by the Engineering Accreditation Commission of 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.

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).
## B.S. MATERIALS ENGINEERING

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser. Courses are displayed by year.

### Freshman

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>MATE 121 Introduction to Materials Engineering</td>
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<td>MATE 122 Introduction to Materials Engineering Analysis</td>
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<tr>
<td>ETME 142 Engineering Drawing I</td>
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<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
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<td>CHEM 124 General Chemistry (B.1.a.)</td>
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<tr>
<td>MATH 142 Calculus II (B.2.)</td>
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<tr>
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<tr>
<td>MATE 224 Metallography</td>
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<tr>
<td>MATE 226, 246 Physical Metallurgy and Lab</td>
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<tr>
<td>CE 204 Strength of Materials</td>
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<tr>
<td>CSC 251 Digital Computer Applications (F.1.)</td>
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<td>MATH 241 Calculus IV</td>
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<td>MATH 242 Differential Equations</td>
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<tr>
<td>ME 211 Engineering Statics</td>
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<tr>
<td>PHYS 132 General Physics</td>
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<td>BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.)</td>
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<td>ENGL 215 Writing: Argumentation or ENGL 218 Professional Writing</td>
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<td>SPC 201 Public Speaking or SPC 202 Principles of Speech</td>
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### Junior

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<tbody>
<tr>
<td>MATE 401 Electronic Properties of Materials</td>
<td>3</td>
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<tr>
<td>MATE 402, 412 Mechanical Behavior of Materials/Lab</td>
<td>4,2</td>
</tr>
<tr>
<td>MATE 403 Materials Inspection</td>
<td>3</td>
</tr>
<tr>
<td>MATE 404 Failure Analysis</td>
<td>3</td>
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<tr>
<td>MATE 427 Composites</td>
<td>3</td>
</tr>
<tr>
<td>MATE 428 Polymers</td>
<td>3</td>
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<td>MATE 429 Instrumental Analysis</td>
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<td>ME 212 Engineering Dynamics</td>
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<tr>
<td>CE 205, 206 Strength of Materials and Lab</td>
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<tr>
<td>EE 201, 251 Electric Circuits Theory and Lab</td>
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<td>IME 314 Engineering Economics</td>
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<tr>
<td>ME 313 Heat Transfer</td>
<td>3</td>
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<tr>
<td>CHEM 305 Physical Chemistry</td>
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<tr>
<td>CHEM 306 Physical Chemistry</td>
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<td>HIST 315 Modern World History (D.2.)</td>
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### Senior

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<thead>
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<td>MATE 421 Materials Thermodynamics I</td>
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<td>MATE 422 Materials Thermodynamics II</td>
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<td>MATE 424 Ceramic Materials</td>
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<td>MATE 425 Corrosion Engineering</td>
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<tr>
<td>MATE 426 Fracture of Materials</td>
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<tr>
<td>MATE 430 Microelectronics Materials Processing</td>
<td>3</td>
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<tr>
<td>MATE 441 Advanced Materials Laboratory I</td>
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<tr>
<td>MATE 442 Advanced Materials Laboratory II</td>
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<tr>
<td>MATE 443 Advanced Materials Laboratory III</td>
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<tr>
<td>MATE 434 Welding Engineering I</td>
<td>3</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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<tr>
<td>ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300-400 level) (D.4.b.)</td>
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<td>Critical reading elective (C.1.)</td>
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**Total Senior Units** 208

---

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 77 of this catalog.)
3 Select 4 units from: IME 141, 142, 143, or IT 141, 302.
4 To be taken concurrently.
5 May substitute CSC 118, 204.
6 IME 426 may be substituted.
7 Any 300-level or higher MATH, STAT, or CSC course in linear algebra, advanced calculus, or statistics.
B.S. MATERIALS ENGINEERING
Courses are displayed by Major, Support, General Education and Breadth, and Electives.

<table>
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MAJOR COURSES

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<td>MATE 224 Metallurgy</td>
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<td>MATE 226, 246 Physical Metallurgy and Lab</td>
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<td>MATE 401 Electronic Properties of Materials</td>
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<td>MATE 402, 412 Mechanical Behavior of Materials, Laboratory</td>
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<td>MATE 430 Microelectronics Materials Processing</td>
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<td>MATE 434 Welding Engineering I</td>
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<tr>
<td>MATE 441 Advanced Materials Laboratory I</td>
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<td>MATE 442 Advanced Materials Laboratory II</td>
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<td>MATE 462 Senior Project</td>
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<td>MATE 463 Undergraduate Seminar</td>
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SUPPORT COURSES

* = Courses satisfy General Education and Breadth requirements

<table>
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<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>CE 204 Strength of Materials</td>
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<tr>
<td>CE 205, 206 Strength of Materials and Lab</td>
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<tr>
<td>CHEM 124 General Chemistry (B.1.a.)*</td>
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<tr>
<td>CHEM 125 General Chemistry</td>
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<td>CHEM 305 Physical Chemistry</td>
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<td>CHEM 306 Physical Chemistry</td>
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<tr>
<td>CSC 251 Digital Computer Applications (F.1.)*</td>
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<tr>
<td>EE 201, 251 Electric Circuits Theory and Lab.</td>
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<tr>
<td>ETME 142 Engineering Drawing I (or ETME 141, 143 or other drafting course)</td>
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<td>ETME 314 Engineering Economics (or ETME 426)</td>
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<tr>
<td>Manufacturing processes electives (select from: IME 141, IME 142, IME 143, IT 141, IT 302)</td>
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<td>MATH 141 Calculus I (B.2.)*</td>
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<td>MATH 142 Calculus II (B.2.)*</td>
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<td>MATH 143 Calculus III</td>
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<td>MATH 241 Calculus IV</td>
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<td>MATH 242 Differential Equations</td>
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Mathematics elective (any 300-400 level MATH, STAT or CSC course in linear algebra, advanced calculus or statistics) | 3 |
| ME 211 Engineering Statics | 3 |
| ME 212 Engineering Dynamics | 3 |
| ME 313 Heat Transfer | 3 |
| PHYS 131 General Physics (B.1.a.)* | 4 |
| PHYS 132 General Physics | 4 |
| PHYS 133 General Physics | 4 |

70

GENERAL EDUCATION AND BREADTH

To be selected according to GEB and EAC/ABET requirements. Please see page 77 for selection of GEB electives. At least 9 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

Area A: | 14
| ENGL 114 (A.1.) |
| ENGL 125/PHIL 125/SPC 125 (A.2.) |
| SPC 201/SPC 202 (A.3.) |
| ENGL 215/218 (A.4.) |

Area B: | 2
A minimum of 18 units is required; 16 of the units are in Support Physical science (B.1.a.)* see Support Courses Life science (B.1.b.) BIO 220 recommended for E.2. and B.1.b. Mathematics/statistics (B.2.)* see Support Courses

Area C: | 18
PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300–400 level) (C.3.)

Area D: | 18
HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/211/222 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)

Area E: | 5
PSY 201/PSY 202 (E.1.) BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.) BIO 220 recommended for E.2. and B.1.b.

Area F: | 0
A minimum of 2 units is required; 2 are in Support Computer literacy (F.1.)* see Support Courses

Total: | 57
A minimum of 75 units is required; 18 of the units are in Support

ELECTIVES | 3

208
MECHANICAL ENGINEERING DEPARTMENT

Engineering Bldg. (13), Room 252
(805) 756-1334

Faculty

Department Head, Ronald L. Mussulman

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. Iancu
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 B. Niku
William B. Patterson
Ramesh T. Shah
Jack D. Wilson
Yuen Cjen Yong

Program

B.S. Mechanical Engineering

It is our goal to graduate students who are prepared to excel as entry-level professionals who are willing and able to grow professionally and personally through their careers. This goal is pursued through a strong education in fundamentals, meaningful introduction to applications, and development of a sense of commitment to ethical and competent professional practice and to citizenship.

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. They also often enhance their careers through further study in graduate programs. 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 specializations through adviser approved electives. Special emphasis is given to electives that prepare students for careers in the HVAC/solar and petroleum industries. Engineering courses are found in all years. In the junior and senior years, the professional specialities include such courses as turbomachinery, robotics, advanced mechanics, mechanical design, heat and mass transfer, mechanical control systems, and solar systems. The program 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, controls, and others.

There are six 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, the American Society of Heating, Refrigerating and Air Conditioning Engineers, the Pi Tau Sigma honorary society, and the Alternative Energy Club. These clubs offer students an active program of professional and social activity.
### B.S. MECHANICAL ENGINEERING

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser. Courses are displayed by year.

<table>
<thead>
<tr>
<th>Year</th>
<th>Course</th>
<th>Units</th>
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<tr>
<td>Freshman</td>
<td><strong>B.S. MECHANICAL ENGINEERING</strong></td>
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<tr>
<td></td>
<td>ME 134 Mechanical Systems (Transfer students must take ME 234)</td>
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<tr>
<td></td>
<td>ETME 141 Applied Descriptive Geometry</td>
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<td></td>
<td>ETME 142 Engineering Drawing I</td>
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<td>ETME 143 Engineering Drawing II</td>
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<td>IME 142 Manufacturing Processes: Materials Joining</td>
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<td>IME 143 Manufacturing Processes: Material Removal</td>
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<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
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<td>CHEM 124 General Chemistry (B.1.a.)</td>
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<td>CHEM 125 General Chemistry</td>
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<td>MATH 143 Calculus III</td>
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<td>PHYS 132 General Physics</td>
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<td><strong>HIST 204 History of American Ideals and Institutions (D.1.)</strong></td>
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<td>ME 211 Engineering Statics</td>
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<td>ME 212 Engineering Dynamics</td>
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<td></td>
<td>ME 236 Thermal Systems</td>
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<td></td>
<td>CE 204 Strength of Materials</td>
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<td>CE 205, 206 Strength of Materials and Lab</td>
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<td>MATE 206, 241 Materials Engineering and Lab</td>
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<td>PHYS 133 General Physics</td>
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<td>CSC 251 Digital Computer Applications (F.1.)</td>
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<td>ECON 201 Survey of Economics (D.3.)</td>
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<td>ENGL 218 Professional Writing: Argumentation and Reports (A.4.)</td>
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<td>MATH 241 Calculus IV</td>
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<td>MATH 242 Differential Equations</td>
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<td>MATH 318 Advanced Engineering Mathematics (B.2.)</td>
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<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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<td>SPC 201 Public Speaking or</td>
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<td>SPC 202 Principles of Speech</td>
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<td>Communication (A.3.)</td>
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**Units**: 53

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<td>ME 318 Mechanical Vibrations</td>
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<td>ME 326 Intermediate Dynamics</td>
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<td>ME 328 Introduction to Design</td>
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<td>ME 329 Intermediate Design</td>
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<td>EE 321, 361 Electronics and Lab</td>
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<td><strong>Total</strong>: 70</td>
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**Units**: 53

| Freshman | **HIST 204 History of American Ideals and Institutions (D.1.)** | 3     |
| Sophomore | **Critical reading elective (C.1.)** | 3     |
| Senior | **Critical reading elective (C.1.)** | 3     |

**Units**: 52

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

1. Choose one unit from IME 141, IT 141 or IT 327.

2. To be selected in accordance with General Education-Breadth and A.B.E.T. requirements. (Please see page 77 of this catalog.)
B.S. MECHANICAL ENGINEERING

Courses are displayed by Major, Support, General Education and Breadth, and Electives.

<table>
<thead>
<tr>
<th>Units</th>
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## MAJOR COURSES
- ETME 141 Applied Descriptive Geometry ........ 2
- ETME 142 Engineering Drawing I ............... 1
- ETME 143 Engineering Drawing II ............... 1
- ME 134 Mechanical Systems (Transfer students must take ME 234) ............... 3
- ME 211 Engineering Statics ....................... 3
- ME 212 Engineering Dynamics ..................... 3
- ME 236 Thermal Systems ............................ 3
- ME 302 Thermodynamics .............................. 3
- ME 313 Heat Transfer .................................. 3
- ME 318 Mechanical Vibrations ..................... 4
- ME 326 Intermediate Dynamics .................... 4
- ME 328 Introduction to Design ..................... 4
- ME 329 Intermediate Design ....................... 4
- ME 341 Fluid Mechanics ............................. 3
- ME 342 Fluid Mechanics ................................ 3
- ME 343 Thermal Science Laboratory ............ 1
- ME 344 Thermal Engineering ....................... 4
- ME 345 Fluid Mechanics Laboratory ................. 1
- ME 422 Mechanical Control Systems ................. 4
- ME 428 Design ........................................ 4
- ME 440 Thermal System Design ..................... 4
- ME 461 Senior Project ................................ 2
- ME 462 Senior Project .................................. 3
- ME 463 Undergraduate Seminar .................... 1
- Adviser approved elective courses ............... 12

### SUPPORT COURSES

<table>
<thead>
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<th>Units</th>
</tr>
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</table>

* = Courses satisfy General Education and Breadth requirements

- CE 204 Strength of Materials ....................... 3
- CE 205, 206 Strength of Materials and Lab ........ 2,1
- CHEM 124 General Chemistry (B.1.a.)* .............. 4
- CHEM 125 General Chemistry (B.1.a.)* .............. 4
- CSC 251 Digital Computer Applications (F.1.)* .... 2
- EE 201, 251 Electric Circuit Theory and Lab .......... 3,1
- EE 321, 361 Electronics and Lab .................. 3,1
- EE 325, 365 Energy Conversion Electromagnetics, Laboratory ........................................... 3,1
- IME 142 Manufacturing Processes: Materials Joining . 2
- IME 143 Manufacturing Processes: Material Removal . 2
- MATE 206, 241 Materials Engineering and Lab ........ 3,1
- MATH 141 Calculus I (B.2.)* ....................... 4
- MATH 142 Calculus II .................................. 4
- MATH 143 Calculus III .................................. 4
- MATH 241 Calculus IV .................................. 4
- MATH 242 Differential Equations .................... 4
- MATH 318 Advanced Engineering Mathematics .......... 4
- PHYS 131 General Physics (B.1.a.)* ................. 4
- PHYS 132 General Physics ................................ 4
- PHYS 133 General Physics ................................ 4
- Manufacturing Processes elective .................... 1
  (IME 141, IT 141 or IT 327)

## GENERAL EDUCATION AND BREADTH

To be selected according to GEB and ABET requirements. Please see page 77 for selection of GEB electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

### Area A:
- A minimum of 14 units is required
  - ENGL 114 (A.1.)
  - ENGL 125/PHIL 125/SPC 125 (A.2.)
  - SPC 201/SPC 202 (A.3.)
  - ENGL 215/ENGL 218 (A.4.) ENGL 218 recommended.

### Area B:
- A minimum of 18 units is required; 16 of the units are in Support
  - Physical science (B.1.a.)* see Support Courses
  - Life Science (B.1.b.)
  - BIO 220 recommended for B.1.b. and E.2.
  - Mathematics/statistics (B.2.)* see Support Courses

### Area C:
- A minimum of 18 units is required
  - PHIL 230/PHIL 231 (C.1.)
  - Critical reading electives (C.1.)
  - Fine and performing arts elective (C.2.)
  - Literature, philosophy, arts elective (300–400 level) (C.3.)
  - Arts and humanities elective (Area C)

### Area D:
- A minimum of 18 units is required
  - HIST 204 (D.1.)
  - POLS 210 (D.1.)
  - HIST 315 (D.2.)
  - ECON 201 (D.3.)
  - ANT 201/GEOG 150/SOC 105 (D.4.a.)
  - ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)

### Area E:
- A minimum of 5 units is required
  - PSY 201/PSY 202 (E.1.)
  - BIO 220/FSN 210/PE 250/PSY 304/REC 100
  - BIO 220 recommended for E.2. and B.1.b.

### Area F:
- A minimum of 2 units is required
  - Computer literacy (F.1.*) see Support Courses

## ELECTIVES
- A minimum of 75 units is required; 18 of the units are in Support
- A minimum of 210 units is required
KEYBOARD LAB
Music Professor Terry Spiller directs students who are practicing to improve their skills in the new Keyboard Lab. Photo by Doug Allen.
## College of Liberal Arts

**Faculty Office Bldg. (47), Room 31**  
(805) 756-2706

**Paul J. Zingg, Dean**  
Harry W. Sharp Jr., Associate Dean  
Susan Currier, Interim Associate Dean

### Department: Program:

- **Art and Design**: Applied Art and Design: BS  
  Art: Minor
- **English**: English: BA, MA, Minor  
  Linguistics: Minor
- **Foreign Languages**: French: Minor  
  German: Minor  
  Spanish: Minor
- **Graphic Communication**: Graphic Communication: BS, Minor
- **History**: History: BA, Minor
- **Journalism**: Journalism: BS
- **Liberal Studies**: Liberal Studies: BA
- **Music**: Music: BA, Minor
- **Philosophy**: Philosophy: BA, Minor
- **Political Science**: Political Science: BA  
  International Relations: Minor  
  Public Administration: Minor
- **Psychology and Human Development**: Human Development: BS  
  Psychology: MS, Minor  
  Gerontology: Minor
- **Social Sciences**: Social Sciences: BS  
  Anthropology & Geography: Minor
- **Speech Communication**: Speech Communication: BA, Minor
- **Theatre and Dance**: Dance: Minor  
  Theatre: Minor

The College includes disciplines which represent four broad areas of knowledge: the fine and performing arts, communications, humanities, and social sciences. While the College 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 College of Liberal Arts administers Study Abroad programs in London. For further information, see the section on Study Abroad programs.

In addition to extensive involvement in the instructional program, the College has a major responsibility for activities which enhance the cultural and intellectual environment of the campus. Through Cal Poly Arts, the College sponsors a full range of cultural programs, including exhibits, concerts, literary presentations, and dramatic productions; and fosters artistic development and accomplishment across the campus. Students with other talents are attracted to the College’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 College regularly sponsors a lecture series on the arts and sciences and supports both the Center for Practical Politics and Cal Poly Arts.

The College of Liberal Arts provides a record of imaginative, and reflective human experience. The College 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.
VALUES, TECHNOLOGY AND SOCIETY MINOR

The purpose of the Values, Technology and Society minor is to increase understanding of how technology shapes and influences modern life. Students taking the minor will have an increased understanding of the social, environmental, economic and political implications of technology in the twentieth century. They will be able to think critically about the intellectual, moral, and historical issues that technological developments pose for the future of humankind.

The courses in the minor provide an overview of technological issues, with an emphasis on the impacts technology has on organizations and society. Technology's impact on society is examined from a values and public policy perspective. Students will be able to tailor their minor program to focus on specific issues through the selection of electives in technology, society, and values areas. The minor is available to students throughout the University regardless of students' technical backgrounds.

For more information, please contact Daniel Levy, Psychology and Human Development Department.

<table>
<thead>
<tr>
<th>Required Courses: (16)</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSC 302 Computers and Society (F.2.) ..................</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 301 Technology in the 20th Century (F.2.) ......</td>
<td>3</td>
</tr>
<tr>
<td>HUM 402 Values and Technology (C.3.) .................</td>
<td>3</td>
</tr>
<tr>
<td>POLS 404 Science, Technology and Public Policy ....</td>
<td>4</td>
</tr>
<tr>
<td>PSY 494 Psychology of Technological Change ..........</td>
<td>3</td>
</tr>
</tbody>
</table>

| Elective Courses: ....................................... | 9-11   |

Students are required to take 3 elective courses, one from each category.

Technology:
- CE 221 Fundamentals of Transportation Engineering (F.2.)
- ENVE 330 Environmental Quality Control (F.2.)
- IE 319 Human Factors Engineering (3)
- IT 301 Current Technological Issues (F.2.)
- PSC 110 Energy for the Present and Future (B.1.a.)
- PSC 171 Nuclear Weapon Proliferation in the Post Soviet World (B.1.a.)

Society:
- ANT 325 Material Culture (3)
- ANT 360 Human Cultural Adaptations (D.4.b.)
- CRP 211 Introduction to Urbanization (F.2.)
- FNR 101 Natural Resources Management and Society (F.2.)
- POLS 304 Politics of Global Survival (4)
- SPC 380 Media Effects (4)

Philosophy and Values:
- HIST 306 History of American Technology (3)
- HUM 302 Human Values in Agriculture (C.3.)
- PHIL 339 Biomedical Ethics (C.3.)
- PHIL 340 Environmental Ethics (C.3.)
- SPC 331 Political Advocacy and Contemporary Rhetoric (4)
- SPC/ENGL/JOUR 385 Mass Media Criticism (4)

Total: 25-27
Faculty

Director, Carolyn J. Stefanco

Program

Women's Studies Minor

Women's Studies is designed to provide students with an understanding of women's contributions to various areas and to women's place in history and society.

WOMEN'S STUDIES MINOR

The Women's Studies 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</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>WS 301 Introduction to Women's Studies</td>
<td>3</td>
</tr>
<tr>
<td>WS 401 Seminar in Women's Studies</td>
<td>3</td>
</tr>
<tr>
<td>WS 411 Women, Race and Class (D.4.b.)</td>
<td>3</td>
</tr>
<tr>
<td>HIST 434 American Women's History to 1870 or</td>
<td>3</td>
</tr>
<tr>
<td>HIST 435 American Women's History since 1870</td>
<td></td>
</tr>
<tr>
<td>PSY 314 Psychology of Women</td>
<td>3</td>
</tr>
</tbody>
</table>

Electives ........................................................... 12

Courses from a variety of departments which analyze women and gender issues are offered every quarter. The courses are chosen by the student and require the approval of a Women's Studies adviser or the Women's Studies Director.
ART AND DESIGN DEPARTMENT

Dexter Bldg. (34), Room 170
(805) 756-1148

Faculty

Department Chair, Charles W. Jennings

Robert S. Densham
Keith W. Dills
Clarissa Hewitt
Robert Howell
George D. Jercich
Eric B. Johnson

Mary LaPorte
Norman Lerner
John P. Mendenhall
Robert Reynolds
Joanne Beaule Ruggles
Henry Wessels

Programs

B.S. Applied Art and Design
with Concentrations in:
Graphic Design
Photography

Art Minor

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. Courses are also offered in the areas of art history and appreciation, studio art, and 3-dimensional design. The department has made a commitment to cultural diversity. Wherever possible, this commitment is evidenced by the inclusion of material which identifies significant multicultural influences on the content of the courses in our curriculum. In addition to the major and support programs, general education courses are available for all students to enrich their understanding, appreciation, and practical skills.

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.

Curricular Concentrations

Graphic Design 1

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, editorial design and 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 program 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 color printing, large-format photography, multimedia, corporate editorial, fashion and illustration as well as computerized electronic imaging. Development of the individual student's creative, expressive abilities is a key ingredient throughout the program. The concentration also includes a study of the history of photography as well as current professional practices and also includes opportunities to work on joint projects with graphic design students.

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.
**B.S. APPLIED ART AND DESIGN**

For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser.

**MAJOR COURSES**

* = Courses satisfy GEB requirements

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ART 101</td>
<td>Fundamentals of Drawing (C.2.)*</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>Select two: ART 211/212/213</td>
<td>Art History</td>
<td>4, 4</td>
</tr>
<tr>
<td>ART 221</td>
<td>Basic B/W Photography</td>
<td>3</td>
</tr>
<tr>
<td>ART 222</td>
<td>35mm Intermediate B/W Photography</td>
<td>3</td>
</tr>
<tr>
<td>ART 224</td>
<td>35mm Advanced B/W Photography</td>
<td>3</td>
</tr>
<tr>
<td>ART 231</td>
<td>Computer Imaging and Design</td>
<td>3</td>
</tr>
<tr>
<td>Select two: ART 310/311/312</td>
<td>Art History</td>
<td>4, 4</td>
</tr>
<tr>
<td>ART 460</td>
<td>Professional Practices</td>
<td>2</td>
</tr>
<tr>
<td>ART 461</td>
<td>Senior Project</td>
<td>3</td>
</tr>
<tr>
<td>ART 462</td>
<td>Senior Portfolio Project</td>
<td>1</td>
</tr>
<tr>
<td>ART 463</td>
<td>Undergraduate Seminar</td>
<td>2</td>
</tr>
<tr>
<td>PHIL 351</td>
<td>Traditional Theories of Aesthetics or PHIL 352 Contemporary Problems in Aesthetics (C.3.)</td>
<td>3</td>
</tr>
<tr>
<td>3-D Studio approved electives (9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ART 108, 135, 242, 245, 255</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>ART 308, 343, 344, 345, 346, 355, 356</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Concentration courses (see below)</td>
<td></td>
<td>55</td>
</tr>
</tbody>
</table>

**GENERAL EDUCATION AND BREADTH**

See page 77 for selection of GEB electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Major courses.

Area A: | | 14 |
| ENGL 114 (A.1.) | | |
| ENGL 125/PHIL 125/SPC 125 (A.2.) | | |
| SPC 201/SPC 202 (A.3.) | | |
| ENGL 215 or 218 (A.4.) | | |

Area B: | | 18 |
| Physical and life sciences electives (one each, one with lab) (B.1.) | | |
| Mathematics elective (B.2.) | | |
| Mathematics or statistics elective (B.2.) | | |
| Mathematics, statistics or science elective (Area B) | | |

Area C: | | 11 |
| A minimum of 18 units is required; 7 of the units are in Major Courses. | | |
| PHIL 230/PHIL 231 (C.1.) | | |
| Critical reading electives (C.1.) | | |
| *see Major Courses (C.2.) | | |
| *see Major Courses (C.3.) | | |
| Arts and humanities elective (Area C) | | |

Area D: | | 18 |
| HIST 204 (D.1.), POLS 210 (D.1.) | | |
| HIST 315 (D.2.) | | |

**ECON 201/211/222 (D.3.)**

**ANT 201/GEOG 150/SOC 105 (D.4.a.)**

**ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)**

Area E: | | 5 |
| PSY 201/PSY 202 (E.1.) | | |
| BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.) | | |

Area F: | | 6 |
| Computer literacy elective (F.1.) | | |
| Technology elective (300–400 level) (F.2.) | | |

**Total: 72**

**A minimum of 79 units is required; 7 of the units are in Major Courses.**

**ELECTIVES** | | 10 |

**CONCENTRATIONS (select one)**

**Graphic Design Concentration**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ART 133</td>
<td>Color and Design</td>
<td>3</td>
</tr>
<tr>
<td>ART 201</td>
<td>Intermediate Drawing or elective</td>
<td>3</td>
</tr>
<tr>
<td>ART 232</td>
<td>Beginning Graphic Design</td>
<td>3</td>
</tr>
<tr>
<td>ART 313</td>
<td>Design History</td>
<td>3</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>
</tr>
<tr>
<td>ART 430</td>
<td>Advanced Typographic Design</td>
<td>3</td>
</tr>
<tr>
<td>ART 431</td>
<td>Package Design</td>
<td>3</td>
</tr>
<tr>
<td>ART 432</td>
<td>Advertising Design</td>
<td>3</td>
</tr>
<tr>
<td>ART 433</td>
<td>Editorial Design</td>
<td>3</td>
</tr>
<tr>
<td>GRC 300</td>
<td>Typography</td>
<td>4</td>
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<tr>
<td>Adviser approved electives (18)</td>
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<tr>
<td>ART 204, 301, 302, 303, 304, 305, 306, 464</td>
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<td>15</td>
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<tr>
<td>ART 307, 336, 408; TH 430, 434; GRC 101</td>
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<td>3</td>
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</table>

**Photography Concentration**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ART 314</td>
<td>History of Photography</td>
<td>4</td>
</tr>
<tr>
<td>ART 320</td>
<td>Fashion Photography</td>
<td>3</td>
</tr>
<tr>
<td>ART 321</td>
<td>Photographic Expression: B/W</td>
<td>4</td>
</tr>
<tr>
<td>ART 322</td>
<td>Color Photography I, Negative</td>
<td>3</td>
</tr>
<tr>
<td>ART 323</td>
<td>Color Photography II, Positive</td>
<td>3</td>
</tr>
<tr>
<td>ART 325</td>
<td>4x5 Camera Techniques, B/W</td>
<td>3</td>
</tr>
<tr>
<td>ART 326</td>
<td>4x5 Camera/Commercial</td>
<td>3</td>
</tr>
<tr>
<td>ART 327</td>
<td>Portraiture B/W</td>
<td>3</td>
</tr>
<tr>
<td>ART 424</td>
<td>Multimedia Photography</td>
<td>4</td>
</tr>
<tr>
<td>ART 426</td>
<td>Illustration Photography I, B/W</td>
<td>3</td>
</tr>
<tr>
<td>ART 427</td>
<td>Illustration Photography II, Color</td>
<td>3</td>
</tr>
<tr>
<td>ART 428</td>
<td>Commercial Photography</td>
<td>4</td>
</tr>
<tr>
<td>Adviser approved electives (15)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ART 133, 201, 204, 301, 302, 303, 304, 305, 306, 336, 464, 465</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>TH 330, 342, 430, 434; GRC 101</td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>
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: Robert Reynolds, Clarissa Hewitt, George Jerchich, Henry Wessels or Keith Dills.

<table>
<thead>
<tr>
<th>Units</th>
<th>Core courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>ART 101 Fundamentals of Drawing (4) (C.2.)</td>
</tr>
<tr>
<td></td>
<td>ART 108 Fundamentals of Sculpture (4) (C.2.)</td>
</tr>
<tr>
<td></td>
<td>ART 112 Survey of Western Art (3) (C.2.)</td>
</tr>
<tr>
<td></td>
<td>ART 312 Art History—Contemporary Art (4) (C.3.)</td>
</tr>
</tbody>
</table>

After consultation with an Art and Design Department adviser, complete a minimum of 3 units from courses listed below.

| 3 | ART 201 Intermediate Drawing (3) |
|   | ART 204 Beginning Watercolor (3) |
|   | ART 242 Glassblowing (3) |
|   | ART 245 Ceramics I (3) |
|   | ART 255 Jewelry Design (3) |

After consultation with an Art and Design Department adviser, complete 12 units from courses listed below.

| 12 | ART 301 Advanced Drawing (3) |
|    | ART 302 Life Drawing I (3) |
|    | ART 303 Life Drawing II (3) |
|    | ART 304 Advanced Watercolor (3) |
|    | ART 305 Painting Techniques (3) |
|    | ART 310 Art History—American Art (4) |
|    | ART 311 Art History—Modern Art (4) |
|    | ART 313 Design History (3) |
|    | ART 308 Advanced Sculpture (3) |
|    | ART 343 Selected Advanced Topics in Glass (4) |
|    | ART 344 Glass Fusing and Forming (3) |
|    | ART 345 Ceramics II (3) |
|    | ART 346 Ceramics III (3) |
|    | ART 355 Metalworking (3) |
|    | ART 356 Jewelry Casting (3) |
|    | ART 311 Art History—Modern Art (4) |
|    | ART 313 Design History (3) |

30
Students interested in any of these programs should write or visit the department office for details.

In cooperation with the University Center for Teacher Education, 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. For more information regarding teaching credential programs, see the University Center for Teacher Education section.

The department supports the concept of international education and encourages students to investigate opportunities for overseas study. For further information, see the Study Abroad programs.
# B.A. ENGLISH

For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser.

## MAJOR COURSES

* = Courses satisfy General Education and Breadth requirements

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 251/252/253</td>
<td>Great Books of World Literature (C.1.)*</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 290</td>
<td>Introduction to Linguistics</td>
<td>4</td>
</tr>
<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 330/331/332</td>
<td>British Literature</td>
<td>4,4</td>
</tr>
<tr>
<td>ENGL 339</td>
<td>Introduction to Shakespeare</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 340, ENGL 341</td>
<td>American Literature</td>
<td>4,4</td>
</tr>
<tr>
<td>ENGL 345</td>
<td>Ethnic American Literature or ENGL 346 Ethnic American Literature</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 350/351/352</td>
<td>Modern Novel, Poetry, or Drama</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 390/395/497/498</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>ENGL 460</td>
<td>Senior Project Seminar</td>
<td>1</td>
</tr>
<tr>
<td>ENGL 461</td>
<td>Senior Project</td>
<td>3</td>
</tr>
<tr>
<td>English elective (300–400 level)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>English electives (400 level)</td>
<td></td>
<td>19</td>
</tr>
</tbody>
</table>

### Units

| Total | 75 |

## SUPPORT COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign language (200 level or above)</td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

### Units

| Total | 4 |

## GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Major and Support courses.

### Area A:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 114</td>
<td>(A.1.)</td>
<td>14</td>
</tr>
<tr>
<td>ENGL 125/PHIL 125/SPC 125</td>
<td>(A.2.)</td>
<td>4</td>
</tr>
<tr>
<td>SPC 201 or 202</td>
<td>(A.3.)</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 215 or 218</td>
<td>(A.4.)</td>
<td>3</td>
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</table>

### Area B:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical and life sciences electives (one each, one with lab) (B.1.)</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Mathematics elective (B.2.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mathematics or statistics elective (B.2.)</td>
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<td></td>
</tr>
<tr>
<td>Mathematics, statistics or science elective (Area B)</td>
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### Area C:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHIL 230/PHIL 231</td>
<td>(C.1.)</td>
<td>15</td>
</tr>
<tr>
<td>Fine and performing arts elective (C.2.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Literature, philosophy, arts elective (300–400 level) (excluding ENGL) (C.3.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arts and humanities elective (Area C)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Area D:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIST 204</td>
<td>(D.1.)</td>
<td>18</td>
</tr>
<tr>
<td>HIST 315</td>
<td>(D.2.)</td>
<td></td>
</tr>
<tr>
<td>ECON 201/211/222</td>
<td>(D.3.)</td>
<td>5</td>
</tr>
<tr>
<td>ANT 201/GEOG 150/SOC 105</td>
<td>(D.4.a.)</td>
<td>6</td>
</tr>
<tr>
<td>ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Area E:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSY 201/PSY 202</td>
<td>(E.1.)</td>
<td>5</td>
</tr>
<tr>
<td>BIO 220/FSN 210/PE 250/PSY 304/REC 100</td>
<td>(E.2.)</td>
<td>6</td>
</tr>
</tbody>
</table>

### Area F:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer literacy elective (F.1.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology elective (300–400 level) (F.2.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Total:

| Units | 76 |

### ELECTIVES:

| Units | 31 |

A minimum of 79 units is required; 3 of the units are in Major Courses.
CURRICULUM FOR ENGLISH MINOR

Units
Required Courses ............................................ 14
ENGL 253 Great Books (3)
ENGL 302 Advanced Composition or
ENGL 326 Literary Criticism (4)
ENGL 339 Introduction to Shakespeare (3)
ENGL 390 Modern English Grammar or
ENGL 395 History of the English Language (4)

Select one of the following British literature courses ..... 4
ENGL 330 British Literature: Medieval Period (C.3.)
ENGL 331 British Literature: The Renaissance (C.3.)
ENGL 332 British Literature: The Enlightenment (C.3.)
ENGL 333 British Literature: The Romantic Movement (C.3.)
ENGL 334 British Literature: The Victorians (C.3.)

Select one of the following American literature courses 4
ENGL 340 American Literature to 1860 (C.3.)
ENGL 341 American Literature 1860-1914 (C.3.)
ENGL 342 American Literature 1914 to the Present (C.3.)

Select one of the following courses .......................... 3
ENGL 350 Modern Novel (C.3.)
ENGL 351 Modern Poetry (C.3.)
ENGL 352 Modern Drama (C.3.)

CURRICULUM FOR LINGUISTICS MINOR

Units
Required courses ............................................. 11
ANT 333 Language and Culture (3)
ENGL 290 Introduction to Linguistics (4)
ENGL 391 Topics in Applied Linguistics (4)

Adviser approved electives, which may include:...... 15-16
ENGL 390 Modern English Grammar (4)
ENGL 395 History of the English Language (4)
ENGL 497 Theories of Language Learning and Teaching (4)
SPC 316 Intercultural Communication (3)

TEACHING ENGLISH AS A SECOND LANGUAGE CERTIFICATE

The Teaching English as a Second Language (TESL) Certificate provides individuals with specialized training to teach successfully in a wide variety of ESL programs. Both undergraduate and graduate students currently enrolled in any degree program at Cal Poly may pursue this certificate. The TESL program is comprised of courses from the departments of English, Social Sciences, and Speech Communication.

The TESL Certificate is designed for two career options:

1. The Post-Secondary/Adult option prepares individuals to teach in college level and adult education programs. Those wishing to teach at the college level are advised that an M.A. in English or a related field is the usual minimum requirement for full-time positions.

2. The K-12 option prepares individuals having a single or multiple subject credential to teach ESL in elementary and secondary schools. Certain courses in this program will assist persons in receiving the California Supplementary Authorization in ESL.

The TESL Certificate Program requires 29 units of study and provides prospective ESL teachers a solid background in theoretical and applied linguistics, cross-cultural communication, language and culture, second language acquisition, and methods of TESL. A practicum allows individuals supervised experience within the ESL classroom. Questions concerning the TESL Certificate should be addressed to the Program Coordinator in the English Department.

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 want to supplement their technical training with communication training. Students may 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, 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 a writing sample submitted to the English Graduate adviser. Non-native speakers should also submit TOEFL scores (Test of English as a Foreign Language). Advancement to 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 Admissions Office. All applications should include a writing sample (a critical essay on a work of literature) and three letters of recommendation.

CURRICULUM FOR M.A. ENGLISH

Required courses .......................................................... 36
ENGL 501 Techniques of Literary Research (4)
ENGL 502 Seminar in Critical Analysis
    Historical and Contemporary (4) (4)
ENGL 503 Seminar in English Linguistics (4)
ENGL 505 Seminar in Composition Theory (4)
ENGL 511 Seminar in American Literary Periods (4) (4)
ENGL 512 Seminar in British Literary Periods (4) (4)
English electives ......................................................... 12
Additional units in the English 400 and 500 series, selected from one of these three emphasis areas: literature, writing or linguistics.

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in English and other subjects.
FOREIGN LANGUAGES AND LITERATURES DEPARTMENT

Faculty Office Bldg. (47), Room 28
(805) 756-1205

Faculty

Department Head, William Little

Hernán Castellano-Girón
Odile Clause
Bianca Rosenthal

Programs

French Minor

German Minor

Spanish Minor

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 sixteen units must be upper division. At least one upper division course must be completed in residence at Cal Poly 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, please refer to "Minors." 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 in Spanish and the ZDAF German Proficiency Examination in conjunction with the Goethe Institute. For more information regarding teaching, please refer to Teacher Credential Programs. The department also supports such student clubs as the French Club, the German Club, the Italian Club, the Japanese Club, the Latin American Student Association, and MECHA (Movimiento Estudiantil Chicano de Aztlán.)

CURRICULUM FOR FRENCH MINOR

- Required courses .......................................................... 20
  - FR 201, FR 202 Intermediate French (4) (4)
  - FR 233 Critical Reading in French Literature (4) (C.1.)
  - FR 301 Advanced French Composition and Grammar (4)
  - FR 305 Significant Writers in French (4) (C.3)
  - Electives to be chosen from the following:...................... 8
  - FR 302 Advanced French Conversation and Grammar (4)
  - FR 405 French Literature in English Translation (4) (C.3.)
  - FR 470 Selected Advanced Topics (1–4) (repeatable to 8)
  - FORL 400 Special Problems for Advanced Undergraduates (1–2)
  - HUM 310 Humanities in World Cultures (French) (3) (C.3.)

CURRICULUM FOR GERMAN MINOR

- Required courses .......................................................... 20
  - GER 201, GER 202 Intermediate German (4) (4)
  - GER 233 Critical Reading in German Literature (4) (C.1.)
  - GER 301 Advanced German Composition and Grammar (4)
  - GER 305 Significant Writers in German (4) (C.3)
  - Electives to be chosen from the following:...................... 8
  - GER 302 Advanced German Conversation and Grammar (4)
  - GER 405 German Literature in English Translation (4) (C.3.)
  - GER 470 Selected Advanced Topics (1–4) (repeatable to 8)
  - FORL 400 Special Problems for Advanced Undergraduates (1–2)
  - HUM 310 Humanities in World Cultures (German) (3) (C.3.)
## CURRICULUM FOR SPANISH MINOR

<table>
<thead>
<tr>
<th>Units</th>
<th>Required courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>SPAN 201, SPAN 202 Intermediate Spanish (4) (4)</td>
</tr>
<tr>
<td></td>
<td>SPAN 233 Critical Reading in Hispanic Literature (4) (C.1.)</td>
</tr>
<tr>
<td></td>
<td>SPAN 301 Advanced Spanish Composition and Grammar (4)</td>
</tr>
<tr>
<td></td>
<td>SPAN 305 Significant Writers in Spanish (4) (C.3.)</td>
</tr>
<tr>
<td>8</td>
<td>Electives to be chosen from the following:</td>
</tr>
</tbody>
</table>

- SPAN 303 Hispanic Culture (3) or HUM 310 Humanities in World Cultures (Spain, Chicano or Latin America) (3) (C.3.)
- SPAN 330 Spanish for Bilingual Speakers (4)
- SPAN 340 Chicano/a Authors (4)
- SPAN 405 Hispanic Literature in English Translation (4) (C.3.)
- SPAN 470 Selected Advanced Topics (1–4) (repeatable to 8)
- FORL 400 Special Problems for Advanced Undergraduates (1–2)

28
Faculty

Department Head, Harvey R. Levenson
Herschel L. Apfelberg               James R. Hutchinson
Michael L. Blum                    W. Stephen Mott
Gary G. Field                      Patrick A. Munroe
Henry J. Heesch                    Philip K. Ruggles

Programs

B.S. Graphic Communication
with Concentrations in:
Computers and Printing Technology
Design Reproduction Technology
Printing Management

Graphic Communication Minor

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 process, 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

Computers and Printing Technology

The Computers and Printing Technology concentration is for those primarily interested in the technical aspects of the graphic arts. The emphasis of the concentration is on digital imaging including electronic color scanning, emerging desktop applications, and digital proofing; the measurement of quality; and advanced production technologies. The concentration prepares students for positions in quality control, prepress systems management, technical sales, product development, technical and production management, and other positions requiring an understanding of computers and technology.

Design Reproduction Technology

The Design Reproduction Technology concentration is unique with respect to its emphasis on modern electronic graphic print technology. This is supported by an understanding of design aesthetics derived from courses with emphasis on design and print. The purpose of this program of study is to combine design with print technology, thus providing its graduates with career opportunities with considerable dynamic flexibility within the graphic arts field.

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 scheduler and controller, customer service representative, print buyer, print broker, estimator, or sales representative. The program also prepares students for management of related graphic communication businesses, including newspapers, commercial printing, service bureaus, business forms and specialized printing operations.

The Design Reproduction Technology concentration of the Graphic Communication Department is distinguished from the Graphic Design concentration of the Art and Design Department. By focusing 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.

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.
B.S. GRAPHIC COMMUNICATION

For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser.

MAJOR COURSES

* = Courses satisfy General Education and Breadth requirements

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRC 101</td>
<td>Introduction to Graphic Communication</td>
<td>4</td>
</tr>
<tr>
<td>GRC 300</td>
<td>Typography</td>
<td>4</td>
</tr>
<tr>
<td>GRC 301</td>
<td>Electronic Publishing Systems</td>
<td>3</td>
</tr>
<tr>
<td>GRC 311</td>
<td>Substrates and Ink</td>
<td>3</td>
</tr>
<tr>
<td>GRC 324</td>
<td>Binding and Finishing Processes</td>
<td>3</td>
</tr>
<tr>
<td>GRC 327</td>
<td>Graphic Arts Photography</td>
<td>4</td>
</tr>
<tr>
<td>GRC 328</td>
<td>Film Assembly and Platemaking</td>
<td>3</td>
</tr>
<tr>
<td>GRC 401</td>
<td>Printing Marketing and Sales</td>
<td>3</td>
</tr>
<tr>
<td>GRC 403</td>
<td>Printing Estimating</td>
<td>4</td>
</tr>
<tr>
<td>GRC 411</td>
<td>Pricing, Costing and Web Estimating</td>
<td>3</td>
</tr>
<tr>
<td>GRC 414</td>
<td>Color Image Assembly</td>
<td>2</td>
</tr>
<tr>
<td>GRC 415</td>
<td>Sheetfed Lithographic Technology</td>
<td>5</td>
</tr>
<tr>
<td>GRC 416</td>
<td>Web Printing Technology</td>
<td>5</td>
</tr>
<tr>
<td>GRC 421</td>
<td>Printing Production Management</td>
<td>4</td>
</tr>
<tr>
<td>GRC 422</td>
<td>Printing Supervision and Personnel Issues</td>
<td>4</td>
</tr>
<tr>
<td>GRC 460</td>
<td>Research Methods in Graphic Communication</td>
<td>1</td>
</tr>
<tr>
<td>GRC 461</td>
<td>Senior Project</td>
<td>3</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>
</tr>
<tr>
<td>ENGL 215</td>
<td>Writing: Argumentation or ENGL 218 Professional Writing: Argumentation and Reports (A.4.)*</td>
<td>4</td>
</tr>
<tr>
<td>GRC electives</td>
<td>Select units from the following</td>
<td>9</td>
</tr>
<tr>
<td>GRC 204, 223, 307, 326, 333, 357, 408, 429, 437</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

SUPPORT COURSES

* = Courses satisfy General Education and Breadth requirements

1 B.2. MATH 118 Pre-Calculus Algebra or MATH 120 Pre-Calculus Algebra and Trigonometry (B.2.)* | 4
1 B.2. STAT 211 Elem. Probability and Stat. (B.2.)* | 3

Area B: ............................................... 3
A minimum of 18 units is required; 15 of the units are in Major and Support
Physical science (B.1.a.)* see Major Courses
Life science elective (B.1.b.)*
Mathematics/statistics (B.2.)* see Support Courses
Mathematics, statistics or science elective (Area B)

Area C: .................................................. 18
PHIL 230/PHIL 231 (C.1.)
Critical reading electives (C.1.)
Fine and performing arts elective (C.2.)
Literature, philosophy, arts elective (300–400 level) (C.3.)
Arts and humanities elective (Area C)

Area D: .................................................. 18
HIST 204 (D.1.), POLS 210 (D.1.)
HIST 315 (D.2.)
ECON 201/211/222 (D.3.)
ANT 201/GEOG 150/SOC 105 (D.4.a.)
ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)

Area E: .................................................. 5
PSY 201/PSY 202 (E.1.)
BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)

Area F: .................................................. 6
Computer literacy elective (F.1.)
Technology elective (300–400 level) (F.2.)

Total..................................................... 60
A minimum of 79 units is required; 19 of the units are in Major and Support Courses

ELECTIVES............................................... 10

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.
CONCENTRATIONS (select one)

Computers and Printing Technology Concentration
CSC 204 C and UNIX ........................................... 3
CSC electives (in addition to GEB F.1.) ...................... 8
PHYS 121 College Physics ..................................... 4
PHYS 122 College Physics ..................................... 4
GRC 302 New Technologies in Graphic Comm. .............. 3
GRC 331 Color Quality Control ................................ 4
GRC 432 Imaging Systems Management ....................... 4

Design Reproduction Technology Concentration
ART 131 2-D Design Fundamentals .......................... 3
ART 132 Beginning Color Theory ............................. 3
ART 133 Color and Design ..................................... 3
ART 331 Typographic Design .................................. 3
ART 332 Symbology ............................................. 3
ART 333 Corporate Identity ................................... 3
GRC 438 Electronic Art Preparation .......................... 4
GRC 439 Line and Halftone Media for Books and Publications ........................................... 4
GRC 440 Advanced Copy Technology for Newspapers and Magazines ....................................... 4

Printing Management Concentration
BUS 207 Business Law ......................................... 4
ACTG 211 Financial Accounting for Nonbusiness Majors .................................................. 4
MKTG 204 Elements of Marketing ............................. 4
GRC 302 New Technologies in Graphic Comm. .............. 3
GRC 331 Color Quality Control ................................ 4
GRC 423 Printing Labor Relations ............................. 4
GRC 432 Imaging Systems Management ....................... 4
Select a minimum of 3 units from the following: .. 3
ENGL 310, SPC 301, or any 300-400 level
BUS/MKTG/ACTG course selected with adviser
approval

GRAPHIC COMMUNICATION MINOR

A minor in Graphic Communication will benefit students interested in pursuing careers in graphic communication or who anticipate using graphic communication in another career. Students in the minor will have a competitive edge when applying for many jobs by understanding concepts, and gaining knowledge and skills in computer applications and desktop publishing, typography and specifying the processes and materials for a broad range of printing and publishing applications. Information and application forms for the declaration of this minor are available in the Graphic Communication Department office.

Required Core ...................................................... 21
GRC 101 Introduction to Graphic Communication (4)
GRC 277 Computer Applications in Desktop Publishing (3) (F.1.)
GRC 300 Typography (4)
GRC 312 Substrates and Ink: Applications (2)
GRC 325 Finishing Processes: Applications (2)
GRC 329 Prepress Methods and Procedures (3)
GRC 330 Print Reproduction Processes (3)

Choose 4 units from the following ................................ 4
GRC 357 Screen Printing Technology (2)
GRC 408 Newspaper and Publications Management (3)
GRC 437 Consumer Packaging (3)
GRC 438 Electronic Art Preparation (4)
GRC 474 Applied Graphic Communication Practices (2)

Units

30
HISTORY DEPARTMENT

Faculty Office Bldg. (47), Room 27C
(805) 756-2543

Faculty

Department Chair, Robert E. Burton

Timothy M. Barnes       Daniel E. Krieger
Lloyd N. Beecher        Edward L. Mayo
Nancy L. Clark          Max E. Riedlspenger
George B. Cotkin        John Snetsinger
Manzar Foroohar        Carolyn J. Stefanco
Donald A. Grinde, Jr.

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>Required courses .................................................................</td>
</tr>
<tr>
<td>HIST 101, HIST 102, HIST 103 History of Western Civilization (3) (3) (3)</td>
</tr>
<tr>
<td>HIST 201 United States History (3)</td>
</tr>
<tr>
<td>HIST 300 Research Methods (3)</td>
</tr>
</tbody>
</table>

| Select 3 units of upper-division United States history ... | 3 |
| HIST 385, 401, 402, 404, 405, 406, 407 |

| Select 6 units from outside the areas of U.S. and European history........................................ | 6 |
| HIST 307, 314, 328, 329, 339, 340, 341, 381, 382, 415, 416, 417 |

| Select 6 units in any 300–400 history courses .......... | 6 |
| (excluding HIST 315) |

<table>
<thead>
<tr>
<th>.........</th>
<th>30</th>
</tr>
</thead>
</table>

Programs

B.A. History

History Minor

Historians study the past in its variety and complexity. With such an analysis, students of history gain multiple perspectives on the present and an aptitude to plan intelligently for the future. Although the lessons to be learned from the past are rarely simple, solutions to present-day problems rest on comprehension of historical forces and events.

History deepens our understanding of other peoples and cultures. All courses offered in the History Department seek to examine the issues of race, gender, class, and cultural diversity.

Majoring in history is excellent preparation for students interested in a teaching career, the legal profession, or advanced work in the discipline. Students wishing to become business executives, administrators, and public servants profit immensely by gaining the methodological skills of the historian. Historians learn to gather, synthesize, analyze, and interpret evidence; they become skilled in presenting their conclusions to a general audience in a lucid and logical manner.

The study of history and its method prepares students for a wide range of careers while also sensitizing them to the complexity and diversity of the past and present. History is an excellent foundation for a broadly based education in the liberal arts.
## B.A. HISTORY

For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser.

### MAJOR COURSES

* = Courses satisfy General Education and Breadth requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIST 101</td>
<td>History of Western Civilization</td>
<td>3</td>
</tr>
<tr>
<td>HIST 102</td>
<td>History of Western Civilization</td>
<td>3</td>
</tr>
<tr>
<td>HIST 103</td>
<td>History of Western Civilization</td>
<td>3</td>
</tr>
<tr>
<td>HIST 201</td>
<td>United States History (D.1)*</td>
<td>3</td>
</tr>
<tr>
<td>HIST 300</td>
<td>Research Methods</td>
<td>3</td>
</tr>
<tr>
<td>HIST 301</td>
<td>Writing and Research Seminar in History</td>
<td>3</td>
</tr>
<tr>
<td>HIST 302</td>
<td>Historiography</td>
<td>3</td>
</tr>
<tr>
<td>HIST 460</td>
<td>Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>HIST 461</td>
<td>Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>History electives (300–400 level)</td>
<td></td>
<td>21</td>
</tr>
<tr>
<td>Foreign language requirement, select one: FR 202, GER 202, SPAN 202</td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

**Total Units:** 50

### SUPPORT COURSES

| Electives (100–200 level) | 11 |
| Electives (300–400, including History) | 23 |

**Total Electives:** 34

### GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Major and Support courses.

| Area A: | 14 |
| ENGL 114 (A.1.) | |
| ENGL 125/PHIL 125/SPC 125 (A.2.) | |
| SPC 201/SPC 202 (A.3.) | |
| ENGL 215/ENGL 218 (A.4.) | |
| Area B: | 18 |
| Physical and life sciences electives (one each, one with lab) (B.1.) | |
| Mathematics elective (B.2.) | |
| Mathematics/statistics elective (B.2.) | |
| Science, mathematics or statistics elective (Area B) | |
| Area C: | 18 |
| PHIL 230/PHIL 231 (C.1.) | |
| Critical reading electives (C.1.) | |
| Fine and performing arts elective (C.2.) | |
| Literature, philosophy, arts elective (300–400 level) (C.3.) | |
| Arts and humanities elective (Area C) | |

**Area D:** 15

A minimum of 18 units is required; 3 of the units are in Major

- History (D.1.)* see Major Courses
- POLS 210 (D.1.)
- HIST 315 (D.2.)
- ECON 201/211/222 (D.3.)
- ANT 201/GEOG 150/SOC 105 (D.4.a.)
- ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)

**Area E:** 5

- PSY 201/PSY 202 (E.1.)
- BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)

**Area F:** 6

- Computer literacy elective (F.1.)
- Technology elective (300–400 level) (F.2.)

**Total:** 76

A minimum of 79 units is required; 3 of the units are in Major Courses

**ELECTIVES:** 26

**Total:** 186
Faculty

Department Head, Nishan R. Havandjian
Clay Carter  Victor Valle
Randall L. Murray

Program

B.S. Journalism

The Journalism Department offers a professional program leading to the Bachelor of Science degree in Journalism. All majors must complete the basic journalism core courses in addition to a list of restricted electives from which they can choose.

In consultation with their academic advisers, majors can put together specific curriculum packages which maximize their preparation for future careers in the newspaper and magazine industry, in radio and television news, in public relations, or in agricultural communication.

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 193 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.

All journalism majors are expected to serve as staff members of departmental communications media, including Mustang Daily, the student newspaper, KCPR, the FM-stereo radio station, or the news and programming operations of CPTV, Cal Poly's developing TV station operated by the Journalism Department. 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, and the Agricultural Communicators of Tomorrow. The department is headquarters for the California Intercollegiate Press Association (CIPA), an organization whose members consist of the student media in California universities.
B.S. JOURNALISM

For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser.

**MAJOR COURSES**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign language 101, 102, 103 (Spanish, French, German or other)</td>
<td>4, 4, 4</td>
</tr>
<tr>
<td>JOUR 203 News Writing and Reporting</td>
<td>4</td>
</tr>
<tr>
<td>JOUR 223 Photojournalism</td>
<td>3</td>
</tr>
<tr>
<td>JOUR 233 Copy Editing</td>
<td>4</td>
</tr>
<tr>
<td>JOUR 290 Multicultural Journalism</td>
<td>3</td>
</tr>
<tr>
<td>JOUR 302 Mass Media Law</td>
<td>4</td>
</tr>
<tr>
<td>JOUR 304 Reporting Contemporary Issues</td>
<td>4</td>
</tr>
<tr>
<td>JOUR 318 Mass Media in Society</td>
<td>4</td>
</tr>
<tr>
<td>JOUR 333 Broadcast News</td>
<td>4</td>
</tr>
<tr>
<td>JOUR 401 International Communication</td>
<td>4</td>
</tr>
<tr>
<td>JOUR 444 Media Internship</td>
<td>3</td>
</tr>
<tr>
<td>JOUR 460 Senior Project</td>
<td>3</td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td>2, 2</td>
</tr>
<tr>
<td>Choose one or both broadcast labs—4 units max/min:</td>
<td></td>
</tr>
<tr>
<td>JOUR 351 Adv. Radio Reporting: KCPR (2) (2)</td>
<td></td>
</tr>
<tr>
<td>JOUR 353 Adv. Television Reporting: CPTV (2) (2)</td>
<td></td>
</tr>
<tr>
<td>OR</td>
<td></td>
</tr>
<tr>
<td>Choose print lab twice—4 units max/min:</td>
<td></td>
</tr>
<tr>
<td>JOUR 352 Advanced Newspaper Reporting: Mustang Daily (2) (2)</td>
<td></td>
</tr>
<tr>
<td>Restricted Journalism electives to be selected from:</td>
<td>18</td>
</tr>
<tr>
<td>JOUR 201, 205, 312, 331, 342, 346, 385, 402, 405, 407, 413, 432, 434, 470.</td>
<td></td>
</tr>
</tbody>
</table>

**SUPPORT COURSES**

Department approved upper division electives | 24

**GENERAL EDUCATION AND BREADTH**

*Please see page 77 for selection of GEB electives. At least 12 units must be at the 300–400 level.*

**Area A:** | 14 |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 114 (A.1.)</td>
<td></td>
</tr>
<tr>
<td>ENGL 125/PHIL 125/SPC 125 (A.2.)</td>
<td></td>
</tr>
<tr>
<td>SPC 201/SPC 202 (A.3.)</td>
<td></td>
</tr>
<tr>
<td>ENGL 215/ENGL 218 (A.4.)</td>
<td></td>
</tr>
</tbody>
</table>

**Area B:** | 18 |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical and life sciences electives (one each, one with lab) (B.1.)</td>
<td></td>
</tr>
<tr>
<td>Mathematics elective (B.2.)</td>
<td></td>
</tr>
<tr>
<td>Mathematics or statistics elective (B.2.)</td>
<td></td>
</tr>
<tr>
<td>Science, mathematics or statistics elective (Area B)</td>
<td></td>
</tr>
</tbody>
</table>

**Area C:** | 18 |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PHIL 230/PHIL 231 (C.1.)</td>
<td></td>
</tr>
<tr>
<td>Critical reading electives (C.1.)</td>
<td></td>
</tr>
</tbody>
</table>

Fine and performing arts elective (C.2.)
Literature, philosophy, arts elective (300–400 level) (C.3.)
Arts and humanities elective (Area C)

**Area D:** | 18 |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>HIST 204 (D.1.), POLS 210 (D.1.)</td>
<td></td>
</tr>
<tr>
<td>HIST 315 (D.2.)</td>
<td></td>
</tr>
<tr>
<td>ECON 201/211/222 (D.3.)</td>
<td></td>
</tr>
<tr>
<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
<td></td>
</tr>
<tr>
<td>ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)</td>
<td></td>
</tr>
</tbody>
</table>

**Area E:** | 5 |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PSY 201/PSY 202 (E.1.)</td>
<td></td>
</tr>
<tr>
<td>BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)</td>
<td></td>
</tr>
</tbody>
</table>

**Area F:** | 6 |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer literacy elective (F.1.)</td>
<td></td>
</tr>
<tr>
<td>Technology elective (300–400 level) (F.2.)</td>
<td></td>
</tr>
</tbody>
</table>

**Total:** | 79

**ELECTIVES:** | 16

**Total:** | 193
LIBERAL STUDIES
An Interdisciplinary Program

Faculty Offices East (Bldg. 25), Room 119
(805) 756-2935

Faculty

Coordinator, Robert S. Cichowski

Program

B.A. Liberal Studies

The Bachelor of Arts degree program in Liberal Studies provides students with a broad, interdisciplinary university education. The Liberal Studies curriculum is designed in two tracks: the Credential Track and the General Track. At least 60 units must be at the 300–400 track.

Students who fulfill the Credential Track 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.

Credential Track students will select an area of emphasis from among the following: art, English, life science, mathematics, music, physical education, physical science, social science or Spanish. 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 not 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.

The General Track will prepare the student with a broadly-based, interdisciplinary foundation. Employment for General Track students is extensive and includes: medical field, management and sales, publishing, and human resource management. Students completing the degree may choose to pursue graduate work in business, law, public service, ministry, and counseling.
B.A. LIBERAL STUDIES

For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser.

MAJOR COURSES

* = Courses satisfy General Education and Breadth requirements.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS 101</td>
<td>Orientation to Liberal Studies</td>
<td>1</td>
</tr>
<tr>
<td>LS 461</td>
<td>Senior Project</td>
<td>3</td>
</tr>
<tr>
<td>ART 111</td>
<td>Introduction to Art (C.2.)*</td>
<td>4</td>
</tr>
<tr>
<td>BIO 127</td>
<td>Natural History: Animal Adaptations (B.1.b)</td>
<td>3</td>
</tr>
<tr>
<td>BIO 128</td>
<td>Natural History: Animal Communities (B.1.b.)*</td>
<td>3</td>
</tr>
<tr>
<td>BIO 129</td>
<td>Natural History: Plant Communities</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 330-353</td>
<td>C.3.*</td>
<td>4</td>
</tr>
<tr>
<td>(ENGL 345/346 recommended for credential track)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linguistics: Select one course from the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGL 390/391/395</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>MATH 116 Pre-Calculus Algebra (B.2.)*</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>MATH 327 Introduction to Modern Mathematics</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>MATH 328 Introduction to Modern Mathematics (B.2.)*</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Ethics: Select one course from the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHIL 331/335/337 (GEB Area C)*</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>PSC 101 The Physical Environment: Matter and Energy</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>PSC 102 The Physical Environment: Atoms and Molecules (B.1.a.)*</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>PSC 103 The Physical Environment: Earth and the Universe</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Foreign language electives</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>International Cultural History. One course, may be selected from: ANT 202; HIST 314, 340, 381, 383, 415</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>U.S. Cultural Pluralism. One course to be selected from current list of USCP courses or adviser approval</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

SUPPORT COURSES

Courses to complete track (see below, select one track) ................................................................. 47

GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Major courses.

<table>
<thead>
<tr>
<th>Area A:</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 114 Writing: Exposition (A.1.)</td>
<td>1</td>
</tr>
<tr>
<td>ENGL 125/PHLIL 125/SPC 125 Critical Thinking (A.2.)</td>
<td></td>
</tr>
<tr>
<td>SPC 201/SPC 202 Public Speaking/Principles of Speech Communication (A.3.)</td>
<td></td>
</tr>
<tr>
<td>ENGL 215/ENGL 218 Writing: Argumentation/Professional Writing (A.4.)</td>
<td></td>
</tr>
</tbody>
</table>

A minimum of 18 units is required; 18 of the units are in Major

Life science (B.1.b.)*see Major Courses

Mathematics/statistics (B.2.)*see Major Courses

A minimum of 18 units is required; 11 of the units are in Major

PHIL 230/PHIL 231 Philosophical Classics (C.1.)

Critical reading elective (C.1.)

Critical reading elective (C.1.)

Fine and performing arts elective (C.2.)*see Major courses

Literature, philosophy, arts elective (300–400 level) (C.3.)*see Major Courses

Arts and humanities elective (Area C)*see Major courses

Area D: .................................................................................................................. 18

HIST 204 History of American Ideals and Institutions (D.1.)

POLS 210 American and California Government (D.1.)

HIST 315 Modern World History (D.2.)

ECON 201/211/222 Survey of Economics/Principles of Economics/Macroeconomics (D.3.)

ANT 201/GEOG 150/SOC 105 Cultural Anthropology/Human Geography/Introduction to Sociology (D.4.a.)

ANT/BUS/ECON/GEOG/POLS/WS elective (300–400 level) (D.4.b.) (GEOG 308 Global Geography required for credential track)

Area E: .................................................................................................................. 5

PSY 201/PSY 202 General Psychology (E.1.)

BIO 220/FSN 210/PE 250/PSY 304/REC 100 Physiology and Biological Adaptation (E.2.) (BIO 220 recommended)

Area F: .................................................................................................................. 6

Computer literacy elective (F.1.)

Technology elective (300–400 level) (F.2.)

Total ......................................................................................................................... 50

A minimum of 79 units is required; 27 of the units are in Major Courses

ELECTIVES ........................................................................................................... 23

Note: It is recommended that students planning to seek a Multiple Subjects Credential from Cal Poly select the following courses (for a total of 11 units) as part of their Elective units: EDUC 301, 303, 426
COURSES IN CREDENTIAL TRACK
EDUC 300 Introduction to the Teaching Profession .......... 3
BIO 306 Applications of Biological Concepts or
   PSC 304 Applications of Physical Science .......... 4
ENGL 260 Children's Literature ................................ 3
MATH 329 Mathematical Applications to Elementary
   Teaching .................................................. 3
MU 360/SPC 310/TH 380 ................................... 3
PSY 256 Developmental Psychology .......................... 4
MU 100 Music Fundamentals .................................. 3
PE 310 Concepts in Elementary Physical Education .......... 3
Area of emphasis ............................................. 21
   At least 7 units must be 300-400 level. .................
   47

COURSES IN GENERAL TRACK
At least 7 units must be 300-400 level.
Courses to complete a minor ............................... 24-30
Psychology adviser approved elective ..................... 3
Music adviser approved elective ............................ 3
Fine/performing arts adviser approved elective .......... 3
Additional electives ....................................... 14-8

   47
MUSIC DEPARTMENT

Davidson Music Center (45), Room 129
(805) 756-2406

Faculty

Department Head, Clifton Swanson
Antonio G. Barata  Alyson McLamore
Thomas H. Davies  Craig H. Russell
William V. Johnson  John G. Russell
Frederick C. Lau  William T. Spiller

Programs

B.A. Music

Music Minor

The Music Department offers a program which develops musical skills, encourages creativity, and cultivates vision for the future. A graduate of this program will be prepared to begin specialized study at the graduate level, to enter a wide variety of professional careers, or to apply for admission to the Teacher Education Credential Program subject to the prerequisite requirements and competency examinations.

The Bachelor of Arts in Music offered at Cal Poly introduces a student to the role of music in today's world, helps form personal goals, and provides the discipline, skills and knowledge to accomplish those goals. The University's polytechnic emphasis also provides an excellent opportunity to explore music in conjunction with a wide range of other fields.

In addition, the Music Department is a valuable resource for the non-music major. Its courses and performing ensembles are open to all students who wish to enrich their lives through music. Qualified students who wish to explore the subject in depth have the opportunity to minor in music.

The Cal Poly Music Department also serves as a cultural center for both the university and the community through a program of public performances by student and faculty groups and through clinics, workshops, concerts, and lectures by outstanding individuals from outside the university.

Acceptance into the music major program requires a demonstrated ability on an instrument, in voice, or talent through other musical media.

Department Requirements

1. New students should contact the Music Department Office immediately upon arrival to arrange for placement examinations for music theory, keyboard proficiency, musicianship (dictation, sight singing), and a performance audition for applied study placement and assignment to performing ensembles. Regardless of courses taken prior to coming to Cal Poly, students will be required to remedy deficiencies before enrolling in advanced music theory or music history courses.

2. Each music major enrolled in at least 6 units of music courses must include a performance ensemble each quarter in order to qualify for applied study of voice or instruments. (See the Music Department for details regarding appropriate ensembles and applied study policies.)

3. Each student is required to attend a minimum of 6 concerts per quarter.

4. Each student must pass a piano proficiency examination in order to graduate. The examination must be taken by the end of the sophomore year and if it is not passed, the student is expected to continue to enroll in piano until it is passed.

5. Use of Music Department instruments, scheduled practice rooms, electronic studio, or lockers requires a Music Use Fee. See the Music Department Office for details.

6. It is important that each student stay closely in touch with his/her adviser in order to progress through the music major program in the most efficient manner.

7. The Music Department is not able to offer the full complement of performing ensembles and private instruction during the Summer Quarter, therefore it is important to take this into consideration when planning coursework for completion of the major.

A music major handbook giving complete details of the program, policies and forms is available from the Music Department.
B.A. MUSIC

For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser.

### MAJOR COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MU 102</td>
<td>Acoustic Communication</td>
<td>3</td>
</tr>
<tr>
<td>MU 103</td>
<td>Music Theory I</td>
<td>3</td>
</tr>
<tr>
<td>MU 104</td>
<td>Musicianship I</td>
<td>1</td>
</tr>
<tr>
<td>MU 105</td>
<td>Music Theory II</td>
<td>3</td>
</tr>
<tr>
<td>MU 106</td>
<td>Musicianship II</td>
<td>1</td>
</tr>
<tr>
<td>MU 120</td>
<td>Music Appreciation</td>
<td>4</td>
</tr>
<tr>
<td>MU 121</td>
<td>Introduction to World Music</td>
<td>3</td>
</tr>
<tr>
<td>MU 150</td>
<td>Applied Music</td>
<td>1,1,1</td>
</tr>
<tr>
<td>MU 201</td>
<td>Music Theory III</td>
<td>3</td>
</tr>
<tr>
<td>MU 208</td>
<td>Musicianship III</td>
<td>1</td>
</tr>
<tr>
<td>MU 250</td>
<td>Applied Music</td>
<td>1,1,1</td>
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<tr>
<td>MU 302</td>
<td>Theory IV</td>
<td>3</td>
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<tr>
<td>MU 304</td>
<td>Introduction to Music Synthesis</td>
<td>3</td>
</tr>
<tr>
<td>MU 320</td>
<td>Research and Writing</td>
<td>3</td>
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<tr>
<td>MU 321</td>
<td>Music History I</td>
<td>3</td>
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<td>MU 322</td>
<td>Music History II</td>
<td>4</td>
</tr>
<tr>
<td>MU 323</td>
<td>Music History III</td>
<td>3</td>
</tr>
<tr>
<td>MU 326</td>
<td>Cultural Concepts and Structures of Music</td>
<td>3</td>
</tr>
<tr>
<td>MU 350</td>
<td>Applied Music</td>
<td>1,1,1</td>
</tr>
<tr>
<td>MU 401</td>
<td>Contemporary Music Theory</td>
<td>3</td>
</tr>
<tr>
<td>MU 420</td>
<td>Music History: Selected Topics</td>
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<tr>
<td>MU 450</td>
<td>Applied Music</td>
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<tr>
<td>MU 461</td>
<td>Senior Project</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Approved music lecture courses (300–400 level)</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Major Ensemble at 100 level with adviser approval</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Major Ensemble at 300 level with adviser approval</td>
<td>6</td>
</tr>
</tbody>
</table>

### GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 12 units must be at the 300–400 level.

- **Area A**: 14 units
  - ENGL 114 (A.1.)
  - ENGL 125/PHIL 125/SPC 125 (A.2.)
  - SPC 201/SPC 202 (A.3.)
  - ENGL 215/ENGL 218 (A.4.)

- **Area B**: 18 units
  - Physical and life sciences electives (one each, one with lab) (B.1.)
  - Mathematics elective (B.2.)
  - Mathematics or statistics elective (B.2.)
  - Science, mathematics or statistics elective (Area B)

- **Area C**: 18 units
  - PHIL 230/PHIL 231 (C.1.)
  - Critical reading electives (C.1.)
  - Fine and performing arts elective (C.2.)

### ELECTIVES

- 18 units

### MUSIC MINOR

A 30-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.

- **Required Courses**: 18 units
  - MU 103 Music Theory I (3)
  - MU 104 Music History I (1)
  - MU 105 Theory II (3)
  - MU 106 Music History II (1)
  - MU 120 Music Appreciation (C.2.) (4)
  - Lower division electives (3)
  - One year of upper division vocal or instrumental study (3)

- **Upper division electives**: 12 units
  - Chosen from 300–400 level Music courses (or, in some cases, specific courses offered by other departments).

- **Total**: 186 units
PHILOSOPHY DEPARTMENT

Faculty Office Bldg. (47), Room 37-B
(805) 756-2041

Faculty

Department Chair, Diane P. Michelfelder

Stephen W. Ball  Paul S. Miklowitz
A. C. W. Bethel  Frederick J. O'Toole
Linda Bonnstad  Ann Owens
Charles T. Hagen  Judy D. Saltzman
Laurence D. Houglate  Talmage E. Scriven
Russell A. Lascola  Kendrick W. Walker

Programs

B.A. Philosophy

Students may select Philosophy Electives or Concentration in:
Ethics and Society

Philosophy Minor

Students can pursue a curriculum leading to a Bachelor of Arts degree in Philosophy, including an optional concentration in Ethics and Society, and a curriculum leading to a minor in Philosophy.

The Philosophy Department offers a sequence of courses in the history of philosophy, as well as courses in the traditional fields of philosophy (logic, ethics, metaphysics, epistemology), and in the philosophical issues arising in other disciplines (e.g. philosophy of art and philosophy of science). The department also offers courses in Religious Studies.

The curriculum for the Bachelor of Arts degree provides strong preparation for careers in government, politics and business; for professional programs in law and business administration; and for graduate study in philosophy, other fields in the humanities, economics, and political science.

Curricular Concentration

Ethics and Society

This concentration is designed for students with an interest in pursuing professional careers in which they will need to address practical ethical issues, especially careers in business, medicine, politics and law.

PHILOSOPHY MINOR

The minor program in Philosophy is designed for students who want to add to their education an understanding of the history of philosophy and of philosophical issues relevant to their major field of study. It consists of 24 units (12 specified, 12 chosen from an approved list). Interested students are invited to contact the Philosophy Department Office for more information and application forms.

Required courses .................................................. 12
ENGL/PHIL/SPC 125 Critical Thinking (3) (A.2.)
PHIL 230 Philosophical Classics (3) (C.1.)
PHIL 231 Philosophical Classics (3) (C.1.)
PHIL 311 Greek Philosophy (3) (C.3.)

Electives to be chosen from the following groups: ....... 12
One of the following:
PHIL 312 Medieval Philosophy (3) (C.3.)
PHIL 313 Continental Philosophy: Montaigne to Leibnitz (3) (C.3.)
PHIL 314 British Philosophy: Bacon to Mill (3) (C.3.)
PHIL 315 German Philosophy: Kant to Nietzsche (3) (C.3.)
One of the following:
PHIL 316 Contemporary European Philosophy (3) (C.3.)
PHIL 317 Contemporary British and American Philosophy (3) (C.3.)
Two additional upper division philosophy courses.

Units

24
B.A. PHILOSOPHY

For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser.

MAJOR COURSES

* = Courses satisfy General Education and Breadth requirements

- PHIL 170 Problems of Philosophy .................. 3
- PHIL 225 Symbolic Logic........................... 3
- PHIL 230 Philosophical Classics (C.1.)* .......... 3
- PHIL 231 Philosophical Classics (C.1.)* .......... 3
- PHIL 311 Greek Philosophy ......................... 3
- PHIL 313 Continental Philosophy: Montaigne to Leibnitz .......... 3
- PHIL 314 British Philosophy: Bacon to Mill ....... 3
- PHIL 315 German Philosophy: Kant to Nietzsche ... 3
- PHIL 321 Philosophy of Science .................... 3
- PHIL 331 Ethics ..................................... 3
- PHIL 411 Metaphysics ................................ 3
- PHIL 412 Epistemology .............................. 3
- PHIL 460 Senior Project ............................. 3
- PHIL 461 Senior Project ............................. 3
- Concentration (see below) or 300–400 level PHIL electives ........ 18

GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 12 units must be at the 300–400 level.

Area A: .................................................. 14
- ENGL 114 (A.1.)
- ENGL 125/PHIL 125/SPC 125 (A.2.)
- SPC 201/SPC 202 (A.3.)
- ENGL 215/ENGL 218 (A.4.)

Area B: .................................................. 18
- Physical and life sciences electives (one each, one with lab) (B.1.)
- Mathematics elective (B.2.)
- Mathematics or statistics elective (B.2.)
- Science, mathematics or statistics elective (Area B)

Area C: .................................................. 12
- A minimum of 18 units is required; 6 of the units are in Major
- Philosophy (C.1.)*see Major Courses
- Critical reading electives (C.1.)
- Fine and performing arts elective (C.2.)
- Literature, arts elective (300–400 level) (excluding PHIL) (C.3.)
- Arts and humanities elective (Area C)

Area D: .................................................. 18
- HIST 204 (D.1.), POLS 210 (D.1.)
- HIST 315 (D.2.)
- ECON 201/211/222 (D.3.)
- ANT 201/GEOG 150/SOC 105 (D.4.a.)
- ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)
- Area E: .................................................. 5
- PSY 201/PSY 202 (E.1.)
- BIO 220/F5N 210/PE 250/PSY 304/REC 100 (E.2.)
- Area F: .................................................. 6
- Computer literacy elective (F.1.)
- Technology elective (300–400 level) (F.2.)

Total ..................................................... 73

A minimum of 79 units is required; 6 of the units are in Major Courses

ELECTIVES............................................ 53

CONCENTRATION OR ELECTIVES

Select either the following concentration or 18 units of 300–400 level PHIL electives.

Ethics and Society Concentration
- PHIL 332 History of Ethics ......................... 3
- PHIL 333 Political Philosophy .................... 3
- PHIL 334 Jurisprudence ........................... 3
- PHIL 335 Social Ethics ............................ 3
- PHIL 337 Professional Ethics .................... 3
- PHIL 339 Biomedical Ethics ..................... 3

- 18

Philosophy Electives
- 300–400 level PHIL electives ...................... 18
POLITICAL SCIENCE DEPARTMENT

Faculty Office Bldg. (47), Room 14-A
(805) 756-2984

Faculty

Department Chair, Allen K. Settle
Randal L. Cruikshanks
John H. Culver
Philip L. Fetzer
David L. George
Reginald H. Gooden, Jr.
Earl D. Huff
Richard B. Kranzdorf
Dianne N. Long
Carl E. Lutrin
Carroll R. McKibbin
Joseph N. Weatherby

Programs

B.A. Political Science

Students may select Individualized Course of Study or a Concentration in:
- International Affairs
- Pre-Law
- Public Administration
- Teaching
- Urban Studies

International Relations Minor

Public Administration Minor

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, in 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 understandings and skills which are essential for effective citizenship and for leadership positions in the public and private sectors.

CURRICULAR CONCENTRATIONS

International Affairs

Prepares 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

Prepares students for careers in the several fields of law. Some students 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

Prepares students for careers in administrative work in government and related agencies and prepares students to enter graduate studies in the field of administration.

Teaching

Prepares students for careers as social studies teachers in junior and senior high schools. With additional coursework as prescribed by the University Center for Teacher Education, 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 the University Center for Teacher Education section.

Urban Studies

Prepares students for careers in broad fields of planning within government and related agencies and prepares students to enter advanced studies in the field of city and regional planning and urban administration.

Individualized Course of Study

Permits students with varying backgrounds and interests to pursue a course of study which meets their individual needs and interests. 27 units of coursework at the 300-400 level are selected by the student and approved by the student's academic adviser.
B.A. POLITICAL SCIENCE

For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser.

### MAJOR COURSES

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>POLS 100 Political Inquiry</td>
<td>4</td>
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<tr>
<td>POLS 105 Introduction to International Relations</td>
<td>4</td>
</tr>
<tr>
<td>POLS 204 Basic Concepts of Political Thought</td>
<td>4</td>
</tr>
<tr>
<td>POLS 305 Political Analysis</td>
<td>4</td>
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<tr>
<td>POLS 461 Senior Project</td>
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<tr>
<td>POLS 462 Senior Project</td>
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<tr>
<td>Political science electives (300–400 level)</td>
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<tr>
<td>Concentration courses or adviser approved electives (see below)</td>
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### SUPPORT COURSES

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<tr>
<td>HIST 102 History of Western Civilization</td>
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<tr>
<td>HIST 103 History of Western Civilization</td>
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</tr>
<tr>
<td>Geography elective (300–400 level)</td>
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</tr>
<tr>
<td>Anthropology/Sociology elective (300–400 level)</td>
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<td>12</td>
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### GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Major and Support courses.

<table>
<thead>
<tr>
<th>Area A</th>
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<tbody>
<tr>
<td>ENGL 114 (A.1.)</td>
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<tr>
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<td>SPC 201/SPC 202 (A.3.)</td>
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<td>ENGL 215 or 218 (A.4.)</td>
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<th>Area B</th>
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<td>Physical and life sciences electives (one each, one with lab) (B.1.)</td>
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<tr>
<td>Mathematics elective (B.2.)</td>
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<tr>
<td>Mathematics or statistics elective (B.2.)</td>
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<td>Mathematics, statistics or science elective (Area B)</td>
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<thead>
<tr>
<th>Area C</th>
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<tbody>
<tr>
<td>PHIL 230/PHIL 231 (C.1.)</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 elective (300–400 level) (C.3.)</td>
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<tr>
<td>Arts and humanities elective (Area C)</td>
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<th>Area D</th>
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<tbody>
<tr>
<td>HIST 204 (D.1.), POLS 210 (D.1.)</td>
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<td>HIST 315 (D.2.)</td>
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<tr>
<td>ECON 201/211/222 (D.3.)</td>
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<tr>
<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
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<tr>
<td>ANT/BUS/ECON/GEOG/SOC/WS elective (300–400 level) (D.4.b.)</td>
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### ELECTIVES

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<tr>
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### CONCENTRATIONS

**International Affairs Concentration**

<table>
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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>POLS 312 International Politics</td>
<td>3</td>
</tr>
<tr>
<td>POLS 382 Comparative Politics</td>
<td>4</td>
</tr>
<tr>
<td>POLS 384 Politics of Developing Areas</td>
<td>3</td>
</tr>
<tr>
<td>POLS 411 Contemporary U.S. Foreign Policy</td>
<td>3</td>
</tr>
<tr>
<td>Adviser approved electives (4 units must be 300–400 level)</td>
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**Pre-Law Concentration**

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<tbody>
<tr>
<td>ENGL 302 Writing: Advanced Composition</td>
<td>4</td>
</tr>
<tr>
<td>POLS 321 American Constitutional Law</td>
<td>4</td>
</tr>
<tr>
<td>POLS 322 Civil Liberties</td>
<td>4</td>
</tr>
<tr>
<td>POLS 334 Jurisprudence</td>
<td>3</td>
</tr>
<tr>
<td>POLS 336 Judicial Process</td>
<td>4</td>
</tr>
<tr>
<td>Pre-Law electives (300–400 level)</td>
<td>8</td>
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</table>

**Public Administration Concentration**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>POLS 314 Public Administration</td>
<td>4</td>
</tr>
<tr>
<td>POLS 340 Government Internship</td>
<td>4</td>
</tr>
<tr>
<td>POLS 401 State and Local Government</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 Administrative Theory and Behavior</td>
<td>4</td>
</tr>
<tr>
<td>POLS 442 Public Personnel Administration</td>
<td>4</td>
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</table>
Teaching Concentration
POLS 301 California State and Local Politics ........... 3
POLS 307 American Political Thought ..................... 3
POLS 336 Judicial Process .................................. 4
POLS 382 Comparative Politics ............................ 4
ECON 304 Comparative Economic Systems ........... 3
GEOG 250 Physical Geography ................................ 3
HIST 101 History of Western Civilization ........... 3
HIST 402 American Revolution ................................ 3
Adviser approved elective ................................... 1

Urban Studies Concentration
POLS 303 Minority Group Politics ...................... 3
POLS 380 Political Behavior ................................ 4
POLS 401 State and Local Government .................. 4
POLS 425 Public Policy Analysis ......................... 4
Adviser approved electives (3 units must be 300-400 level) .................................................. 12

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.

Required courses .................................................. 23
POLS 314 Public Administration (4)
POLS 340 Government Internship (4)
POLS 405 Politics of Finance and Planning (3)
POLS 425 Public Policy Analysis (4)
POLS 441 Administration Theory and Behavior (4)
POLS 442 Public Personnel Administration (4)
Electives .............................................................. 6
6 units of adviser approved electives.

27

INTERNATIONAL RELATIONS MINOR
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 coursework in three categories: required coursework, area of emphasis (Latin America, Middle East, Africa, Europe), and adviser approved electives. Details are available from the Political Science Department. At least 15 units must be at the 300-400 level.

Required courses ............................................... 13
POLS 105 Introduction to International Relations (4)
POLS 411 Contemporary U.S. Foreign Policy (3)
ECON 325 Underdevelopment and Economic Growth (3) (D.4.b.)
GEOG 308 Global Geography (3) (D.4.b.)
Area of emphasis .................................................. 9-12
Adviser approved electives ................................... 7-4

29
PSYCHOLOGY AND HUMAN DEVELOPMENT DEPARTMENT

Faculty Office Bldg. (47), Room 24
(805) 756-2033

Faculty

Department Head, Patrice L. Engle
Margaret M. Berrio
Robert L. Blodget
Shawn Burn
Harry J. Bussele
Robert A. Christenson
David L. Englund
Basil A. Fiorito
Laura A. Freberg
Laura M. King
Daniel J. Levi
J. Kelly Moreno

Programs

B.S. Human Development
with Concentrations in:
Applied Developmental Psychology
Applied Family Psychology
Applied Social Psychology
Early Childhood Education

M.S. Psychology
Gerontology Minor
Psychology Minor

B.S. HUMAN DEVELOPMENT

Human Development majors study lifespan, human development, psychology, and research and intervention methods as preparation for work with children and adults. Students participate in department-operated infant, toddler, and preschool programs. They attend psychology laboratories and complete internships in area schools, organizations and agencies as part of the "learn by doing" educational process.

CONCENTRATIONS

Applied Developmental Psychology

Prepares students for careers in human service agencies, health care settings, and special needs programs. Students study the nature of human development throughout the life span and learn to use psychological and developmental principles to assess and analyze behavior and to implement behavior change. Students are prepared for graduate study in psychology and counseling.

Applied Family Psychology

Interdisciplinary study that provides knowledge and experience necessary for a variety of careers in family, social service and counseling-related agencies in the public and private sectors. Appropriate for students who wish to work in educational or helping agencies and who desire a family focus rather than a broad social science perspective. Students also pursue further graduate-level training in a variety of areas.

Applied Social Psychology

Methods and principles of social psychology relevant to occupations in business and industry, government agencies, and nonprofit organizations. Careers include research, evaluation of social intervention programs, management, consultation to business and government agencies, and social activism. In addition to the various areas of psychology, students are prepared for graduate study in human resources management, public administration, and related disciplines.

Early Childhood Education

Students selecting this concentration prepare for careers in preschool and elementary 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.

B.S. PSYCHOLOGY

At the time the catalog went to press, a B.S. in Psychology and a revision of the B.S. in Human Development had been forwarded to the Trustees and the Chancellor's Office for approval. Please contact the department for the current status of these degree programs.
PSYCHOLOGY MINOR

The Psychology minor provides students with a broad background in the principles of psychology in order to 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. Interested students are encouraged to contact the Psychology and Human Development Department for information and application forms.

Required courses ................................................. 18-19
PSY 201/202 General Psychology (E.1.) (3)
PSY 304 Physiological Psychology (E.2.) (3)
PSY 305 Personality (3)
PSY 405 Abnormal Psychology (3)
ANT 360 Human Cultural Adaptation (D.4.b.) (3)
or PSY 252 Social Psychology (4)
STAT 211/217/321 (B.2.) (3)

Adviser approved PSY courses (200–400 level)...... 9-8
At least 5 units must be upper division

GERONTOLOGY MINOR AND CERTIFICATE

This is an interdisciplinary minor that prepares students in various majors whose careers will be directly or indirectly related to gerontology. The certificate program is available to upgrade the skills and increase the knowledge of persons already in the field of gerontology. Coursework includes the biological, psychological, and social aspects of aging; changing roles; stress related problems; and an understanding of the impact of an aging population on social, economic, and political institutions.

Among the requirements for admission to the program is a minimum GPA of 3.00. All applicants will be reviewed by a faculty committee.

Required core .................................................... 18
BIO 330 Biology of Aging (3)
PE 408 Exercise and Health Promotion for Seniors (3)
PSY 318 Psychology of Aging (3)
SOC 326 Sociology of Aging (3)
FSN 315 Nutrition in Aging (3)
PSY 310 Death, Dying and Bereavement (3)

Adviser approved elective ...................................... 3
May be selected from: HD 308, POLS 425, PSY 317,
PSY 459

Gerontology-related Fieldwork ............................... 3
May be fulfilled as an elective in the student's major or it may be challenged due to previous work.

RELATED MINORS

Integrative Technology Minor: an interdisciplinary program with faculty involvement from the departments of Industrial and Manufacturing 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. For more information, see the Industrial Technology Department.

Values, Technology and Society Minor: an interdisciplinary program which increases the student's understanding of how technology shapes and influences modern life. The minor is available to students throughout the University regardless of students' technical backgrounds. For more information, see the College of Liberal Arts section of this catalog, or contact Dan Levy, Psychology and Human Development Department.
**B.S. HUMAN DEVELOPMENT**

Courses are displayed by Major, Support, General Education and Breadth, and Electives.

<table>
<thead>
<tr>
<th>Units</th>
<th>MAJOR COURSES</th>
<th>* = Courses satisfy GEB</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HD 102 Human Development: Introduction to Issues and Applications</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>HD 130 Supervised Study of Children</td>
<td>4</td>
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<td>HD 203 Family Development</td>
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<td>HD 230/PSY 351/PSY 429</td>
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<td>HD 306 Adolescence</td>
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<td>HD 308 Adulthood</td>
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<td></td>
<td>HD 330 Supervised Internship or PSY 453 Supervised Fieldwork</td>
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<td>HD 430 Advanced Internship or PSY 454 Supervised Fieldwork</td>
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<td>HD 461, 462 Senior Project (2) (2) or PSY 461, 462 Senior Project (1) (3)</td>
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<tr>
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<td>PSY 201/PSY 202 General Psychology (E.1)*</td>
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<tr>
<td></td>
<td>PSY 252 Social Psychology</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>PSY 254 Family Psychology</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>PSY 256 Developmental Psychology or HD 209 Early Development</td>
<td>4/5</td>
</tr>
<tr>
<td></td>
<td>PSY 305 Personality</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PSY 323 The Helping Relationship</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>PSY 329 Research Methods in Psychology and Human Development</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>PSY 405 Abnormal Psychology or PSY 456 Behavior Disorders in Children</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PSY 458 Learning</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Concentration courses (see below)</td>
<td>35-37</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>102-107</strong></td>
</tr>
</tbody>
</table>

**SUPPORT COURSES**

<table>
<thead>
<tr>
<th>Units</th>
<th>SUPPORT COURSES</th>
<th>* = Courses satisfy GEB</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BIO 302 Human Genetics (B.1.b.)*</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>ES (any course)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>FSN 210 Nutrition (E.2.)* or PSY 304 Physiological Psychology (E.2.)*</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>STAT 211/217/251/321 (B.2.)*</td>
<td>3/4</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>12/13</strong></td>
</tr>
</tbody>
</table>

**GENERAL EDUCATION AND BREADTH**

Please see page 77 for selection of GEB electives. At least 12 units must be at the 300–400 level.

Additional GEB courses are listed under Major and Support Courses.

**Area A:**

| ENGL 114 (A.1.) | 14 |
| ENGL 125/PHIL 125/SPC 125 (A.2.) |  |
| SPC 201/202 (A.3.) |  |
| ENGL 215/218 (A.4.) |  |

A minimum of 18 units is required; 6 of the units are in Support.

Physical and life sciences electives (one each, one with lab) (B.1.)

Life science (B.1.b.)* see Support Courses

Mathematics elective (B.2.)

Statistics (B.2.)* see Support Courses

Mathematics, statistics or science elective (Area B)

**Area B:**

| PHIL 230/PHIL 231 (C.1.) | 18 |
| Critical reading electives (C.1.) |  |
| Fine and performing arts elective (C.2.) |  |
| Literature, philosophy, arts elective (300–400 level) (C.3.) |  |
| Arts and humanities elective (Area C) |  |

**Area D:**

| HIST 204 (D.1.), POLS 210 (D.1.) | 18 |
| HIST 315 (D.2.) |  |
| ECON 201/211/222 (D.3.) |  |
| ANT 201/GEOG 150/SOC 105 (D.4.a.) |  |
| ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.) |  |

**Area E:**

A minimum of 5 units is required; 5 of the units are in Major and Support

Psychology (E.1.)* see Major Courses

(E.2.)* see Support Courses

**Area F:**

| Computer literacy elective (F.1.) | 6 |
| Technology elective (300–400 level) (F.2.) |  |

Total.......................... 68

A minimum of 79 units is required; 11 of the units are in Major and Support

**ELECTIVES**

| 16-10 |
| 198 |
CONCENTRATIONS (select one)

Applied Developmental Psychology Concentration
- PSY 419 Development of Self & Individuality ........ 3
- PSY 420 Social and Emotional Development .......... 3
- PSY 421 Cognitive Development ...................... 3
- PSY 432 Psychological Testing ....................... 3
- PSY 459 Lifespan Theories ............................ 3
- PSY 465 Cross-Cultural Issues in Psychology ....... 3
- Adviser approved electives ............................ 18
- Total: 36

Applied Social Psychology Concentration
- PSY 302 Behavior in Organizations .................... 3
- PSY 311 Environmental Psychology .................... 3
- PSY 317 Psychology of Stress ........................ 3
- PSY 359 Applied Psychology Research Methods ..... 4
- PSY 432 Psychological Testing ........................ 3
- PSY 496 Applied Social Psychology ................... 4
- SOC 330/POLS 380/MGT 314 ............................. 3
- Adviser approved electives ............................ 12
- Total: 35

Applied Family Psychology Concentration
- PSY 303 Family Interaction ............................ 3
- PSY 380 Issues in Family Psychology: Past, Present, Future ...................... 4
- PSY 450 Family Therapy and Crisis Intervention .... 4
- PSY 481 Family Theory ................................ 3
- Adviser approved concentration electives ............ 23
- Total: 37

Early Childhood Education Concentration
- HD 128 Program Planning for Infants and Toddlers . 3
- HD 211 Early Childhood Learning: Applications for the Preoperational Period .................. 5
- HD 311 Early Childhood Learning: Applications for the Transitional Period ................. 5
- HD 324 Guiding Young Children ....................... 3
- HD 401 Perspectives on Childhood Education ........ 3
- HD 404 Administration of Children's Programs .... 3
- PSY 421 Cognitive Development ....................... 3
- FSN 310 Maternal and Child Nutrition ............... 3
- PE 280 First Aid and CPR ............................. 3
- Select two courses from the following: ............... 6
  - ART 104, ENGL 260, MU 100, PSC 103, TH 380, HD 405, 413, DANC 135, SPC 302, 303, 320, MATH 327, 328, ENGL 302
- Total: 37
MASTER OF SCIENCE DEGREE IN PSYCHOLOGY

General Characteristics

The Master of Science in Psychology is a 90-quarter unit professional degree program designed for persons who desire to practice in the field of clinical/counseling psychology. The primary purpose of the program is to develop mastery of a substantial body of knowledge and skills to prepare highly qualified masters-level professionals to clinically counsel individuals, couples, families, children and groups. The program places a heavy emphasis on clinical skill training and applied experience which begins early in the program and culminates with an intensive supervised internship in a community mental health setting.

Admission to the Program

In addition to the general requirements of the University, specific requirements for admission to classified graduate standing are:

1. an acceptable baccalaureate degree from an institution accredited by a regional association;
2. a minimum grade point average of 3.0 in the last 90 quarter units (60 semester units) attempted;
3. satisfactory performance on the General Tests (Verbal, Quantitative, Analytical) of the Graduate Record Examination (GRE); the GRE Advanced Test in Psychology is not required;
4. four letters of recommendation;
5. autobiographical information;
6. a screening interview.

Related work or volunteer experience is highly desirable. Candidates should request from the department a supplemental application packet for admission to the program.

Prerequisites

Prerequisites are coursework in abnormal psychology, behavioral effects of psychoactive drugs, behavior disorders in children, physiological psychology, personality, psychological testing, introductory statistics, and research methods in psychology (or related discipline). Candidates who have not completed such courses will not be denied admission to the university, but will be required to remove deficiencies within three quarters of admission.

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 (60 semester units) attempted and shall have earned an acceptable baccalaureate degree from an institution accredited by a regional association. Additionally, the 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 the program.

Conditionally Classified Standing

The student may enroll in a graduate degree curriculum if in the opinion of the M.S. Program Committee 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 M.S. Program Committee. Students must maintain a minimum GPA of 3.0 in all coursework completed subsequent to admission to the program.

Continuation in the Program

The student must maintain a grade point average of 3.0 (B) or better in all courses taken subsequent to program admission. 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.

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 M.S. Program Committee.

The Master of Science degree in Psychology requires a culminating experience that includes either the completion of a thesis/project or the supervised comprehensives. 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 Psychology, MFCU 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.

**MFCC Licensing**

The Department does not issue licenses but the Master of Science in Psychology is designed to meet the educational requirements for the Marriage, Family and Child Counseling (MFCC) license in the State of California. Students seeking verification of these educational requirements must complete the MFCC Emphasis which adds 6-9 units to the 90-unit M.S. degree program. Students are advised to acquire and read the laws governing MFCC licensure from the Board of Behavioral Science Examiners, 400 R Street, Suite 3150, Sacramento, CA 95814-6240. See the program coordinator for the procedure required for application for this license. State documents must be filed by the applicant within 30 days of program commencement and graduation.

**Grades:** If a candidate for University recommendation for MFCC licensure has more than one grade of C or lower among the courses to be verified for the Board of Behavioral Sciences, that form will not be approved by the Chief Academic Officer Designee of Cal Poly.

**Field Experience:** Field experience or internship courses represent the student's demonstration of the clinical skills basic to marriage, family and child counseling. A student who receives a grade of C or lower in field experience is on probation regarding continuation in the MFCC Emphasis. A second grade of C or lower will disqualify the student for continuation in the MFCC Emphasis and ultimate University recommendation for the license. Further candidates may be disqualified from this program for actions judged by the M.S. Program Committee to reflect unethical, unprofessional or incompetent behavior or clinical skills.

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### CURRICULUM FOR M.S. PSYCHOLOGY

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSY 450 Family Therapy and Crisis Intervention</td>
<td>4</td>
</tr>
<tr>
<td>PSY 459 Lifespan Theories</td>
<td>3</td>
</tr>
<tr>
<td>PSY 504 Psychoneurology and Pharmacology</td>
<td>3</td>
</tr>
<tr>
<td>EDUC/PSY 555 Counseling and Communication</td>
<td>4</td>
</tr>
<tr>
<td>EDUC 556 Ethnic Counseling</td>
<td>4</td>
</tr>
<tr>
<td>EDUC/PSY 560 Counseling Theories and Assessment</td>
<td>4</td>
</tr>
<tr>
<td>EDUC/PSY 561 Group Counseling</td>
<td>3</td>
</tr>
<tr>
<td>PSY 564 Ethics and the Law: MFC Counseling</td>
<td>3</td>
</tr>
<tr>
<td>PSY 565 Diagnosis/Treatment Psychopathology</td>
<td>4</td>
</tr>
<tr>
<td>PSY 566 Group Therapy</td>
<td>3</td>
</tr>
<tr>
<td>PSY 568 Advanced Psychotherapies</td>
<td>3</td>
</tr>
<tr>
<td>1 PSY 569 Counseling Clinic Practicum</td>
<td>6</td>
</tr>
<tr>
<td>PSY 574 Applied Psychological Testing</td>
<td>3</td>
</tr>
<tr>
<td>1 PSY 573 Field Experience: Counseling or PSY 576 Field Experience: Marital and Family Counseling</td>
<td>12</td>
</tr>
<tr>
<td>PSY 585 Research Methods for Counseling Psychology</td>
<td>4</td>
</tr>
<tr>
<td>PSY 590 Research Applications in Psychology and Human Services</td>
<td>4</td>
</tr>
<tr>
<td>2 PSY 599 Thesis/Project (3) or 3 units of approved electives and written comprehensive examination</td>
<td>3</td>
</tr>
<tr>
<td>3 Adviser approved electives</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>90</td>
</tr>
</tbody>
</table>

1 Additional fieldwork will be required to meet on-site requirements of MFCC educational verification.

2 Must register for thesis/project credit each quarter of advisement.

3 Students seeking the MFCC emphasis within the M.S. in Psychology must meet the content area requirements prescribed by California legislation (see adviser).
SOCIAL SCIENCES DEPARTMENT

Faculty Office Bldg. (47), Room 13-D
(805) 756-2260

Faculty

Department Chair, Harold R. Kerbo

Anthropology
Barbara E. Cook
Robert L. Hoover
Patrick C. McKim

Sociology
James W. Coleman
Warren W. DeLey
John A. McKinstry
Barbara L. Mori
Leo W. Pinard II
Richard A. Shaffer

Geography
Donald R. Floyd
William L. Preston
George J. Suchand
Calvin H. Wilvert

Programs

B.S. Social Sciences
Students may select Individualized Course of Study or a Concentration in:
Criminal Justice
Cross-Cultural Studies
Organizations
Social Sciences (Teaching)
Social Services

Anthropology-Geography Minor

The Social Sciences Department provides a broadly based, multicultural and multidisciplinary perspective on humanity, society and the environment. Since we offer courses in anthropology, geography and sociology, our students have an opportunity to examine human experience from a greater variety of viewpoints than can be had in any other department at Cal Poly. In anthropology, we address humanity in both the biological and cultural dimensions, emphasizing the diversity of our species in the present as well as the past. Geography bridges the gap between the physical and social sciences. It focuses on regional patterns and linkages between culture and natural environments. In sociology, we explore the nature and dynamics of human society and the interrelationship between individuals and their social groups.

The world of the 21st century will demand a greater understanding than ever of the complexity and diversity of the world's peoples and their problems. The Social Sciences Department serves the University by providing several important offerings in general education. Our primary mission in the general education program is to provide some essential tools of national and global citizenship. Some of these courses focus on American society, emphasizing issues of class, race, ethnicity and gender. Other courses have an international orientation, dealing with both the past and present diversity of the world's societies, economies, politics, religions, and physical environments. We also offer courses that stress environmental problems on both local and global levels.

The occupational objectives of the department are to prepare students for those numerous entry jobs in government and business which require a bachelor's degree in the social sciences, and to educate those who expect to teach in secondary or elementary schools.

Students with majors in fields other than the social sciences may select courses which will aid in qualifying them for a variety of occupations. 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 concentrations leading to different careers.

CURRICULAR CONCENTRATIONS

Criminal Justice
Prepares students for careers in law, law enforcement, corrections, detention, probation, parole and other criminal justice agencies.

Cross-Cultural Studies
Prepares 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
Provides students the opportunity to pursue a course of study which meets their individual needs and interests. It consists of 27 units at the 300–400 level. The student selects the courses in consultation with advising faculty and provides a written justification for the courses and the way they constitute a cohesive, integrated study. The list of courses is a contract between the student and the Department.

Organizations

Students learn to apply the general principles of human behavior to the understanding of modern organizations. It prepares them for careers in either business or government organizations.
Social Services

Provides students the general principles of human social behavior and specialized professional courses to prepare for careers in the helping professions such as social work and counseling.

Teaching

With additional coursework as prescribed by the University Center for Teacher Education students 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 a "waiver" program which eliminates the National Teacher Examination requirement for the Single Subject credential. For more information regarding teacher credential programs, please see the University Center for Teacher Education section.

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 (College of Business).

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>Foundation Courses .................................................</td>
</tr>
<tr>
<td>ANT 201 Cultural Anthropology (D.4.a.) (3)</td>
</tr>
<tr>
<td>ANT 203 Physical Anthropology (3)</td>
</tr>
<tr>
<td>GEOG 150 Human Geography (D.4.a.) (3)</td>
</tr>
<tr>
<td>GEOG 250 Physical Geography (3)</td>
</tr>
<tr>
<td>Global Courses (select 2) ...........................................</td>
</tr>
<tr>
<td>ANT 202 World Prehistory (3)</td>
</tr>
<tr>
<td>ANT 325 Material Culture (3)</td>
</tr>
<tr>
<td>ANT 341 Comparative Societies (3)</td>
</tr>
<tr>
<td>GEOG 305 Political Geography (3)</td>
</tr>
<tr>
<td>GEOG 308 Global Geography (D.4.b.) (3)</td>
</tr>
<tr>
<td>GEOG 315 Resource Utilization (3)</td>
</tr>
<tr>
<td>Ecological Courses (select 2) ........................................</td>
</tr>
<tr>
<td>ANT 360 Human Cultural Adaptations (D.4.b.) (3)</td>
</tr>
<tr>
<td>GEOG 215 Human Impact on the Earth (3)</td>
</tr>
<tr>
<td>GEOG 325 Climate and Humanity (3)</td>
</tr>
<tr>
<td>AGB 307 World Agricultural Resources (3)</td>
</tr>
<tr>
<td>Area Courses (select 1) .................................................</td>
</tr>
<tr>
<td>ANT 450 Area Studies (3)</td>
</tr>
<tr>
<td>GEOG 340 California Geography (3)</td>
</tr>
<tr>
<td>GEOG 350 Geography of the USA (3)</td>
</tr>
<tr>
<td>GEOG 401 Area Geography (3)</td>
</tr>
<tr>
<td>SOC 350 Sociology of Japan (3)</td>
</tr>
<tr>
<td>Special Skills (select 1) .............................................</td>
</tr>
<tr>
<td>ANT 310 California Archaeology (3)</td>
</tr>
<tr>
<td>ANT 333 Language and Culture (3)</td>
</tr>
<tr>
<td>ANT 401 Culture and Health (3)</td>
</tr>
<tr>
<td>ANT 420 Development Anthropology (3)</td>
</tr>
<tr>
<td>ANT 444 Sex, Death and Human Nature (3)</td>
</tr>
<tr>
<td>GEOG 310 Urban Geography (3)</td>
</tr>
<tr>
<td>AE 345 Aerial Photogrammetry and Remote Sensing (3)</td>
</tr>
<tr>
<td>MSC 111 Orienteering (3)</td>
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</table>
B.S. SOCIAL SCIENCES

Courses are displayed by Major, Support, Concentration, General Education and Breadth, and Electives.

### MAJOR COURSES

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>ANT 201 Cultural Anthropology (D.4.a.)*</td>
<td>3</td>
</tr>
<tr>
<td>ANT 202 World Prehistory</td>
<td>3</td>
</tr>
<tr>
<td>ANT 203 Physical Anthropology</td>
<td>3</td>
</tr>
<tr>
<td>Anthropology electives (300–400 level)</td>
<td>6</td>
</tr>
<tr>
<td>GEOG 150 Human Geography</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 215 Human Impact on the Earth</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 250 Physical Geography</td>
<td>3</td>
</tr>
<tr>
<td>Geography electives (300–400 level)</td>
<td>6</td>
</tr>
<tr>
<td>SOC 105 Introduction to Sociology</td>
<td>3</td>
</tr>
<tr>
<td>SOC 106 Social Problems</td>
<td>3</td>
</tr>
<tr>
<td>SOC 323 Social Stratification</td>
<td>3</td>
</tr>
<tr>
<td>SOC 333 Social Research Methods I</td>
<td>3</td>
</tr>
<tr>
<td>SOC 334 Social Research Methods II</td>
<td>3</td>
</tr>
<tr>
<td>SOC 421 Social Theory</td>
<td>3</td>
</tr>
<tr>
<td>SOCS 461 Senior Project</td>
<td>2</td>
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<tr>
<td>SOCS 462 Senior Project</td>
<td>2</td>
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<tr>
<td>Sociology electives (300–400 level)</td>
<td>6</td>
</tr>
<tr>
<td>Concentration courses or individualized course of study (see below)</td>
<td>27</td>
</tr>
</tbody>
</table>

### SUPPORT COURSES

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>History elective (300–400 level)</td>
<td>3</td>
</tr>
<tr>
<td>Political science elective (300–400 level)</td>
<td>3</td>
</tr>
<tr>
<td>STAT 211 Elementary Probability and Statistics (B.2.)*</td>
<td>3</td>
</tr>
</tbody>
</table>

### GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Major and Support courses.

<table>
<thead>
<tr>
<th>Area A:</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 114 (A.1.)</td>
<td></td>
</tr>
<tr>
<td>ENGL 125/PHIL 125/SPC 125 (A.2.)</td>
<td></td>
</tr>
<tr>
<td>SPC 201/SPC 202 (A.3.)</td>
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</tr>
<tr>
<td>ENGL 215 or 218 (A.4.)</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area B:</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>A minimum of 18 units is required; 3 of the units are in Support</td>
<td></td>
</tr>
<tr>
<td>Physical and life sciences electives (one each, one with lab) (B.1.)</td>
<td></td>
</tr>
<tr>
<td>Mathematics elective (B.2.)</td>
<td></td>
</tr>
<tr>
<td>Statistics (B.2.)* see Support Courses</td>
<td></td>
</tr>
<tr>
<td>Mathematics, statistics or science elective (Area B)</td>
<td></td>
</tr>
</tbody>
</table>

### ELECTIVES

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHIL 230/PHIL 231 (C.1.)</td>
<td>18</td>
</tr>
<tr>
<td>Critical reading electives (C.1.)</td>
<td></td>
</tr>
<tr>
<td>Fine and performing arts elective (C.2.)</td>
<td></td>
</tr>
<tr>
<td>Literature, philosophy, arts elective (300–400 level) (C.3.)</td>
<td></td>
</tr>
<tr>
<td>Arts and humanities elective (Area C)</td>
<td></td>
</tr>
<tr>
<td>Area D:</td>
<td>15</td>
</tr>
<tr>
<td>A minimum of 18 units is required; 3 of the units are in Major</td>
<td></td>
</tr>
<tr>
<td>HIST 204 (D.1.), POLS 210 (D.1.)</td>
<td></td>
</tr>
<tr>
<td>HIST 315 (D.2.)</td>
<td></td>
</tr>
<tr>
<td>ECON 201/211/222 (D.3.)</td>
<td></td>
</tr>
<tr>
<td>(D.4.a.)* see Major Courses</td>
<td></td>
</tr>
<tr>
<td>BUS/ECON/POLS/WS elective (300–400 level) (D.4.b.)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area E:</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSY 201/PSY 202 (E.1.)</td>
<td></td>
</tr>
<tr>
<td>BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)</td>
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</table>

<table>
<thead>
<tr>
<th>Area F:</th>
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</thead>
<tbody>
<tr>
<td>Computer literacy elective (F.1.)</td>
<td></td>
</tr>
<tr>
<td>Technology elective (300–400 level) (F.2.)</td>
<td></td>
</tr>
</tbody>
</table>

Total: 73

A minimum of 79 units is required; 6 of the units are in Major and Support

**SELECT CONCENTRATION OR INDIVIDUALIZED COURSE OF STUDY (select one)**

### Criminal Justice Concentration

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOC 316 American Ethnic Minorities</td>
<td>3</td>
</tr>
<tr>
<td>SOC 402 Crime and Delinquency</td>
<td>3</td>
</tr>
<tr>
<td>SOC 412 Criminal Justice</td>
<td>3</td>
</tr>
<tr>
<td>SOC 413 Methods of Social Work</td>
<td>3</td>
</tr>
<tr>
<td>SOCS 440 Internship</td>
<td>3</td>
</tr>
<tr>
<td>Adviser approved electives</td>
<td>12</td>
</tr>
</tbody>
</table>

Total: 27

### Cross-Cultural Studies Concentration

**Required courses (12 units)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANT 341 Comparative Societies</td>
<td>3</td>
</tr>
<tr>
<td>ANT 360 Human Cultural Adaptation</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 308 Global Geography</td>
<td>3</td>
</tr>
<tr>
<td>SOC 309 The World System and Its Problems</td>
<td>3</td>
</tr>
</tbody>
</table>

**Development courses to be selected from**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANT 325, ANT 420, GEOG 315</td>
<td>6</td>
</tr>
</tbody>
</table>

**Problems and Issues courses to be selected from**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANT 401, GEOG 305, GEOG 325, SOC 315</td>
<td>6</td>
</tr>
</tbody>
</table>

**Regions and Applications courses to be selected from approved list. See adviser.**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

Total: 27
### Organizations Concentration

Select from the following courses: 20–21

- SOC 310 Self, Organizations and Society (3)
- SOC 350 Social Organization in Modern Japan (3)
- SOC 395 Sociology of Complex Organizations (3)
- SOCS 440 Internship (3)
- MGT 312 Organization and Mgmt. Theory (4)
- MGT 314 Human Resource Management (4)
- MGT 317 Organizational Behavior (4) or
- PSY 302 Behavior in Organizations (3)

Adviser approved electives 7–6

---

### Social Services Concentration

- SOC 301 Social Work in the U.S.A. 3
- SOC 302 Social Welfare Institutions 3
- SOC 344 Sociology of Poverty 3
- SOC 413 Methods of Social Work 3
- SOCS 440 Internship 6

Adviser approved electives 9

---

### Teaching Concentration

- GEOG 340 Geography of California 3
- GEOG 350 Geography of the United States 3
- SOC 316 American Ethnic Minorities 3
- SOCS 424 Organizing and Teaching Social Sciences 3
- SOCS 440 Internship or
- EDUC 300 Intr. Teaching Profession 3
- HIST 101, HIST 102, HIST 103 History of
  - Western Civilization 3,3,3
- HIST 385 Topics in California History 3

---

### Individualized Course of Study 27
SPEECH COMMUNICATION DEPARTMENT

Faculty Office Bldg. (47), Room 33
(805) 756-2553

Faculty

Department Chair, Raymond F. Zeuschner

James R. Conway
Bernard K. Duffy
Susan Duffy
Michael L. Fahn
David Henry

Lorraine D. Jackson
Steven McDermott
Alexis S. Olds
Harry Sharp, Jr.
Terrence C. Winebrenner

Programs

B.A. Speech Communication

Speech Communication Minor

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, critical 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 goal 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 various 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, 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.

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.

Required courses (15)

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPC 201 Public Speaking</td>
<td>3</td>
</tr>
<tr>
<td>SPC 202 Principles of Speech Communication</td>
<td>4</td>
</tr>
<tr>
<td>SPC 212 Interpersonal Communication</td>
<td>4</td>
</tr>
<tr>
<td>SPC 312 Communication Theory</td>
<td>4</td>
</tr>
<tr>
<td>SPC 330 Classical Rhetorical Theory</td>
<td>4</td>
</tr>
<tr>
<td>SPC 331 Political Advocacy and Contemporary Rhetoric</td>
<td>10</td>
</tr>
</tbody>
</table>

Electives

10 units of Speech Communication of which at least 8 units must be 300-400 level.

Total: 25 units
B.A. SPEECH COMMUNICATION

For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser.

**MAJOR COURSES**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPC 101</td>
<td>1</td>
</tr>
<tr>
<td>SPC 212</td>
<td>4</td>
</tr>
<tr>
<td>SPC 213</td>
<td>4</td>
</tr>
<tr>
<td>SPC 217</td>
<td>4</td>
</tr>
<tr>
<td>SPC 250</td>
<td>1</td>
</tr>
<tr>
<td>SPC 305</td>
<td>4</td>
</tr>
<tr>
<td>SPC 312</td>
<td>4</td>
</tr>
<tr>
<td>SPC 322</td>
<td>4</td>
</tr>
<tr>
<td>SPC 330</td>
<td>4</td>
</tr>
<tr>
<td>SPC 350</td>
<td>2</td>
</tr>
<tr>
<td>SPC 411</td>
<td>4</td>
</tr>
<tr>
<td>SPC 430</td>
<td>4</td>
</tr>
<tr>
<td>SPC 460</td>
<td>1</td>
</tr>
<tr>
<td>SPC 461</td>
<td>3</td>
</tr>
<tr>
<td>Speech Comm. Electives (300-400 level)</td>
<td>16</td>
</tr>
</tbody>
</table>

**SUPPORT COURSES**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 302</td>
<td>4</td>
</tr>
<tr>
<td>HIST 101</td>
<td>3</td>
</tr>
<tr>
<td>HIST 102</td>
<td>3</td>
</tr>
<tr>
<td>HIST 103</td>
<td>3</td>
</tr>
</tbody>
</table>

**GENERAL EDUCATION AND BREADTH**

Please see page 77 for selection of GEB electives. At least 12 units must be at the 300-400 level. Additional GEB courses are listed under Major and Support courses.

**Area A:**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 114</td>
<td>1</td>
</tr>
<tr>
<td>ENGL 125/PHIL 125/SPC 125</td>
<td>1</td>
</tr>
<tr>
<td>SPC 201/SPC 202</td>
<td>1</td>
</tr>
<tr>
<td>ENGL 215 or 218</td>
<td>1</td>
</tr>
</tbody>
</table>

**Area B:**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical and life sciences electives</td>
<td>18</td>
</tr>
<tr>
<td>Mathematics elective</td>
<td>1</td>
</tr>
<tr>
<td>Mathematics or statistics elective</td>
<td>1</td>
</tr>
<tr>
<td>Mathematics, statistics or science elective (Area B)</td>
<td>18</td>
</tr>
</tbody>
</table>

**Area C:**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHIL 230/PHIL 231</td>
<td>1</td>
</tr>
<tr>
<td>Critical reading electives</td>
<td>1</td>
</tr>
<tr>
<td>Fine and performing arts elective</td>
<td>1</td>
</tr>
<tr>
<td>Literature, philosophy, arts elective (300-400 level)</td>
<td>1</td>
</tr>
<tr>
<td>Arts and humanities elective (Area C)</td>
<td>1</td>
</tr>
</tbody>
</table>
THEATRE AND DANCE DEPARTMENT

Davidson Music Center (45), Room 104
(805) 756-1465

Faculty

Department Head, Alvin J. Schnupp
Maria L. Junco Moon Ja Minn Suhr
Michael R. Malkin David S. Thayer

Programs

Dance Minor

The courses offered by the Theatre and Dance Department provide students with a well-balanced program of studies, useful as a solid foundation on which to build further graduate or professional studies, or as a way of expressing themselves creatively.

In the dance program, a full range of studio dance courses—ballet, modern, jazz, folk, social—is available. Courses such as Dance Appreciation, Dance History, Dance Notation and Dance Production, as well as courses designed for future teachers of dance (primarily in elementary or secondary schools) are also offered.

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 cultural focus for the campus and community with its three mainstage dramatic productions and, since 1970, its annual Orchesis dance concert. Cal Poly students have the opportunity to participate in these productions through auditioning, volunteering, or coursework. Recent stage productions have included Censored, Brighton Beach Memoirs, You're a Good Man, Charlie Brown, and four world premieres. The department frequently sponsors guest lecturers and student-directed productions. Minors are offered in both Dance and Theatre.

DANCE MINOR

The Dance Minor consists of 26 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. Students must have more than a 2.0 GPA.

Units

Core courses (19)

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>DANC 134 Beginning Social Dance</td>
<td>2</td>
</tr>
<tr>
<td>DANC 221 Dance Appreciation (C.2.)</td>
<td>3</td>
</tr>
<tr>
<td>DANC 231 Intermediate Ballet</td>
<td>2</td>
</tr>
<tr>
<td>DANC 232 Intermediate Modern Dance</td>
<td>2</td>
</tr>
<tr>
<td>DANC 321 Dance History (C.3.)</td>
<td>3</td>
</tr>
<tr>
<td>DANC 340 Dance Improvisation and Composition</td>
<td>3</td>
</tr>
<tr>
<td>DANC 381 Methods of Teaching Dance</td>
<td>4</td>
</tr>
</tbody>
</table>

Elective courses to be selected from:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>DANC 135 International Folk Dance</td>
<td>(1)</td>
</tr>
<tr>
<td>DANC 211 Dance Fundamentals</td>
<td>(2)</td>
</tr>
<tr>
<td>DANC 233 Intermediate Jazz</td>
<td>(2)</td>
</tr>
<tr>
<td>DANC 234 Intermediate Social Dance</td>
<td>(2)</td>
</tr>
<tr>
<td>DANC 320 Dance Notation</td>
<td>(3)</td>
</tr>
<tr>
<td>DANC 345 Choreography (3–12)</td>
<td></td>
</tr>
<tr>
<td>DANC 346 Dance Production (3–12)</td>
<td></td>
</tr>
<tr>
<td>DANC 400 Special Problems for Undergraduates</td>
<td>(1–2)</td>
</tr>
<tr>
<td>DANC 470 Selected Advanced Topic</td>
<td>(1-3)</td>
</tr>
<tr>
<td>DANC 471 Selected Advanced Laboratory</td>
<td>(1-3)</td>
</tr>
</tbody>
</table>

Total Units: 26
THEATRE MINOR

The Theatre Minor requires 28 units designed to provide the student with a sound foundation in the major aspects of theatre. This program assures each student of a balanced program in the major areas of theatre, and it allows for a degree of specialization in an area of the student's choice. Students should discuss their interests with department faculty.

Admission to the minor is contingent upon a departmental interview and review. Students must have more than a 2.0 GPA.

<table>
<thead>
<tr>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core courses (18-21)</td>
</tr>
<tr>
<td>TH 210 Introduction to Theatre (C.2.) ................. 3</td>
</tr>
<tr>
<td>TH 327 Theatre History and Literature (C.3.) .......... 3</td>
</tr>
<tr>
<td>TH 328 Theatre History and Literature (C.3.) .......... 3</td>
</tr>
<tr>
<td>TH 330 Stagecraft ........................................ 3-9</td>
</tr>
<tr>
<td>TH 340 Acting ............................................... 3</td>
</tr>
<tr>
<td>TH 430 Introduction to Stage Design: Scenery ....... 3</td>
</tr>
</tbody>
</table>

Elective courses to be selected from the following ...... 10-4

| TH 342 Directing (3) |
| TH 345 Rehearsal and Performance (3-9) |
| TH 350 Advanced Playwriting (3) |
| 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 470 Selected Advanced Topics (1-3) | 28 |
SCIENCE and POLITICS

Physics professor David Hafemeister and Ronald Lehman, former chief U.S. negotiator on the START I treaty, speak with physics student, Craig Kent, and political science senior, Laura Crystle. The Physics Department sponsored a speakers series, drawing upon Hafemeister's connections he developed as a staffer for the Senate Foreign Relations Committee. Students were given the opportunity to hear the reality on nuclear disarmament and related issues from experts. Photo by Marty Sconduto.
College of Science and Mathematics

Faculty Offices East (25), Room 229
(805) 756-2226

Philip S. Bailey, Dean

<table>
<thead>
<tr>
<th>Department</th>
<th>Program:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological Sciences</td>
<td>Biological Sciences: BS, MS</td>
</tr>
<tr>
<td></td>
<td>Ecology and Systematic Biology: BS</td>
</tr>
<tr>
<td></td>
<td>Microbiology: BS</td>
</tr>
<tr>
<td>Chemistry</td>
<td>Biochemistry</td>
</tr>
<tr>
<td></td>
<td>Chemistry</td>
</tr>
<tr>
<td>Mathematics</td>
<td>Mathematics: BS, MS, Minor</td>
</tr>
<tr>
<td>Physical Education</td>
<td>Physical Education: BS, MS</td>
</tr>
<tr>
<td>and Kinesiology</td>
<td></td>
</tr>
<tr>
<td>Physics</td>
<td>Physical Science: BS</td>
</tr>
<tr>
<td></td>
<td>Physics: BS</td>
</tr>
<tr>
<td>Statistics</td>
<td>Statistics: BS, Minor</td>
</tr>
</tbody>
</table>

In cooperation with the University Center for Teacher Education the College offers programs leading to teaching credentials in Biological Sciences, Mathematics, Physical Education and Physical Sciences. The College 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 the College's undergraduate, graduate, and minor programs.

The College 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 College Office 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.

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 (53), Room 219
(805) 756-2615

A College advising office supplements the role of the faculty adviser. The Advising Center staff provide information on College programs, coordinates public relations efforts, distributes registration materials, and furnishes information on academic and career advising.

APPLYING TO GRADUATE COLLEGE

College of Science and Mathematics faculty have earned master's and doctoral degrees from a wide variety of universities and are excellent sources for information and advice about 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 Health Professions for more information.
BIOTECHNOLOGY MINOR

The Biotechnology Minor consists of a core of required courses and restricted elective courses. Advising for students in the Biotechnology minor will take place in the student’s major department, including selection of restricted electives and preparation of an agreement form listing specific courses to satisfy the requirements for the minor.

Biological Sciences students preparing for the minor should take CHEM 316, 317, and 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 are not eligible to satisfy the requirements for the minor.

<table>
<thead>
<tr>
<th>Units</th>
</tr>
</thead>
</table>

**Core courses (14-15)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 375/CHEM 375 Molecular Biology Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>BIO 475/CHEM 475 Tissue Culture Techniques</td>
<td>4</td>
</tr>
<tr>
<td>BIO 304 Molecular Genetics or CHEM 373 Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 473 Immunochemistry or ZOO 426 Serology and Immunology</td>
<td>3-4</td>
</tr>
<tr>
<td>CHEM 474 Protein Laboratory Techniques</td>
<td>2</td>
</tr>
</tbody>
</table>

**Restricted electives**

10–9

Biochemistry Majors

To be selected from the following. Some of the prerequisites may be waived or substituted with approval of the instructor and adviser. With adviser approval, 3 units may be chosen from other courses. BACT 333, 402, 403, 423, 424; BIO 311, 322, 323, 324, 426; BOT 450; CHEM 477, 439

Biological Science Majors

To be selected from the following. Select at least one course from Group A and one from Group B.

**Group A:**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 321, 322, 323, 324, 426; BOT 450, CHEM 374</td>
<td></td>
</tr>
</tbody>
</table>

**Group B:**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BACT 333, 402, 403, 423; BIO 311; CHEM 331, 372, 477; ZOO 433</td>
<td></td>
</tr>
</tbody>
</table>

Microbiology Majors

To be selected from the following list.

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BACT 333, 403, 342; BIO 311, 321, 322, 323, 324; BIO 426; BOT 450; CHEM 331, 371, 372, 374, 477, 439</td>
<td></td>
</tr>
</tbody>
</table>
BIOLOGICAL SCIENCES DEPARTMENT

Fisher Science Hall (33), Room 273
(805) 756-2788

Faculty

Department Chair, V. L. Holland

Frederick P. Andoli
Leslie S. Bowker
Robert J. Brown
Raul J. Cano
Jaime S. Coloné
Alan F. Cooper
Alvin A. Dejong
Douglas D. Donaldson
Harry L. Fiestine
Dennis F. Frey
Roger D. Gambs
David V. Grady
Michael T. Hanson
Dennis N. Homan
Peter Jankay
Eric V. Johnson

David J. Keil
Anthony E. Knable
George N. Knecht
Richard J. Krejsa
A. Mark Kubinski
Kingston L. Leong
Royden Nakamura
Maria E. Ortiz
Lee R. Parker
Elizabeth K. Perryman
Thomas L. Richards
Rhonda L. Riggins
Dirk R. Walters
Archie M. Waterbury
Michael A. Yoshimura

Programs

B.S. Biological Sciences
Students may select Individualized Course of Study or a Concentration in:
Anatomy-Physiology
Biology

B.S. Ecology and Systematic Biology
with Concentrations in:
Ecology
Marine Biology and Fisheries
Systematics
Wildlife Biology

B.S. Microbiology

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, 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.

The department supports the concept of international education and encourages students to investigate opportunities for overseas study. For further information, see Study Abroad Programs.

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 the biological sciences 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 and provides a background for entry level jobs, graduate study or a single-subject teaching credential in biological sciences.

Individualized Course of Study

This program is designed to allow students who do not select either of the above concentrations to design their own career tracks with approval of their faculty advisers.

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.

Marine Biology and Fisheries
This concentration prepares students for advanced training or professional employment in public or private agencies concerned with marine sciences, freshwater ecology, fisheries biology, fisheries management, or related fields. By judicial selection of electives, the student will be academically prepared to apply for professional certification 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.

Wildlife Biology
This concentration prepares students for advanced training or professional employment in public or private agencies concerned with the biology and management of both game and nongame terrestrial wildlife species. By judicial selection of electives, the student will be academically prepared to apply for professional certification as an Associate Wildlife Biologist with the Wildlife Society.

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.

Students are encouraged to select one of six available career tracks. Students with unique career goals are encouraged to design their own track in consultation with their adviser.

BIOTECHNOLOGY MINOR
For information regarding the Biotechnology Minor, please see College of Science and Mathematics Section.

B.S. BIOLOGICAL SCIENCES
Courses are displayed by Major, Support, General Education and Breadth, and Electives.

MAJOR COURSES
* = Courses satisfy General Education and Breadth requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>BACT 221 General Bacteriology</td>
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<tr>
<td>BIO 151 Introduction to Biology (B.1.b.)*</td>
<td>5</td>
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<tr>
<td>BIO 152 Biology of Plants and Fungi</td>
<td>5</td>
</tr>
<tr>
<td>BIO 153 Biology of Animals</td>
<td>5</td>
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<tr>
<td>BIO 303 Genetics</td>
<td>3</td>
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<tr>
<td>BIO 304 Molecular Genetics (B.1.b.)*</td>
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<tr>
<td>BIO 414 Evolution</td>
<td>3</td>
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<tr>
<td>BIO 423 Cell Biology</td>
<td>4</td>
</tr>
<tr>
<td>BIO 461 Senior Project</td>
<td>3</td>
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</tbody>
</table>

Technology. Select one course from:
- BIO 322, 324, 342, 375, 475; BOT 450
- Ecology. Select one course from:
- BIO 325 or BOT 326
- Botany. Select one course from:
- BOT 223, 333, 426, 437
- Zoology. Select one course from:
- ZOO 321, 322, 323, 329, 335, 336, 341, 425
- Physiology. Select one course from:
- BIO 431 or BOT 322

Concentration or individualized course of study (see below)........... 25-34

78-87

SUPPORT COURSES
* = Courses satisfy General Education and Breadth requirements

<table>
<thead>
<tr>
<th>Course</th>
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<tr>
<td>CHEM 127 General Chemistry (B.1.a.)*</td>
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<td>CHEM 128 General Chemistry</td>
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<tr>
<td>CHEM 129 General Chemistry</td>
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<tr>
<td>MATH 120 Pre-Calculus Algebra and Trigonometry (B.2.)*</td>
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<tr>
<td>(MATH 118 &amp; 119 or MATH 141 substitute)</td>
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<tr>
<td>PHYS 121 College Physics</td>
<td>4</td>
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<tr>
<td>PHYS 122 College Physics</td>
<td>4</td>
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<td>PHYS 123 College Physics</td>
<td>4</td>
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<tr>
<td>STAT 211 Elementary Probability and Statistics (B.2.)*</td>
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<td>Computer literacy elective (F.1.)*</td>
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<td>(CSC 110 or 113 recommended)</td>
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GENERAL EDUCATION AND BREADTH
Please see page 77 for selection of GEB electives. At least 12 units must be at the 300-400 level.
Additional GEB courses are listed under Major and Support Courses.
Area A: ................................................. 14
ENGL 114 (A.1.)
ENGL 125/PHIL 125/SPC 125 (A.2.)
SPC 201/SPC 202 (A.3.)
ENGL 215/ENGL 218 (A.4.)
Area B: .................................................. 0
A minimum of 18 units is required, 18 of the units are in Major and Support
Physical science (B.1.a.)* see Support Courses
Life science (B.1.b.)* see Major Courses
Mathematics/statistics (B.2.)* see Support Courses
Area C: .................................................. 18
PHIL 230/PHIL 231 (C.1.)
Critical reading electives (C.1.)
Fine and performing arts elective (C.2.)
Literature, philosophy, arts elective (300-400 level) (C.3.)
Arts and humanities elective (Area C)
Area D: .................................................. 18
HIST 204 (D.1.)
POLS 210 (D.1.)
HIST 315 (D.2.)
ECON 201/211/222 (D.3.)
ANT 201/GEOG 150/SOC 105 (D.4.a.)
ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300-400 level) (D.4.b.)
Area E: .................................................. 5
PSY 201/PSY 202 (E.1.)
FSN 210/PE 250/PSY 304 elective (E.2.)
Area F: .................................................. 3
A total of 6 units is required, 3 of the units are in Support
Computer literacy (F.1.)* see Support Courses
Technology elective (F.2.)
Total .................................................... 58
A minimum of 79 units is required, 21 of the units are in Major and Support
ELECTIVES .................................................. 9-18
..................................................... 189

CONCENTRATION OR INDIVIDUALIZED COURSE OF STUDY (select one)

Anatomy and Physiology Concentration
CHEM 316 Organic Chemistry .................. 4
CHEM 317 Organic Chemistry .................. 5
CHEM 331 Quantitative Analysis I ............ 5
CHEM 371 Biochemical Principles .............. 4
CHEM 372 Metabolism ............................. 3
Select three of the following courses: ........ 13
ZOO 422 Functional Histology
ZOO 432 Physiology II Comparative Systems
ZOO 433 Physiology III: Endo. & Reproductive
ZOO 405 Vertebrate Development .............. 34

Biology Concentration
Select one course from each of the following areas.
A course cannot fulfill the requirements for the Major and the Concentration.
Botany ................................................ 4
BOT 223, 333, 334, 426, 437
Zoology ............................................. 4
ZOO 321, 322, 323, 329, 335, 336, 341, 436
Anatomy/Physiology ............................. 3
BACT 424
BIO 431
BOT 322, 335
ZOO 237, 238 & 239, 340
Organic Chemistry ............................... 4
CHEM 326 Survey of Organic Chemistry. CHEM 316 & 317 may be substituted.
Biochemistry .......................... 4
CHEM 328 Survey of Biochemistry.
CHEM 371 & 372 may be substituted.
Adviser approved electives ..................... 6

Individualized Course of Study
CHEM 326 Survey of Organic Chemistry ........ 4
CHEM 316 & 317 may be substituted.
CHEM 328 Survey of Biochemistry .............. 4
CHEM 371 & 372 may be substituted.
Adviser approved electives ..................... 17
To be selected with adviser approval from 200, 300, 400-level BACT, BIO, BOT, CONS, ZOO courses excluding BIO 205, 220, 300, 302, 306.

..................................................... 25
## B.S. ECOLOGY AND SYSTEMATIC BIOLOGY

Courses are displayed by Major, Support, General Education and Breadth, and Electives.

### MAJOR COURSES

- \(* = \text{Courses satisfy General Education and Breadth requirements} \)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<td>BACT 221</td>
<td>General Bacteriology</td>
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<td>BIO 151</td>
<td>Introduction to Biology (B.1.b.)*</td>
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<td>BIO 152</td>
<td>Biology of Plants and Fungi</td>
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<td>BIO 153</td>
<td>Biology of Animals</td>
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<tr>
<td>BIO 303</td>
<td>Genetics</td>
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<tr>
<td>BIO 325</td>
<td>General Ecology</td>
<td>4</td>
</tr>
<tr>
<td>BIO 414</td>
<td>Evolution</td>
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<tr>
<td>BIO 431</td>
<td>Physiology I: General</td>
<td>4</td>
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<tr>
<td>BIO 442</td>
<td>Biometry</td>
<td>4</td>
</tr>
<tr>
<td>BIO 461</td>
<td>Senior Project</td>
<td>3</td>
</tr>
<tr>
<td>BOT 223</td>
<td>Introductory Plant Taxonomy</td>
<td>4</td>
</tr>
<tr>
<td>BOT 333</td>
<td>Field Botany</td>
<td>4</td>
</tr>
<tr>
<td>ZOO 335</td>
<td>General Entomology</td>
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</tr>
<tr>
<td>ZOO 437</td>
<td>Animal Behavior</td>
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**Concentration courses (see below)**: 20-25 units

<table>
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<tr>
<th>Units</th>
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### SUPPORT COURSES

- \(* = \text{Courses satisfy General Education and Breadth requirements} \)

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<td>CHEM 128</td>
<td>General Chemistry</td>
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<tr>
<td>CHEM 326</td>
<td>Survey of Organic Chemistry (B.1.a.)*</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 318</td>
<td>Writing for Scientific Journals</td>
<td>4</td>
</tr>
<tr>
<td>FNR 403</td>
<td>Environmental Impact Analysis</td>
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</tr>
<tr>
<td>MATH 120</td>
<td>Pre-Calculus Algebra and Trig. (B.2.)*</td>
<td>5</td>
</tr>
<tr>
<td>PHYS 121</td>
<td>College Physics</td>
<td>4</td>
</tr>
<tr>
<td>SS 121</td>
<td>Introductory Soil Science (F.2.)*</td>
<td>4</td>
</tr>
<tr>
<td>STAT 211</td>
<td>Elem. Probability and Stat. (B.2.)*</td>
<td>3</td>
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<tr>
<td>STAT 212</td>
<td>Statistical Methods</td>
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<td>Computer literacy elective (F.1.)*</td>
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<td>(CSC 110 or CSC 113 recommended)</td>
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<table>
<thead>
<tr>
<th>Units</th>
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</table>

### GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 12 units must be at the 300-400 level.

Additional GEB courses are listed under Major and Support Courses.

**Area A:** 14 units

- ENGL 114 (A.1.)
- ENGL 125/PHIL 125/SPC 125 (A.2.)
- SPC 201/SPC 202 (A.3.)
- ENGL 215/ENGL 218 (A.4.)

**Area B:** 0 units

A minimum of 18 units is required; 18 of the units are in Major and Support

- Physical science (B.1.a.)* see Support Courses
- Life science (B.1.b.)* see Major Courses
- Mathematics/statistics (B.2.)* see Support Courses

**Area C:** 18 units

- PHIL 230/PHIL 231 (C.1.)
- Critical reading electives (C.1.)
- Fine and performing arts elective (C.2.)
- Literature, philosophy, arts elective (300-400 level) (C.3.)
- Arts and humanities elective (Area C)

**Area D:** 18 units

- HIST 204 (D.1.)
- POLS 210 (D.1.)
- HIST 315 (D.2.)
- ECON 201/211/222 (D.3.)
- ANT 201/GEOG 150/SOC 105 (D.4.a.)
- ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300-400 level) (D.4.b.)

**Area E:** 5 units

- PSY 201/PSY 202 (E.1.)
- BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.) (PSY 304 recommended)

**Area F:** 0 units

A minimum of 6 units is required; 6 of the units are in Support

- Computer literacy (F.1.)* see Support Courses
- Technology (F.2.)* see Support Courses

**Total Units:** 190

A minimum of 79 units is required; 24 of the units are in Major and Support

**ELECTIVES:** 14-9 units
**CONCENTRATIONS (select one)**

### Ecology Concentration
- **BIO 415 Biogeography** ........................................ 3
- **BOT 326 Plant Ecology** ......................................... 4
- **CONS 207 Resource Survey** ..................................... 3
- **ZOO 329 Vertebrate Field Zoology** .......................... 4
- Select two courses from the following .......................... 6
  - **BIO 328, 334, 342**
  - **CONS 320, 426, 431**

### Marine Biology and Fisheries Concentration
- **BIO 328 Marine Biology or**
  - **BIO 334 Limnology** ........................................... 3
  - **BOT 437 Algology** ............................................. 4
- **CONS 320 Fishery Resource Management or**
  - **CONS 422 Freshwater Fisheries** ............................. 4
- **ZOO 322 Ichthyology** ........................................... 4
- **ZOO 436 Functional Invertebrate Zoology** ................. 4
- Select with adviser approval from: ............................. 6
  - **BIO 328, 334, 437**
  - **CONS 120, 210, 320, 422, 426, 433**
  - **FNR 203, 406**
  - **ZOO 321, 341, 421**

### Systematics Concentration
- **BIO 415 Biogeography** ........................................ 3
- **BOT 335 Plant Anatomy or**
  - **ZOO 326 Comparative Anatomy of the Chordates** ........ 4
- **BOT 443 Systematic Botany** ................................... 3
- **CONS 210 Biology and Conservation of Endangered Species** ........................................... 3
- Select either **Botany or Zoology** emphasis with adviser approval: ......................................... 12
  - **Botany**
    - **ZOO 329 Vertebrate Field Zoology** (4)
    - Select two from: **BOT 334, 426, 437**
  - **Zoology**
    - Select three from: **ZOO 321, 322, 323, 336, 341** 25

### Wildlife Biology Concentration
- **CONS 120 Fisheries and Wildlife Management** ............ 3
- **CONS 427 Habitat Management** ............................... 4
- **CONS 431 Game Management** .................................. 4
- **ZOO 321 Mammalogy** ........................................... 4
- **ZOO 323 Ornithology** ........................................... 4
- Select with adviser approval from: ............................. 6
  - **BIO 334**
  - **CONS 207, 210, 221, 426**
  - **FNR 203, 302, 406**
  - **ZOO 341, 421**

For students seeking certification, select **FNR 203, 302, 406 in lieu of free electives.** 25
B.S. MICROBIOLOGY

Courses are displayed by Major, Support, General Education and Breadth, and Electives.

Units

MAJOR COURSES
* = Courses satisfy General Education and Breadth requirements.

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>BACT 221 General Bacteriology</td>
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</tr>
<tr>
<td>BACT 222 General Microbiology</td>
<td>5</td>
</tr>
<tr>
<td>BACT 402 General Virology</td>
<td>3</td>
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<tr>
<td>BACT 421 Food Microbiology</td>
<td>4</td>
</tr>
<tr>
<td>BACT 423 Medical Microbiology</td>
<td>5</td>
</tr>
<tr>
<td>BACT 424 Bacterial Cytology and Physiology</td>
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<tr>
<td>BIO 151 Introduction to Biology (B.1.b.)*</td>
<td>5</td>
</tr>
<tr>
<td>BIO 152 Biology of Plants and Fungi</td>
<td>5</td>
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<td>BIO 153 Biology of Animals</td>
<td>5</td>
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<tr>
<td>BIO 303 Genetics</td>
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<td>BIO 304 Molecular Genetics</td>
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<td>BIO 375 Molecular Biology Laboratory</td>
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<td>BIO 461 Senior Project</td>
<td>3</td>
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<tr>
<td>ZOO 426 Serology and Immunology</td>
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Restricted electives .......................................................... 16

To be selected in conference with adviser. Students are encouraged to select one of the following career tracks: Biotechnology, Medical Technology, Public Health, Applied Microbiology, Pre-Health Professions, and Postgraduate Studies.

SUPPORT COURSES
* = Courses satisfy General Education and Breadth requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>CHEM 127 General Chemistry (B.1.a.)</td>
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<td>CHEM 328 Survey of Biochemistry</td>
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<td>CHEM 331 Quantitative Analysis</td>
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<td>PHYS 123 College Physics</td>
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<td>STAT 211 Elementary Probability and Statistics (B.2.)</td>
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TOTAL: ........................................................................... 72

GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 12 units must be at the 300–400 level.

Additional GEB courses are listed under Support Courses.

Area A: .......................................................... 14

<table>
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<th>Course</th>
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<td>ENGL 125/PHIL 125/SPC 125 (A.2.)</td>
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<td>SPC 201/SPC 202 (A.3.)</td>
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<td>ENGL 215/ENGL 218 (A.4.)</td>
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Area B .......................................................... 0

A minimum of 18 units is required; 18 of the units are in Major and Support.

Physical science (B.1.a.)* see Support Courses
Life science (B.1.b.)* see Major Courses
Mathematics/statistics (B.2.)* see Support Courses

Area C: .......................................................... 18

<table>
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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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<tr>
<td>Arts and humanities elective (Area C)</td>
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Area D: .......................................................... 18

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<th>Course</th>
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<tbody>
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<td>HIST 204 (D.1.)</td>
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<tr>
<td>POLS 210 (D.1.)</td>
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<tr>
<td>HIST 315 (D.2.)</td>
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<td>ECON 201/211 (D.3.)</td>
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<tr>
<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
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<tr>
<td>ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)</td>
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Area E: .......................................................... 5

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<td>FSN 210/PE 250/PSY 304 (E.2.)</td>
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Area F: .......................................................... 6

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<th>Course</th>
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<tbody>
<tr>
<td>Computer literacy elective (CSC 111 recommended) (F.1.)</td>
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<tr>
<td>Technology elective (F.2.)</td>
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Total .......................................................... 61

A minimum of 79 units is required; 18 of the units are in Major and Support.

ELECTIVES .......................................................... 9

<table>
<thead>
<tr>
<th>Course</th>
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TOTAL: ........................................................................... 186

1 CHEM 316 and CHEM 317 will substitute for CHEM 326.
(Substitution strongly recommended for students in the General Microbiology Concentration.)

2 CHEM 371 may be used to substitute.

3 MATH 119 or 120 will substitute.

4 MATH 141 will substitute.
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, satisfactory scores on the Graduate Record Examination, and letters of recommendation from persons knowing your academic potential. 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 (Graduate Coordinator) 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>Course</th>
<th>Thesis Plan</th>
<th>Coursework Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 501 Cellular Biology</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>BIO 502 Biology of Organisms</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>BIO 503 Population Biology</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>BIO 590 Seminar in Biology</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>BIO 599 Thesis, including oral defense of thesis</td>
<td>9</td>
<td>-</td>
</tr>
<tr>
<td>BIO 500 Individual Study, including written report</td>
<td>-</td>
<td>4</td>
</tr>
</tbody>
</table>

Comprehensive Exam:
- GRE Advanced Biology: Yes
- Essay: No

Electives from 500-level courses: 9 units
Electives from 400- and 500-level courses: 15 units

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

Faculty Offices East Bldg. (25), Room 125B
(805) 756-2693

Faculty

Department Chair, John C. Maxwell

Linda Atwood
Christina A. Bailey
Philip S. Bailey
Albert C. Censullo
Robert S. Cichowski
Lee C. Coombs
Norman L. Eatough
Leland S. Endres
Thomas G. Frey
John W. F. Goers
Ralph A. Jacobson
Dane R. Jones

David L. Keeling
Martin A. Kellerman
John F. Marlier
Neil J. Moir
William C. Rife
Michael G. Silvestri
Jan W. Simek
Russell L. Tice
James D. Westover
David G. Williamson
Max T. Wills

Programs

B.S. Biochemistry

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, and the Bachelor of Science in Biochemistry; 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.

B.S. Chemistry

Students may select Advanced Chemistry Electives or Concentration in: Polymers and Coatings

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 degree candidates 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 College of Science and Mathematics section.
## CURRICULUM FOR B.S. CHEMISTRY

Courses are displayed by Major, Support, General Education and Breadth, and Electives.

### MAJOR COURSES
* = Courses satisfy General Education and Breadth requirements

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Units</th>
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<tbody>
<tr>
<td>CHEM 127</td>
<td>General Chemistry (B.1.a.)</td>
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<td>CHEM 128</td>
<td>General Chemistry</td>
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<tr>
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<td>General Chemistry</td>
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<td>CHEM 156</td>
<td>General Chemistry Laboratory</td>
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<tr>
<td>CHEM 253</td>
<td>Chemical Literature</td>
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<td>CHEM 305</td>
<td>Physical Chemistry (B.1.a.)</td>
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<tr>
<td>CHEM 306</td>
<td>Physical Chemistry</td>
<td>3</td>
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<td>CHEM 316</td>
<td>Organic Chemistry</td>
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<td>CHEM 318</td>
<td>Organic Chemistry</td>
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<td>CHEM 331</td>
<td>Quantitative Analysis I</td>
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<tr>
<td>CHEM 332</td>
<td>Quantitative Analysis II</td>
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<td>CHEM 355</td>
<td>Physical Chemistry Laboratory</td>
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<td>CHEM 356</td>
<td>Physical Chemistry Laboratory</td>
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<td>CHEM 439</td>
<td>Instrumental Analysis</td>
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<td>CHEM 459</td>
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<td>CHEM 461</td>
<td>Senior Project</td>
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<tr>
<td>CHEM 481</td>
<td>Inorganic Chemistry</td>
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<tr>
<td>CHEM 483</td>
<td>Inorganic Synthesis</td>
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<tr>
<td></td>
<td>Advanced chemistry electives to complete major or concentration</td>
<td>18</td>
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</table>

### SUPPORT COURSES
* = Courses satisfy General Education and Breadth requirements

<table>
<thead>
<tr>
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<th>Course Title</th>
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<tbody>
<tr>
<td>BIO 101/BOT 121/ZOO 131 (B.1.b.)*</td>
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<tr>
<td>CSC 110 Computers and Computer Applications or CSC 111 Introduction to Computer Applications for the Sciences (F.1.)*</td>
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<tr>
<td>MATH 131, 132, 133 Technical Calculus or MATH 141, 142, 143 Calculus I, II, III (B.2.)*</td>
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<td>4,4,4</td>
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<tr>
<td>MATH 241, MATH 242 or STAT or CSC courses</td>
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<tr>
<td>PHYS 131 General Physics (B.1.a.)*</td>
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<tr>
<td>PHYS 132 General Physics</td>
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<td>PHYS 133 General Physics</td>
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<tr>
<td>Physics elective (200-level and above except PHYS 215)</td>
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### GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 12 units must be at the 300–400 level.

Additional GEB courses are listed under Major and Support Courses.

<table>
<thead>
<tr>
<th>Area</th>
<th>Course Code</th>
<th>Units</th>
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<tbody>
<tr>
<td>A</td>
<td>ENGL 114 (A.1.)</td>
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<td>ENGL 125/PHIL 125/SPC 125 (A.2.)</td>
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<td>SPC 201/SPC 202 (A.3.)</td>
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<td>ENGL 215/218 (A.4.)</td>
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<td>B</td>
<td>PHIL 230/PHIL 231 (C.1.)</td>
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<td></td>
<td>Critical reading electives (C.1.)</td>
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<tr>
<td></td>
<td>Fine and performing arts elective (C.2.)</td>
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<tr>
<td></td>
<td>Literature, philosophy, arts elective (300–400 level) (C.3.)</td>
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<td>Arts and humanities elective (Area C)</td>
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<tr>
<td>D</td>
<td>HIST 204 (D.1.)</td>
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<td></td>
<td>HIST 315 (D.2.)</td>
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<td></td>
<td>ECON 201/ECON 211/ECON 222 (D.3.)</td>
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<tr>
<td></td>
<td>BUS/ECON/GEOG/POLS/SOC elective (300–400 level) (D.4.a.)</td>
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<tr>
<td></td>
<td>ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)</td>
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<tr>
<td>E</td>
<td>PSY 201/PSY 202 (E.1.)</td>
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<td></td>
<td>BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)</td>
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<tr>
<td>F</td>
<td>ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)</td>
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<td></td>
<td>Computer literacy (F.1.)* see Support Courses</td>
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<td></td>
<td>Technology elective (F.2.)</td>
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### ELECTIVES

<table>
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<tr>
<th>Units</th>
</tr>
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<tbody>
<tr>
<td>9</td>
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</table>

| Total | 58 |

A minimum of 79 units is required; 21 of the units are in Major and Support.

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**Units:** 80

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188
ADVANCED CHEMISTRY ELECTIVES OR CONCENTRATION

Select either the advanced chemistry electives or the concentration.

**Advanced Chemistry Electives** ........................................ 18

Select 18 units of approved chemistry electives. 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 (4)
- CHEM 341 Environmental Chemistry: Water Pollution (3)
- CHEM 342 Environmental Chemistry: Air Pollution (3)
- CHEM 344 Chemical Process Principles (3)
- CHEM 350 Chemical Safety (1)
- 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 385 Geochemistry (3)
- CHEM 400 Special Problems (1–3)
- CHEM 446 Surface Chemistry of Materials (3)
- CHEM 447 Polymers and Coatings Laboratory I (2)
- CHEM 448 Polymers and Coatings Laboratory II (2)
- CHEM 449 Internship in Polymers and Coatings (2)
- CHEM 450 Chemical Warfare (2)
- CHEM 455 FT-NMR Laboratory (1)
- CHEM 470 Selected Advanced Topics (1–3)
- CHEM 471 Selected Advanced Laboratory (1–3)
- CHEM 473 Immunochemistry (3)
- CHEM 474 Protein Techniques Laboratory (2)
- CHEM 477 Biochemical Pharmacology (3)
- CHEM 485, 495 Cooperative Ed. Experience (6, 12)

**List B** (Select at least 3 courses)
- CHEM 419 Bioorganic Chemistry (3)
- CHEM 420 Advanced Organic Chemistry - Synthesis (3)
- CHEM 444 Polymers and Coatings I (3)
- CHEM 445 Polymers and Coatings II (3)
- CHEM 446 Surface Chemistry of Materials (3)
- CHEM 457 Qualitative Organic Analysis (3)
- CHEM 458 Instrumental Org. Qualitative Analysis (3)
- CHEM 462 Senior Project (2)

**Polymers and Coatings Concentration**

CHEM 444 Polymers and Coatings I ..................... 3
CHEM 445 Polymers and Coatings II ..................... 3
CHEM 446 Surface Chemistry of Materials ............. 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
MATE 206 Materials Engineering ...................... 3

---

**Total Units:** 18
B.S. BIOCHEMISTRY

Courses are displayed by Major, Support, General Education and Breadth, and Electives.

### MAJOR COURSES

* = Courses satisfy General Education and Breadth requirements

- **CHEM 127 General Chemistry (B.1.a.)* .................................. 4
- **CHEM 128 General Chemistry ........................................ 4
- **CHEM 129 General Chemistry ........................................ 4
- **CHEM 253 Chemical Literature ....................................... 2
- **CHEM 301, 302 Biophysical Chemistry .............................. 3,4
  (CHEM 305, 306, 355 will substitute)
- **CHEM 316 Organic Chemistry ........................................ 4
- **CHEM 317 Organic Chemistry ......................................... 5
- **CHEM 318 Organic Chemistry ......................................... 5
- **CHEM 331 Quantitative Analysis I ................................... 5
- **CHEM 371 Biochemical Principles .................................. 4
- **CHEM 372 Metabolism .................................................... 3
- **CHEM 373 Molecular Biology ......................................... 3
- **CHEM 374 Biochemistry Laboratory .................................. 2
- **CHEM 459 Undergraduate Seminar ................................. 2
- **CHEM 461 Senior Project ............................................... 2
- Approved Chemistry electives ......................................... 9
- **CHEM 156, 252, 300-400-level courses (except 326 and 328).**

### SUPPORT COURSES

* = Courses satisfy General Education and Breadth requirements

- **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, 132 Technical Calculus or MATH 141, 142 Calculus I, II (B.2.)* ........................................... 4,4
- **PHYS 121, 122 College Physics or PHYS 131, 132 General Physics (B.1.a.)* ......................................... 4,4
- **PHYS 123 College Physics or PHYS 133 General Physics ........................................... 4
- Life science elective ........................................... 3

### GENERAL EDUCATION AND BREADTH

Please see page 77 for selection of GEB electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

**Area A:** ................................................................. 14
- **ENGL 114 (A.1.)**
- **ENGL 125/PHIL 125/SPC 125 (A.2.)**
- **SPC 201/SPC 202 (A.3.)**
- **ENGL 215/218 (A.4.)**

**Area B:** ................................................................. 2
- A minimum of 18 units is required; 16 of the units are in Major and Support
- Physical science (B.1.a.)* see Major and Support Courses
- Life sciences elective (300 level recommended) (B.1.b.)* also see Support Courses
- Mathematics/statistics (B.2.)* see Support Courses

**Area C:** ................................................................. 18
- PHIL 230/PHIL 231 (C.1.)
- Critical reading electives (C.1.)
- Fine and performing arts elective (C.2.)
- Literature, philosophy, arts elective (300–400 level) (C.3.)
- Arts and humanities elective (Area C)

**Area D:** ................................................................. 18
- **HIST 204 (D.1.)**
- **POLS 210 (D.1.)**
- **HIST 315 (D.2.)**
- **ECON 201/ECON 211/ECON 222 (D.3.)**
- **ANT 201/GEOG 150/SOC 105 (D.4.a.)**
- **ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)**

**Area E:** ................................................................. 5
- **PSY 201/PSY 202 (E.1.)**
- **BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)**

**Area F:** ................................................................. 3
- A minimum of 6 units is required; 3 of the units are in Major and Support
- Computer literacy (F.1.)* see Support Courses
- Technology elective (F.2.)

**Total:** ..................................................................... 60
- A minimum of 79 units is required; 19 of the units are in Major and Support

**ELECTIVES** ................................................................. 31

---

1 CHEM 305, 306, 355 will substitute for CHEM 301, 302.
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 subject credential requirements.

All of these programs provide a strong mathematical foundation for the student contemplating the pursuit of an advanced degree in mathematics.

Programs

B.S. Mathematics

M.S. Mathematics

Mathematics Minor

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. The applied flavor of these courses increases both the usefulness of and the demand for the graduates with a degree in mathematics. In addition, the Mathematics Department offers courses that serve all departments in the university.

The undergraduate program for math majors contains a central core of courses. These courses give a solid basis for advanced work that is tailored to fit the needs and objectives of each individual student. The choice of advanced coursework is chosen in close consultation with faculty advisers.

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
## B.S. MATHEMATICS

Courses are displayed by Major, Support, General Education and Breadth, and Electives.

### MAJOR COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>* MATH 141</td>
<td>Calculus I (B.2.)*</td>
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</tr>
<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>MATH 202</td>
<td>Orientation to the Mathematics Major...</td>
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</tr>
<tr>
<td>1 MATH 206</td>
<td>Linear Algebra I</td>
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<tr>
<td>MATH 241</td>
<td>Calculus IV</td>
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</tr>
<tr>
<td>MATH 242</td>
<td>Differential Equations</td>
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</tr>
<tr>
<td>MATH 248</td>
<td>Methods of Proof in Mathematics</td>
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<tr>
<td>MATH 336</td>
<td>Combinatorial Mathematics</td>
<td>3</td>
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<tr>
<td>MATH 412</td>
<td>Advanced Calculus I</td>
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</tr>
<tr>
<td>MATH 459</td>
<td>Undergraduate Seminar</td>
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<td>2 MATH 461</td>
<td>Senior Project</td>
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<tr>
<td>MATH 462</td>
<td>Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>MATH 481</td>
<td>Modern Algebra I</td>
<td>4</td>
</tr>
<tr>
<td>3 Advanced Work in Major</td>
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### SUPPORT COURSES

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<thead>
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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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<td>4 CSC 201/CSC 207/CSC 240</td>
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<td>3</td>
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<tr>
<td>CSC 218</td>
<td>Fundamentals of Computer Science II...</td>
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<tr>
<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>PHYS 133</td>
<td>General Physics</td>
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<tr>
<td>STAT 321</td>
<td>Statistical Analysis I (B.2.)*</td>
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<tr>
<td>STAT 322</td>
<td>Statistical Analysis II</td>
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<tr>
<td>3 Advanced Work in Support</td>
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</table>

### GENERAL EDUCATION AND BREADTH

*Please see page 77 for selection of GEB electives. At least 12 units must be at the 300–400 level.

Additional GEB courses are listed under Support Courses.

**Area A:**

- ENGL 114 (A.1.)
- ENGL 125/PHIL 125/SPC 125 (A.2.)
- SPC 201/SPC 202 (A.3.)
- ENGL 215/ENGL 218 (A.4.)

**Area B:**

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>PHIL 230/PHIL 231</td>
<td>Undergraduate Seminar</td>
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<tr>
<td>PHYS 131/PHYS 210</td>
<td>Critical reading electives (C.1.)</td>
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<tr>
<td>HIST 315</td>
<td>History (D.2.)</td>
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<tr>
<td>ECON 201/ECON 211/ECON 222</td>
<td>Mathematics/statistics (B.2.)*</td>
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<td>ANT 201/GEOG 150/SOC 105</td>
<td>Mathematics/statistics (B.2.)*</td>
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<td>3 Advance Work in Major and Support</td>
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**Total:** 67-75

### ELECTIVES

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<tr>
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<td>Psychology (E.1.)</td>
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<tr>
<td>BIO 220/FSN 210/PE 250/PSY 304/REC 100</td>
<td>Physical Science (B.1.a.)</td>
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**Area F:**

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<thead>
<tr>
<th>Course Code</th>
<th>Course Code</th>
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</thead>
<tbody>
<tr>
<td>PSU 201/PSU 202</td>
<td>Computer literacy (F.1.)*</td>
<td>4</td>
</tr>
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**Total:** 186

1. Recommended to be taken concurrently with MATH 241.
2. Candidates for a teaching credential in mathematics may take EDUC 410 and EDUC 420 in place of MATH 461.
3. Advanced Work in Major and Support are to total 28 units.
4. CSC 207 to be taken by Math majors in the teaching credential program.
ADVANCED WORK IN THE B.S. MATHEMATICS CURRICULUM

Select 28 units from the advanced study tracks or from the list of additional electives below. Three advanced study tracks must be completed, at least two of which are to be chosen from the first four tracks listed.

Advanced Study Tracks

Select a minimum of two tracks from the following:

MATH 306, 406 Linear Algebra II, III (4) (4)
MATH 341 Theory of Numbers (4), MATH 482 Modern Algebra II (4)
MATH 413, 414 Advanced Calculus II, III (4) (4)
MATH 431, 432 Mathematical Optimization I, II (3) (3)

Additional study tracks:

MATH 304 Vector Analysis (4), MATH 404 Introduction to Differential Geometry and Topology (4)
MATH 304 Vector Analysis (4), MATH 418 Partial Differential Equations (4)
MATH 335 Graph Theory (3), MATH 437 Game Theory (3)
MATH 408 Functions of a Complex Variable (4), MATH 409 Complex Analysis (4)
MATH 442 Euclidean Geometry (4), MATH 443 Modern Geometries (4)

Additional electives in Major. Select from:

MATH 300, 350, 417, 419, 470

Additional electives in Support. Select from:

CSC 219, 221, 332, 333, 345, 346, 350, 360, 433
IME 301, 305
STAT 425, 426, 427

MATHMATICS MINOR

Students may earn a minor in mathematics by completing a coordinated course of study consisting of 30 units. The program consists of a core of required courses, followed by two tracks of advanced work, to be chosen in concert with a student's career objectives. Interested students should contact the Mathematics Department for individual advisement.

I. Required courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 206 Linear Algebra I (4)</td>
<td></td>
</tr>
<tr>
<td>MATH 248 Methods of Proof in Mathematics (4)</td>
<td></td>
</tr>
</tbody>
</table>

II. Complete at least two of the following tracks...

A track consists of at least two courses from the following groups of courses.
Completion of all four courses in the last group is considered two tracks.
Some tracks have additional mathematics prerequisites such as MATH 242.

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 304 Vector Analysis (4)</td>
<td></td>
</tr>
<tr>
<td>MATH 317/318 Engineering Math (4)</td>
<td></td>
</tr>
<tr>
<td>MATH 418 Partial Differential Equations (4)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 306 Linear Algebra II (4)</td>
<td></td>
</tr>
<tr>
<td>MATH 406 Linear Algebra III (4)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 335 Graph Theory (3)</td>
<td></td>
</tr>
<tr>
<td>MATH 336 Combinatorial Mathematics (3)</td>
<td></td>
</tr>
<tr>
<td>MATH 437 Game Theory (3)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 408 Functions of a Complex Variable (4)</td>
<td></td>
</tr>
<tr>
<td>MATH 409 Complex Analysis (4)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 412 Advanced Calculus I (4)</td>
<td></td>
</tr>
<tr>
<td>MATH 413 Advanced Calculus II (4)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 431 Mathematical Optimization I (3)</td>
<td></td>
</tr>
<tr>
<td>MATH 432 Mathematical Optimization II (3)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 442 Euclidean Geometry (4)</td>
<td></td>
</tr>
<tr>
<td>MATH 443 Modern Geometries (4)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 341 Theory of Numbers (4)</td>
<td></td>
</tr>
<tr>
<td>MATH 419 Intro. to History of Mathematics (4)</td>
<td></td>
</tr>
<tr>
<td>MATH 481 Modern Algebra I (4)</td>
<td></td>
</tr>
<tr>
<td>MATH 482 Modern Algebra II (4)</td>
<td></td>
</tr>
</tbody>
</table>

III. Completion of 30 units of Mathematics courses with at least 15 units in 300 or 400 level courses...

<table>
<thead>
<tr>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
</tr>
</tbody>
</table>
MASTER OF SCIENCE DEGREE IN
MATHEMATICS

General Characteristics

The master of science program in mathematics prepares students to enter careers in government, industry or teaching. A student who completes the degree will be qualified and eligible to teach at the community college level. Many of the graduates of the program also pursue further graduate study at Ph.D. granting institutions.

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. Applicants with majors in other areas or applicants with deficiencies in their undergraduate background may be admitted conditionally. For information concerning additional departmental requirements, the student should contact the Graduate Coordinator in the Mathematics Department.

Advancement to candidacy requires completion of 12 units of an approved study plan with a minimum grade point average of 3.0 and satisfactory completion of the preliminary examinations in analysis and algebra.

CURRICULUM FOR M.S. MATHEMATICS

<table>
<thead>
<tr>
<th>Units</th>
<th>Required courses</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>MATH 540 Introduction to Topology (4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MATH 550 Real Analysis (4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MATH 560 Field Theory (4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Complete one of the following two tracks:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MATH 520, 521, 522 Applied Analysis I, II, III (12)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MATH 530, 531, 532 Graduate Discrete Mathematics with Applications I, II, III (12)</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>MATH, CSC, STAT electives</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Select 400–500 level MATH, CSC, or STAT courses as approved by the advising committee.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Electives</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Select additional units at the 400 or 500 level as approved by the advising committee.</td>
<td></td>
</tr>
</tbody>
</table>

Satisfactorily complete the comprehensive examinations.

45
PHYSICAL EDUCATION AND KINESIOLOGY DEPARTMENT

Physical Education Bldg. (43), Room 453
(805) 756-2545

Faculty

Department Head, Dwayne G. Head
Doris Acord
Katharine Barthels
C. Andrea Brown
Victor A. Buccola
Steven C. Davis
Gerald DeMers
Sonja M. Glassmeyer
Kellie G. Hall
Vaughan D. Hitchcock
Raymond Nakamura
Andrew J. Proctor
Mary L. Stallard
James L. Webb

Programs

B.S. Physical Education
Students may select Individualized Course of Study or a Concentration in:
Commercial and Corporate Fitness
Health Education
Pre-Physical Therapy
Teaching

M.S. Physical Education

The Physical Education and Kinesiology Department offers undergraduate and graduate degree programs in physical education. The department also contributes to the general education and elective needs of all students by providing health education, 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 new Recreation Center, which opened in 1993, provides state-of-the-art laboratory, activity and office space for the department. Campus facilities accommodate an extensive physical education instructional program as well as full-scale athletic, intramural, and recreational sports programs.

The B.S. in Physical Education is a broad based program offering students curricular choices for a wide range of career opportunities. Concentrations include teaching, health education, commercial and corporate fitness, and pre-physical therapy. Students also have the option of choosing an individualized course of study.

CURRICULAR CONCENTRATIONS

Commercial and Corporate Fitness
Incorporates basic knowledge of business and managerial skills with the scientific and clinical knowledge of exercise physiology, human chemistry, psychology and nutrition.

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
Prepares students for careers in education, public and private health-related agencies and for graduate school in the health sciences. Coursework focuses on working with others to enhance the quality of life through physical and mental health.

Pre-Physical Therapy
Prepares students seeking a career in physical therapy and for admission to a graduate program in physical therapy. The course of study focuses on the biological and physical concepts underlying the practice of physical therapy. Physical therapy professionals work with persons of all ages with movement disfunctions in public and private therapy settings, in hospitals and homes, and as consultants to businesses and health promotion programs.

Teaching
Prepares students to meet subject matter competency required for application to the Single Subject Credential program in Physical Education. Also see Teaching Credential Programs.

Individualized Course of Study
Students may choose one of the above mentioned concentrations or pursue an individualized course of study. Courses are selected with adviser approval.

Certificates

Aquatic Certificate
Provides students from all disciplines an opportunity to develop knowledge and skills necessary for employment as aquatic facility managers or directors. National certifications are available as water safety instructor, lifeguard instructor, and certified pool operator.

Coaching Certificate
Provides teaching credential students, who are in a discipline other than physical education, an opportunity to develop knowledge and skills necessary for effective coaching. The program benefits those students who wish to coach individual or team sports at the high school or junior high level or who wish to coach non-school related sports.
B.S. PHYSICAL EDUCATION

For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser.

Units

MAJOR COURSES
PE 206–PE 229 Professional Activity/DANC 211
  Dance Fundamentals .................................. 8
PE 218 Aquatics ......................................... 2
PE 250 Health Education ................................ 2
PE 252 Introduction to Athletic Training ............ 2
PE 280 First Aid and CPR .............................. 3
PE 302 Mechanical Kinesiology ....................... 4
PE 303 Physiology of Exercise ......................... 4
PE 307 Adaptive Physical Education .................. 4
PE 318 Measurement and Evaluation in Physical Education I ................................. 3
PE 319 Measurement and Evaluation in Physical Education II ............................... 4
PE 401 Administration of Physical Education and Health/Fitness Programs ........ 3
PE 402 Motor Learning and Control .................. 4
PE 404 Motor Development ................................ 3
PE 411 The Human Element in Sport .................. 3
PE 461 Senior Project .................................. 2
PE 462 Senior Project .................................. 1
PE 474 History and Philosophy of Physical Education ........................................... 3
Concentration courses (see below) .................. 37-39
Total ..................................................... 92-94

SUPPORT COURSES
* = Courses satisfy General Education and Breadth requirements
CHEM 121 General Chemistry or CHEM 127
  General Chemistry (B.1.a.)* .......................... 4
ENGL 302/ENGL 310/ENGL 318 (Students in Teaching Concentration must take ENGL 302) .......... 4
FSN 210 Nutrition (E.2.)* .................................. 3
MATH 118 or MATH 116 and MATH 117 (B.2.)* .... 3
PSY 201/PSY 202 General Psychology (E.1.)* ....... 3
STAT 217 Statistical Methods (B.2.)* .................. 4
ZOO 131 General Zoology (B.1.b.)* ................... 4
ZOO 237 Human Anatomy ................................ 3
ZOO 238, ZOO 239 Human Physiology (B.1.b.)* .... 3,3
ZOO 340 Human Muscle Anatomy ..................... 2
Total ..................................................... 36

GENERAL EDUCATION AND BREADTH
Please see page 77 for selection of GEB electives. At least 12 units must be at the 300–400 level.
Additional GEB courses are listed under Support Courses.

Area A: ..................................................... 14
  ENGL 114 (A.1.)
  ENGL 125/PHIL 125/SPC 125 (A.2.)
  SPC 201/SPC 202 (A.3.)
  ENGL 215/ENGL 218 (A.4.)

Area B: ..................................................... 0
  A minimum of 18 units is required; 18 of the units are in Major and Support

Area C: ..................................................... 18
  PHIL 230/PHIL 231 (C.1.)
  Critical reading electives (C.1.)
  Fine and performing arts elective (C.2.)
  Literature, philosophy, arts elective (300–400 level) (C.3.)
  Arts and humanities elective (Area C)

Area D: ..................................................... 18
  HIST 204 (D.1.)
  POLS 210 (D.1.)
  HIST 315 (D.2.)
  ECON 201/ECON 211/ECON 222 (D.3.)
  ANT 201/GEOG 150/SOC 105 (D.4.a.)
  ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)

Area E: ..................................................... 0
  A minimum of 5 units is required; 5 of the units are in Support

Area F: ..................................................... 6
  Computer literacy elective (F.1.)
  Technology elective (F.2.)

Total ...................................................... 56
  A minimum of 79 units is required; 23 of the units are in Major and Support

ELECTIVES ............................................... 11-9

TOTAL ................................................... 195
## Commercial and Corporate Fitness Concentration

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE 408 Exercise and Health Promotion for Senior Adults</td>
<td>3</td>
</tr>
<tr>
<td>PE 434 Design and Implementation of Health and Fitness Programs</td>
<td>3</td>
</tr>
<tr>
<td>PE 439 Commercial/Corporate Fitness Internship or PE 485/PE 495</td>
<td>3</td>
</tr>
<tr>
<td>PE 445 Electrocardiography</td>
<td>3</td>
</tr>
<tr>
<td>PE 450 Lifestyle Management</td>
<td>3</td>
</tr>
<tr>
<td>PE 451 Nutrition for Fitness and Sport</td>
<td>3</td>
</tr>
<tr>
<td>PE 452 Testing and Exercise Prescription for Fitness Specialists</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 326 Survey of Organic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 328 Survey of Biochemistry</td>
<td>4</td>
</tr>
<tr>
<td>MGT 118 Intro. to Human Relations in Business</td>
<td>3</td>
</tr>
<tr>
<td>MGT 201 Principles of Management</td>
<td>3</td>
</tr>
<tr>
<td>SPC 301 Business and Professional Communication</td>
<td>4</td>
</tr>
</tbody>
</table>

## Health Education Concentration

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE 305 Drug Education</td>
<td>2</td>
</tr>
<tr>
<td>PE 354 School Health Programs</td>
<td>2</td>
</tr>
<tr>
<td>PE 405 Administration of Health Education</td>
<td>2</td>
</tr>
<tr>
<td>PE 408 Exercise &amp; Health Promotion Senior Adults</td>
<td>3</td>
</tr>
<tr>
<td>PE 450 Lifestyle Management</td>
<td>3</td>
</tr>
<tr>
<td>PE 451 Nutrition for Fitness and Sport</td>
<td>3</td>
</tr>
<tr>
<td>ANT 401 Culture and Health</td>
<td>3</td>
</tr>
<tr>
<td>BACT 221 General Bacteriology</td>
<td>4</td>
</tr>
<tr>
<td>BIO 253 Orientation to the Health Professions</td>
<td>1</td>
</tr>
<tr>
<td>BIO 300 Biology of Cancer</td>
<td>2</td>
</tr>
<tr>
<td>BIO 302 Human Genetics</td>
<td>3</td>
</tr>
<tr>
<td>FSN 310 Maternal and Child Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>HD 308 Adulthood or PSY 459 Lifespan Theories</td>
<td>3</td>
</tr>
<tr>
<td>PSY 205 Human Sexuality</td>
<td>3</td>
</tr>
</tbody>
</table>

## Teaching Concentration

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE 209 Creative and Non-Traditional Games</td>
<td>1</td>
</tr>
<tr>
<td>PE 215 Field Sports</td>
<td>2</td>
</tr>
<tr>
<td>PE 275 Sports Officiating</td>
<td>2</td>
</tr>
<tr>
<td>PE 276 Athletic Coaching Theory</td>
<td>3</td>
</tr>
<tr>
<td>PE 296 Planning Techniques in Physical Education</td>
<td>3</td>
</tr>
<tr>
<td>PE 354 School Health Programs</td>
<td>2</td>
</tr>
<tr>
<td>PE 356 Teaching Gymnastics</td>
<td>2</td>
</tr>
<tr>
<td>PE 384 Water Safety Instructor</td>
<td>3</td>
</tr>
<tr>
<td>PE 419 Curriculum and Program Content in Elementary Physical Education</td>
<td>3</td>
</tr>
<tr>
<td>PE 421 Strategies for Teaching Physical Education</td>
<td>3</td>
</tr>
<tr>
<td>PE 422 Teaching Elementary Physical Education</td>
<td>2</td>
</tr>
<tr>
<td>PE 423 Teaching Secondary Physical Education</td>
<td>3</td>
</tr>
<tr>
<td>PE 424 Organization and Implementation of K-12 Physical Education</td>
<td>3</td>
</tr>
<tr>
<td>DANC 381 Methods of Teaching Dance</td>
<td>4</td>
</tr>
<tr>
<td>REC 260 Intramural and Recreational Sports</td>
<td>3</td>
</tr>
</tbody>
</table>

## Pre-Physical Therapy Concentration

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 121 College Physics</td>
<td>4</td>
</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>BIO 153 Biology of Animals</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 128 General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 129 General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>Select from the following with adviser's approval</td>
<td>12</td>
</tr>
<tr>
<td>PE 400, 408, 432, 434, 437, 445</td>
<td></td>
</tr>
<tr>
<td>BACT 221</td>
<td></td>
</tr>
<tr>
<td>CHEM 326</td>
<td></td>
</tr>
<tr>
<td>PSY 317, 405</td>
<td></td>
</tr>
</tbody>
</table>

Total Credits: 39

Total Credits: 37
MASTER OF SCIENCE DEGREE IN PHYSICAL EDUCATION

General Characteristics

The degree program is designed 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 teaching physical education at the secondary and community college levels, and positions in corporate, private, and governmental agencies as well as those in clinical preventative and/or rehabilitative health settings.

Areas of Emphasis

Students may select one of the following areas of emphasis which is most compatible with career and personal objectives.

Exercise Science and Health Promotion

Exercise Science and Health Promotion is an extension of the Commercial/Corporate Fitness Concentration under the B.S. degree program in Physical Education. This emphasis prepares students to work in the health promotion field in diversified settings, including corporate, club, private, and governmental. It also qualifies graduates to pursue clinically oriented positions in preventative and rehabilitative health programs as well as providing students with an excellent background for advanced study.

Human Movement and Sport

This emphasis is offered for students who wish advanced preparation for elementary, secondary, or college positions in physical education 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; and (c) continued graduate work at other institutions.

Prerequisites

Conditionally Classified Standing

Applicants to the M.S. degree program in Physical Education should have an undergraduate degree in Physical Education or equivalent academic preparation. Those applicants with undergraduate deficiencies must remove these deficiencies through coursework or examination before Advancement to Candidacy.

Information pertaining to specific requirements for admission may be obtained from the Graduate Coordinator of the Physical Education Program.

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 have:
A. Successfully completed all "conditionally classified requirements;
B. Successfully completed the Graduation Writing Requirement;
C. Maintained a minimum 3.0 GPA for all course work completed; and
D. Filed a Formal Study Plan.
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 33 of these units must be completed at the 500 level in Physical Education.

All candidates must meet the current Graduation Writing Requirement.

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 or project must successfully defend the thesis or project in an oral examination, or (2) those students not presenting a thesis or project 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 courses with adviser approval, provided these courses were not required as part of the undergraduate degree 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. A maximum of 12 adviser approved units may be taken outside of the Physical Education and Kinesiology Department.
### CURRICULUM FOR M.S. PHYSICAL EDUCATION

<table>
<thead>
<tr>
<th>Units</th>
<th>Required courses</th>
</tr>
</thead>
</table>
| 19    | PE 515 Behavior and Communication in a Health and Physical Education Setting (3)  
      | PE 517 Research Methods in Physical Education (3)  
      | PE 519 Evaluation of Current Studies (3)  
      | PE 522 Biomechanics (3)  
      | PE 525 Human Performance and Learning (3)  
      | PE 530 Advanced Physiology of Exercise (4) |
| 12/16 | Area of Emphasis  
      | Exercise and Health Promotion Emphasis (16)  
      | PE 503 Seminar in Adult Wellness (3)  
      | PE 504 Cardiopulmonary Physiology, Pathology and Exercise (3)  
      | PE 514 Health Education Planning (3)  
      | PE 516 Management of Health Promotion in the Workplace (3)  
      | PE 536 Advanced Electrocardiography (4) |
| 12     | Human Movement and Sport Emphasis (12)  
       | PE 502 Current Trends and Issues in Physical Education (3)  
       | PE 511 Administration of Physical Education and Athletics (3)  
       | PE 526 Sport in American Society (3)  
       | PE 539 Observation, Development and Analysis of Teaching (3) |
| 14/10  | Electives to be selected with adviser's approval... |

For more detailed information or advisement, students should communicate with the Coordinator of Graduate Studies for Physical Education.
PHYSICS DEPARTMENT

Science Bldg. (52), Room D-37
(805) 756-2448

Faculty

Chair, Robert H. Dickerson

Lawrence H. Balthaser
Joseph C. Boone
Ronald F. Brown
Anthony J. Buffa
Arthur S. Cary
David H. Chipping
Gayle Cook
Neil L. Fleishon
Theodore C. Foster
Richard B. Frankel
David W. Hafemeister
Kenneth A. Hoffman
James S. Kalathil
Randall D. Knight

John Mottmann
Kenneth S. Ozawa
Ralph A. Peters
John E. Poling
David M. Roach
Richard A. Saenz
Thomas G. Schumann
Keith S. Stowe
Nilgun Sungar
Willem L. van Wyngaarden
Leonard W. Wall
Walter D. Wilson
Ronald E. Zammit

Programs

B.S. Physical Science

B.S. Physics

Students may select Advanced Physics Electives or a Concentration in:

Electronics

Electro-optics

The Physics Department offers curricula in physics and in physical sciences leading to the Bachelor of Science degree. It also serves all colleges of the university by offering courses which provide the scientific foundations for work taken by students in their major fields. The department 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.

B.S. PHYSICS

The department's goal in educating physics majors is to train them for positions as physicists in industry or government laboratories, 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 provides students with excellent preparation for graduate school. Physicists are engaged in many fields, including electronics and computers, lasers, aerospace, energy production and utilization, the development of new materials, and state-of-the-art research on topics ranging from quarks to astrophysics.

To prepare physics majors effectively for employment, the department provides a comprehensive laboratory program. Facilities 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.

Students have the choice of selecting one of the specialized concentrations or following the general physics curriculum, which offers a variety of elective coursework. Students who are planning to pursue graduate studies in physics are advised to follow the general curriculum. The electronics concentration is designed for students wishing to acquire a working knowledge of electronics for use in experimental physics. The electro-optics concentration provides a background in optical devices and techniques used in this rapidly expanding field.

High school students planning to major in physics should include in their high school program as much as possible of the following: eight semesters of college preparatory mathematics, two of physics and two of chemistry.

B.S. PHYSICAL SCIENCE

The B.S. in Physical Science is designed primarily to prepare students who intend to be secondary school teachers 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. 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.
# B.S. Physics

Courses are displayed by Major, Support, Concentration, General Education and Breadth, and Electives.

## Major Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 131</td>
<td>General Physics</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</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 206</td>
<td>Instrumentation in Experimental Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 211</td>
<td>Modern Physics I</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 212</td>
<td>Modern Physics II</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 243</td>
<td>Introductory Modern Physics Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>PHYS 301</td>
<td>Thermal Physics I</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 302</td>
<td>Analytical Mechanics I</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 303</td>
<td>Analytical Mechanics II</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 323</td>
<td>Optics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 341</td>
<td>Quantum Physics Laboratory I</td>
<td>1</td>
</tr>
<tr>
<td>PHYS 342</td>
<td>Quantum Physics Laboratory II</td>
<td>2</td>
</tr>
<tr>
<td>PHYS 363</td>
<td>Undergraduate Seminar</td>
<td>2</td>
</tr>
<tr>
<td>PHYS 405</td>
<td>Quantum Mechanics I</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 408</td>
<td>Electromagnetic Fields and Waves I</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 409</td>
<td>Electromagnetic Fields and Waves II</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 461</td>
<td>Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>PHYS 462</td>
<td>Senior Project</td>
<td>2</td>
</tr>
<tr>
<td>MATH 242</td>
<td>Differential Equations</td>
<td>4</td>
</tr>
<tr>
<td>MATH 304</td>
<td>Vector Analysis (B.2.) *</td>
<td>4</td>
</tr>
<tr>
<td>MATH 318</td>
<td>Advanced Engineering Mathematics</td>
<td>4</td>
</tr>
<tr>
<td>MATH 418</td>
<td>Partial Differential Equations</td>
<td>4</td>
</tr>
</tbody>
</table>

Advanced Physics electives or Concentration courses (see below) ................................... 21

| Total       |                                                  | 93    |

## Support Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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</tr>
</thead>
<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 (B.1.a.) *</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 129</td>
<td>General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CSC 118/204</td>
<td>(F.1.) *(CSC 118 recommended)</td>
<td>3</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</td>
<td>4</td>
</tr>
<tr>
<td>MATH 143</td>
<td>Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>MATH 241</td>
<td>Calculus IV</td>
<td>4</td>
</tr>
</tbody>
</table>

| Total       |                                                  | 31    |

## General Education and Breadth

Please see page 77 for selection of GEB electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

<table>
<thead>
<tr>
<th>Area A</th>
<th></th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 114</td>
<td>(A.1.)</td>
<td></td>
</tr>
<tr>
<td>ENGL 125/PHIL 125/SPC 125 (A.2.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPC 201/SPC 202 (A.3.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGL 215/ENGL 218 (A.4.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area B</th>
<th></th>
<th>3</th>
</tr>
</thead>
</table>

A minimum of 18 units is required; 16 of the units are in Major and Support

Physical science (B.1.a.)* see Support Courses
Life sciences elective (B.1.b.)
Mathematics/statistics (B.2.)* see Major and Support Courses

<table>
<thead>
<tr>
<th>Area C</th>
<th></th>
<th>18</th>
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</thead>
<tbody>
<tr>
<td>PHIL 230/PHIL 231 (C.1.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Critical reading electives (C.1.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fine and performing arts elective (C.2.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Literature, philosophy, arts elective (300–400 level) (C.3.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arts and humanities elective (Area C)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area D</th>
<th></th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIST 204</td>
<td>(D.1.)</td>
<td></td>
</tr>
<tr>
<td>POLS 210</td>
<td>(D.1.)</td>
<td></td>
</tr>
<tr>
<td>HIST 315</td>
<td>(D.2.)</td>
<td></td>
</tr>
<tr>
<td>ECON 201/211/222 (D.3.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area E</th>
<th></th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSY 201/PSY 202 (E.1.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area F</th>
<th></th>
<th>3</th>
</tr>
</thead>
</table>

A minimum of 6 units is required; 3 of the units are in Support

Computer literacy (F.1.)* see Support Courses
Technology elective (F.2.)

| Total       |                                                  | 60    |

A minimum of 79 units is required; 18 of the units are in Support

## Electives

| Total       |                                                  | 9     |

| Total       |                                                  | 194   |
ADVANCED PHYSICS ELECTIVES OR CONCENTRATION

Select either the advanced physics electives or one of the concentrations.

Advanced Physics Electives

Select one of the following: PHYS 403, 406, or 412 .... 3
Select 18 units of approved physics electives (listed below)........................................... 18
For students anticipating an industrial career PHYS 357, 412, 413, 423, and 452 are suggested electives.
For students anticipating graduate work in physics PHYS 202, 401, 406, 424, and MATH 408 are suggested electives. In addition, PHYS 357 is suggested for students who anticipate becoming experimental physicists.
PHYS 202 Physics and the Computer (3)
PHYS 317 Special Theory of Relativity (3)
PHYS 357 Advanced Instrumentation in Experimental Physics (3)
PHYS 401 Thermal Physics II (3)
PHYS 403 Nuclear and Particle Physics (3)
PHYS 406 Quantum Mechanics II (3)
PHYS 410 Physics of the Solid Earth (3)
PHYS 412 Solid State Physics (3)
PHYS 413 Advanced Topics in Solid State Physics (3)
PHYS 416 Theoretical Acoustics (3)
PHYS 423 Advanced Optics (4)
PHYS 424 Theoretical Physics (3)
PHYS 452 Solid State Physics Laboratory (1)
PHYS 470 Selected Advanced Topics (1-3)
PHYS 471 Selected Advanced Laboratory (1-3)
MATH 408 Functions of a Complex Variable (4)

Electronics Concentration

Students will not be allowed to enroll in EE 301 until they have a) completed PHYS 357 and MATH 318, and b) received the approval of advisers in both Physics and Electrical Engineering. Students will then be allowed to enroll in EE courses with physics courses substituting for EE prerequisites.

PHYS 357 Advanced Instrumentation in Experimental Physics .................................................. 3
EE 301 Linear Systems Analysis .................................. 3
EE 302 Linear Control Systems ................................ 3
EE 307 Digital Integrated Electronics ........................... 3
EE 341 Linear Analysis Laboratory ............................ 1
EE 342 Control Systems Laboratory ........................... 1
EE 347 Digital Integrated Electronics Laboratory ........ 1
EE electives to be selected from the following list:........ 6
EE 308, 309, 313, 328, 348, 349, 353

Electro-optics Concentration

Students will not be allowed to enroll in EE 301 until they have a) completed PHYS 357 and MATH 318, and b) received approval of advisers in both Physics and Electrical Engineering. Students will then be allowed to enroll in EE courses with physics courses substituting for EE prerequisites.

PHYS 357 Advanced Instrumentation in Experimental Physics .................................................. 3
PHYS 423 Advanced Optics ...................................... 4
EE 301 Linear Systems Analysis ............................... 3
EE 341 Linear Analysis Laboratory ............................ 1
EE 403 Fiber Optics Communication ........................... 3
EE 418 Photonic Engineering ................................... 3
EE 458 Photonic Engineering Laboratory .................... 1
Electives to be selected from the following list:........... 3
EE 302, 307, 328.
EE 342, 414, 443 are recommended additional courses.
# B.S. PHYSICAL SCIENCE

Courses are displayed by Major, Support, General Education and Breadth, and Electives.

## MAJOR COURSES

\* = Courses satisfy General Education and Breadth requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTR 301</td>
<td>The Solar System or ASTR 302</td>
<td>Stars and Galaxies</td>
</tr>
<tr>
<td>Astronomy and/or earth science adviser approved elective</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CHEM 127, 128, 129</td>
<td>General Chemistry (B.1.a.)*</td>
<td>4, 4, 4</td>
</tr>
<tr>
<td>CHEM 301</td>
<td>Biophysical Chemistry or CHEM 305</td>
<td>Physical Chemistry (B.1.a.)*</td>
</tr>
<tr>
<td>CHEM 316</td>
<td>Organic Chemistry or CHEM 326</td>
<td>Organic Chemistry</td>
</tr>
<tr>
<td>CHEM 328</td>
<td>Survey of Biochemistry or CHEM 371</td>
<td>Biochemical Principles</td>
</tr>
<tr>
<td>Chemistry adviser approved elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>GEOL 201</td>
<td>Physical Geology</td>
<td>3</td>
</tr>
<tr>
<td>Physical sciences adviser approved elective (300–400 level) (Prospective teachers take PSC 424)</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>PHYS 131, 132, 133</td>
<td>General Physics or PHYS 121, 122, 123</td>
<td>College Physics (B.1.a.)*</td>
</tr>
<tr>
<td>PHYS 211</td>
<td>Modern Physics</td>
<td>4</td>
</tr>
<tr>
<td>Physics adviser approved elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Physics adviser approved elective (300–400 level)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>PSC 461, CHEM 461, or PHYS 461</td>
<td>Senior Project</td>
<td>2</td>
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</tbody>
</table>

## SUPPORT COURSES

\* = Courses satisfy General Education and Breadth requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>CSC 110</td>
<td>Computers and Computer Applications (F.1.)</td>
<td>3</td>
</tr>
<tr>
<td>MATH 141, 142, 143</td>
<td>Calculus I, II, III or MATH 131, 132, 133</td>
<td>Technical Calculus (B.2.)*</td>
</tr>
<tr>
<td>MATH/CSC/STAT</td>
<td>200-level electives</td>
<td>8</td>
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</table>

## GENERAL EDUCATION AND BREADTH

*Please see page 77 for selection of GEB electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Major and Support Courses.*

<table>
<thead>
<tr>
<th>Area</th>
<th>Courses</th>
<th>Units</th>
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<tbody>
<tr>
<td>A</td>
<td>ENGL 114 (A.1.)</td>
<td>14</td>
</tr>
<tr>
<td>ENGL 125/PHIL 125/SPC 125 (A.2.)</td>
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<td></td>
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<tr>
<td>SPC 201/SPC 202, (A.3.)</td>
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<tr>
<td>ENGL 215/ENGL 218 (A.4.)</td>
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</table>

A minimum of 18 units is required; 15 of the units are in Major and Support

Physical science (B.1.a.)* see Major Courses

Life sciences elective (B.1.b.)

Mathematics/statistics (B.2.)* see Support Courses

<table>
<thead>
<tr>
<th>Area</th>
<th>Courses</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>B</td>
<td>PHYS 230/PHIL 231 (C.1.)</td>
<td>18</td>
</tr>
<tr>
<td>Critical reading electives (C.1.)</td>
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<td></td>
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<tr>
<td>Fine and performing arts elective (C.2.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Literature, philosophy, arts elective (300–400 level) (C.3.)</td>
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<tr>
<td>Arts and humanities elective (Area C)</td>
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<table>
<thead>
<tr>
<th>Area</th>
<th>Courses</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>HIST 204 (D.1.)</td>
<td>18</td>
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<td>POLS 210 (D.1.)</td>
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<tr>
<td>HIST 315 (D.2.)</td>
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<tr>
<td>ECON 201/211/222 (D.3.)</td>
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<tr>
<td>ANT 201/GEOG 150/SOC 105 (D.4.a.)</td>
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<td></td>
</tr>
<tr>
<td>ANT/BUS/ECON/GEOG/POLS/SOC/WS elective (300–400 level) (D.4.b.)</td>
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</table>

<table>
<thead>
<tr>
<th>Area</th>
<th>Courses</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>PSY 201/PSY 202 (E.1.)</td>
<td>5</td>
</tr>
<tr>
<td>BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)</td>
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<table>
<thead>
<tr>
<th>Area</th>
<th>Courses</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>A minimum of 6 units is required; 3 of the units are in Support</td>
<td>3</td>
</tr>
<tr>
<td>Computer literacy (F.1.)* see Support Courses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology elective (F.2.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Total | Support Courses | 61 |

A minimum of 79 units is required; 18 of the units are in Major and Support

| ELECTIVES | Courses | 35 |

Students planning on qualifying for a teaching credential should contact the University Center for Teacher Education about necessary courses.

---

1 A choice of the PHYS 121, 122, 123 sequence or CHEM 326 or CHEM 328 restricts the Physics and Chemistry electives available to the student later in this program.
Faculty

Department Chair, Roxy L. Peck

James C. Daly  Richard J. Rossi
Jay L. Devore  Robert K. Smidt
John E. Groves  Kent D. Smith
Y. Leon Maksoudian  Sing-Chou Wu
John M. Rogers

Programs

B.S. Statistics

Statistics Minor

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, aircraft manufacturing, banking, computer manufacturing, and pharmaceutical development.

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 STATISTICS MINOR

Select one of the following introductory sequences ... 6–8

- STAT 211 Elementary Probability and Statistics (3), and STAT 212 Statistical Methods (3)
- STAT 251 Statistical Inference for Mgmt. I (4), and STAT 252 Statistical Inference for Mgmt. II (4)
- STAT 321 Statistical Analysis I (3) and STAT 322 Statistical Analysis II (4)

Select from the following ........................................ 9

STAT 313 Applied Experimental Design and Regression Models (3) or STAT 323 Analysis of Variance (3)
STAT 324 Applied Regression Analysis (3)
STAT 330 Statistical Uses of Computers (3)

Select from any 400-level STAT course ..................... 6

Select six units 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

27-29
B.S. STATISTICS

Courses are displayed by Major, Support, General Education and Breadth, and Electives.

**MAJOR COURSES**

* = Courses satisfy General Education and Breadth requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSC 332 Numerical Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>MATH 141 Calculus I (B.2.)*</td>
<td>4</td>
</tr>
<tr>
<td>MATH 142 Calculus II (B.2.)*</td>
<td>4</td>
</tr>
<tr>
<td>MATH 143 Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>MATH 206 Linear Algebra I</td>
<td>4</td>
</tr>
<tr>
<td>STAT 321 Statistical Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>STAT 322 Statistical Analysis II</td>
<td>4</td>
</tr>
<tr>
<td>STAT 323 Analysis of Variance</td>
<td>3</td>
</tr>
<tr>
<td>STAT 324 Applied Regression Analysis</td>
<td>3</td>
</tr>
<tr>
<td>STAT 330 Statistical Uses of Computers</td>
<td>3</td>
</tr>
<tr>
<td>STAT 423 Linear Models</td>
<td>3</td>
</tr>
<tr>
<td>STAT 425 Probability Theory and Applications I</td>
<td>3</td>
</tr>
<tr>
<td>STAT 426 Probability Theory and Applications II</td>
<td>3</td>
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<tr>
<td>STAT 427 Mathematical Statistics</td>
<td>3</td>
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<tr>
<td>STAT 461 Senior Project</td>
<td>2</td>
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<tr>
<td>STAT 462 Senior Project</td>
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<tr>
<td>STAT 463 Undergraduate Seminar</td>
<td>2</td>
</tr>
<tr>
<td>Statistics electives (400 level)</td>
<td>12</td>
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</tbody>
</table>

**SUPPORT COURSES**

* = Courses satisfy General Education and Breadth requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
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<tbody>
<tr>
<td>CSC 118 Fundamentals of Computer Science I (F.1.)</td>
<td>4</td>
</tr>
<tr>
<td>CSC 201/CSC 204/CSC 218</td>
<td>3</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>MATH electives to be selected with adviser's approval from: MATH 306, 335, 336, 406, 412, 431, 437</td>
<td>6</td>
</tr>
<tr>
<td>Adviser approved technical electives</td>
<td>15</td>
</tr>
</tbody>
</table>

**GENERAL EDUCATION AND BREADTH**

Please see page 77 for selection of GEB electives. At least 12 units must be at the 300–400 level.

Additional GEB courses are listed under Major and Support Courses.

**Area A:** .......................................................... 14

ENGL 114 (A.1.)

ENGL 125/PHIL 125/SPC 125 (A.2.)

SPC 201/SPC 202 (A.3.)

ENGL 215/ENGL 218 (A.4.)

**Area B:** .......................................................... 10

A minimum of 18 units is required; 8 of the units are in Major

Physical and life sciences electives (one each, one with lab) (B.1.)

Physical or life science elective (B.1.)

Mathematics/statistics (B.2.)* see Major Courses

**Area C:** .......................................................... 18

PHIL 230/PHIL 231 (C.1.)

Critical reading electives (C.1.)

Fine and performing arts elective (C.2.)

Literature, philosophy, arts elective (300–400 level) (C.3.)

Arts and humanities elective (Area C)

**Area D:** .......................................................... 18

HIST 204 (D.1.)

POLS 210 (D.1.)

HIST 315 (D.2.)

ECON 201/211/222 (D.3.)

ANT 201/GEOG 150/SOC 105 (D.4.a.)

ANT/BUS/ECON/GEOG/POLS/SOC/W&S elective (300–400 level) (D.4.b.)

**Area E:** .......................................................... 5

PSY 201/PSY 202 (E.1.)

BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)

**Area F:** .......................................................... 2

A minimum of 6 units is required; 4 of the units are in Major

Computer literacy (F.1.)* see Major Courses

Technology elective (F.2.)

**Total**.............................................................. 67

A minimum of 67 units is required; 12 of the units are in Major and Support

**ELECTIVES** ........................................................ 14

**TOTAL**.............................................................. 186
A NEW ERA IN ETHNIC STUDIES AT CAL POLY
With this catalog Cal Poly offers a new minor in Ethnic Studies. Students from all majors can benefit from Ethnic Studies courses. The approach is comparative and inclusive enabling students to learn more about their own ethnic heritage and its relation to the broader ethnic heritage of California, the United States, and the larger global community. Photo (l-r): Dr. Robert Gish, Director and Professor; Yolanda Tiscareno, Secretary; Dr. Willi Coleman, Professor; and Irasema Garcia, student. Photo by Doug Allen.

ETHNIC
STUDIES
Ethnic Studies

English Building, Room 201
(805) 756-1707

Faculty
Director, Robert F. Gish
Willi Coleman

Program
Ethnic Studies Minor

Ethnic Studies is interdisciplinary. Courses in Ethnic Studies seek a broader understanding of the various cultural characteristics of diverse groups of people, including their origins, diaspora, and other ethnic and cultural classifications. Courses in Ethnic Studies involve race, language, artistic, literary, historical, political, economic, and mythic traditions and contexts as well as issues of class, gender, and social values and mores. Ethnic Studies is a discipline which proceeds from assumptions that the human condition is diverse and complex and that "truths" about culture are best achieved from a variety of approaches.

Ethnic Studies at Cal Poly is a developing program which seeks to integrate aspects of the arts and the science, technology and society, the humanities and general education. Although housed in the College of Liberal Arts, the scope of Ethnic Studies extends to the other colleges and the larger university and society. Its curricular and social missions attempt to reinforce democratic and egalitarian principles.

<table>
<thead>
<tr>
<th>ETHNIC STUDIES MINOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Ethnic Studies Minor provides students with interdisciplinary understanding of various cultural and other identifying characteristics of diverse groups of people, including their origins and diaspora. Ethnic Studies examine race, language, artistic, literary, historical, political, economic, and mythic perceptions as well as issues of class, gender, social mores, folkways, and values. Students completing the minor have an appreciation of cultural diversity and the contributions of ethnic groups to American history and culture. They understand issues of culture, race, gender, racism, stereotyping, and discrimination. Students gain a knowledge of historical trends and strategies for addressing contemporary issues. Finally, students improve their abilities to deal with issues and people with sensitivity and responsibility, use critical thinking skills, nurture tolerance, and celebrate diversity.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Core courses (12)</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES 110 Introduction to Ethnic Studies</td>
<td>3</td>
</tr>
<tr>
<td>ES 114 Racism and American Culture</td>
<td>3</td>
</tr>
<tr>
<td>ES 210 U.S. Cultural Heritage</td>
<td>3</td>
</tr>
<tr>
<td>ES 320 Cultural Images</td>
<td>3</td>
</tr>
</tbody>
</table>

Adviser approved electives .......................... 15

Electives will reinforce and enhance student's understanding of issues of culture, race, and gender. A minimum of 11 units must be 300-400 level.
EDUCATION BUILDING
The recently remodeled building houses the University Center for Teacher Education. Top photo by Stephen Hughes; view from the stairway looking out at campus. Bottom photo by Doug Allen; entrance to the building.
University Center for Teacher Education

Education Bldg. (02), Room 121
(805) 756-2583

Faculty

Director, Susan Roper

Mary Lud Baldwin
Donald Cheek
Leonard Davidman
Patricia Davidman
Erlan G. Dettloff
Howard Drucker
Robert L. Levison

Donald K. Maas
Susan L. McBride
Patricia A. Mulligan
Dennis M. Nulman
Kenneth F. Palmer
Bernard A. Troy

The following faculty participate with the University Center for Teacher Education and hold academic rank in a department outside the Center:

Doris Acord
Frederick P. Andoli
Kathleen Balgley
John Battenburg
Lloyd N. Beecher
C. Andrea Brown
Carl R.V. Brown
Glen R. Casey
Robert S. Cichowski
Susan Duffy
Robert A. Flores
Alan W. Holz
Robert L. Inchausti
William C. Kellogg
Sarah S. Lord
Joseph E. Sabol
H. Bernard Strickmeier

Programs

M.A. in Education
with Specializations in:
Counseling and Guidance
Curriculum and Instruction
Educational Administration
Reading
Special Education

credential programs include preliminary and professional clear teaching credentials in single and multiple subjects. Service and specialist credentials in Administrative Services, Pupil Personnel Services, Reading/Language Arts 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 University Center for Teacher Education 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 Center operates the Reading Clinic, providing diagnostic and remedial services for clients of school age.

Credential Programs

The University Center for Teacher Education is designed to promote an all-University approach toward teacher education and to develop a strong, collaborative, and enduring partnership with area school districts.

The Center offers a wide variety of courses and programs leading to careers in education. Common to all programs is a commitment to excellence, to cooperation and collaboration, to preparation for future educational challenges. 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, or reading. To meet the need for excellent teachers the Center seeks talented, creative students who are committed to a long-term career in education and to the improvement of educational processes and institutions.

The University Center for Teacher Education offers a Master of Arts degree in Education with a broad range of specializations and credential programs for qualified candidates. The M.A. in Education has areas of specialization in: Counseling and Guidance, Curriculum and Instruction, Educational Administration, Reading, and Special Education.

Credential programs include preliminary and professional clear teaching credentials in single and multiple subjects. Service and specialist credentials in Administrative Services, Pupil Personnel Services, Reading/Language Arts 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 University Center for Teacher Education 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 Center operates the Reading Clinic, providing diagnostic and remedial services for clients of school age.
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. The specializations 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 units of 500-level Education courses. 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.

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 EDUC 590 Research Applications in Education, or the completion of a thesis/project. Students must enroll in EDUC 599 Thesis/Project (or EDUC 598) for every quarter in which they are receiving advisement.

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.
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 references, an autobiographical statement, and an interview. 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 EDUC 562 in their formal program of study. EDUC 590 and a comprehensive written examination or EDUC 599 are required for degree completion. 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 degree program in Psychology in the Psychology and Human Development Department.

| Units |
|-----------------------------|-----------------------------|
| Education Core ............... | EDUC 587 Educational Foundations and Current Issues (4) |
|                             | EDUC 588 Education, Culture and Learning (4) |
|                             | EDUC 589 Research Methods and Analysis in Education (5) |
| Required in the Area of Specialization .......... | EDUC 555 Counseling and Communication (4) |
|                             | EDUC 556 Ethnic Counseling (4) |
|                             | EDUC 557 Career Development (4) |
|                             | EDUC 560 Counseling Theories and Assessment (4) |
|                             | EDUC 561 Group Counseling (3) |
|                             | EDUC 573 Field Experience–Counseling (6) |
| Electives (to be selected with adviser's approval)........ | 6 |

---

M.A. EDUCATION, SPECIALIZATION IN CURRICULUM AND INSTRUCTION

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 or the equivalent prior to entering the program.

EDUC 590 and a comprehensive written examination, or EDUC 599, are required for the completion of a master's degree with a specialization in curriculum and instruction.

| Units |
|-----------------------------|-----------------------------|
| Education Core .................. | EDUC 587 Educational Foundations and Current Issues (4) |
|                             | EDUC 588 Education, Culture and Learning (4) |
|                             | EDUC 589 Research Methods and Analysis in Education (5) |
| Required in Area of Specialization ................ | EDUC 501 Problems and Practices in Curriculum Development (3) |
|                             | EDUC 503 Seminar in Language Arts Curriculum and Methods (3) |
|                             | EDUC 504 Seminar in Science and Mathematics Curriculum and Methods (4) |
|                             | EDUC 505 Seminar in Social Studies Curriculum and Methods (3) |
|                             | EDUC 506 Models of Instruction (4) |
|                             | EDUC 507 Instructional Materials and Technology (3) |
|                             | EDUC 532 Adv. Field Experiences in Education (3) |
|                             | EDUC 590 Research Applications in Education (4) |
| Electives (selected with adviser's approval)........... | 5 |

(Suggested Electives: EDUC 427, 440, 450, 470, 480, 511, 512, 513, 515, 526, 529, 555, PE 422)

---

1 If EDUC 599 Thesis/Project is selected in lieu of EDUC 590, student must register for credit each quarter of advisement.
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. EDUC 590 and a comprehensive written examination, or EDUC 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>Education Core</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDUC 587 Educational Foundations and Current Issues (4)</td>
<td>13</td>
</tr>
<tr>
<td>EDUC 588 Education, Culture and Learning (4)</td>
<td></td>
</tr>
<tr>
<td>EDUC 589 Research Methods and Analysis in Education (5)</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Required in Area of Specialization</th>
<th>12</th>
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</thead>
<tbody>
<tr>
<td>EDUC 512 Educational Organization and Management (4)</td>
<td></td>
</tr>
<tr>
<td>EDUC 513 Educational Planning Decision Making (4)</td>
<td></td>
</tr>
<tr>
<td>EDUC 590 Research Applications in Education (4)</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electives (to be selected with adviser's approval)</th>
<th>20</th>
</tr>
</thead>
</table>

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 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.

EDUC 590 and a comprehensive written examination, or EDUC 599, are required for the completion of the Master's degree with a specialization in Special Education.

<table>
<thead>
<tr>
<th>Education Core</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDUC 587 Educational Foundations in Current Issues (4)</td>
<td>13</td>
</tr>
<tr>
<td>EDUC 588 Education, Culture and Learning (4)</td>
<td></td>
</tr>
<tr>
<td>EDUC 589 Research Methods and Analysis in Education (5)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Required in Area of Specialization</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDUC 525 Reading Processes, Programs, and Technology (4)</td>
<td></td>
</tr>
<tr>
<td>EDUC 526 Diagnosing and Remediating Reading Problems (4)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electives (to be selected with adviser's approval)</th>
<th>21</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suggested electives: EDUC 529, 531.</td>
<td></td>
</tr>
</tbody>
</table>

1 If EDUC 599 Thesis/Project is selected in lieu of EDUC 590, the student must register for credit each quarter of advisement.
The Teaching Credential Programs consist of coursework and field experiences, including student teaching, required to obtain the Preliminary and Professional Clear Multiple and Single Subject teaching credentials in California. Guidelines for all credentials are established by the State of California's Commission on Teacher Credentialing (CTC), and are subject to change.

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

### Basic Credentials

(Preliminary and Professional Clear)

- Multiple Subject Instruction (as commonly practiced in California elementary and middle schools)
- Crosscultural Language and Academic Development (CLAD) Emphasis
- Bilingual Crosscultural Language and Academic Development (BCLAD) Emphasis
- Single Subject Instruction (as commonly practiced in California high schools and most junior high schools)
- Agriculture
- English (and Speech Communication)
- Home Economics
- Life Science (Biology)
- Mathematics
- Physical Education
- Physical Science (Chemistry and Physics)
- Social Science (History and Political Science)

### Advanced Credentials

Specialist Credentials (Clear)

- Adapted Physical Education Specialist
- Agriculture Specialist
- Reading/Language Arts Specialist
- Special Education
  - Learning Handicapped Specialist, and
  - Severely Handicapped Specialist

Services Credentials

- Administrative Services (Preliminary and Professional)
- Pupil Personnel Services (School Counseling)

Candidates for the single subject teaching credential in Agriculture or the Agricultural Specialist credential 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.

### CLAD and BCLAD

Cal Poly's Crosscultural Language and Academic Development (CLAD) and Bilingual Crosscultural Language and Academic Development (BCLAD) programs stress knowledge of language structure acquisition and development; methodologies for English language development and specially designed content instruction delivered in English; and general cultural concepts relevant to Education.

Additionally, BCLAD is designed to prepare teachers for bilingual classrooms. The BCLAD emphasis focuses on knowledge of bilingual teaching methodologies, the Latino culture, and proficiency in Spanish.

### Multiple and Single Subject Teaching Credential Program

**Admission Requirements**

- admission to Cal Poly as a postbaccalaureate student,
- required cumulative GPA (see below),
- evidence of taking the California Basic Educational Skills Test (CBEST),
• evidence of passing the Multiple Subject Assessment for Teachers Examination or an approved Waiver (coursework) statement, and

• evidence of application for Certificate of Clearance (Multiple Subject only).

The requirements for admission to Cal Poly to pursue a Multiple Subject credential differ slightly from those for the Single Subject credential. Details concerning specific credential program admission requirements are available from the appropriate adviser, and in the advisement handbook.

Admission to the university does not guarantee admission to the teacher education program.

Admission to the Teaching Credential Program – Step I

To enter the credential program and to identify additional requirements that must be completed prior to beginning student teaching, a "Step I" application is to be submitted at least two quarters before student teaching (not including summer quarter). For most credential candidates this is done upon completion of the baccalaureate degree or during the first quarter of postbaccalaureate studies. Check with your credential program adviser and the credential handbook to be sure that all requirements are completed.

Minimum Scholarship Standards for Admission to Teaching Credential Programs

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Minimum GPA 1992-94</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>2.50</td>
</tr>
<tr>
<td>Biological Sciences</td>
<td>2.72</td>
</tr>
<tr>
<td>Education (includes Physical Education and Industrial Arts)</td>
<td>2.69</td>
</tr>
<tr>
<td>Home Economics (includes Child Development)</td>
<td>2.68</td>
</tr>
<tr>
<td>English (includes Speech)</td>
<td>2.80</td>
</tr>
<tr>
<td>Mathematics</td>
<td>2.72</td>
</tr>
<tr>
<td>Physical Sciences (includes Chemistry and Physics)</td>
<td>2.66</td>
</tr>
<tr>
<td>Social Sciences (includes History and Political Science)</td>
<td>2.90</td>
</tr>
<tr>
<td>Multiple Subjects</td>
<td>2.94</td>
</tr>
</tbody>
</table>

Note: GPA's are subject to change.

Single Subjects:

Single Subject student teaching involves a six unit and a twelve unit assignment. Six unit student teaching consists of a part-time (half day) experience in the classroom observing and teaching. Twelve unit student teaching consists of a full-time all day experience with the student teacher gradually assuming responsibility for the class.

Application for the Preliminary or Professional Clear Credential

Upon completion of Cal Poly's Teaching Credential Program (Multiple or Single Subject) each student must apply for their Preliminary or Professional Clear Credential. These applications are available through the University Center for Teacher Education Services Center and may be submitted as early as two weeks prior to completing the final credential requirements. See the credential handbooks for more information.

Professional Clear Credential – Fifth Year of Study

To qualify for the Professional Clear Multiple or Single Subject credential candidates must complete the following requirements beyond the Preliminary credential.
requirements. This is also referred to as the Fifth Year of Study.

- 45 quarter units of adviser approved postbaccalaureate coursework;
- coursework in Health Education (PE 250, PE 305, and verification of completion of a training program in cardiopulmonary resuscitation (CPR) (American Red Cross Community CPR or American Heart Association Level B);
- coursework in Special Education (EDUC 440, 4 units);
- coursework in Computer Education (EDUC 480, PE 350, MATH 300, or AGED 410), and
- recommendation from a California college or university with a CTC approved Teacher Preparation Program.

* coursework in

Passing the California Basic Education Skills Test (CBEST) is required for all credentials.

Minimum GPA Requirements

Students may enter the credential program as an undergraduate or as a postbaccalaureate candidate. The minimum GPA which must be maintained each quarter after admission to the program for undergraduate candidates is the same as their required admission GPA (see above table).

Postbaccalaureate candidates must maintain a 3.00 quarterly GPA. The required grade point averages must be maintained in both the professional education coursework (see Credential Program Handbook for specific courses) and all other coursework attempted after admission to the credential program.

ADVANCED CREDENTIALS

Advanced credential candidates must maintain a grade point average of 3.0 (B) or better in all credential required coursework. Calculation of the grade point average will include grades received in all classes required for the credential, although only courses with A, B, or C grades will be counted to satisfy credential requirements.

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 at 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 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.

The program emphasizes advanced skill development in building-level or central office administration with emphasis on the job application of management skills.

For 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, Educational Administration program, University Center for Teacher Education.

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, University Center for Teacher Education.

Reading/Language Arts Specialist

The Reading/Language Arts Specialist Credential program is designed to supplement the basic multiple subject or single subject credential. The Reading/Language Arts 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 program the candidate must hold a valid Multiple Subject or Single Subject Preliminary or Life Credential; and have completed a reading methods course or the equivalent. The Reading/Language Arts 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/Language Arts, University Center for Teacher Education.

**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. These credentials enable the teacher to work with students ages 3–21, with mild, moderate and/or severe problems in a variety of settings. 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 a preliminary teaching credential that is valid in California. Applicants must also meet general personal and professional standards determined by an admission interview and recommendations. 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.

**Learning Handicapped Specialist Credential**

This program is designed to give students the competencies needed to teach mildly handicapped students ages 3–21. This program stresses practical skills across a wide variety of areas. The Learning Handicapped Specialist Credential may be combined with the Reading/Language Arts Specialist Credential.

**Severely Handicapped Specialist 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 multiple handicapped. The training emphasis is upon functional curriculum planning, integration into least restrictive environments, vocational preparation, and community living skills.

The Severely Handicapped Specialist Credential may be combined with the Learning Handicapped Specialist Credential.

For more information regarding this program, contact the Coordinator, Special Education, University Center for Teacher Education.
### COLLEGES, DEPARTMENTS AND COURSE PREFIXES

#### COLLEGE OF AGRICULTURE

<table>
<thead>
<tr>
<th>Department</th>
<th>Prefixes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>AG</td>
</tr>
<tr>
<td>Agribusiness</td>
<td>AGB</td>
</tr>
<tr>
<td>Agricultural Education</td>
<td>AGED</td>
</tr>
<tr>
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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.

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ACTG–ACCOUNTING

ACTG 211 Financial Accounting for Nonbusiness Majors (4)
Introduction to financial accounting theory and practice with an emphasis on financial statement preparation and analysis. Not open to Business majors. 4 lectures.

ACTG 224 Financial Accounting (5)
Principles of financial accounting for Business majors. The course prepares students to read and interpret financial statement information. Financial reporting standards are explored to give students an understanding of how financial transactions and events are reflected in financial statements. 5 lectures. Prerequisite: Sophomore standing.

ACTG 225 Managerial Accounting (4)
Applications of accounting to management decision-making, planning and control including cost behavior, budget preparation, performance reporting, motivational and behavioral considerations, and ethics. 4 lectures. Prerequisite: MATH 221, STAT 252, ECON 222, CSC 120 or equivalent, and ACTG 211 or ACTG 224 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 224 and CSC 120 or equivalent.

ACTG 304 Tax Accounting (4)
Federal income taxation of individuals. 4 lectures. Prerequisite: ACTG 211 or ACTG 224 or consent of instructor.

ACTG 321, 322, 323 Intermediate Accounting I, II, III (4) (4) (4)
Comprehensive coverage of financial reporting. 321 covers financial statements, assets, leases, and long-term debt. 322 covers revenue recognition, income taxes, pensions, liabilities, equities, accounting changes, and cash flows. 323 covers accounting for inflation, international accounting, interim and segment reporting, special measurement problems, financial disclosures and analysis. 4 lectures. Prerequisite: 321: ACTG 224 and junior standing; 322: ACTG 321 with minimum grade of C-; 323: ACTG 322 with minimum grade of C-.

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 and consent of instructor.

ACTG 402 Advanced Cost Accounting (4)
Product costing systems including hybrid costing systems, management control systems, cost allocation, activity based costing, cost information for decision making, new manufacturing environment, backflush costing and strategic control systems. International dimension integrated in the course content. 4 lectures. Prerequisite: ACTG 225.

ACTG 404 Taxation of Partnerships, Estates and Trusts and Complex Capital Transactions (4)
Federal income taxation of sales and exchanges, Subchapter S corporations, partnerships, estates and trusts, Federal gift and estate taxes. 4 lectures. Prerequisite: ACTG 304.

ACTG 405 Corporate Tax Accounting and Tax Administration (4)
Federal income taxation of regular corporations, tax research, tax administration, and IRS practice. 4 lectures. Prerequisite: ACTG 304.

ACTG 421 Accounting for Business Combinations (2)
Concepts and techniques of accounting for various forms of business combinations including acquisitions, mergers, and consolidations. Emphasis is placed on the preparation of consolidated financial statements for acquisitions classified as purchases and poolings-of-interests. 2 lectures. Prerequisite: ACTG 323 with minimum grade of C-, or consent of instructor.

ACTG 422 Accounting for Governments and Not-For Profit Entities (2)
Accounting concepts and techniques used by state and local units of governments and private not-for-profit entities. Emphasis is placed on the accounting and reporting practices of state and local units of governments. 2 lectures. Prerequisite: ACTG 321 with minimum grade of C-, or consent of instructor.

ACTG 423 Financial Reporting by Public Companies (2)
A study of the Securities and Exchange Commission and its reporting requirements. Emphasis is placed on the Commission's regulation of accounting, reporting, internal controls, and auditing. Impact on accountants' legal liability is also examined. 2 lectures. Prerequisite: ACTG 323 with minimum grade of C-, or consent of instructor.

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 with minimum grade of C-, or consent of instructor.

ACTG 446 Auditing (4)
Survey of the auditing environment including institutional, ethical, and legal liability dimensions. Introduction to audit planning, assessing materiality and audit risk, collecting and evaluating audit evidence, considering the internal control structure, substantive testing, and reporting, 4 lectures. Prerequisite: ACTG 323 with minimum grade of C-, or consent of instructor. Recommended: MIS 221.

ACTG 447 Advanced Auditing (4)
Advanced coverage of selected topics including assessing materiality and audit risk, applying nonstatistical and statistical sampling, auditing computerized accounting systems, performing other attestation and accounting services, and researching auditing problems. 3 lectures, 1 activity. Prerequisite: ACTG 446. Recommended: MIS 321.
ACTG 461 Senior Project (1)
Provides practice in using primary research sources and materials in accounting and auditing. Original authoritative sources used include professional standards, academic journals, and computerized data bases. 1 seminar. Prerequisite: ACTG 323, senior standing, and completion of graduation writing requirement.

ACTG 462 Senior Project (3)
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 90 hours total time. Prerequisite: ACTG 461.

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 121 Agricultural Mechanics (2) GFB F.2.
Identification and use of tools and materials; shop safety; 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. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 laboratory. Prerequisite: MATH 116 or equivalent, high school drafting or concurrent enrollment.

AE 128 Introduction to Fundamentals of Agricultural Technology (3)
Introduction to agricultural engineering and agricultural engineering technology. Career opportunities. Problem solving techniques. Selection of materials for fabrication. Laboratory skills development in wood, metal, concrete, plumbing and projects in creative design. Strength tests of wood joints and concrete. Performance test of student design projects. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: MATH 116 or equivalent, high school drafting or concurrent enrollment in AE 133 or ETME 131.

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 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 151 CAD for Agricultural Engineering (1)
Computer aided drafting on the Macintosh or similar computer using Autocad 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: ETME 142 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 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 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 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 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 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: AE 143, 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: AE 236, SS 121, MATH 141 or consent of instructor.

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 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, or consent of instructor.

AE 345 Aerial Photogrammetry and Remote Sensing (3)
Object recognition, three-dimensional equipment, and interpretation. Print alignment, stereoscopic viewing, scales, elevation determination, and application. Application of aerial photos to regional studies. 2 lectures, 1 laboratory. Prerequisite: MATH 116.

AE 348 Energy for a Sustainable Society (3)
Transition from fossil-fuel to renewable energy sources including hydro, biomass, solar, wind, and energy conservation. Environmental, economic, and political consequences of a renewable energy-based sustainable society. 3 lectures. Prerequisite: Junior standing, GEB B.1. course.

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, IME 314, MATH 242, STAT 321.

AE 405 Chemigation (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)
Design of on-farm irrigation systems; micro, surface, and sprinkler irrigation systems; canals and pumps; economic and strategies of pipe design; pipeline protection. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: AE 331 or AE 340; hydraulics.

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, IME 142.

AE 422 Equipment Engineering (3)
Design and construction of specialized agricultural components and equipment. 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. Compressing control logic to evaluate stability behavior of systems of computer interfacing, data input and control output. 2 lectures, 1 laboratory. Prerequisite: ASM 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
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: AE 312, AE 333, ME 302.

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 or consent of instructor.

AE 446 Geographic Information Data Sources (2)
Techniques for preparing data for geographic information systems. Digital data from surveying, aerial photographs, satellite imagery, and government data sources will be entered, displayed, and edited using computer software and translated for use in other software packages. 1 lecture, 1 laboratory. Prerequisite: AE 237 or AE 131, and GEI F.1. computer literacy course.

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 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 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. Net 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: Consent of instructor.

AE 500 Individual Study (1–3)
Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: 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.

AERO 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.

AERO 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.

AERO 581 Graduate Seminar in Agricultural Engineering (3)
Group study of current problems of the agricultural engineering industry; current experimental and research findings as applied to field of agricultural engineering. Class Schedule will list topic selected. Total credit limited to 9 units. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

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 210 History of Aviation (3)
History of technological innovations which led to modern aviation. People and circumstances that contributed to the major breakthroughs in aeronautics and astronautics. Impact of aviation on society. Discussion of current events in aviation. 3 lectures.

AERO 215 Aerospace Engineering Analysis I (2)
Introduction to problem solving techniques in aerospace engineering using digital computers. Primary emphasis on the solution of problems in aerodynamics, aerospace structures, performance, stability and control, and astronautics. 2 laboratories. Prerequisite: CSC 251, MATH 143.

AERO 240 Additional Engineering Laboratory (1–2) (CR/NC)
Total credit limited to four units, with not more than two units in any one quarter. Credit/No Credit grading. 1 or 2 laboratories.

AERO 301, 302, 303 Aerothermodynamics (5) (5) (3)
Properties and characteristics of fluids, fluid statics and dynamics, the thermodynamic relations, laminar and turbulent subsonic flows as applied to flight vehicles. Introduction to heat transfer. 5 lectures, fall and winter; 3 lectures, spring. Prerequisite: ME 211, MATH 242.

AERO 304 Experimental Aerothermodynamics (2)
Laboratory experiments verify the momentum and energy equations. Fan performance, boundary layer measurements, diffuser performance, heat transfer and solar collector performance experiments are evaluated. 1 lecture, 1 laboratory. Prerequisite: ENGL 218. Concurrent: AERO 302.

AERO 306 Aerodynamics I (3)

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: AERO 302, AERO 306, ENGL 218.

AERO 315 Aerospace Engineering Analysis II (3)
Analysis methods for aerospace engineering problems. Applications of analysis methods to solving problems in aerodynamics, aerospace structures, stability and control, and astronautics. 3 lectures. Prerequisite: AERO 215, MATH 242.

AERO 320 Fundamentals of Guidance and Control (3)
Introduction to state-space and transfer function models for aircraft, missiles, and helicopters. Elementary classical and modern analysis techniques using interactive computer graphics. 3 lectures. Prerequisite: AERO 215. Concurrent: AERO 315.

AERO 330 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 302, AERO 306, CHEM 124.

AERO 404 Gas Dynamics (3)
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. 3 lectures. Prerequisite: AERO 302.

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 306, AERO 404.

AERO 406 Hypersonic Flow Theory (3)
Theoretical and analytical methods for the high-speed flight of aerospace vehicles. Review of gas dynamics, local surface inclination methods, inviscid methods, boundary layer and aerodynamic heating, and viscous interactions. 3 lectures. Prerequisite: AERO 306, AERO 404.

AERO 407 Reentry Aerodynamics (3)

AERO 409 Flight Test (3)
Principles of flight testing with applications to performance, stability and control, and avionics system test. Data analysis and presentation. Test planning and principles of in-flight simulation. 1 lecture, 2 laboratories. Prerequisite: AERO 306, AERO 320.

AERO 416 Principles of Rotary Wing Flight (3)
Introduction to analysis of rotary wing aircraft. Overview of avionics systems. Performance figures of merit. Stability and control of helicopters. Equations of motion for forward flight. 3 lectures. Prerequisite: AERO 306 and AERO 315.

AERO 418 Fundamentals of Flight Simulation (3)
Overview of flight simulators and supporting facilities. Aircraft equations of motion and navigation equations with respect to the earth's surface. Ground, environmental, avionics systems models. Lab simulation and flight evaluation. 2 lectures, 1 laboratory. Prerequisite: AERO 320 or EE 301 or CSC 360 or ME 422.

AERO 420 Stability and Control of Aerospace Vehicles (4)
Steady-state and perturbed equations of motion for a rigid body in flight. Static and dynamic stability derivatives. Modes of motion in response to control inputs. State-space and transfer function analysis. Introduction to feedback control. 4 lectures. Prerequisite: AERO 306 and AERO 320 or ME 212.

AERO 430 Aerospace Structural Analysis (4)

AERO 432 Experimental Stress Analysis (1)
Employing the knowledge of stress analysis and aerospace structural analysis in an individual and group design project dealing with aerospace structures. 1 laboratory. Prerequisite: AERO 430.

AERO 434 Structural Dynamics Analysis (4)

AERO 443, 444, 445 Flight Vehicle Design (2) (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. AERO 443: 2 laboratories. AERO 444 and AERO 445: 2 lectures, 2 laboratories. Prerequisite: AERO 306, AERO 330, senior standing. Concurrent: AERO 401, AERO 420.

AERO 447, 448, 449 Spacecraft Design (2) (4) (4)
Preliminary layout of typical space vehicle using design and calculation techniques developed in previous aeronautical engineering courses. Design of selected component structures and preparation of necessary drawings. AERO 447: 2 laboratories. AERO 448 and AERO 449: 2 lectures, 2 laboratories. Prerequisite: AERO 315, senior standing. Concurrent: AERO 401, AERO 420, AERO 451, AERO 430.

AERO 451 Orbital Mechanics I (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: ME 212.

AERO 452 Orbital Mechanics II (3)
Orbital motion, perturbing forces. Asphericity of the earth, aerodynamic drag, third-body tidal forces, etc. Enke and Cowell solution techniques. Restricted 3-body problem. Satellite attitude dynamics, rigid body-symmetric and asymmetric semirigid bodies. Attitude control, spinning/fixed
gravity gradient. Gyroscopic instruments. 3 lectures. 
Prerequisite: AERO 451.

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 485 Cooperative Education Experience (6) (CR/NC)
Part-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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

AERO 495 Cooperative Education Experience (12) (CR/NC)
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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and 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 lectures. Prerequisite: AERO 302, AERO 315, AERO 330, 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, MATH 502, graduate standing or consent of instructor.

AERO 522 Boundary-Layer Theory (3)
Concept of boundary-layer. Boundary-layer equations, similarity transformation, integral methods for steady, two-dimensional laminar and turbulent boundary layers. 3 lectures. Prerequisite: AERO 302, graduate standing or consent of instructor. Concurrent: MATH 501.

AERO 523 Turbulence (3)

AERO 526 Computational Fluid Dynamics I (3)
Classification of partial differential equations. Numerical methods for solving elliptic, parabolic, and hyperbolic sets of partial differential equations, including implicit and explicit methods. Consideration of accuracy, stability of numerical methods, and programming complexity. Fundamental equations of fluid dynamics and appropriate numerical solutions. 3 lectures. Prerequisite: CSC 311, AERO 303, graduate standing or consent of instructor.

AERO 527 Computational Fluid Dynamics II (3)
Application of computational techniques to solving fluid dynamic problems using potential equations, Euler's equation, boundary-layer equations, and Navier-Stokes equations. Grid generation. Turbulence modeling. 2 lectures, 1 laboratory. Prerequisite: AERO 526.

AERO 530 Inelastic Structural Analysis (3)

AERO 532 Advanced Composite Structures Analysis and Design (4)

AERO 535 Advanced Aerospace Structural Analysis (3)
Advanced flight vehicle and fracture mechanics analysis and design. Fundamentals and applications of modern fatigue analysis in the aerospace industry. 3 lectures. Prerequisite: AERO 430, 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, AERO 404, graduate standing or consent of instructor.

AERO 541 Aircraft Gas Turbine Engines (4)
Aerothermodynamics of propulsion systems, characterization of power plant utilization and operation cycle analysis, on-off design performance, component characterization, component design, component matching, optimization, and introduction to power plant and airframe integration systems for aircraft. 4 lectures. Prerequisite: AERO 401 or ME 443, 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 451.

AERO 550 Analysis and Design of Flight Control Systems (3)
Fundamental principles of flight control design for modern aircraft. Automatic control of aircraft and missiles. Selected advanced topics in computer analysis of control systems. 2 lectures, 1 laboratory. Prerequisite: AERO 420 or ME 422, graduate standing or consent of instructor.

AERO 551 Advanced Topics in Estimation and Control (3)
Principles of multi-loop analysis and design using state representations of actual systems. Optimal design for regulators and trackers. Observers and Kalman filter applications. Current research in robust control. 2 lectures, 1 laboratory. Prerequisite: AERO 420 or AERO 550 or ME 422, graduate standing or consent of instructor.

AERO 555 Flying Qualities and Flight Test of Piloted Vehicles (3)
Principles of flight test applied to handling qualities research. Flying qualities prediction from reduced-order models. Transfer function models for the pilot. Cooper-Harper scale, pilot-induced-oscillation, fly-by-wire systems, in-flight simulation and testing. 2 lectures, 1 laboratory. Prerequisite: AERO 450 or AERO 550 or ME 450, graduate standing or consent of instructor.

AERO 565 Advanced Topics in Aircraft Design (3)
Application of advanced analytic engineering methods to aircraft design problems. Analysis and synthesis of advanced topics related to design of aircraft. 3 lectures. Prerequisite: AERO 522, AERO 530 and AERO 550, graduate standing or consent of instructor. Concurrent: AERO 520.

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 100 Agriculture 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. Registration is through department offices and subtopics will list the department supervising the project. Credit/No Credit grading only.

AG 124 Small Engines (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 activity.

AG 201 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.

AG 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.

AG 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.

AG 235 Agricultural Power (3)
Principles of spark ignition and compression ignition engines and related accessories. Service, trouble-shooting, and repair procedures. 1 lecture, 2 laboratories.

AG 241 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: AG 235.

AG 242 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: AG 235 or equivalent or consent of instructor.
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 244 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 104, AG 234.

AG 245 Agricultural Equipment Projects (3)
Construction of special agricultural equipment related to any agricultural enterprise. 1 lecture, 2 laboratories. Prerequisite: AG 244.

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. Miscellaneous course fee required—see Class Schedule. 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 485 Cooperative Education Experience (6) (CR/NC)
Part-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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

AG 495 Cooperative Education Experience (12) (CR/NC)
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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of 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 585 Cooperative Education Experience (6) (CR/NC)
Advanced study analysis and part-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 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

AG 595 Cooperative Education Experience (12) (CR/NC)
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 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

AG 598 Reading and Conference (1–12) (CR/NC)
Systematic development of an agricultural thesis research project including literature searches, reports and experimental design. Repeatable for up to 12 units. Credit/No Credit grading only. Prerequisite: Graduating standing and instructor consent.

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 facilities are used or advisement is received. Degree credit limited to 6 units. Prerequisite: Graduate standing and consent of instructor.

AGB—AGRIBUSINESS

AGB 101 Introduction to Agribusiness and Agricultural Economics (4)
Understanding the breadth, depth and structure of the agribusiness industry. Introduction to the economic aspects of agriculture and their implications to the agricultural producer, consumer, and the food system. The role of agricultural resources, major agricultural resource issues, and their policy remedies. 4 lectures.

AGB 200 Special Problems for Undergraduates (1–2) (CR/NC)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a
maximum of 2 units per quarter. Credit can only be used to satisfy free electives. Credit/No Credit grading only. 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 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 101, ECON 201, or ECON 211.

AGB 213 Agricultural Economic Analysis (4)
Advanced agricultural microeconomics with emphasis on mathematical problem solving; production and cost functions, single and multiple input allocation, agricultural output combinations, agricultural market structures, and economies of size. 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. reported internship. Credit/No Credit grading. Prerequisite: Consent of internship instructor.

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 Associations and Cooperatives (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 301.

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 pricing, product management, pricing, promotion and distribution. 3 lectures. Prerequisite: AGB 212 or ECON 201.

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 or ECON 201 or ECON 211.

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 AGB 321.

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 and ECON 222, or ECON 201 or ECON 211.

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: Upper division 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 213 and 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 213, AGB 312, and 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: AG 250 or equivalent, 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 212, a course in the plant sciences, and a course in the animal sciences.

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 250 or equivalent, and upper division 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 APD enterprise analysis. Income tax laws pertaining to agriculture. 3 lectures, 1 activity. Prerequisite: AGB 212 or consent of instructor.

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 and ECON 222, 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 and AG 250.

AGB 400 Special Problems for Advanced Undergraduates (1–2) (CR/NC)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Credit can only be used to satisfy free electives. Credit/No Credit grading only. Prerequisite: Consent of department head or instructor.

AGB 401 Managing Cultural Diversity in Agricultural Labor Relations (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, MKTG 301, AGB 213, STAT 212.

AGB 406 Agribusiness Marketing Planning (4)
Client centered course where self-managed teams develop agribusiness marketing plan. Emphasis on developing presentation skills. Integration of marketing mix, particularly promotional elements in developing agribusiness marketing strategy emphasized. 4 lectures. Prerequisite: AGB 405.

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 (4)
Structure and performance of the agricultural lending industry. Advanced agricultural loan analysis and risk assessment. Agricultural loan documentation, securitization of farm loans, and firm bankruptcy. Exploration of interest rate impacts on agricultural lending. 4 lectures. Prerequisite: ACTG 211, AGB 310 and senior standing.

AGB 412 Advanced Agricultural Policy (4)
Agricultural resource allocation issues with emphasis on policies that impact the production of food and fiber and inputs used in their production. Special topics in agricultural resource allocation stressing issues and policies emphasizing economic externalities. 4 lectures. Prerequisite: AGB 312, AGB 315, and AGB 421 or AGB 433.

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: AGB 250, AGB 213, STAT 212.

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, trust and other tools in estate planning. 3 lectures. Prerequisite: Upper division standing.

AGB 433 Agricultural Price Analysis (3)
Application of statistical tools for price analysis. Emphasis on price making process for specific agricultural commodities. Utilization of market reports and production estimate data in
price forecasting and analysis. 2 lectures, 1 activity. Prerequisite: AG 250, AGB 213, STAT 212.

AGB 435 Linear Programming in Agriculture (3)
Application of linear programming to modern commercial agriculture; assumptions and data requirements; graphic and simplex solutions; preparation, coding and solutions of models simulating current problems. 2 lectures, 1 activity. Prerequisite: AG 250, AGB 213, AGB 322.

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 301.

AGB 446 Wine Market Analysis (2)
Application of statistical theory to collection and interpretation of production/sales data. Also includes introduction to forecasting and decision theory. Financial ratios and industry averages. 2 seminars. Prerequisite: AGB 301 or consent of instructor.

AGB 447 Wine Distribution and Pricing (2)
Wine distribution channels with emphasis on agents, brokers, distributors, and retailers. Inventory management and distribution cooperatives. Domestic and international shipping regulations. The impact of price on distribution will be highlighted. 2 seminars. Prerequisite: AGB 304 or consent of instructor.

AGB 448 Governmental Wine Regulations and Compliance (2)
Legal aspects of wine marketing. Emphasis on federal (BATF) requirements as well as the operation and/or use of state tax laws and state monopolies that tend to restrict the free movement of wine. 2 seminars. Prerequisite: Consent of instructor.

AGB 449 Wine Promotion and Packaging (2)
All types of mass media promotional strategies and complete coverage of the following areas: personal selling, publicity, public relations, direct marketing, and direct promotions. Label design, packaging, and point of sale promotions. Ethics for responsible advertising. 2 seminars. Prerequisite: AGB 446 or consent of instructor.

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 456 Crop Management Problems (4)
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. Includes whole farm budget development and analysis. 3 lectures, 1 activity. Prerequisite: AGB 322.

AGB 457 Livestock Management Problems (4)
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. Includes whole farm budget development and analysis. 3 lectures, 1 activity. Prerequisite: AGB 322.

AGB 458 Dairy Management Problems (4)
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. Includes whole farm budget development and analysis. 3 lectures, 1 activity. Prerequisite: AGB 322.

AGB 460 Research Methodology in Agribusiness (2)
Empirical application of the scientific method as it relates to the design and development of Senior Project. 2 seminars. Prerequisite: Senior standing and AGB 213.

AGB 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 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: Senior standing.

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. Prerequisite: Graduate standing or consent of instructor.

AGB 514 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 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: Graduate standing or consent of instructor.

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: Graduate standing or consent of instructor.

AGB 543 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 speculations and hedging simulation. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

AGB 555 Technological and Economic Change in Agribusiness (4)
Ramifications and impacts in agribusiness firms from technological and economic changes. Emphasis on specific agribusiness firms and their managerial process of dealing with problems and opportunities in the operational environments of economic, technology, political, global, domestic and marketing. 4 seminars. Prerequisite: Graduate standing, or consent of instructor.

AGB 563 International 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.

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 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 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 330 FFA and Supervised Agriculture Programs (6)
Implementation processes and operational procedures for initiating, conducting and integrating FFA activities and SOE Programs appropriate to community, school and student needs. Demonstration, application and observation of practices and techniques utilized by agriculture instructors in conducting organized classroom, shop, school farm, laboratory and home visit instruction in agriculture, FFA and SOE activities. 3 activities, and supervision. Prerequisite: AGED 202.

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. SOE 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. 2 activities. 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 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 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 426 Presentation Methods (3)
Development and evaluation of effective means of communication by use of a variety of presentation methods including demonstration. 3 activities. Prerequisite: SPC 201.

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. Prerequisite: Consent of instructor.

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 459 Senior Project (2)
Empirical application of the scientific method as it relates to the selection of a project under faculty supervision. Projects typical of problems that graduates must solve in their field of employment. Minimum 60 hours total time.

AGED 542 Senior Project (3)
Completion of a project begun in AGED 461 under faculty supervision. Projects typical of problems that graduates must solve in their field of employment. Project results are presented in a formal report. Minimum 90 hours total time. Prerequisite: AGED 461 or consent of instructor.

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.
ANT 310 California Archaeology (3)
Diversity of California Indian cultures; field studies in locating, surveying, and analyzing aboriginal sites; excavation of a site; laboratory techniques for recording, preserving, and reporting of artifacts; relating observations and finds to the natural environment in which the site is located; integrating knowledge of natural and social sciences for the use in archaeology. 2 lectures, 1 laboratory. Prerequisite: A course in anthropology or consent of instructor.

ANT 325 Material Culture (3)
Description of processes of invention and diffusion in a multicultural world. Role of environment and primitive technology on culture. Major preindustrial inventions and their social correlates throughout the world. 3 lectures. Prerequisite: ANT 201 or consent of instructor.

ANT 333 Language and Culture (3)
A global perspective on the social and cultural factors which influence language form and language use. Topics include: language and thought; the origins and development of human language; language learning; language and cultural metaphors; language and gender; dialects; bilingualism and multilingualism; language and ethnic identity; language and political persuasion. 3 lectures. Prerequisite: Junior standing.

ANT 341 Comparative Societies (3)
Comparative study of contemporary cultures. Uses the ethnographic case study approach to investigate solutions to human problems. Examines cultural themes across at least three different cultures in different areas of the world. 3 lectures. Prerequisite: ANT 201 and junior standing.

ANT 360 Human Cultural Adaptations (3)  GEB D.4.b.
Evolution of cultures and societies from an ecological perspective, emphasizing the material processes leading to both cultural diversity and similarity. 3 lectures. Prerequisite: Any course in GEB area D.4.a.

ANT 401 Culture and Health (3)

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 cultural diversity and uniformity within a selected region (e.g., Latin America, 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 224 Mechanics of Structural Members Laboratory (1)
Testing and analysis of structural members. Experiments pertaining to concepts examined in ARCE 222 and ARCE 223. 1 laboratory. Prerequisite: ARCE 222. Co-requisite: ARCE 223.

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)
Continuation of ARCE 221. Advanced topics in two-dimensional equilibrium and three-dimensional equilibrium of structural building systems. 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. Co-requisite: ARCE 302.

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 and ARCE 227.

ARCE 305 Masonry Design (2)
Design of load-bearing walls, shear walls, columns and beams in masonry. 2 lectures. Prerequisite: ARCE 223 and ARCE 227.

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. 3 lectures. Prerequisite: ARCE 226.

ARCE 322 Steel Design (3)
Design of steel structures. Limitations and potential of the material to the design and construction process. For architecture and construction students. 3 lectures. Prerequisite: ARCE 226.

ARCE 323 Concrete and Masonry Design (3)
Design of reinforced concrete and masonry structures. Limitations and potential of the material to the design and construction process. For architecture and construction students. 3 lectures. Prerequisite: ARCE 226.

ARCE 325 Dynamics (4)
Static and dynamic loads, rigid body dynamics. Vibrations of spring-mass systems. Degrees of freedom and vibration modes. 4 lectures. Prerequisite: ARCE 223 and MATH 242.

ARCE 351 Structural Computing Analysis I (1)
Computer calculations, programming and technical reporting. Emphasis on use of spreadsheets to generate structural analyses of buildings: the structural system and its individual elements. Miscellaneous course fee may be required—see Class Schedule. 1 laboratory. Prerequisite: ARCE 222.

ARCE 352 Structural Computing Analysis II (1)
Computer calculations, programming and technical reporting. Emphasis on use of two-dimensional structural analysis software to analyze a building's structural system and its individual elements. Miscellaneous course fee may be required—see Class Schedule. 1 laboratory. Prerequisite: ARCE 222.

ARCE 353 Structural Computing Analysis III (1)
Emphasis on the use of nonplanar structural analysis software to analyze a building's structural system and its individual elements. Miscellaneous course fee may be required—see Class Schedule. 1 laboratory. Prerequisite: ARCE 302.

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 231. Co-requisite: ARCE 302.

ARCE 372 Steel Structures Design Laboratory (3)
Design project utilizing structural steel. 3 laboratories. Prerequisite: ARCH 231, ARCE 302, ARCE 303, ARCE 352 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 Advanced Steel Structures Laboratory (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 laboratories. 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.
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 Laboratory (3)
Theory and design of basic reinforced concrete elements: columns, beams, tee beams and one way slabs. 3 laboratories. Prerequisite: ARCE 371 and ARCE 372.

ARCE 445 Prestressed Concrete Design Laboratory (3)
Design and analysis of prestressed concrete structures. 3 laboratories. Prerequisite: ARCE 444.

ARCE 446 Advanced Structural Systems Laboratory (3)
Concepts and issues involved in the design of complex structures including tall buildings, shells, arches and tension structures. 3 laboratories. Prerequisite: ARCE 226 or ARCE 371 or consent of instructor.

ARCE 447 Advanced Reinforced Concrete Laboratory (3)
Advanced topics in the design of reinforced concrete structures with emphasis on isolated and combined foundations, retaining walls, seismic-resistant ductile frames and plastic design method for slabs, plates, beams and shells. 3 laboratories. Prerequisite: ARCE 444 or equivalent.

ARCE 451 Timber and Masonry Structures 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 372 or consent of instructor.

ARCE 452 Concrete Structures 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 Project Laboratory (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 or ARCE 452, ARCE 483.

ARCE 457 Structural CAD for Building Design (2)
Emphasis on the use of computer graphics software to represent a building's structural system and its individual elements. Miscellaneous course fee may be required—see Class Schedule. 1 lecture, 1 laboratory. Prerequisite: ARCH 113 and CSC 250.

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 laboratories. 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 Experimental Laboratory (1)
Application of techniques of physical modeling to obtain solutions to structural design problems. Miscellaneous course fee may be required—see Class Schedule. 1 laboratory. Prerequisite: ARCE 444.

ARCE 483 Seismic Analysis and 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 372, CSC 331.

ARCE 485 Cooperative Education Experience (6) (CR/NC)
Part-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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

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 495 Cooperative Education Experience (12) (CR/NC)
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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

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.

ARCH 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.

ARCH 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 101 Survey of Architectural Education and Practice 
(2) (CR/NC) 
Exploration of the major paradigms which have guided the 
development of architectural education and the profession. 
Survey of the roles of the architects and an introduction to 
curricula and programs designed to prepare students for 
careers in architecture. 2 lectures. Credit/No Credit grading 
only.

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, ARCH 250.

ARCH 221, 222 Architectural Design Fundamentals (3) 
Development of knowledge and abilities in the theories, 
processes, and methods of creative problem solving; basic 
visual and verbal communication; basic two and three-
dimensional design and composition and the analysis of the 
built environment. 3 laboratories. Prerequisite: EDES 101, 
ARCH 111, ARCH 113.

ARCH 231 Architectural Practice (3) 
Wood construction methods and processes. Construction 
documents used as communication medium for such 
methods and processes. 3 laboratories. Prerequisite: ARCH 
106 and ARCH 111. Prerequisite or concurrent enrollment in 
ARCH 250.

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. 
History of computing and its use in architectural practice, 
hardware options, operating systems, electronic mail, 
databases, programming languages, graphics systems, survey 
and use of selected applications in architecture. 
Miscellaneous course fee required—see Class Schedule. 2 
lectures, 1 laboratory.

ARCH 251 Architectural Design Fundamentals I (5) 
Theories, principles, methods and means pertaining to the 
creation of two- and three-dimensional visual organizations 
to communicate intended concepts and meanings. 5 
laboratories. Prerequisite: ARCH 111, ARCH 112, ARCH 
113, EDES 101.

ARCH 252 Architectural Design Fundamentals II (5) 
Continuation of the content and issues introduced in ARCH 
251 plus the theories, principles, methods and means 
pertaining to the creation of architectural form, space and 
organizations and the incorporation of function and light as 
issues that shape the built environment and support the 
communication of intended concepts and meanings. 5 
laboratories. Prerequisite: ARCH 251.

ARCH 253 Architectural Design Fundamentals III (5) 
Continuation of the content and issues introduced in ARCH 
251 and ARCH 252 plus the theories, principles, methods 
and means pertaining to the incorporation of context, 
structure and climate as issues that shape the built 
environment and support the communication of intended 
concepts and meanings. 5 laboratories. Prerequisite: ARCH 
251, ARCH 252, ARCH 106.
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 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 College of
Architecture and Environmental Design or consent of
instructor.

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. Concurrent enrollment required in ARCH 352.

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  Advanced Delineation (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 and urbanism in the Mediterranean Basin,
Europe and Asia from prehistory to about AD 900. Cultural
and physical conditions which influenced the built
environment. 3 lectures. Prerequisite: ENGL 114.

ARCH 318  History of Architecture (3)  GEB C.3.
Architecture and urbanism in the Pre-Columbian Americas,
and the developments in the West from the Middle Ages until
the end of the Baroque. Cultural and physical conditions
which influenced the built environment. 3 lectures.
Prerequisite: ENGL 114.

ARCH 319  History of Architecture (3)  GEB C.3.
Architecture and urbanism from Neo-Classicism to the
present. Cultural and physical conditions which influenced
the built environment. 3 lectures. Prerequisite: ENGL 114.

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.

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 CAED. 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 CAED. Credit/No Credit
grading only. 1 lecture, 1 laboratory. Prerequisite: ARCH
111, ARCH 112, ARCH 113.

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 253.
Concurrent enrollment required in ARCH 341: ARCH 351;
ARCH 342: ARCH 353.

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  Architectural Design (5)
Continuation of ARCH 253. Development and exploration of
architectural theories, building systems, and design processes
involved in creating appropriate architecture on a sensitive
site; implications of the site as building form generator.
Miscellaneous course fee required—see Class Schedule. 5
laboratories. Prerequisite: ARCE 226, ARCH 231, ARCH 253.
Concurrent enrollment required in ARCH 341.

ARCH 352  Architectural Design (5)
Continuation of ARCH 351. Development and exploration of
architectural theories, building systems, and design processes
involved in creating appropriate sustainable architecture with
an emphasis on ecological and environmental concerns.
Miscellaneous course fee required—see Class Schedule. 5
laboratories. Prerequisite: ARCE 226, ARCH 231, ARCH 253.
Concurrent enrollment required in ARCH 307.
ARCH 353 Architectural Design (5)
Continuation of ARCH 352. Development and exploration of architectural theories, building systems, and design processes involved in creating appropriate architecture with an emphasis on socio-cultural and space planning/life safety concerns. Miscellaneous course fee required—see Class Schedule. 5 laboratories. Prerequisite: ARCH 352, ARCH 253. Concurrent enrollment required in ARCH 342.

ARCH 357 Computer Graphics in Architecture (4)
Computer-aided drawing methods in architectural practice, focusing on two-dimensional and three-dimensional graphics on micro-computers. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: ARCH 250.

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. Concurrent enrollment required in ARCH 451.

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 307.

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 420 Seminar in Architectural History (3)
Architectural history, theory and criticism. Specific areas, periods, approaches and the relevance of history on present and future design issues. Class Schedule will list topic selected. 3 seminars. Prerequisite: 4th year or senior standing and ARCH 317, ARCH 318, and ARCH 319.

ARCH 441 Professional Practice (3)
The practice of architecture as it relates to the profession, firm organization and management. An introduction to the process and requirements from graduation to licensed professional. 1 lecture, 2 activities. Prerequisite: ARCH 407 and ARCH 451. Concurrent enrollment required in ARCH 452.

ARCH 442 Professional Practice (3)
Continuation of ARCH 441. The practice of architecture as it relates to the architect's role and responsibilities for building project development, delivery, and construction administration. Introduction to the architect's legal and ethical relationship to owner, contractor and subcontractors before, during and following the building construction process. 1 lecture, 2 activities. Prerequisite: ARCH 441 and ARCH 452. Concurrent enrollment required in 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 multifunctional buildings. Miscellaneous course fee required—see Class Schedule. 5 laboratories. Prerequisite: ARCH 307, ARCH 341, ARCH 342, ARCH 351, ARCH 352, ARCH 353, ARCE 321, ARCE 332, ARCE 323. Concurrent enrollment required in ARCH 407.

ARCH 452 Architectural Design (5)
Continuation of ARCH 451. Problems of increasing architectural complexity involving the comprehensive integration of architectural theory, design processes, and building systems with emphasis placed on multifunctional buildings. Miscellaneous course fee required—see Class Schedule. 5 laboratories. Prerequisite: ARCH 407 and ARCH 451. Concurrent enrollment required in ARCH 441.

ARCH 453 Architectural Design (5)
Continuation of ARCH 452. Problems of increasing architectural complexity involving the comprehensive integration of architectural theory, design processes, and building systems with emphasis placed on multifunctional projects in an urban context. Miscellaneous course fee
required—see Class Schedule. 5 laboratories. Prerequisite: ARCH 441 and ARCH 452. Concurrent enrollment required in ARCH 442.

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: ARCH 303 or consent of instructor.

ARCH 460 Advanced Computer Graphics in Architecture (3)
Advanced methods in the application of computer graphics and multi-media techniques in architectural design. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 activity. Prerequisite: ARCH 250 or equivalent and consent of instructor.

ARCH 461 Advanced Computer-Aided Design in Architecture (3)
Advanced applications of computers in architectural design with emphasis on utilizing intelligent tools in the design process. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 activity. Prerequisite: Fourth-year standing in architecture. Credit/No Credit grading only.

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 superseded 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 (5)
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 15 units, with a maximum of 5 units per quarter. Miscellaneous course fee required—see Class Schedule. 5 laboratories. Prerequisite: ARCH 407, ARCH 441, ARCH 442, ARCH 451, ARCH 452, ARCH 453 and fifth year standing.

ARCH 485 Cooperative Education Experience (6) (CR/NC)
Part-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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

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. Projects involving other disciplines encouraged. 2 laboratories. Prerequisite: ARCH 407, ARCH 441, ARCH 442, ARCH 451, ARCH 452, ARCH 453 and fifth year standing. Concurrent enrollment required in ARCH 481.

ARCH 495 Cooperative Education Experience (12) (CR/NC)
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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

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. 1 lecture, 2 seminars. 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 303, ARCH 453, or consent of instructor.

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: Graduate standing.

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 a master project demonstrating in-depth research ability at a graduate level. Total credit limited to 9 units. 3 or 6 laboratories. Prerequisite: Consent of graduate adviser.

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.

ART

ART 101 Fundamentals of Drawing (4)
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)
Studio course in the creative investigation of 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)
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)
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 (3)
Studio course in research and application of principles, elements and criticism of three-dimensional design concepts. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories.
ART 135 Introduction to Product Design (3)
Studio course using 3-dimensional forms and materials. Introduction of product design including concept, illustration and assembly methods. Miscellaneous course fee required—see Class Schedule. 3 activities. Prerequisite: ART 134, or consent of instructor.

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 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.

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 portraiture, close-ups, product, and action. 2 lectures, 1 laboratory. Prerequisite: ART 221, ART 222.

ART 231 Computer Imaging and Design (3)
Introduction to the Macintosh system to acquaint students with operating procedures. Students will learn QuarkXPress, Adobe Illustrator, Aldus Freehand, and Adobe Photoshop for use in their own creative design or photography. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: ART 133 and CSC 113 or consent of the instructor.

ART 232 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)
Studio course 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 245 Ceramics I (3)
Studio course in basic clay working with emphasis on design quality, hand building, and use of the potter's wheel. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories.

ART 255 Jewelry Design (3)
Studio course in nonferrous metal techniques including cutting, forming, soldering, and forging with emphasis on creative design solutions. Miscellaneous course fee required—see Class Schedule. 3 activities.

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 Advanced Sculpture (3)
Advanced studio course in expressive use of form with modeling, casting, carving, and/or assembly. Miscellaneous course fee required—see Class Schedule. 3 activities. Prerequisite: ART 108, or ART 134, or consent of instructor.

ART 310 Art History—American Art (4)
Major historical periods of American art from the colonial period to the present. Special emphasis will be given to the broader notion of American art as a process of developing an identity of the varied historical and sociological forces which have shaped images in American art. 4 lectures. Prerequisite: ART 111, ART 213, or consent of instructor.

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 213 or ART 214.

ART 312 Art History—Contemporary Art (4) GEB C.3.
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 313 Design History (3)
Survey of graphic and product design 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 314 History of Photography (4) GEB C.3.
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 and ART 111 or ART 112 for all other students; or consent of instructor.

ART 320 Fashion Photography (3)
Posing and directing models in fashion photography using 35mm and medium format cameras in black and white. 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, series, high contrast and digital manipulation. 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)
Development of consistent control of 35mm transparency exposure and printing. Introduction to digital manipulation techniques and vocabulary. Theory of color in expression and communication; exploration of both a descriptive approach and interpretive approach; a survey of contemporary color photography. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: ART 322. Recommended: CSC 113.

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. Computer applications are encouraged for appropriate problems. 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. Computer applications are encouraged for appropriate problems. 3 activities. Prerequisite: ART 332, junior standing.

**ART 333 Corporate Identity (3)**
Design and implementation of corporate logos. Development of graphic standards manuals for use of identity in diverse applications. Computer applications are encouraged for appropriate problems. 3 activities. Prerequisite: ART 332, junior standing.

**ART 336 Exhibition Design/Museum Studies (3)**
Theory and applied principles of exhibition design for art objects in the museum or gallery setting. Class responsible for planning and installing actual gallery exhibitions. 2 lectures, 1 laboratory. Prerequisite: ART 131, ART 134, or consent of instructor.

**ART 343 Selected Advanced Topics in Glass (4)**
Continued exploration into the use of glass as a creative medium. Topics may include glass casting, glass blowing, mold making, and kiln work. Studio time is by arrangement. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 activities. Prerequisite: ART 108 or ART 242, or consent of instructor.

**ART 344 Glass Fusing and Forming (3)**
Studio course in the creative 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. 3 activities. Prerequisite: ART 108 or ART 242 or consent of instructor.

**ART 345 Ceramics II (3)**
Studio course in hand, wheel, mold, extruder, jigger, and press forming skills. Design of single and multiple forms and kiln firing procedures. Miscellaneous course fee required—see Class Schedule. 3 activities. Prerequisite: ART 108, or ART 134, or ART 245 or consent of instructor.

**ART 346 Ceramics III (3)**
Studio use of clay, slip, engobe, glaze, stoneware and raku. Contemporary craftmaker's skills are developed through use of historic and industrial techniques. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 activities. Prerequisite: ART 108, or ART 134, or ART 245 or consent of instructor.

**ART 355 Metalsmithing (3)**
Studio course investigating intermediate fabrication including raising, box construction and masonite dye. Exploration of surface design techniques for nonferrous metals. Emphasis on creative design solutions to problems. Miscellaneous course fee required—see Class Schedule. 3 activities. Prerequisite: ART 108 or ART 255, or consent of instructor.

**ART 356 Jewelry Casting (3)**
Introduction to casting for the jeweler with emphasis on creative design solutions to assigned problems. Use of lost wax techniques including design, wax working, casting and finishing. Miscellaneous course fee required—see Class Schedule. 3 activities. Prerequisite: ART 108 or ART 255, or consent of instructor.

**ART 400 Special Problems for Advanced Undergraduates (1–2)**
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Senior standing and consent of instructor.

**ART 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 Multimedia Photography (4)**
Multimedia 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 430 Advanced Typographic Design (3)**
Advanced principles of letterform design and modification related to the communication of ideas through graphic design. Advanced analysis of type characteristics. Computer application to the typographic design processes. Miscellaneous course fee required—see Class Schedule. 3 activities. Prerequisite: ART 333 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. Computer applications are encouraged for appropriate problems. 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. Computer applications are encouraged for appropriate problems. 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. Computer applications are encouraged for appropriate problems. 3 activities. Prerequisite: ART 431 and senior standing.

**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, résumé and portfolio preparation with visiting professionals. For Applied Art and Design majors only. 2 lectures. Prerequisite: ART 461 and 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.

**ART 485 Cooperative Education Experience (6) (CR/NC)**
Part-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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

**ART 495 Cooperative Education Experience (12) (CR/NC)**
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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

### ASCI—ANIMAL SCIENCE

**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 141 Market Beef Production (4)**
Survey of industry characteristics, breeds, market classes, carcass residues, environmental protection and diet/health issues. Application of management skills, health care and behavior. 3 lectures, 1 laboratory.

**ASCI 142 Swine Science (4)**
Role of swine in agriculture, consideration of product quality assurance, diet/health issues and animal welfare concerns. Evaluation of brood stock and progeny product, husbandry systems, management skills, feeding systems and health management. 3 lectures, 1 laboratory.

**ASCI 143 Systems of Sheep Production (4)**
Types of sheep operations and geographic influence on management. The role of sheep in world agriculture. Social concerns including humane care, residues and diet/health issues. Evaluation of products, management skills, health care and behavior. 3 lectures, 1 laboratory.

**ASCI 144 Equine Science (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 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 220  Introductory Animal Nutrition and Feeding (4)
Food nutrients, identification and nutrient quality of feedstuffs and uses for each class of livestock. Ration formulation based on the digestion and utilization of feeds. Economy and least price purchasing based on nutrient content and market value of livestock. 3 lectures and 1 laboratory.

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 231  General Animal Science (3)
Relationship of animal agriculture to society and the economy and their role for human use and consumption. Discussion of nutrition, reproduction and management of beef cattle, sheep, swine and horses. Credit not allowed for Animal Science majors. 3 lectures.

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 144 recommended.

ASCI 260  Preparation of Livestock for Shows and Sales (2)
Techniques, equipment and knowledge necessary in order to properly condition, groom, and present beef cattle or horses for evaluation and merchandising. Total credit limited to 4 units. 2 laboratories.

ASCI 290  Livestock Management Enterprise (2–4)
(CR/NC)
Management techniques of the livestock enterprise. Providing health, nutritional and physical care to a representative group of animals. Planning, budgeting and marketing. Instructor approval required. Prerequisites may exist for some enterprises. Total degree credit for 290/490 limited to 9 units. Credit/No Credit grading only. Prerequisite: Consent of instructor.

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 141.

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 142.

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 143.

ASCI 314  Advanced Horse Management (3)
Management practices relative to the training and conditioning of the horse. Investigation of the nutritional, behavioral and physiological parameters required of the horse in work, sport and recreational events. Miscellaneous course fee required—see Class Schedule. 3 lectures. Prerequisite: ASCI 144 and ASCI 244, or consent of instructor.

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 144, ASCI 244.

ASCI 344  Equine and Human Communication (3)
Behavior of the horse and its relationship with people. Learning, motivation, social behavior and communication with techniques to improve the safety and understanding between people and horses. 3 laboratories. Prerequisites: ASCI 144, ASCI 244, ASCI 260 and consent of instructor.
ASCI 345 Equine Behavior Modification (3)
Advanced principles of equine behavior modification for training young horses under saddle. Identifying differences in individual horse's attitudes, techniques to teach horses to respond to various stimuli, management of young equine athlete. 3 laboratories. Prerequisite: ASCI 344 or 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 anatomy of male and female farm animals. General endocrinology and systemic physiology. Endocrine system effects on the various aspects of reproduction, such as: gametogenesis, estrus, gestation, parturition, mothering and seasonality. Introduction to reproductive biotechnology and embryo manipulation. 3 lectures, 1 laboratory. Prerequisite: VS 123.

ASCI 410 Ultrasonography (1)
Utilization of ultrasound technology for pregnancy diagnosis in sheep, beef cattle, swine and horses and live animal carcass estimation in sheep, beef cattle and swine. 1 laboratory. Prerequisite: FSN 211, ASCI 401, VS 123 and senior standing.

ASCI 420 Animal Nutrition (3)
Metabolism of proteins, carbohydrates, lipids, minerals, vitamins and water, and the relationship of nutrient utilization to animal production. 3 lectures. Prerequisite: ASCI 220 and CHEM 326 (or CHEM 316 and CHEM 317).

ASCI 421 Animal Nutrition (Pre-Veterinary and Graduate Students) (3)
Nutrient metabolism and the relationship of nutrient metabolism and utilization to metabolic dysfunctions and food-animal production. 3 lectures. Prerequisite: ASCI 220 and CHEM 328 (or CHEM 371 and CHEM 372).

ASCI 461 Senior Project (2)
Selection of a project and an ASCI 462 adviser, formulation of an outline and a literature review. Projects selected in the student's expected field of employment. Outline and literature review will be presented as part of the ASCI 462 final report. Minimum 60 hours. 2 seminars. Prerequisite: Senior standing.

ASCI 462 Senior Project (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 60 hours.

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.
ASM 324 Principles of Agricultural Electrification (4)
Applications of DC/AC electricity in agriculture. National Electric Code regulations. The wiring of agricultural structures and electrical distribution. Series, parallel and series-parallel circuits, R-L-C circuits, electric motors, electronics. 3 lectures, 1 laboratory. Prerequisite: MATH 119 or MATH 120, PHYS 104.

ASM 325 Agricultural Energy Systems (3)
Use of energy systems in modern agriculture with a focus on the economic and moral dilemmas facing our technological society. 2 lectures, 1 laboratory. Prerequisite: PHYS 104, ASM 325.

ASM 402 Agricultural Materials (3)
Introduction to the physical aspects and properties of a wide variety of materials encountered in the field of agriculture. Physical interactions between agricultural commodities and the machines used in handling. 2 lectures, 1 laboratory. Prerequisite: ASM 325.

ASM 432 Agricultural Buildings (4)
Selection of buildings, storage units, and related equipment for production agriculture. Economics and functionality of various designs and construction materials. Environmental factors affecting crop storage and animal housing. 3 lectures, 1 laboratory. Prerequisite: PHYS 104, ASM 402.

ASM 463 Undergraduate Seminar (1)
Group discussion of current agricultural engineering topics presented by individual members of the class and visitors. Placement opportunities and requirements. 1 seminar.

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 222 General Microbiology (5) GEB B.1.b.
Genetics and ecology of microorganisms. Host-parasite relationships, mechanisms of genetic transfer in bacteria, and physiologic and ecologic aspects of various microbial groups will be emphasized. 3 lectures, 2 laboratories. Prerequisite: BACT 221.

BACT 322 Dairy Microbiology (4) GEB B.1.b.
Methods used in the isolation, identification and enumeration of microorganisms important to the dairy industry, with emphasis on those instrumental in dairy fermentations and ripening processes, those used as sanitary indicators, and on major spoilage organisms. 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 humans. 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 microorganisms, humans, 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 (5)**
Cellular structure and life processes of bacteria; chemical composition, growth and metabolism. General biological and evolutionary considerations. 3 lectures, 2 laboratories. Prerequisite: BACT 225 and CHEM 328.

**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: BIO 152, BIO 153, and 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 for credit to students who have completed BIO 151 or BOT 121 or ZOO 131. 3 lectures.

**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 151 Introduction to Biology (5) GEB B.1.b.**
Fundamental principles of biology with emphasis on the physical and chemical basis of life; cytology; bioenergetics; storage; processing and expression of genetic information; ecology; evolution. 3 lectures, 2 laboratories. Recommended prerequisite: Concurrent or previous enrollment in college chemistry course.

**BIO 152 Biology of Plants and Fungi (5) GEB B.1.b.**
Structure, ecology, reproduction, and evolution of fungi, cyanobacteria, algae, and plants. 3 lectures, 2 laboratories. Prerequisite: BIO 151.

**BIO 153 Biology of Animals (5) GEB B.1.b.**
Survey of the prost and animal kingdoms; fundamentals of animal form and function. 3 lectures, 2 laboratories. Prerequisite: BIO 151.

**BIO 205 Traces Through Time (3) (Also listed as PSC 205) GEB B.1.a. or B.1.b.**
Survey of evidence supporting evolution including origin of the universe, radiometric dating, structure of Earth and plate tectonics. Evolutionary evidence from chemistry, biology, fossils, and the geographical distribution of life. Fundamental differences between science and creationism will be explored. A student using this course for GEB credit also must take at least one other course in Area B.1.b. and at least one other course in Area B.1.a. 3 lectures.

**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. Not open for credit to students who have completed ZOO 131. 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 BIO 153 or ZOO 131.

**BIO 300 Biology of Cancer (2)**
BIO 301 Human Ecology (3) GEB B.1.b.
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) GEB B.1.b.
Basic principles of human inheritance. Transmission of genetic traits, chromosomal anomalies of humans, gene action, mutations and mutagenic agents, eugenics, and principles of genetic counselling. Not for Biology credit for Biological Sciences majors. 3 lectures. Prerequisite: One course in college biology (preferably BIO 101, BIO 151, or ZOO 131).

BIO 303 Genetics (3) GEB B.1.b.
Principles of heredity and variation. 3 lectures. Prerequisite: One quarter of college biology and one quarter of college mathematics. Recommended: STAT 211.

BIO 304 Molecular Genetics (3) GEB B.1.b.
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. 3 lectures, 1 laboratory. Prerequisite: BIO 101 and BIO 105, or equivalent.

BIO 311 Radiation Biology (3) GEB B.1.b.
Review of production and characteristics of non-ionizing and ionizing radiation; interaction and effect of radiation on living cells, tissues, organs, and organisms; introduction to use of radioisotopes; radiation protection and dosimetry; impact of nuclear energy on the biological world. 3 lectures. Prerequisite: CHEM 122 or CHEM 128 and one of the following: BIO 101, BIO 151, BOT 121, ZOO 131.

BIO 321 Biological Instrumentation (3)
Theory and operation of instruments commonly used in biological investigation. 1 lecture, 2 laboratories. Prerequisite: BIO 151, 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: BIO 151, 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 microscopy 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) GEB B.1.b.
Interactions between living organisms and their environment in terrestrial and aquatic habitats. 3 lectures, 1 laboratory. Prerequisite: BIO 152 and BIO 153.

BIO 328 Marine Biology (4) GEB B.1.b.
Biological and environmental studies of marine organisms, with emphasis on their economic importance. 2 lectures, 2 laboratories. Prerequisite: BIO 152 or BIO 153, or consent of instructor.

BIO 330 Biology of Aging (3) GEB B.1.b.
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) GEB B.1.b.
Biological, physical, and chemical dynamics of freshwater ecosystems. 2 lectures, 1 laboratory. Prerequisite: BIO 325. Recommended: One college level course in biological science and one course in computer science.

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) GEB B.1.b.
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 chair.

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 Cell Biology (4)
Detailed study of the structure and function of animal and plant cells. 3 lectures, 1 laboratory. Prerequisite: BIO 152 and BIO 153 or 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, polytoids 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; BIO 152 or BIO 153.

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: BIO 152 and ZOO 336.

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 recitation. Prerequisite: One year of biology, STAT 212 or STAT 321 and completion of computer literacy requirement.

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 485 Cooperative Education Experience (6) (CR/NC)
Part-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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

BIO 495 Cooperative Education Experience (12) (CR/NC)
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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

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 585 Cooperative Education Experience (6) (CR/NC)**

Advanced study analysis and part-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 9 units. 1 two-hour seminar. 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 595 Cooperative Education Experience (12) (CR/NC)**

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 9 units. Credit/No Credit grading only. 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 223 Introductory Plant Taxonomy (4)**

Introduction to classification and identification of vascular plants, emphasizing major plant families; field and herbarium techniques. 2 lectures, 2 laboratories. Prerequisite: BIO 152 or 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: BIO 152 or 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: BIO 152 or BOT 121.

**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: BIO 152 or 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 223.

**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 223.

**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: BIO 152 and BOT 223.

**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: BIO 152 or BOT 121.

**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: BIO 152 or BOT 121.
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 Algyology (4)
Classification of marine and fresh-water algae. Consideration of ecological, physiological and economic aspects. 2 lectures, 2 laboratories. Prerequisite: BIO 152.

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 223.

BOT 450 Plant Cell and Tissue Culture (5)
Principles and methods of plant cell and tissue culture important to industry and basic science. 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 207 Business Law (4)
American legal system, contracts, agency, business organizations, and real property. Case studies. 4 lectures. Prerequisite: Sophomore standing.

BUS 308 Business Law II (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. Case studies. 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)
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. Case studies. 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. Case studies. 4 lectures. Prerequisite: BUS 207 or equivalent.

BUS 430 Internship (2–4) (CR/NC)
Placement as an employee in a business firm approved by the department head. Periodic written progress reports required. Collateral reading correlated with the work experience. Credit/No Credit grading. Prerequisite: Approval of department head.

BUS 461, 462 Senior Project (2) (2)
Selection and analysis of a problem under faculty supervision. Problems typical of those which graduates must solve in their fields of employment. Formal report is required. Minimum 120 hours total time. 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 485 Cooperative Education Experience (6) (CR/NC)
Part-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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and 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 495 Cooperative Education Experience (12) (CR/NC)
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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and 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 resources 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 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: CE 112, 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. 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 or consent of instructor.

**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, interchanges, and freeways in urban and rural areas. 3 lectures, 1 laboratory. Prerequisite: CE 221 or consent of instructor.

**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: CE 221 or consent of instructor.

**CE 431 Coastal Hydraulics (3)**
Waves and their characteristics, types of waves, water wave theories, orbital velocities, refraction of waves, wave diffraction, wave reflection, application of linear theory to wave forces on cylindrical structures, submerged pipelines and vertical flat barriers (sea walls), wave uprush, rubble mound breakwaters. 3 lectures. Prerequisite: 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. Design of reinforced concrete spread footings. 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 485 Cooperative Education Experience (6) (CR/NC)**
Part-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. Credit/No Credit grading only. Total credit limited to 16 units. Prerequisite: Sophomore standing and consent of instructor.

**CE 495 Cooperative Education Experience (12) (CR/NC)**
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. Credit/No Credit grading only. Total credit limited to 16 units. Prerequisite: Sophomore standing and consent of instructor.

**CE 500 Individual Study (1–3)**
Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.

**CE 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 221, CE 259, graduate standing or consent of instructor.

**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 facility design problems. 2 lectures, 2 laboratories. Prerequisite: CE 221, graduate standing, or consent of instructor.

**CE 523 Transportation Systems Planning (4)**
Planning of urban and regional multimodal transportation systems. Selection of routes and types of systems based on economic, social, technological, and other characteristics. 2 lectures, 2 laboratories. Prerequisite: CE 221, graduate standing, or consent of instructor.

**CE 525 Airport Planning and Design (4)**
Historical background of aviation and airport development; financing; estimating demand; aircraft characteristics; airport capacity; airspace and air traffic control; site selection; airport configuration; geometric design of landing area; planning and development of terminal areas; lighting; pavement design and drainage. 3 lectures, 1 laboratory. Prerequisite: CE 221, graduate standing, or consent of instructor.

**CE 527 Traffic Engineering—Operations and Controls (4)**
Techniques for making traffic engineering investigations. Advanced traffic control concepts. Centralized versus decentralized systems. New technologies. IVHS. 3 lectures, 1 laboratory. Prerequisite: CE 421, graduate standing, or consent of instructor.

**CE 528 Transportation Analysis (4)**
Principles and applications of engineering systems analysis to transportation using examples from different modes. Identification of transportation benefits, costs, user and non-user impacts, vehicle operating characteristics, programming and scheduling. 3 lectures, 1 laboratory. Prerequisite: CE 221, ME 314, graduate standing, or consent of instructor.

**CE 529 Modeling and Simulation in Transportation (4)**
Theory and operation of transportation systems, the systems approach, simulation techniques. Use of available software packages. Simulation model development, calibration and use. 2 lectures, 2 laboratories. Prerequisite: CE 421, graduate standing, or consent of instructor.

**CE 533 Advanced Water Resources Engineering (3)**
Matrix and simulation methods in hydrology, statistical studies in hydrology and their applications to civil engineering problems. Generalized hydrologic characteristics. Hydrologic simulation, computer applications, urban and small watershed hydrology, macroscopic and microscopic approach. Storm water management models. Hydrologic design. 3 lectures. Prerequisite: CE 336 or graduate standing.

**CE 554 Matrix Analysis of Structures (3)**
Matrix terminology and operations. Matrix procedures for analysis of continuous beams, planar 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, 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, for construction. 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: Graduate standing or consent of instructor.

**CE 573 Public Works Administration (3)**
Management and engineering of transportation and related systems in public jurisdictions. Traffic systems, streets and highways, illumination, distribution systems, etc. Personnel management, financing, public relations, and contract management. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**CE 574 Computer Applications in Civil Engineering (3)**
Overview of computer application, hardware and software alternatives, use of selected application programs, CAD, microcomputers, management and application of resources. 1 lecture, 2 laboratories. Prerequisite: Graduate standing or consent of instructor.

**CE 581 Advanced Geotechnical Engineering (3)**
Stress-strain-deformation response of soils under both drained and undrained loading. Computer-aided analysis using modern constitutive models. Conventional and advanced strength testing using the Bishop-Wesley Triaxial Cell and the Rowe Consolidometer. 1 lecture, 2 laboratories. Prerequisite: CE 481, graduate standing or consent of instructor.

**CE 582 Advanced Geotechnical Testing (3)**
Standard penetration, cone penetration, and flat-plate dilatometer testing. Equipment operation and maintenance. Interpretation of CPT/DMT sounding data. Stratigraphic analysis. CPT/DMT-based analysis and design of shallow and
deep foundations. 1 lecture, 2 laboratories. Prerequisite: CE 481, 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 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 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 individuals. 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.

**CHEM 121** General Chemistry (4)  GEB B.1.a.
Fundamental principles including atomic structure, bonding, nomenclature, chemical equations, states of matter, solutions, and energy with attention to applications to related fields. Intended primarily for students whose majors are not in the Schools of Engineering 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) GEB B.1.a.
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) GEB B.1.a.
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 331.

CHEM 305 Physical Chemistry (3) GEB B.1.a.
Introduction to chemical thermodynamics. Thermochemistry. Phase equilibria. Chemical equilibrium. 3 lectures. Prerequisite: PHYS 123 or PHYS 133, CHEM 125 or CHEM 129, MATH 132 or MATH 142.

CHEM 306 Physical Chemistry (3) GEB B.1.a.
Applications of chemical thermodynamics. Electrochemistry. Kinetic theory of gases. Chemical kinetics. 3 lectures. Prerequisite: CHEM 305.

CHEM 307 Physical Chemistry (4) GEB B.1.a.
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) GEB B.1.a.
Structure, bonding, nomenclature, isomerism, stereochemistry and physical properties of organic compounds. Reactions and mechanisms of alkanes, alkenes, alkynes, cycloalkanes. Laboratory techniques in organic preparations. 3 lectures, 1 laboratory. Prerequisite: CHEM 122, CHEM 125 or CHEM 129.

CHEM 317 Organic Chemistry (5) GEB B.1.a.
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) GEB B.1.a.
Chemistry of amines, aromatic compounds, heterocycles, macromolecules, some biomolecules, carbanions, rearrangements; mass spectrometry. Practice in organic synthesis. 3 lectures, 2 laboratories. Prerequisite: CHEM 317.

CHEM 326 Survey of Organic Chemistry (4) GEB B.1.a.
Structure, nomenclature, some characteristic reactions of functional groups and applications of organic chemicals in agriculture, medicine, industry and the home. A terminal survey course not open to students with credit in CHEM 316. 3 lectures, 1 laboratory. Prerequisite: CHEM 122, CHEM 125 or CHEM 128.

CHEM 328 Survey of Biochemistry (4) GEB B.1.a.
Fundamental chemistry of carbohydrates, proteins, fats, vitamins, enzymes and hormones as applied to their function in plant and animal metabolism. Special reference to the application of chemistry to the areas of agriculture, human health and nutrition, and the production of food and animal feeds. 3 lectures, 1 laboratory. Prerequisite: CHEM 326.

CHEM 331 Quantitative Analysis I (5) GEB B.1.a.
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 (3) GEB B.1.a.
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, polarimetry and spectrophotometry. 2 lectures, 1 laboratory. Prerequisite: CHEM 331.

CHEM 335 Clinical Chemistry (3) GEB B.1.a.
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) GEB B.1.a.
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 or CHEM 372 or permission of instructor.
CHEM 341 Environmental Chemistry: Water Pollution (3) GEB B.1.a.
Chemical aspects of water and water pollution: alkalinity; acid deposition, particularly relating to lake and stream acidification and forest decline; drinking water treatment and THMs; wastewater treatment; detergents, builders, and eutrophication; pesticides; other toxic organic compounds such as PCBs and dioxin; hazardous wastes; toxic elements such as Pb, Hg, Sn, Cd, and Se. 3 lectures. Prerequisite: CHEM 129 and CHEM 326 or CHEM 316.

CHEM 342 Environmental Chemistry: Air Pollution (3) GEB B.1.a.
Chemical aspects of the atmosphere and air pollution: greenhouse effect and global climate change; CFCs, the ozone layer, and the ozone hole; carbon monoxide, nitrogen oxides, and photochemical smog, particulate matter; radon, asbestos, indoor air pollution; sulfur oxides and acid deposition, particularly relating to atmospheric reactions and control options. 3 lectures. Prerequisite: CHEM 129 and CHEM 326 or CHEM 316.

CHEM 344 Chemical Process Principles (3) GEB B.1.a.
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) GEB B.1.a.
Experimental studies of gases, solutions, thermochemistry and chemical equilibria. 1 laboratory. Corequisite: CHEM 305. Prerequisite: CHEM 331.

CHEM 356 Physical Chemistry Laboratory (1) GEB B.1.a.
Experimental studies of phase rule, electrochemistry and chemical kinetics. 1 laboratory. Corequisite: CHEM 306. Prerequisite: CHEM 331.

CHEM 371 Biochemical Principles (4) GEB B.1.a.
Chemical and physical factors in biological processes. Chemistry and function of major cellular constituents: proteins, nucleic acids, lipids, carbohydrates, vitamins. 3 lectures, 1 laboratory. Prerequisite: CHEM 326 or CHEM 317. Strongly recommended: CHEM 331.

CHEM 372 Metabolism (3) GEB B.1.a.
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) GEB B.1.a.

CHEM 374 Biochemistry Laboratory (2) GEB B.1.a.
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) GEB B.1.a.
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) GEB B.1.a.
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 385 Geochemistry (3) GEB B.1.a.
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 (1–3)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 3 units per quarter. Prerequisite: Junior standing and consent of department head.

CHEM 419 Bioorganic Chemistry (3)
Methods of investigating reaction mechanisms, mechanisms of chemical catalysis, organic models of enzymes, chemistry of vitamins that serve as enzyme cofactors, chemistry of the phosphate group, synthesis of biomolecules. 3 lectures. Prerequisite: CHEM 318.

CHEM 420 Advanced Organic Chemistry–Synthesis (3)

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 MATE 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: CHEM 317 or consent of instructor.

CHEM 450 Chemical Warfare (2)
History, development, and use of chemical weapons. Chemical disarmament. Production and destruction of modern agents. Use of chemical agents in Southeast Asia and Middle East. Ethics of chemical warfare. 2 seminars. Prerequisite: CHEM 326 or CHEM 316.

CHEM 455 FT-NMR Laboratory (1) (CR/NC)
Basic theory and operation of the high-field Fourier transform nuclear magnetic resonance spectrometer. Credit/No Credit grading only. 1 laboratory. Prerequisite: CHEM 318.

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 (3)
Separation, purification, and identification of organic molecules using chemical and instrumental methods, including nuclear magnetic resonance, infrared and ultraviolet spectroscopy and mass spectroscopy, and techniques in high resolution FT-NMR. 1 lecture, 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
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 477 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 481 Inorganic Chemistry (3)
A systematic study of chemical and physical properties of inorganic compounds based on periodic groupings with emphasis on chemical bonding and structure. Topics will include coordination chemistry and kinetics, organometallic chemistry, advanced acid-base relationships and bonding theories plus other selected topics. 3 lectures. Prerequisite: CHEM 306 and CHEM 331 or consent of instructor.

CHEM 483 Inorganic Synthesis (1)
Synthetic methods involving the preparation and characterization of a variety of inorganic, organometallic and coordination compounds employing high temperature, inert atmosphere, photolytic, electrolytic and other synthetic techniques. 1 laboratory. Prerequisite or concurrent: CHEM 481.

CHEM 485 Cooperative Education Experience (6) (CR/NC)
Part-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. 2 units only applicable to approved chemistry electives. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

CHEM 495 Cooperative Education Experience (12) (CR/NC)
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. 2 units only applicable to approved chemistry electives. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

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.

CM—CONSTRUCTION MANAGEMENT

CM 321 Concrete Technology (3)
Modern concepts which form the basis for solutions to problems of concrete construction. Includes significant developments in concrete chemistry and strength theory. Concrete mix design, physical properties of concrete, use of admixtures, concrete batching, curing and testing. Includes physical testing of designed mixes. 2 lectures, 1 laboratory. Prerequisite: Third-year standing.

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: ACTG 211 and third-year standing or consent of instructor.

CM 332 Cost Alternatives Evaluation (4)
Basic principles of economic evaluations between cost alternatives. 4 lectures. Prerequisite: ECON 211 or ECON 222 and third-year standing 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: BUS 201 and third-year standing or consent of instructor.

CM 341 Residential and Light Commercial 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 Commercial, Institutional and Industrial 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 352 Building Support System Construction Practices (5)
Equipment, materials and techniques of installation and construction of underground utilities and electrical power systems. Includes water supply and collection, electrical and gas distribution. Communications, CATV and conveyance systems. Emphasis on the role of specialty contractors in the construction process. 5 activities. Prerequisite: Third-year standing.

CM 353 Building Support System Construction Practices (5)
Equipment, materials and techniques of installation and construction of environmental systems. Includes commercial and industrial piping, environmental systems controls, and conveyances. Emphasis on the role of specialty contractors in the construction process. 5 activities. Prerequisite: Third-year standing.

CM 364 Project Administration (3)
Management activities applicable to the construction project involving techniques, applications, and theory needed in a changing environment. An interdisciplinary approach addressing the relationship and roles of the project team of the contractor, architect, engineers and owner. 3 activities. Prerequisite: Third-year standing.

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 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 or consent of instructor.

CM 444 Concrete Formwork and Temporary Structures (3)
Methods and techniques used in the design and construction of concrete formwork, temporary earth retaining systems, and other temporary construction structures. 3 activities. Prerequisite: Fourth-year standing or consent of instructor.

CM 445 Heavy Construction Methods and Techniques (2)
Methods and procedures; field operations for heavy construction projects. 2 activities. Prerequisite: 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 or consent of instructor.

CM 454 Building Estimating (4)
Procedures for determining quantities of materials and estimating costs for construction projects. 4 laboratories. Prerequisite: Fourth-year standing 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. Miscellaneous course fee required-see Class Schedule. 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 485 Cooperative Education Experience (6) (CR/NC)
Part-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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

CM 495 Cooperative Education Experience (12) (CR/NC)
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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and 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–CONSERVATION

CONS 120 Fisheries and Wildlife Management (3)
Survey of fisheries and wildlife resources and management
practices. Relationships to recreational values, land
management, food production, and preservation. 3 lectures.

CONS 207 Resource Survey (3)
Introduction to survey and analysis methods used in
assessing biological resources. Inventory methods 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 preservation and captive propagation.
Emphasis on North American plants and animals. 3 lectures.
Prerequisite: One course in Biological Sciences.

CONS 221 Wildlife Techniques (3)
Techniques for terrestrial wildlife investigations. Field and lab
procedures including telemetry, marking, capture, age and
sex determination, and population analysis. 2 lectures, 1
laboratory. Prerequisite: 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 (4)
Biological, geographical, historical, political and economic
aspects of freshwater fishes, fishery resources, and fresh
waters of the Pacific Coast. Identification, life history,
distribution and ecology of important western and local
species. Field trips to water projects, warm and cold water
fishery facilities, major aquarium. 3 lectures, 1 laboratory.
Prerequisite: ZOO 322.

CONS 426 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 necessary. 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: BIO 152,
ZOO 336 or consent of instructor.

CPE–COMPUTER ENGINEERING

CPE 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 CPE
Director.

CPE 215 Computer Architecture I (4) (Also listed
as CSC 215)
Assembly level computer organization. Basic machine
representation of numeric and non-numeric data. Assembly
level instruction sets, their corresponding addressing modes,
and the underlying computer architecture. Introduction to
algorithmic problem solving and program design in assembly
language. Intended for CPE and CSC majors. Miscellaneous
course fee required—see Class Schedule. 3 lectures, 1
laboratory. Prerequisite: CPE 219 (or concurrent enrollment) and CSC 218.

CPE 219 Logic and Switching Circuits (3) (Also listed as EE 219)
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.

CPE 259 Logic and Switching Circuits Laboratory (1) (Also listed as EE 259)
Laboratory synthesis of combinational and sequential logic circuits. Introduction to laboratory equipment such as digital oscilloscopes and logic state analyzers. Use of software (both off-the-shelf and customized) for logic simulation. Introduction to switch bouncing, hazards, and other logic faults. 1 laboratory. Concurrent: CPE 219.

CPE 315 Computer Architecture II (4)
Intermediate architecture topics: levels of virtual machines and their languages, with special emphasis on level 1 and microprogramming; design of conventional machines; study of tradeoffs in various designs. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: CPE 215, CPE 219, and CSC 345.

CPE 316 Computer Architecture III (4)
Microprocessor architecture and interfacing. Emphasis on study of one microprocessor and how it interfaces with other logical components of a computer system. Serial and parallel I/O, static and dynamic RAM, ROM, DMA and Disk Controllers. 3 lectures, 1 laboratory. Prerequisite: CPE 315.

CPE 319 Digital System Design (3) (Also listed as EE 319)
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. Tradeoffs between system design utilizing hardware, firmware and microprocessors. 3 lectures. Prerequisite: CPE 219, EE 307.

CPE 353 Computer Systems Programming (3)
Design of assemblers, macroprocessors, linkers and loaders. Advanced macrowriting, I/O programming, and interrupt handlers. 3 lectures. Prerequisite: CPE 215, CSC 240, CSC 345.

CPE 359 Digital System Design Laboratory (1) (Also listed as EE 359)
Laboratory synthesis of combination and sequential logic circuits. Sequential subsystems analysis with the logic state analyzer. Fault testing and automated checkout procedures. Familiarization with the characteristics of SSI and MSI logic components. 1 laboratory. Prerequisite: CPE 259, EE 347. Concurrent or prerequisite: CPE 319.

CPE 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 CPE coordinator.

CPE 404 Computer Networks (4) (Also listed as CSC 404)
Communications architectures and distributed systems; multicomputer complexes and interprocessor communications; communications media, message switching, and communications protocol standards. 3 lectures, 1 laboratory. Prerequisite: CSC 304, CSC 453, or consent of instructor.

CPE 405 Computer Networks II (4) (Also listed as CSC 405)
Network architectures and protocols; network performance analysis; the theory of error detection and correction; other advanced topics such as routing, network management, integrated services, satellite networks, fiber optics. 3 lectures, 1 laboratory. Prerequisite: CPE 404 or consent of instructor.

CPE 406 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: CPE 215, CPE 319, or consent of instructor. Concurrent: CPE 446.

CPE 407 Digital Computer Subsystems (3)
Design of registers, counters, sequencers, 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: CPE 319.

CPE 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: CPE 407 or consent of instructor.

CPE 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: CPE 406, or consent of instructor.

CPE 410 Performance Analysis (4)
Statistical and mathematical techniques for modeling and analyzing the performance of computer and communication systems. Tools and techniques for measuring performance of operational systems. Theory and methodologies for the design, procurement and evaluation of systems. Introduction to elementary concepts of discrete event simulation. 3 lectures, 1 laboratory. Prerequisite: STAT 321 or consent of instructor.

CPE 415 Microcomputer Systems (4)
Recent advances in microcomputer architectures. RISC, parallel processing advances, and component
communication. 3 lectures, 1 laboratory. Prerequisite: CPE 316.

CPE 446 Microprocessor Interfacing Laboratory (1)

CPE 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: CPE 359, and CPE 407 or CPE 409 or consent of instructor.

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: Senior standing.

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.

CPE 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.

CPE 485 Cooperative Education Experience (6) (CR/NC)
Part-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. Credit/No Credit grading only. Total credit limited to 16 units. Prerequisite: Sophomore standing and consent of instructor.

CPE 495 Cooperative Education Experience (12) (CR/NC)
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. Credit/No Credit grading only. Total credit limited to 16 units. Prerequisite: Sophomore standing and consent of instructor.

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 for planning. Orthographic and isometric projection. Mechanical perspective, shades and shadows. 3 laboratories.

CRP 112 Basic Graphics (3)
Drawing as a communication tool in planning. 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)
Elements of visual perception. Theories of environmental design. Program development. Analytic techniques and problem solving methodologies. Behavioral and social implications of environmental design decisions. Projects in the planning context. 3 laboratories. Prerequisite: CRP 111, CRP 112.

CRP 203 Applied Design and Planning Fundamentals (3)
Applications of basic design fundamentals and the design of environments through design exercises applied to planning. Miscellaneous course fee required—see Class Schedule. 3 laboratories. Prerequisite: CRP 202, LA 213.

CRP 211 Introduction to Urbanization (3) GEB F.2.
Evolution, planning, and design of cities in different cultures and eras. 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 Population and Housing Studies (3)
Collection, organization, analysis and presentation of information and data related to city and regional planning. Analytical applications to population composition and distribution; housing needs, characteristics and markets; community services. 3 lectures. Prerequisite: CRP 212.

CRP 214 Land Use and Transportation Studies (3)
How cities and regions work. Relationship between human activities and patterns of land use and circulation. Spatial analysis and locational theories. Methods for conducting studies to describe, analyze, and map land uses. Transportation analysis, traffic impact, and circulation patterns. 3 lectures. Prerequisite: CRP 212.

CRP 216 Computer Applications for Planning (3)
Introduction to the use of computer hardware, applications for planners including spreadsheets, statistical applications, database, graphics. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories. Prerequisite: CSC 110.

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.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites/Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRP 314</td>
<td>Planning Theory (3)</td>
<td>Theories of planning. Role of planner in society, purpose of planning, administrative framework in which planning takes place. Alternative approaches to planning, values, ethics in planning. 3 lectures. Prerequisite: CRP 212.</td>
</tr>
<tr>
<td>CRP 315</td>
<td>Economic and Fiscal Analysis for Planning (3)</td>
<td>Basic theoretical frameworks for understanding regional economic trends. Techniques for analyzing the strengths and weaknesses of local and regional economies. Fiscal impact analysis and feasibility studies at the local level. 3 lectures. Prerequisite: CRP 212, CRP 213, CRP 214.</td>
</tr>
<tr>
<td>CRP 347, 348</td>
<td>Urban and Regional Design (3) (3)</td>
<td>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.</td>
</tr>
<tr>
<td>CRP 351, 352, 353</td>
<td>Community Planning Laboratory (4) (4) (4)</td>
<td>Case study application of planning theory to the community, its components, and to the city and its region. Relationships of city spaces and structures. Basic planning studies, planning and implementation. Computer applications. Field trips. Individual, team, and interdisciplinary approaches. Miscellaneous course fee required—see Class Schedule. 4 laboratories. Prerequisite: CRP 213, CRP 214, CRP 216, LA 213, GEOL 201, STAT 211.</td>
</tr>
<tr>
<td>CRP 400</td>
<td>Special Problems for Advanced Undergraduates (1–2)</td>
<td>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.</td>
</tr>
<tr>
<td>CRP 404</td>
<td>Environmental Law (3) (Also listed as FNR 404)</td>
<td>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, or consent of instructor.</td>
</tr>
<tr>
<td>CRP 408</td>
<td>Water Resource Law and Policy (3) (Also listed as FNR 408)</td>
<td>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: FNR 302 or instructor approval, senior standing.</td>
</tr>
<tr>
<td>CRP 409</td>
<td>Planning Internship (2–4) (CR/NC)</td>
<td>Work experience as a supervised employee in a planning or related agency or firm. 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.</td>
</tr>
<tr>
<td>CRP 420</td>
<td>Planning Law (4)</td>
<td>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: senior standing, or consent of instructor.</td>
</tr>
<tr>
<td>CRP 427</td>
<td>Local Economic Development Planning (3)</td>
<td>Goals, processes and approaches for planning local economic development. Theoretical principles and assumptions underlying local economic development programs. Alternative strategies and analytical techniques for planning economic development programs and projects. 3 seminars. Prerequisite: Senior standing.</td>
</tr>
<tr>
<td>CRP 430</td>
<td>Planning Administration (3)</td>
<td>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.</td>
</tr>
<tr>
<td>CRP 435</td>
<td>Transportation Theory (3)</td>
<td>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 seminars. Prerequisite: CRP 212, or consent of instructor.</td>
</tr>
<tr>
<td>CRP 442</td>
<td>Housing and Planning Seminar (3)</td>
<td>Investigation of housing issues, policies and programs from a planning perspective, including the economic underpinnings of land markets and housing markets, housing plans, finance, public programs, affordable housing. 3 seminars. Prerequisite: CRP 353 or consent of instructor.</td>
</tr>
<tr>
<td>CRP 444</td>
<td>Infrastructure and Planning Management (4)</td>
<td>Basic infrastructure systems necessary to support urban development. Basic components of systems and how they are planned, financed and managed. 4 seminars. Prerequisite: CRP 352, ENVE 331 or senior standing.</td>
</tr>
<tr>
<td>CRP 447</td>
<td>Design Regulations (3) (Also listed as ARCH 447)</td>
<td>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.</td>
</tr>
<tr>
<td>CRP 451, 452</td>
<td>Regional and Environmental Planning Laboratory (4) (4)</td>
<td>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, FNR 304.</td>
</tr>
</tbody>
</table>
CRP 453 Planning and Design Laboratory (4)
Selected advanced laboratory applications, including urban and regional design. Miscellaneous course fee required—see Class Schedule. 4 laboratories. Prerequisite: CRP 348, CRP 452.

CRP 457 Planning Information Systems (3)
Computer based systems to manage information pertinent to planning. Approaches to systematic data acquisition, processing and maintenance. Potential of data base systems for information gathering and analysis. Miscellaneous course fee required—see Class Schedule. 2 seminars. 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 planning. Project results presented in a formal report. To be completed in two quarters. Minimum 120 hours time. Prerequisite: CRP 409, CRP 452.

CRP 463 Undergraduate Seminar (2)
Research and problem analysis in planning. Professional practice in planning. Professional ethics. Students present organized material on some subject of interest. 2 seminars. Prerequisite: CRP 409, 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)
Lecture and discussion by 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 Cities and Planning (4)
Origins and evolutionary stages of settlement patterns and the use of land and natural environment. Changing spatial structure in the development of cities and regions. Beginnings and the historical development of the planning profession. 4 lectures. Prerequisite: Graduate standing.

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. Political and social context of planning. Alternative professional roles, and planning processes. Values and ethical issues in planning. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

CRP 513 Planning Research Methods (4)
Application of research design to planning issues. Comparison of case study, comparative and problem-solving methods. Primary and secondary data sources, including field survey techniques. 3 seminars, 1 supervision. Prerequisite: Graduate standing, STAT 211 or equivalent, or consent of instructor.

CRP 514 Computer Applications for M.C.R.P. (2)
Microcomputer applications used by planners. Focus on planners' adaptations of spreadsheets, statistical applications, data base systems, graphic presentation. Miscellaneous course fee required—see Class Schedule. 2 laboratories. Prerequisite: Graduate standing.

CRP 515 Presentation and Communication Techniques for Planners (3)
Basic techniques used in effective planning presentations. Introduction to various drawing media and delineation techniques for planners, three-dimensional visualization, graphic skills. Integration of visual and electronic media in presentations. 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: CRP 454, graduate standing or consent of instructor.

CRP 518 Policy Analysis for Planners (4)
Analysis of social, economic, and environmental context of public planning decisions. Externalities and other rationales for planning activities. Policy analysis tools for evaluating equity and efficiency aspects of plan implementation. Local funding options for community development and redevelopment. Non-monetary issues and techniques. 4 seminars. Prerequisite: CRP 501, CRP 510, CRP 514.

CRP 520 Feasibility Studies in Planning (4)
Fundamental analysis for assessing feasibility of public and private development projects. Principles and techniques for analyzing markets and assessing cash flow for individual projects. Economic, fiscal and tax impacts as factors determining public participation in private projects. 4 seminars. Prerequisite: CRP 501 or consent of instructor.
CRP 525 Plan Implementation (4)
Theory and practice of plan implementation. Regulatory and non-regulatory frameworks for plan implementation. Growth management, development regulation, capital improvement programs, redevelopment. 4 seminars. Prerequisite: CRP 510 or consent of instructor.

CRP 530 Planning Agency Management (3)
Preparation for mid-level and higher positions in public planning agencies and private firms. Applications of organization theory to planning agencies and firms. Work programs, staff development, budgets, contracting, proposal preparation, conflict management. Relationships with other agencies and firms, clients, public and media. 3 seminars. Prerequisite: CRP 501, CRP 510 or consent of instructor.

CRP 545 Environmental Planning, Policies and Principles (4)
Environmental planning as a field of inquiry and action. Review and application of policies and techniques used in environmental planning, including analysis of environmental programs and processes within the land use planning context. 2 seminars, 2 activities. Prerequisite: Graduate standing or consent of instructor.

CRP 548 Principles of City Design (3)
Introduction to the philosophy and theory particular to city 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 Community 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 548.

CRP 554 Regional Planning and Analysis (4)
Application of 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 501.

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 597 Policy, Planning and Management (4)
This course provides a synthesis of the M.C.R.P. program. Expansion and integration of material on planning principles, practice, theory and quantitative methods. 4 seminars. Prerequisite: CRP 409, CRP 420, CRP 510, CRP 516, CRP 518, CRP 525, CRP 530, CRP 552, CRP 554 and advancement to candidacy.

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: CRP 513, advancement to candidacy, consent of department head.

CRSC—CROP SCIENCE

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 123 Forage Crops (4)
Forages as a world resource in food and animal production, soil and water conservation and sustainable agricultural systems. Forage use systems: pasture and range, green chop, silage, hay and cubes. Identification and management of limiting factors of forage plant growth. Botany of legumes and grasses. Grass, legume and weed identification. Forage crop improvement. Forage composition and quality. Antiquality factors. 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 230. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory.

CRSC 132 Cereal Grain Production (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 Crop Production (4)
Adaptation, distribution, production, processing, and utilization of major row crops such as potatoes, tomatoes,
dry beans, and sugar beets. Special emphasis on working with beds and furrows. 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 201 Agricultural Chemical and Equipment Safety (2)
Principles and applications of agricultural chemical and equipment safety for enterprise project participants primarily. Pesticide toxicity, poisoning symptoms, medical treatment, safe handling and application techniques. Pesticide laws and regulations. Safe operation of tractors, implements, and processing equipment. Equipment demonstrations. Repeatable, but not for credit. 2 activities.

CRSC 202 Enterprise Project (1-4) (CR/NC)
Beginning field experience in production and marketing of an agronomic crop, under faculty supervision. Project participation is subject to approval by the department head and the Cal Poly Foundation. Degree credit limited to 4 units. Credit/No Credit grading only. Prerequisite: CRSC 201, or consent of instructor.

CRSC 221 Weed Science (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, aquatics, forests. 3 lectures, 1 laboratory. Prerequisite: BOT 121 or CRSC 131 or FRSC 131.

CRSC 230 Agronomic Crop Production (4) GEB F.2.
Production, harvest, and use of important cereal and field crops in California. Production areas, crop rotations, disease and pest control. Field trip required. Not open to students with credit in CRSC 131. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory.

CRSC 231 Commercial Seed Production and Conditioning (4)
Production and processing of certified and commercial seed including seed technology, germination, quality control, cleaning and storage, 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 131 or consent of instructor.

CRSC 304 Plant Improvement (4)
Principles and techniques used to develop new plant varieties. Sexual reproduction, inheritance, selection and biotechnology methods useful in breeding of plants. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: CRSC 131 and BIO 303.

CRSC 311 Insect Pest Management (4)
Principles of controlling insect pests including biological, cultural, physical, and chemical controls. Identification of insects injurious to California field, fruit, and vegetable crops. Insecticide formulation and methods of application. Pesticide laws and regulations. 3 lectures, 1 laboratory. Miscellaneous course fee may be required—see Class Schedule. Prerequisite: CHEM 121 or introductory courses in biology, botany or zoology or consent of instructor.

CRSC 327 Vertebrate Pest Management (4)
Vertebrate pests injurious to crops, livestock, forest products, wildlife, stored products and humans. Life habits, identification, control methods, and materials. Related laws and regulations. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: Junior standing.

CRSC 330 Advanced Forage Crop Production (4)
Three methods of producing, harvesting and utilizing forage species; grazing, haying and ensiling plant materials. Forage identification, hay grades and quality; preservatives to enhance quality. Grazing systems; forage mixtures versus single species; problems in pasturing, fencing, the silage-making process and silo structures. Field trip to a production area required. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: CRSC 123, CRSC 131 or CRSC 230 or consent of instructor.

CRSC 333 Greenhouse Vegetable Production (4)
Development, practices, history, and future of crop production in greenhouses. Research applications, commercial applications, production problems, marketing, and economics. Special emphasis on growing transplants in greenhouses and use of nutrient solutions. Field trips to a commercial greenhouse operation and/or analysis lab 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 402 Enterprise Project (1-4) (CR/NC)
Advanced experience in production of an agronomic crop. Development of a plan for field operations, a marketing plan, and a budget. Management decision-making. Project participation is subject to approval by the department head and the Cal Poly Foundation. Degree credit limited to 4 units. Credit/No Credit grading only. Prerequisite: CRSC 202, and consent of instructor.

CRSC 405 Advanced Weed Science (4)
Group study and discussion of the importance of the ecology and biology of weeds for successful management; integrated weed management; herbicide selectivity based on mode of actions; herbicides and the environment; regulatory aspects of weed control. Field trip required. Miscellaneous course fee may be required—see Class Schedule. 3 seminars, 1 laboratory. Prerequisite: CRSC 221 or consent of instructor.

CRSC 410 Crop Physiology (4)
Environmental, chemical, and biological interrelationships associated with the physiology of crop production. Field trip
is required. 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. Statistics and computers utilized. 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 221 and BOT 121.

CRSC 422 Tropical Crop, Fruit and Nut Production (4) (also listed as FRSC 422)
Production, distribution and utilization of major agronomic, fruit and nut crops grown exclusively in the tropics. Includes discussions of tropical weather systems and climates, tropical soils, tropical cropping systems and slash-and-burn agriculture. 3 lectures, 1 laboratory. Prerequisite: CRSC, VGSC or FRSC 100/200-level course, or consent of instructor.

CRSC 431 Advanced Insect Pest Management (4)
Strategies and case studies of modern insect pest management. Group study and discussion of integrated pest management (IPM) of insects and mites. Pesticide resistance management, insect and mite monitoring, pest management regulatory issues, biotechnology applications, biological/microbial control, and preparation for Pest Control Advisor's licensing. Industry speakers. Field trips required. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: CRSC or consent of instructor.

CRSC 441 Biological Control of Insects (4)
Biological control of insects to include history of classical methods, augmentation and inundative release of beneficial arthropods, nematodes, microbiicals, and other biorational agents. Identification of beneficial arthropods to family level. Laws and regulations governing use of biocontrol agents. Field trips to insectories, quarantine facilities, crop production areas. 3 lectures, 1 laboratory. Prerequisite: CRSC 311 or consent of instructor.

CRSC 445 Cropping Systems (4)
Systems approaches to improvement of agricultural situations. Consideration of human factors and the agroecosystem in efforts to create a more sustainable agriculture. Field trip required. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: SS 121 and BOT 121, or CRSC 131, or BOT 326, 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 Crop Production (4) (Also listed as VGSC 521)
Production and management of crops under intensive and extensive cultural systems and low-input agriculture. Interaction between the various growth factors at various levels of production and interaction of cultural practices and plant requirements. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: Graduate standing and consent of instructor.

CRSC 527 Animal Damage Management (4)
Animal damage management in natural ecosystems, agroecosystems, disturbed environments, and urban settings. Ecological aspects of various problem wildlife species in both nation and international settings. Holistic approach to identifying and mitigating damage or losses caused by problem wildlife species. One field trip is required. Miscellaneous course fee may be required—see Class Schedule. 3 seminars, 1 laboratory. Prerequisite: CRSC 327 or consent of instructor.

CRSC 581 Graduate Seminar in Crop/Fruit Production (3) (also listed as FRSC 581)
Group study of current problems, trends and research results pertaining to production or marketing of field, vegetable or fruit crops. 3 seminars. Prerequisite: Graduate standing.

CSC—COMPUTER SCIENCE

CSC 110 Computers and Computer Applications: MS-DOS (3)
GEB F.1.
The computer as a problem-solving tool. A practical introduction to microcomputers, timeshared computer systems and fundamental computing concepts. Use of applications software for word processing, spreadsheets, and communications. Credit not allowed for CSC majors. 2 lectures, 1 activity.

CSC 111 Introduction to Computer Applications for the Sciences (3)
GEB F.1.
Exploration of capabilities of computers as tools in science and undergraduate studies. Emphasis is on an introduction to computer applications and application software in both Macintosh and MS-DOS environments with examples drawn from biology, physics, chemistry and statistics. Credit not allowed for CSC majors. 2 lectures, 1 laboratory.

CSC 112 Pascal Programming (3)
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 113 Computers and Computer Applications:
Macintosh (3) GEB F.1.
The computer as a problem-solving tool. A working
introduction to microcomputers, networked computer
systems and related concepts. Several applications software
packages, including electronic mail and word processing.
Credit not allowed for CSC majors. Miscellaneous course fee
required—see Class Schedule. 2 lectures, 1 activity.

CSC 118 Fundamentals of Computer Science I (4) GEB F.1.
Introduction to the syntactic and execution characteristics of a
modern programming language. Basic ideas of algorithmic
problem solving and programming, using principles of top-
down design, stepwise refinement, and procedural
abstraction. Basic control structures, data types, and I/O
conventions. 3 lectures, 1 activity.

CSC 120 Principles of Business Data
Processing (4) GEB F.1.
Fundamental concepts of digital computing. Survey of
computing devices, systems, and applications software 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: CSC
110, CSC 111, CSC 112, CSC 113 or equivalent, or consent
of instructor.

CSC 209 Selected Programming Languages (3)
Language to be studied will be selected from high level
programming languages of current interest. Emphasis on
language syntax and usage, and unique features. Intended for
proficient programmers who want to learn another
programming language. Class Schedule will list topic
selected. Total credit limited to 6 units. 3 lectures.
Prerequisite: CSC 218.

CSC 215 Computer Architecture I (4) (Also listed
as CPE 215)
Assembly level computer organization. Basic machine
representation of numeric and non-numeric data. Assembly
level instruction sets, their corresponding addressing modes,
and the underlying computer architecture. Introduction to
algorithmic problem solving and program design in assembly
language. Intended for CPE and CSC majors. Miscellaneous
course fee required—see Class Schedule. 3 lectures, 1
laboratory. Prerequisite: EE 219 (or concurrent enrollment)
and CSC 218.

CSC 218 Fundamentals of Computer Science II (3)
Issues concerned with development of high quality software:
specifications, abstract data types, and paradigms for the
design and implementation of large software systems.
Computational complexity and its use in the analysis of
algorithms. Elementary and structured data types: arrays,
records, access, and file types. Specification and
implementation of user-defined data types and their
applications: stacks, queues, and priority queues. 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, Ada
or C.

CSC 240 Programming Environments I (3)
Professional use of C and UNIX, including UNIX utilities,
system interfaces and all aspects of C syntax and semantics.
Programming exercises stressing abstract data types, object-
oriented approaches to software engineering principles for
constructing large C programs. 3 lectures. Prerequisite: CSC
218 or equivalent.

CSC 241 Advanced Topics in UNIX (3)
Advanced techniques in UNIX. System calls and library
functions, shell scripts, and selected UNIX tools. 3 lectures.
Prerequisite: CSC 240.

CSC 245 Discrete Structures (3)
Introduction to structures and proof techniques of computer
science: sets, functions, relations, elementary combinatorics,
propositional and predicate logic. Boolean algebra, proof
techniques, verification of algorithm correctness, elementary
complexity of algorithms, recurrence relations, applications
of graph theory. Not open to students with credit in MATH 124. 3 lectures. Prerequisite: MATH 118 and MATH 119 or equivalent.

CSC 248 Computer System Administration (2)
Fundamental concepts of system administration in a Unix operating system environment; use of shell scripts and utilities; techniques of networks and data communications; methods of system maintenance and accounting. 2 seminars. Prerequisite: CSC 240 or permission of instructor.

CSC 251 Digital Computer Applications (2) GEB F.1.
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 computer graphics in their own disciplines. Use of Paint and Draw systems to create graphics on the CRT display and on film, color printer, PostScript printers and plotters. Use of business graphics packages to create various charts and presentation graphics. Credit not allowed for both CSC 255 and CSC 455 or CSC 456. 3 lectures, 1 laboratory.

CSC 302 Computers and Society (3) GEB F.2.
Social, ethical, political and technological implications and effects of computers in the modern world. Examination of the benefits and side-effects of computer applications and automation. 3 lectures. Prerequisite: junior standing and F.1. computer literacy course.

CSC 311 Numerical Engineering Analysis (4)
An intensive survey of numerical analysis techniques used for solving problems in engineering. Areas include solution of nonlinear equations, solution of linear systems, interpolation, numerical quadrature, ordinary differential equations, boundary value problems. 4 lectures. Prerequisite: Knowledge of a high level programming language, e.g. FORTRAN and/or C, and MATH 242 or equivalent.

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, Ada, 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, Ada, or C.

CSC 333 Numerical Analysis II (3) (Also listed as MATH 333)
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)
Graphical user interfaces and the software development tools of their environments. Development of window-oriented programs using the environments' systems programming language. 3 lectures, 1 laboratory. Prerequisite: CSC 240 and CSC 345.

CSC 345 Data Structures (3)
Development of high quality software; specifications, abstract data types, and paradigms for design and implementation of large software systems. Abstract data types and their specification and implementation for basic data structures: lists, priority queues, tables, trees and graphs. Complexity analysis and recursive algorithms. 3 lectures. Prerequisite: CSC 245 or MATH 124.

CSC 346 File Structures (3)
Principles of file organization. Analysis of time-space trade offs for secondary searching and sorting algorithms. Sequential, indexed sequential, hashed, B-Tree and multiple-key files. Secondary storage devices, blocking and buffering, data compression. 3 lectures. Prerequisite: CSC 345.

CSC 347 Introduction to Database Systems (4)
Basic principles of database management systems (DBMS) and of application development using DBMS. DBMS objectives, systems architecture, database models with emphasis on Entity-Relationship and Relational models, data definition and manipulation languages, the Structured Query Language (SQL), database design, application development tools. 3 lectures, 1 laboratory. Prerequisite: CSC 345.

CSC 349 Theory and Analysis of Algorithms (3)
Intermediate and advanced algorithms and their analysis. Topics will include mathematical, geometrical, and graph algorithms and NP-complete problems. Additional topics will be chosen from parallel processing, file compression, cryptography, dynamic and linear programming, and exhaustive search. 3 lectures. Prerequisite: MATH 143 and 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 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) (Also listed as CPE 404)
Communications architecture and distributed systems; multicomputer complexes and interprocessor communications; communications media, message switching, and communications protocol standards. 3 lectures, 1 laboratory. Prerequisite: CSC 304, CSC 453, or consent of instructor.

CSC 405 Computer Networks II (4) (Also listed as CPE 405)
Network architectures and protocols; network performance analysis; the theory of error detection and correction; other advanced topics such as routing, network management, integrated services, satellite networks, fiber optics. 3 lectures, 1 laboratory. Prerequisite: CSC 404 or consent of instructor.

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 112 or CSC 118.

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 videodisk overlay to create a multi-media learning environment. 3 lectures, 1 laboratory. Prerequisite: CSC 414.

CSC 433 Numerical Analysis III (3) (Also listed as MATH 433)
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 445 Theory of Computing I (3)
Finite state machines and regular languages. Pushdown automata and context-free languages. Turing machines. Computation theory, computational complexity, and program verification. 3 lectures. Prerequisite: CSC 245 or equivalent.

CSC 447 Database Management Systems Implementation (3)
Data structures and algorithms used in the implementation of Database Systems. Implementation of data and transaction managers: access methods interfaces, concurrency control and recovery, query processors and optimizers. Introduction to implementation of distributed database systems. 3 lectures. Prerequisite: CSC 346 and CSC 347.

CSC 450 Programming Languages II: Description and Analysis (4)
Regular languages and finite automata. Table-driven lexical analysis. Recognition of reserved words. Symbol table construction. Parsing: top-down (LL) and bottom-up (LR). Table-driven versus recursive descent parsing. Context-free languages and pushdown automata. 3 lectures, 1 laboratory. Prerequisite: CSC 351, CSC 445.

CSC 451 Programming Languages III: Compiler Implementation (4)

CSC 453 Introduction to Operating Systems (4)
Introduction to sequential and multiprogramming operating systems; kernel calls, interrupt service mechanisms, scheduling, filesystem 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: CPE 315.

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 455 Computer 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.

CSC 456 Advanced Rendering Techniques (4)
Illumination models, reflectance, absorption, emittance, Gouraud shading, Phong shading, raytracing polyhedra and other modeling primitives, coherence, acceleration methods, radiosity, form factors, advanced algorithms. 3 lectures, 1 laboratory. Prerequisite: CSC 455.

CSC 458 Computer Graphics Seminar (2)
Current topics in computer graphics. Total credit limited to 4 units. 2 seminars. Prerequisite: CSC 455.

CSC 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: Recommended: CSC 440 for CSC 461; CSC 441 for CSC 462.

CSC 463 Undergraduate Seminar (2) (CR/NC)
Presentations by students of topics of interest to computer science professionals. Students make presentations of professional quality that are evaluated by the entire class. Possible topics include computers and society, ethical issues in computing, social and legal implications of computing, interpretation of technical material for management. Notable speakers from industry are invited to address the class. Offered only on a Credit/No Credit basis. 2 activity periods.

CSC 470 Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

CSC 472 Object Oriented Design (3)
C++ syntax and semantics. Principles of object oriented programming, classes with inheritance and polymorphism as extensions of abstract data types, function and operator overloading. Basic object oriented design principles, clan relationships and diagrams. 2 lectures, 1 laboratory. Prerequisite: CSC 240 and CSC 345.

CSC 484 Computer Vision (3)
Fundamental issues in computer vision. Convolution, edge detection and image segmentation. Pattern classification methods and neural networks. Stereoscopic vision and optical flow. 3 lectures. Prerequisite: CSC 345, CSC 221, MATH 204, MATH 143 or consent of instructor.

CSC 485 Cooperative Education Experience (6) (CR/NC)
Part-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. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

CSC 495 Cooperative Education Experience (12) (CR/NC)
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. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

CSC 500 Directed 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 501 Languages 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 502 Database Systems (4)
Current topics in database systems: distributed databases and transactions, nested and long-running transactions, distributed concurrency control, semantic and object-oriented data models, database systems for non-traditional applications: engineering design databases, active, logic, temporal, multi-media, and real-time databases. 4 seminars. Prerequisite: CSC 447.

CSC 503 Operating 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 504 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 505 Theory of Computing II (4)
Advanced topics in theoretical computer science from such areas as automata theory, cellular automata theory, computational complexity, and program verification. 4 seminars. Prerequisite: CSC 445, graduate standing or consent of instructor.
CSC 506 Artificial 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: STAT 211 or STAT 321, 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 570 Current 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 585 Cooperative Education Experience (6) (CR/NC)
Advanced study analysis and part-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. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

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 595 Cooperative Education Experience (12) (CR/NC)
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. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

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, turnout, 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, merengue, rumba, samba, swing, 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)
Introduction to international folk dances including round, longway, and square sets. Study of various dance steps, formation, positions, historical and cultural background. 1 activity.

DANC 211 Dance Fundamentals (2)
Body placement, alignment, rhythmic analysis and movement techniques. Theory and practice of fundamentals to promote ease and efficiency of movement. Introduction to dance forms such as ballet, modern, jazz, folk, square and social. 2 activities.

DANC 221 Dance Appreciation (3)
Concentrates on major dance works and artists from the 19th century to present. Includes cultural contexts as well as styles and forms used in dance. 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 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 Dance History (3)
Historical influences on contemporary Western dance from prehistoric times to the present, with special emphasis on European, African and Hispanic sources. 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 12 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 (4)
Dance forms such as folk, social, square, modern, ballet and jazz studies. Rhythmic structure and analysis of dance steps. Development of teaching methods and techniques, curricular materials and evaluation procedures related to teaching dance forms. 2 lectures, 2 activities. Prerequisite: DANC 131, 132, 133, or 134 and consent of instructor.

DANC 400 Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research and studies or survey of selected problems in dance and related areas. Total credit limited to 4 units with a maximum of 2 units per quarter. Prerequisite: Consent of instructor and department head.

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.

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DSCI—DAIRY SCIENCE

DSCI 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.

DSCI 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.

DSCI 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.

DSCI 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.

DSCI 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.

DSCI 202 Dairy Product Marketing Programs (3)
Promotional programs of national dairy companies, integrated supermarket firms and independents. Programs of major dairy organizations; for example, National Dairy Council and Dairy Board, California Dairy Council, and Milk Advisory Board. 2 lectures, 1 activity. Prerequisite: DPT 134 or consent of instructor.

DSCI 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: DSCI 121.

DSCI 223 Frozen Dairy Foods (3)
Selection of ingredients, calculating, and processing ice cream, and related frozen products. 2 lectures, 1 laboratory. Prerequisite: DSCI 121.
DSCI 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 science majors. 3 lectures, 1 laboratory.

DSCI 231 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 non-dairy science students. Survey course for dairy husbandry majors. 3 lectures, 1 laboratory.

DSCI 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.

DSCI 234 Dairy Foods Evaluation (3)
In-depth study of 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, 2 activities.

DSCI 241 Dairy Cattle Selection (3)
Selection of dairy cattle on type conformation and the correlation between type and production. Body condition scoring, animal analysis and linear classification. 1 lecture, 2 activities. Prerequisite: DSCI 121 or DSCI 230.

DSCI 250 Dairy Farm Safety and Production Practices (3)
Communication of dairy farm safety practices with emphasis on equipment operation, livestock handling and common farm hazards. Applied practices necessary for successful operation of a modern dairy farm. 2 lectures, 1 activity. Prerequisite: DSCI 121 or consent of instructor.

DSCI 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: DSCI 101 or ASCI 101 and computer literacy elective.

DSCI 321 Lactation Physiology (3)
Mechanisms of milk component secretion, including protein, lactose and fat synthesis. Disorders of the mammary gland (mastitis) and appropriate management practices for mastitis control. 3 lectures. Prerequisite: DSCI 101, DSCI 121, ZOO 131, CHEM 121.

DSCI 323 Breeds, Fitting and Showing, and Management of Dairy Cattle (3)
Origin of modern dairy cattle breeds, breed comparisons, families, and pedigrees. Purebred herd management. Dairy cattle fitting and showing, photography, and merchandising. 2 lectures, 1 laboratory. Prerequisite: DSCI 121 or DSCI 230.

DSCI 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.

DSCI 330 Artificial Insemination (3)
Semen collection, evaluation processing and handling. Inseminating techniques. Fertility problems. Record keeping and measurements of reproductive efficiency. Endocrinology of reproduction. Estrous synchronization, embryo transfer and splitting of embryos. Ovarian structure and palpation of ovaries. 2 lectures, 1 laboratory. Prerequisite: DSCI 121 or consent of instructor.

DSCI 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: DSCI 121 or consent of instructor.

DSCI 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: DSCI 233, BACT 221.

DSCI 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: DSCI 121 or consent of instructor.

DSCI 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.

DSCI 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.

DSCI 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.

DSCI 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.

**DSCI 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, DSCI 241.

**DSCI 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: DSCI 301, DSCI 323, DSCI 330, and DSCI 422.

**DSCI 433 Dairy Plant Management and Equipment (3)**
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. Prerequisite: PHYS 121 and junior standing.

**DSCI 450 Dairy Biotechnology (3)**
Current biotechnology used on dairies. Microbiological techniques, biochemical polymorphisms, recombinant DNA technology and their application in dairy production. Applied activities in the culture, transfer and manipulation of embryos. 2 lectures, 1 activity. Prerequisite: ZOO 131, DSCI 121, DSCI 330, BIO 303, and CHEM 328.

**DSCI 461, 462 Senior Project (2) (2)**
Selection and completion of research-oriented projects under faculty supervision. Project results are presented in a formal report. Minimum 120 hours total time. DSCI 461: 1 seminar and supervision. DSCI 462: Supervision.

**DSCI 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.

**DSCI 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.

**DSCI 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 373
3 lectures, 1 activity. 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 activity. Prerequisite: ECON 211 or ECON 222, CSC 120, MATH 221, MATH 222, STAT 251, STAT 252, STAT 253.

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 323 Economic History of the Advanced World (4)
Analysis of the growth advancement of the economic institutions of Europe from about 600 to the present. Includes the spread of European economic structures and institutions to European colonies. Analyzes the internal development of the industrial economy in Europe and its expansion to other parts of the globe. Includes analysis of the interface of endogenous cultural values and the industrial imperative. Examines the role of economic imperialism, international trade, banking, transportation, and government actions to the evolution of the industrial economies. 4 lectures. Prerequisite: ECON 201 or ECON 211 or ECON 222.

ECON 324 American Economic History (4)
Topical and statistical analysis of the major trends and events of American economic history. Examines the causes and evolution of the United States economy from colonial times to the present. Assessment of the development of agriculture, transportation, industrial and government sectors of the economy and their interconnections. Application of the tools of the new economic history to the economic experience of the United States. 4 lectures. Prerequisite: ECON 201 or ECON 211 or ECON 221 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 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 338 Stochastic Modeling in Decision Making Systems (4)
Introduction to the theory and practice of decision making. Decision support systems applications of the microcomputer, exploring prevailing concepts through the development of topical projects related to the technology of decision making in economics and business. Practical applications discovering and exploring model applications and formulation. General techniques with applications in various areas of microeconomics and macroeconomics. Computerized projects required. 3 lectures, 1 activity. Prerequisite: CSC 120, STAT 252, MATH 221, ECON 211, ECON 212 or ECON 221, ECON 222.

ECON 339 Econometrics (4)
Application of statistical methods useful in economics. General linear regression model. Specific issues and problems related to economic models: multicollinearity, autocorrelation, heteroscedasticity, dummy variables, lagged variables, and simultaneous equation estimation. Application and evaluation of selected examples of empirical economic research. Microcomputer applications. 3 lectures, 1 activity. Prerequisite: CSC 120, MATH 221, MATH 222, STAT 251, STAT 252, or consent of instructor.

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 212 or ECON 221.

ECON 402 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 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 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 212 or ECON 221.

ECON 417 Development of Economic Analysis (4)
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. 4 lectures. Prerequisite: ECON 211, ECON 212 or ECON 221, ECON 222.

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 only. Prerequisite: Junior standing.

ECON 431 Environmental Economics (4)
Economic dimensions of environmental abuse and protection. Use of simple economic models in developing and evaluating environmental policies. Overview of current environmental problems. Issues related to the sustainability of economic growth at the national and international levels. 4 lectures. Prerequisite: ECON 201 or ECON 211 or ECON 221.

ECON 432 Economics of Energy and Resources (4)
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. Case studies. Computer software applications in the study of natural resources and energy under uncertainty. 4 lectures. Prerequisite: ECON 201 or ECON 211 or ECON 222.

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 rates, income levels, and the quality of life in urban regions. 4 lectures. Prerequisite: ECON 201 or ECON 211 or ECON 222.

ECON 460 Undergraduate Seminar in Research Methods (2)
Seminar in applications of economic theory with emphasis on current problems. 2 seminars.

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 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 (1-4)
Advanced study planned and completed under the direction of a departmental faculty member. Open only to graduate students demonstrating ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head.

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 college's programs as they relate to individual aptitudes. The design process. Visiting speakers. Credit/No Credit grading. 2 lectures.

EDES 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.

EDES 311 Construction Contract Documents (5)
Basic skills and techniques required to produce construction contract documents conforming to current building codes and standards, including working drawings, specifications, bid documents, addenda and change orders. 5 laboratories. Prerequisite: ARCH 106, ARCH 111, LA 212.

EDES 408 Sustainable Architecture (3)
A survey course covering the concepts and principles of sustainable buildings and communities. Examines resource origins, delivery systems, treatment infrastructure, current use patterns, and potentials for conservation and re-use. Emphasis is on developing sustainable communities. 3 lectures. Prerequisite: Third year standing or consent of instructor.

EDUC–EDUCATION

EDUC 125 Efficient Reading (2) (CR/NC)
Development of reading efficiency required in modern business, industry, and the professions, as well as study skills in subject matter content areas. Total credit limited to 4 units. Credit/No Credit grading only. 1 lecture, 1 activity.

EDUC 300 Introduction to the Teaching Profession (3) (CR/NC)
Supervised observation and participation in cooperating schools. Discussion focuses on subject matter taught in grades observed. Separate class sections for students interested in elementary or secondary teaching—see Class Schedule. Total credit limited to 6 units. Credit/No Credit grading only.
EDUC 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.

EDUC 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 making fundamental changes in the rules, roles and relationships in schools. 2 lectures, 1 activity. Prerequisite: Any course in GEB Area D.

EDUC 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.

EDUC 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.

EDUC 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.

EDUC 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. Miscellaneous course fee required—see Class Schedule. 3 seminars, 1 activity. Prerequisite: EDUC 301, EDUC 303, EDUC 426, and admission to the Teacher Education Credential program (Step I).

EDUC 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: EDUC 302, EDUC 305, or consent of instructor.

EDUC 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. Miscellaneous course fee required—see Class Schedule. 2 seminars, 2 activities. Prerequisite: EDUC 301, EDUC 303, EDUC 426, and admission to the Teacher Education Credential program (Step I).

EDUC 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: EDUC 301, EDUC 303, EDUC 426, EDUC 402, or consent of multiple subject coordinator. Concurrent: EDUC 410.

EDUC 409  Teaching in the Secondary School (4)
Principles of effective teaching; planning for instruction; management techniques involving instruction; peer coaching. Taken immediately prior to preliminary student teaching. 3 seminars, 1 activity. Prerequisite: Admission into the Single Subject Credential program.

EDUC 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.

EDUC 411  Classroom Management and Discipline in the Secondary School (3)
Principles of establishing classroom routines and procedures; maintaining classroom control; managing groups; school law; parent-teacher relations. 2 seminars, 1 activity. Prerequisite: EDUC 409. Concurrent enrollment in EDUC 410 recommended.

EDUC 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.

EDUC 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 EDUC 420 required.

EDUC 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.
EDUC 426  Language Development in the Multilingual K-12 Classroom (4)

Patterns of classroom organization, application of reading programs, approaches, methods in English and Spanish, and supervised field experiences in elementary classrooms with bilingual students. Miscellaneous course fee required—see Class Schedule. 3 seminars, 1 activity. Prerequisite: EDUC 301, EDUC 303, minimal fluency in Spanish, and consent of instructor.

EDUC 427  Theories, Methods, and Assessment for First and Second Language Acquisition (3)

Review of theories, methods, language assessment for N.E.P./L.E.P. students. Methods, including rationale and instruction of primary language skills and concepts, transitional English and redesignation procedures to L.E.P. status. A review of screening and assessment procedures. 3 seminars. Prerequisite: EDUC 426 or consent of instructor.

EDUC 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, EDUC 300, EDUC 301 or EDUC 305.

EDUC 444  The Atypical Infant (4) (Also listed as PSY 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, PSY 256 or HD 209, and EDUC 440 or consent of instructor.

EDUC 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: EDUC 440 or consent of instructor.

EDUC 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.

EDUC 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. Miscellaneous course fee required—see Class Schedule. 2 seminars, 1 activity. Prerequisite: Completion of computer literacy GEB F.1. course, CSC 410 or CSC 416, or equivalent.

EDUC 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.

EDUC 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.

EDUC 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.

EDUC 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. Miscellaneous course fee required—see Class Schedule. 3 seminars, 1 activity. Prerequisite: Graduate standing.

EDUC 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.

EDUC 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.

EDUC 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. Miscellaneous course fee required—see Class Schedule. 2 seminars, 1 activity. Prerequisite: Graduate standing.

EDUC 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.

EDUC 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.

EDUC 512  Educational Organization and Management (4)

Principles of organization, management, and leadership and their relationship to educational effectiveness and
productivity. Activity experience in the application of management theory in schools. 3 seminars, 1 activity. Prerequisite: Graduate standing or consent of instructor.

EDUC 513 Educational Planning and Decision Making (4)
Concepts of planning and decision making in educational administration including administrators' responsibilities associated with decision making roles in public schools. 3 seminars, 1 activity. Prerequisite: Graduate standing and consent of instructor.

EDUC 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.

EDUC 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: EDUC 501, graduate standing, or consent of instructor.

EDUC 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.

EDUC 517 Organizational Development in Education (3)
Educator's role in group processes, including fundamentals of human relations, working with formal and informal groups, and applying organizational development strategies to enhance school effectiveness. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

EDUC 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 be applied toward master's degree. Credit/No Credit grading only. Prerequisite: Admittance to the Administrative Services Credential program or consent of instructor.

EDUC 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.

EDUC 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.

EDUC 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. Miscellaneous course fee required--see Class Schedule. 2 seminars, 2 activities. Prerequisite: Graduate standing.

EDUC 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.

EDUC 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. 2 seminars, 2 activities. Prerequisite: Graduate standing.

EDUC 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.

EDUC 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.

EDUC 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.

EDUC 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: EDUC 440.
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
<th>Prerequisite</th>
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<tbody>
<tr>
<td>EDUC 546</td>
<td>Teaching Strategies for the Severely Handicapped</td>
<td>Instructional strategies; current methodology and techniques of curriculum modification necessary to individualize instructional activities for the severely handicapped student. 3 seminars. Prerequisite: EDUC 551.</td>
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<tr>
<td>EDUC 547</td>
<td>Atypical Learning Patterns</td>
<td>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 individual(s). 3 seminars, 1 activity. Prerequisite: EDUC 440, EDUC 525, EDUC 545 or EDUC 551.</td>
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<tr>
<td>EDUC 550</td>
<td>Assessment of the Exceptional Individual</td>
<td>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.</td>
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<tr>
<td>EDUC 551</td>
<td>Characteristics of the Severely Handicapped</td>
<td>Characteristics, identification procedures, causation, needs, legal issues, community attitudes, educational and social programs for severely handicapped person. 3 seminars. Prerequisite: EDUC 440.</td>
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<tr>
<td>EDUC 553</td>
<td>Current Issues in Special Education</td>
<td>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.</td>
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<tr>
<td>EDUC 555</td>
<td>Counseling and Communication</td>
<td>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.</td>
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<tr>
<td>EDUC 556</td>
<td>Ethnic Counseling</td>
<td>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.</td>
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<tr>
<td>EDUC 557</td>
<td>Career Development</td>
<td>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. Miscellaneous course fee required—see Class Schedule. 3 seminars, 1 activity. Prerequisite: Graduate standing.</td>
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<tr>
<td>EDUC 558</td>
<td>Academic Counseling in Elementary Schools</td>
<td>Effective developmental and preventative counseling in an elementary school’s academic setting. 3 seminars, 1 activity. Prerequisite: Graduate standing and P.P.S. credential candidate, or consent of instructor.</td>
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<tr>
<td>EDUC 559</td>
<td>Academic Counseling in Secondary Schools</td>
<td>Effective procedures in teaching and counseling in secondary schools 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 and P.P.S. credential candidate, or consent of instructor.</td>
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<tr>
<td>EDUC 560</td>
<td>Counseling Theories and Assessment</td>
<td>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: EDUC 555, or consent of instructor.</td>
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<tr>
<td>EDUC 561</td>
<td>Group Counseling</td>
<td>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: EDUC/PSY 555, EDUC 560 or consent of instructor.</td>
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<tr>
<td>EDUC 562</td>
<td>Student Development—Higher Education</td>
<td>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.</td>
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<tr>
<td>EDUC 563</td>
<td>Counseling At-Risk Students</td>
<td>Specific counseling strategies and issues related to chronic absenteeism of public school students. Will study alienation, violence, parenting, drugs and alcohol, HIV/AIDS, and other critical current topics. 3 seminars. Prerequisite: Graduate standing.</td>
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<tr>
<td>EDUC 573</td>
<td>Field Experience, Counseling</td>
<td>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 6 units may be applied toward Master of Arts in Education. Prerequisite: EDUC/PSY 555, EDUC 557 and consent of Counseling Coordinator Committee.</td>
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<td>EDUC 581</td>
<td>Graduate Seminar in Education</td>
<td>Contemporary problems in education. Trends, developments, and issues. Total credit limited to 9 units. Prerequisite: Graduate standing.</td>
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<tr>
<td>EDUC 582</td>
<td>Seminar in Educational Administration</td>
<td>Review of current management practice, research, and literature related to school site and central office administration. 4 seminars. Prerequisite: Graduate standing</td>
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and completion of the Preliminary Administrative Services Credential or master's degree in administration.

EDUC 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.

EDUC 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.

EDUC 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.

EDUC 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.

EDUC 589 Research Methods and Analysis in Education (5)
Compare and contrast educational research methods to develop a plan which demonstrates a student's knowledge of basic research methodology, integration and application of descriptive and inferential statistics to research designs, computer technology. 4 seminars, 1 activity. Prerequisite: Graduate standing; completion of GEB F.1. computer literacy elective or equivalent, or consent of instructor.

EDUC 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, EDUC 589, and a minimum of 30 units in a master's degree curriculum.

EDUC 598 Reading and Conference (1-2) (CR/NC)
Reading and study material to be chosen with adviser. Not for degree credit. Total credit limited to 6 units. Credit/No Credit grading only. Prerequisite: 6 units of EDUC 599.

EDUC 599 Thesis or Project (3) (3)
Completion of a thesis or project pertinent to the field of education. Prerequisite: Consent of graduate committee and supervising faculty member(s).

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 chair.

EE 201 Electric Circuit Theory (3)
Application of fundamental circuit laws and theorems to the analysis of DC, and steady-state single-phase and three-phase circuits. For engineering majors except electronic/electrical. 3 lectures. Prerequisite: MATH 242, PHYS 133.

EE 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 211, PHYS 211.

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 219 Logic and Switching Circuits (3) (Also listed as CPE 219)
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.

EE 241 Electric Circuit Analysis Laboratory II (1)
Use of electrical and electronic test equipment. Experimental verification of circuit analysis concepts including Kirchoff'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. Prerequisite: EE 241 or consent of department chair. Concurrent: EE 212.
EE 248 Electronic Devices Laboratory (1)
Experimental determination of device characteristics and models. 1 laboratory. Prerequisite: EE 241. Concurrent: EE 208.

EE 251 Electric Circuits Laboratory (1)
Techniques of measurement of DC and steady-state AC circuit parameters. Equivalent circuits, nonlinear elements, resonance. 1 laboratory. Concurrent or prerequisite: EE 201.

EE 259 Logic and Switching Circuits Laboratory (1) (Also listed as CPE 259)
Laboratory synthesis of combinational and sequential logic circuits. Introduction to laboratory equipment such as digital oscilloscopes and logic state analyzers. Use of software (both off-the-shelf and customized) for logic simulation. Introduction to switch bouncing, hazards, and other logic faults. 1 laboratory. Concurrent: EE 219.

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 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 304 Random Signals and Noise (3)
Probabilistic treatment of signals and noise in electrical engineering. Topics include the concept of probability, sample space, distributions, random variables, independence, moments, covariance, random processes, time and ensemble averages, stationarity, common processes, correlation functions, spectra, shot and thermal noise, filtering. 3 lectures. Prerequisite: EE 301.

EE 307 Digital Integrated Electronics (3)
Integrated logic circuits: RTL, DTL, TTL, I2L, ECL, MOS, CMOS, interfacing different logic families. 3 lectures. Prerequisite: EE 208, EE 219.

EE 308 Electronic Circuits (3)
Analysis and design of linear small-signal amplifiers. 3 lectures. Prerequisite: EE 301, EE 307.

EE 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, EE 308.

EE 313 Signal Transmission (3)
Distributed-circuit concepts and traveling waves. Transmission line parameters. Lines with and without reflection. Standing waves. Smith Chart and its applications. Transmission line measurements and impedance matching techniques. 3 lectures. Prerequisite: EE 301.

EE 319 Digital System Design (3) (Also listed as CPE 319)
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: EE 219, EE 307.

EE 321 Electronics (3)
Semiconductor devices and circuits. Instrumentation amplifiers, power control rectifiers, feedback, pulse circuits, digital logic circuits. Not for Electronic or Electrical Engineering majors. 3 lectures. Prerequisite: EE 201.

EE 325 Energy Conversion Electromagnetics (3)
Fundamentals of electro-mechanical energy conversion. Magnetic circuits and electromagnetic devices. Theory of operation and operating characteristics of transformers, DC machines, AC induction machines, and synchronous machines. Stepper motors. 3 lectures. Prerequisite: EE 212 or EE 201, PHYS 133.

EE 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, EE 308.

EE 328 Discrete Time Systems (3)
Discrete-time signals and the sampling theorem, basic systems concepts, solution of linear difference equations, Z transform. Discrete-time Fourier Transform, Discrete Fourier Transform (DFT). Cyclic convolution application of transforms to system analysis. Introduction to digital filtering. Relationships of digital filters to their continuous-time counterparts. 3 lectures. Prerequisite: EE 301.

EE 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: PHYS 133, MATH 317.

EE 341 Linear Analysis Laboratory (1)

EE 342 Control Systems Laboratory (1)
Laboratory work in feedback control systems. 1 laboratory. Prerequisite: EE 341. Concurrent: EE 302.

EE 347 Digital Integrated Electronics Laboratory (1)
Experimental investigation of the characteristics of different logic families. 1 laboratory. Prerequisite: EE 248. Concurrent: EE 307.
EE 381 Electronic Circuits Laboratory (1)
Design, construction and testing of solid state amplifier to meet stated specifications. 1 laboratory. Prerequisite: EE 341, EE 347. Concurrent: EE 308.

EE 349 Integrated Electronic Circuits Laboratory (1)

EE 353 Signal Transmission Laboratory (1)
Transmission and reflection measurements. Impedance matching techniques. 1 laboratory. Prerequisite: EE 341. Concurrent: EL 313.

EE 359 Digital System Design Laboratory (1) (Also listed as CPE 359)
Laboratory synthesis of combination and sequential logic circuits. Sequential subsystems analysis with the logic state analyzer. Fault testing and automated checkout procedures. Familiarization with the characteristics of SSI and MSI logic components. 1 laboratory. Prerequisite: EE 259, EE 347. Concurrent or prerequisite: EE 319.

EE 361 Electronics Laboratory (1)
Instrumentation amplifiers, feedback, rectifiers and power control, pulse and digital logic circuits. 1 laboratory. Prerequisite: EE 251. Concurrent or prerequisite: EE 321.

EE 365 Energy Conversion Laboratory (1)
Single-phase and three-phase transformers. Starting of rotating machines, evaluation of characteristics of rotating machines. 1 laboratory. Prerequisite: EE 242 or EE 251. Concurrent: EE 325.

EE 400 Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

EE 401 Electromagnetic Fields II (3)
Time changing electric and magnetic fields. Maxwell's equations, with the relationship between field and circuit theory. Plane waves in dielectric and conducting media. Selected topics from wave polarization, reflection and refraction. 3 lectures. Prerequisite: EE 313, EE 334.

EE 402 Microwave Engineering (3)

EE 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 receivers. Design of optical communication systems with applications in telecommunication and local area networks (LANs). 3 lectures. Prerequisite: EE 309, EE 401 or PHYS 207 and PHYS 323.

EE 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: EE 313, EE 309.

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 309, EE 325.

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 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: EE 309, EE 414.

EE 413 Advanced Electronic Design (4)
Design of electronic circuits and sub-systems. Non-linear circuit applications, signal generators, voltage references, modeling and automatic test system design. 3 lectures, 1 laboratory. Prerequisite: EE 309.

EE 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: EE 302, EE 304, EE 328.

EE 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: EE 309, EE 414.

EE 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. Other topics such as: synchronization, quantization, multiplexing and multiple access, spread spectrum techniques. 3 lectures. Prerequisite: EE 414.

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, EE 365.

EE 418 Photonic Engineering (3)
Modern optical design with emphasis on 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 device (CCD) arrays. Miscellaneous course fee required—see Class Schedule. 3 lectures. Prerequisite: EE 401 or equivalent or PHYS 323.

EE 419 Digital Signal Processing (3)

EE 420 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 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.

EE 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: EE 401.

EE 425 Analog Filter Design (3)

EE 431 Computer-Aided Design of VLSI Devices (3)
Design of VLSI circuits, design of subsystems, PLAs and finite-state machines, patterning, hand layout, and CIF programming. 3 lectures. Prerequisite: EE 319, EE 309.

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, EE 334.

EE 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: EE 313, EE 353, EE 401.

EE 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: EE 349. Prerequisite or concurrent: EE 403.

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 341, EE 406.

EE 445 Advanced Amplifier Design Laboratory (1)
Experimental investigation employing advanced techniques. Design of electronic amplifiers and amplifier systems utilizing recently developed components. 1 laboratory. Prerequisite: EE 353, EE 349. Concurrent or prerequisite: EE 405.

EE 445 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. Prerequisite: EE 349. Concurrent or prerequisite: EE 425.

EE 446 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: EE 342, EE 414.

EE 458 Photonic 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: EE 418.

EE 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: EE 341. Concurrent enrollment in EE 419; knowledge of C or assembly language desirable.

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. Minimum 150 hours total time. Prerequisite: EE 325, EE 309, EE 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 485 Cooperative Education Experience (6) (CR/NC)
Part-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. Credit/No Credit grading only. Total credit limited to 16 units. Prerequisite: Sophomore standing and consent of instructor.

EE 495 Cooperative Education Experience (12) (CR/NC)
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. Credit/No Credit grading only. Total credit limited to 16 units. Prerequisite: Sophomore standing and 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 chair, 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 Advanced Topics in Automatic Control (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 EE 328, graduate standing or consent of instructor.

EE 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: EE 414, graduate standing or consent of instructor.

EE 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: EE 414, EE 525, 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 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. 4 seminars. Prerequisite: EE 427, or consent of instructor.

EE 522 Microprocessor-Based Digital System Design (4)
Design and implementation of microprocessor-based digital systems. Their analysis and cost effective use in system design problems. Data acquisition and control systems. Role of microperipheral controllers. Laboratory problems associated with interfacing microprocessors to various systems. 3 seminars, 1 laboratory. Prerequisite: EE 404, or consent of instructor.

EE 523 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: EE 319, graduate standing or consent of instructor.

EE 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.

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: EE 304 or equivalent, graduate standing or consent of instructor.

EE 526 Digital Communications (4)
M-ary signals. Vector space representation of signals. Optimum receiver principles. Common signal sets. Signal space dimensionality versus time-bandwidth product. 4 seminars. Prerequisite: EE 414 and EE 525, 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 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: EE 414, EE 525, graduate standing or consent of instructor.

EE 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: EE 401, PHYS 412 or equivalent, graduate standing or consent of instructor.

EE 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: EE 401, EE 414 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.

EET—ELECTRONIC ENGINEERING TECHNOLOGY

EE 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: EET 338.

EE 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: EET 335.
ENGL—ENGLISH

ENGL 101 Basic Writing I (4) (CR/NC)
Practice in writing expository prose with attention paid to sentence variety, fluency, and editing skills. Emphasis on reading and the writing process. Directed readings of exemplary writings. Credit/No Credit grading only. Repeatable. 4 lectures.

ENGL 102 Basic Writing II (4) (CR/NC)
Instruction in the writing process. Practice in the strategies of writing, revising, and editing paragraphs and essays with attention paid to focus, support, and organization. Directed readings of exemplary prose. Credit/No Credit grading only. Repeatable. 4 lectures.

ENGL 104 Writing Lab Tutorial (1) (CR/NC)
Individual tutorials of at least three hours a week in the University Writing Lab. Practice in various essay writing strategies based on a student's needs and at student's own pace. Preparation for freshman composition. Credit/No Credit grading only. Repeatable. 1 laboratory. Prerequisite: At least one quarter of basic writing.

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 113 Essay Writing/ESL (4) (CR/NC)
Practice in essay writing with special attention paid to the writing process. Focus on using details and examples for effective development. Review of grammar problems specific to ESL students. Journal writing to enhance fluency. Directed readings of essays and fiction. Credit/No Credit grading only. 4 lectures. Prerequisite: ENGL 111 or ENGL 112, or consent of instructor.

ENGL 114 Writing: Exposition (4) GEB A.1.
Writing and stylistic analysis of expository papers. Study and application of techniques of exposition. Critical reading of model essays. 4 lectures.

ENGL 125 Critical Thinking (3) (Also listed as PHIL 125 and SPC 125) GEB A.2.
Nature of critical thinking. Analysis of inductive and deductive arguments. Practice in the composing of arguments in English. 3 lectures. Prerequisite: ENGL 114 or equivalent.

ENGL 200 Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems at the lower division level. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

ENGL 215 Writing: Argumentation (4) GEB A.4.
Writing and critical evaluation of argumentative papers. Techniques of research and evaluation of research sources. Discussion of elements of argumentation, inductive and deductive reasoning and use of supporting documentation in written discourse. Examination of special problems in invention, form, style and evaluation. Not open to students with credit in ENGL 218. 4 lectures. Prerequisite: ENGL 114 and ENGL 125 or PHIL 125 or SPC 125.

ENGL 218 Professional Writing: Argumentation and Reports (4) GEB A.4.
Extensive writing practice in professional situations: reports, proposals, letters, memoranda. Composing and conveying technical information. Methods of research. Analysis of writing situations. Analysis and criticism of student reports and technical reports. Not open to students with credit in ENGL 215. 4 lectures. Prerequisite: ENGL 114 and ENGL 125 or PHIL 125 or SPC 125.

ENGL 230 Masterworks of British Literature: Through the Eighteenth Century (4) GEB C.1.
Selected readings in British literature from its beginnings through the Eighteenth Century. Early and middle English works read in translation. Includes works by such authors as Chaucer, Shakespeare, Milton, Swift, Pope and Johnson. 4 lectures. Prerequisite: ENGL 114 or equivalent.

ENGL 231 Masterworks of British Literature: Romantic Period to the Present (4) GEB C.1.
Selected readings in British literature from the Romantic period to the present. Includes works by such Romantic, Victorian, Edwardian and Twentieth Century writers as Wordsworth, Byron, Tennyson, Shaw, Yeats and Eliot. 4 lectures. Prerequisite: ENGL 114 or equivalent, 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, Dostoievsky, 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 Professional Writing (4)
Professional writing as produced in industry and government. Analytic reports, manuals, instructions, specifications. Trade journal articles. Editing skills. Orientation to professional 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 338 Shakespeare in London (4) GEB C.3.
Readings from such works as Hamlet, King Lear, A Midsummer Night's Dream, and the sonnets. Attendance at performances of these plays in or near London. Not open to
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.

ENGL 341 American Literature: 1860-1914 (4) GEB C.3.
Selected prose and poetry by American writers from the Civil War to World War I with the focus on local-color fiction and on literary Realism and Naturalism. Representative writers include Whitman, Dickinson, Twain, James, Howell, Chopin and Crane. 4 lectures. Prerequisite: 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) GEB C.3.
Selected prose, poetry and drama by American writers from World War I to the present, depicting the social and psychological complexities of the Twentieth Century. Representative authors include Frost, Eliot, Stevens, Fitzgerald, Hemingway, Faulkner and O'Neill. 4 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

ENGL 345 Women Writers (4) GEB C.3.
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. Special emphasis upon the intersections of race, gender, and class as these intersections affect the creative process. 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) GEB C.3.
Literature 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, discussion of the intersections of race, gender, and class as these intersections shape the creative process. 4 lectures. Prerequisite: ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253, or consent of instructor.

ENGL 350 Modern Novel (3) GEB C.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) GEB C.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) GEB C.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 353 Modern Drama in London (4) GEB C.3.
Readings in representative Twentieth Century drama with special emphasis on form and ideas. Attendance at play performances required. 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 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) GEB C.3.
Major works of international cinema with emphasis on critical interpretation, on the ways film communicates visually and verbally, and on the historical and cultural contexts in which films are created. Contains films by directors such as Howard Hawks, Orson Welles, Ingmar Bergman and Akira Kurosawa. 3 lectures, 1 laboratory. 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) GEB C.3.
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 laboratory. Prerequisite: ENGL 114 and ENGL 230, ENGL
ENGL 380 Contemporary Literary Ideas (4)  GEB C.3.
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: ENGL 114 or equivalent.

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 391 Topics in Applied Linguistics (4)
Issues in applied linguistics including sociolinguistics, first and second language acquisition, literacy, bilingualism, and dialectology. Applications to teaching the English language. 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 399 Tutor Training (2) (CR/NC)
Studies of approaches tutoring one-on-one. Practice in tutoring, with supervision, in the University Writing Lab. Two hours of lecture per week which reviews the special needs of ESL, dialect-different, dyslexic, and remedial students. Overview of Writing Lab administration and design. Repeatable. Non-baccalaureate credit. Credit/No Credit grading only. 1 lecture, 1 laboratory. Prerequisite: ENGL 114, ENGL 215, ENGL 302.

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 chair.

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, or ENGL 339.

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 460 Senior Project Seminar (1)
Discussion of selected subjects such as Renaissance Drama, comedy or tragedy, creative writing, and the like, for purposes of defining individual topics for completion in ENGL 461. 1 seminar. To be taken concurrently with ENGL 461. Prerequisite: English department approval.
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 485 Cooperative Education Experience (6) (CR/NC)
Part-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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and 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 Cooperative Education Experience (12) (CR/NC)
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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

ENGL 497 Theories of Language Learning and Teaching (4)
Theories of first and second language learning and acquisition in the context of teaching English as a second language/dialect. 4 lectures. Prerequisite: Eight units of linguistics or consent of instructor.

ENGL 498 Approaches to Teaching English as a Second Language/Dialect (4)
Approaches to teaching English to second language and second dialect students. Attention to materials development and testing. Practicum allows for experience within the ESL classroom. 4 lectures. Prerequisite: ENGL 497.

ENGL 499 Practicum in Teaching English as a Second Language/Dialect (2) (CR/NC)
Practical experience in the English as a Second Language/Dialect classroom under the supervision of a cooperating teacher. Teaching materials development, and curriculum design. Credit/No Credit grading only. 1 seminar, and supervision. Prerequisites: ENGL 497 and ENGL 498.

ENGL 501 Techniques of Literary Research (4) (CR/NC)
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. Credit/No Credit grading only. 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 12 units. 4 seminars. Prerequisite: Graduate standing.

ENGL 503 Seminar in English Linguistics (4)
Current modes of linguistic study and their application to English grammar. Class Schedule will list topic selected. 4 seminars. May be repeated to 12 units. Prerequisite: ENGL 290, ENGL 390 or consent of instructor.

ENGL 504 Seminar in Applied English Linguistics (4)
Consideration of applications of linguistics to literature, dialectology, language acquisition, literacy, bilingualism, or discourse analysis. Class Schedule will list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: ENGL 290, ENGL 390, or ENGL 503, or equivalent, 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 12 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 12 units. 4 seminars. Prerequisite: Graduate standing, completion of or concurrent enrollment in ENGR 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 analysis, composition theory 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 (2-4)
Supervised independent or group study of special problems in selected areas of language, composition, or literature. Total credit limited to 12 units. Prerequisite: Graduate standing in English.

ENGR—ENGINEERING

ENGR 110 Engineering Science I (3)
Introduction to engineering and computer science. Graphical communication and visualization as well as engineering orientation. Cultural pluralism and gender issues. 3 lectures.

ENGR 111 Engineering Science II (3)
Introduction to engineering and computer science. Computer-aided design (CAD) and manufacturing (CAM), and fabrication, as well as engineering orientation. Cultural pluralism and gender issues. 3 lectures.

ENGR 112 Engineering Science III (3)
Introduction to engineering and computer science. Computer science and engineering orientation. Cultural pluralism and gender issues. 3 lectures.

ENGR 141 Engineering Orientation—Freshman Seminar (2) (CR/NC)
College success skills for the technical student, including group study, time management, technical project, identification 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) GEB F.2.
Role of science, engineering and technology in the Twentieth Century. Effects of technological change, the function of the scientist-engineer in society. Computer as a tool, case studies of systems to compare alternative approaches to problem solving. 3 lectures. Prerequisite: Junior standing or consent of instructor.

ENGR 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 485 Cooperative Education Experience (6) (CR/NC)
Part-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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

ENGR 495 Cooperative Education Experience (12) (CR/NC)
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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

ENGR 581 Biochemical Engineering I (4)

ENGR 582 Biochemical Engineering II (4)
ENGR 583 Biochemical Engineering III (4)
Biochemical separations. Biological materials. Removal of insoluble-centrifugation, filtration, cell disruption. Primary product isolation: extraction, ultrafiltration, adsorption, ion exchange, fixed and fluidized bed operation. Production purification: gel filtration, affinity chromatography, salt fractionation. Final isolation: drying, crystallization. Quality control. 3 seminars, 1 laboratory. Prerequisite: ENGR 582 or consent of instructor.

ENGR 585 Cooperative Education Experience (6) (CR/NC)
Advanced study analysis and part-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 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

ENGR 595 Cooperative Education Experience (12) (CR/NC)
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 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing and 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.

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: CE 112, MATH 241, PHYS 133, and CSC 204 or CSC 251.

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, ME 341.

ENVE 324 Introduction to Air Pollution (3) GEB F.2.
Causes and effects of air pollution on the individual, the community and industry. Legal and economic aspects. For 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 330 Environmental Quality Control (3) GEB F.2.
Application of scientific and engineering principles to control the development and use of air, water and land resources. Control of pollution of the environment. Disposal of wastes. Administrative and legal aspects. For non-Engineering majors. 3 lectures. Prerequisite: Junior standing.

ENVE 331 Introduction to Environmental Engineering (3)
Application of scientific, engineering, and economic principles to development and control of environmental problems. Mathematical modeling of environmental systems. Environmental interactions between air, soil, and water. Legal and administrative aspects. 3 lectures. Prerequisite: MATH 242, CHEM 125, ME 341.

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 and senior standing.

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. 3 lectures. Prerequisite: ENVE 325, ME 313, ME 341.

ENVE 426 Air Quality Measurements (3)
Planning and conducting air quality measurements in the atmosphere, indoors and at the source. Topics include both particulates, gases and meteorological measurements. 2 lectures, 1 laboratory. Prerequisite: ENVE 325, CHEM 326.

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 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 and senior standing.

ENVE 438 Water and Wastewater Treatment Design (3)
Design of facilities for physical and chemical treatment of water and wastewater, biological treatment of wastewater, and treatment and disposal of sludge. Design of land treatment systems and septic tanks. Use of computers for design problems. 3 lectures. Prerequisite: ENVE 331.

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 442 Advanced System Design (3)
Individual and team project work in designing environmental systems including air and water pollution control, solid waste disposal and hazardous waste management. 1 lecture, 2 laboratories. Prerequisite: ENVE 411, and ME 456.

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 485 Cooperative Education Experience (6) (CR/NC)
Part-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. Credit/No Credit grading only. Total credit limited to 16 units. Prerequisite: Sophomore standing and consent of instructor.

ENVE 495 Cooperative Education Experience (12) (CR/NC)
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. Credit/No Credit grading only. Total credit limited to 16 units. Prerequisite: Sophomore standing and 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, and 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. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

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: ENVE 421 and 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) (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.

ES–ETHNIC STUDIES

ES 110 Introduction to Ethnic Studies (3)
Introduction to comparative approaches involved in the interdisciplinary study of United States and international ethnic groups, and how they relate to linguistic, institutional, gender and racial struggles of influence and power.

ES 114 Racism in American Culture (3)
Survey and analysis of racism in the development of American institutions and its effect upon ethnic groups, women, and society. 3 lectures.

ES 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 chair.

ES 210 United States Cultural Heritage (3)
History and culture of selected ethnic groups (American Indian, Asian American, African American, Latino/Chicano/a), their comparative roles in and contributions to the American cultural heritage and to the processes and struggles for ethnic and gender equality. 3 lectures.

ES 230 Chicano/a Literature (3)
Overview of contemporary Chicano and Chicana literary production since 1848. Thematic concerns and literary techniques that appear in poetry, short stories, novels and drama of Chicano/a writers. Historical and socio-economic factors that have shaped Chicano and Chicana fiction. Aztlán as an ancient myth and contemporary metaphor. 3 lectures.

ES 320 American Cultural Images (3)
Comparative study of stereotypical and archetypal impressions, images, and projections of American cultural/ethnic minority/majority groups in American popular opinion and consciousness, with emphasis on African Americans, American Indians, Asian Americans, and Mexican Americans/Latinos. See Class Schedule for group selected. 3 lectures. Prerequisite: ES 110.

ES 325 African American Women's Experiences (3)
Examination of the experiences of African American women, from their arrival in the United States through contemporary times. Ordinary as well as extraordinary Black women and their lives will occupy the center of inquiry, with the following themes in mind: economics, gender roles, race and socio-political movements. Experiences of African American females as both integral to and a unique aspect of the past, present and future of the United States. 3 lectures. Prerequisite: ES 110.

ES 350 Asian American and African American Environments (3)
Historical and cultural factors shaping various Asian American and African American environments, emphasizing the understanding of the physical settings in relation to the intentions and social situations of these different groups. 3 lectures. Prerequisite: ENGL 114, POLS 210, HIST 204, junior standing.

ES 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.

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 a maximum of 2 units per quarter. Prerequisite: Consent of department head.

ET 461, 462 Senior Project (2) (3)
Selection and completion of a project under faculty supervision. Projects are typical of problems graduates must solve in their fields of employment. Project results are presented in a formal report. Miscellaneous course fee required—see Class Schedule. Minimum 150 hours total time. Prerequisite: Senior standing and consent of instructor.

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 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 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 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 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: EET 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.

ETWT—ENGINEERING TECHNOLOGY—WELDING TECHNOLOGY

ETWT 335 Nondestructive Evaluation (3)
Theory and application of nondestructive evaluation systems for quality control. Includes radiography, ultrasonic, magnetic particle, penetrants, and eddy current. 2 lectures, 1 laboratory. Prerequisite: ETME 301, ETME 337, ENGL 218.

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 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: FIN 342.

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, conditions, 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 342. FIN 330 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 342. Recommended: 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, and ECON 337.

FIN 466 Computer Applications in Finance (4)
A combination lecture/computer lab course focusing on computer acquisition of financial data and the subsequent application of financial theory and analysis to this data so as to facilitate financial decision making. 3 lectures, 1 activity. Prerequisite: FIN 342 and MIS 321.

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.

FIN 489 Case Studies in Finance (4)
Development of analytical and decision-making techniques in applying financial theory to business management problems. Emphasizes working capital management, financial analysis and forecasting, mergers and acquisitions, and other current topics in finance, including financial ethics. Cases are used to emphasize practical problems. 4 lectures. Prerequisite: FIN 342, ACTG 321, and FIN 411.

FNR—FORESTRY AND NATURAL RESOURCES

FNR 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.

FNR 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, county, regional, national, and international levels. 3 lectures.

FNR 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 him in planning and implementation phases of an academic career program at Cal Poly. Credit/No Credit grading. 1 activity. Prerequisite: Consent of instructor.

FNR 201 Forest Resources (3)  GEB F.2.
Fundamentals of forestry including basic silviculture, forest protection, measurement and policy. Integrated resource management of forest lands for water production, forage, recreation, wildlife, and timber. 3 lectures.

FNR 202 Environmental Management (3)  GEB F.2.
Environmental management as a process within functioning societies seeking a harmonious balance between human activities and intrinsic behavior of the natural environment. Major components of the natural environment and the political and social activities that impact that environment. 3 lectures.

FNR 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.

FNR 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.

FNR 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 223.

FNR 220 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 8 units. Credit/No Credit grading only. Prerequisite: FNR 201 or equivalent.

FNR 250 Survey and Management of Mediterranean Ecosystems (2)
Woody 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.

FNR 290 Intercollegiate Forestry Activities (1) (CR–NC)
Beginning through advanced skills in the event areas of college forestry activities. Instruction in use of specialized equipment and safety. Minimum of 4 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.

FNR 300 Computer Applications in Resource Management (2)
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: AG 250 or CSC 113, junior standing or consent of instructor.

FNR 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: FNR 112, FNR 201.

FNR 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: FNR 304 or consent of instructor.

FNR 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.

FNR 305 Forest Harvesting (3)
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 or consent of instructor.

FNR 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.

FNR 314 Forest Mensuration (5)
Methods and principles of measurement for contents of trees, stands and felled timber. Construction and use of volume tables. Application of statistical measures, sampling and inventory techniques. Miscellaneous course fee required—see Class Schedule. 3 lectures, 2 laboratories. Weekend field trips required. Prerequisite: MATH 120 or equivalent, STAT 212, and AE 237.

FNR 316 Growth and Yield (3)
Site, growth and current and future yield prediction; techniques of growth determination for plantations, even-aged and all-aged forests. Use of models such as CRYPTOS. Volume from logs. Growth response to stand treatments. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Saturday field trips required. Prerequisite: FNR 314.

FNR 318 Applications of GIS in Natural Resources (2)
(Also listed as 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: Junior standing, and AG 250 or CSC 113 or consent of instructor.

FNR 325 Woodlot and Christmas Tree Management (3)
Management of farm woodlots and small forest holdings. Measurement, care and improvement of existing woodlots. 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. Weekend or full-day field trips required. 2 lectures, 1 laboratory. Prerequisite: FNR 201, FNR 208, FNR 314 or consent of instructor.

FNR 327 Forest Products (4)
Manufacturing and marketing of wood products, wood identification, study of wood structure and mechanical properties. Weekend or full-day field trip required. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: FNR 201, FNR 208, PHYS 104, or consent of instructor.

FNR 332 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. Prerequisite: FNR 201, FNR 208, FNR 314 or consent of instructor.

FNR 339 Internship in Forest and Natural Resources (1–12) (CR/NC)
Selected students will spend up to 12 weeks with an approved firm or agency engaged in forest or natural resources management. Applying and developing 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.

FNR 340 Resource Fire Management (2)
Wildland fuels, fire weather, fire behavior, and fire danger ratings in the chaparral, grassland, and wooded areas of forests, parks, and wildlands. Management implications,
Policy and objectives of fire management organizations. Saturday field trips may be required. 2 lectures. Prerequisite: FNR 204 or consent of instructor.

**FNR 342 Fire Ecology (3)**
Effects of wildland fires on shrub, woodland, and forest environments to include fuels, plants, soil, water, wildlife, and air. Emphasis is on western U.S., worldwide forest and shrub ecosystem. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: FNR 304 or ecology course, and FNR 204 or consent of instructor.

**FNR 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: FNR 304 or consent of instructor.

**FNR 350 Urban Forestry (3)**
Establishment and management of city forests, 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. Weekend or full-day field trips required. 2 lectures, 1 laboratory. Prerequisite: FNR 208, FNR 325 or consent of instructor.

**FNR 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.

**FNR 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 201.

**FNR 403 Environmental Impact Analysis (3)**
Federal and state 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: FNR 304 or equivalent, and senior standing.

**FNR 404 Environmental Law (3) (Also listed as CRP 404)**
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.

**FNR 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: FNR 403 or senior standing.

**FNR 406 Natural Resources Administration (2)**
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. Prerequisite: FNR 302.

**FNR 407 Silviculture and Vegetation Management (4)**
Interaction of forest and chaparral plant communities; influence of external factors upon wildlands, particularly those suited to forestry practices; growth and development of individual plants; cultural practices and tolerance of forest and chaparral plant communities. Impacts of intermediate and harvest treatments. Miscellaneous course fee required—see Class Schedule. Overnight and/or weekend field trips required. 3 lectures, 1 laboratory. Prerequisite: FNR 208, FNR 314.

**FNR 408 Water 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: FNR 302 or instructor approval, senior standing.

**FNR 409 Coastal Resource Management (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: FNR 304 or one course in biological or physical sciences.

**FNR 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: FNR 112 or consent of instructor.

**FNR 415 Forest and Natural Resources Valuation (3)**
Wildland, timber, and non-market appraisal, valuation and appraisal techniques. Financial and business aspects of forestry. Economic alternatives in addition to timber production. 2 lectures, 1 laboratory. Prerequisite: FNR 401. FNR 407 recommended.

**FNR 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. Basic recreation planning skills examined. Examples emphasize planning for parks and recreation. 2 lectures, 1 laboratory. Prerequisite: FNR 112 or consent of instructor.

**FNR 418 Integrated Forest Resources Management (4)**
Methods of organizing forest resources for sustained yield management; regulation of annual cut, and preparation of management plans. Multiple-use resource management will be emphasized. Discussion of Forestry Practices Act. Impact of timber management decisions on wildlife, recreation, range, and watershed resources; importance of human relations, ethics and communication. International aspects of multiple use forest resource management. Miscellaneous course fee required—see Class Schedule. Saturday or full-day field trips required. 3 lectures, 1 laboratory. Prerequisite: FNR 314, FNR 407.

**FNR 434 Tree Growth and Wood Properties (2)**
Physiology of wood formation, effects of hereditary and environmental factors on the structure, properties and uses of wood. Weekend or full-day field trips required. 1 lecture, 1 laboratory. Prerequisite: FNR 332 or consent of instructor.

**FNR 438 Wood Energy and Residue Utilization (2)**
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. International and tropical aspects of wood fuel are also considered. Miscellaneous course fee required—see Class Schedule. Overnight or full-day field trips required. 1 lecture, 1 laboratory. Prerequisite: FNR 305 or FNR 332 or consent of instructor.

**FNR 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: FNR 304 and SS 121.

**FNR 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: FNR 440.

**FNR 442 Watershed Protection (2)**
Watershed protection and rehabilitation, and water quality aspects of land use. Sampling techniques, cumulative watershed impacts. Development of watershed protection plan. 1 lecture, 1 laboratory. Overnight field trips required. Prerequisite or concurrent enrollment in: FNR 440.

**FNR 450 Community Forestry (3)**
Development and management of the urban/wildland interface. Socio-economic problems related to forest tree establishment, care, and harvest utilization. International implications also covered. Weekend or full-day field trips required. 2 seminars, 1 laboratory. Prerequisite: FNR 350 or consent of instructor.

**FNR 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.

**FNR 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.

**FNR 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.

**FNR 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.

**FNR 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.

**FNR 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.

**FNR 503 Tropical Forest Ecosystem Management (3)**
Tropical forest ecosystem classification, function and limitations. Applied tropical forest management systems; tropical problems, management, and political strategies; over-grazing and desertification; overcutting and fuelwood shortages. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**FNR 504 Agroforestry Systems (2)**
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. Special applications to tropical forest ecosystems. 2 lectures. Prerequisite: Graduate standing or consent of instructor.

**FNR 506 World Forestry in Social Context (2)**
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. International
development aspects of social forestry. 2 lectures. 
Prerequisite: FNR 504 or consent of instructor.

FNR 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.

FNR 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 seminars. Prerequisite: Graduate 
standing or consent of instructor.

FNR 571 Selected Topics in Forest Resources 
Laboratory (1–3)
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.

FNR 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.

FNR 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 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 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 within a cultural context. 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. 4 lectures. Prerequisite: FR 202 or equivalent.

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.

FR 302 Advanced French Conversation and Grammar (4)
Topics focus on culture and selected grammar points. 
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 123 Beekeeping (3)
Studies and exercises in the handling of European honey 
bees with special reference to pollination of commercial 
crops. Honey processing and marketing. Hive inspection and 
disease detection. 2 lectures, 1 laboratory.
FRSC 131 Pomology (4)
History and outlook for California fruit growing and its
relation to world fruit production. General principles of fruit
production. Field laboratories in orchard management
practices, tree and fruit identification, harvesting, grading and
packing. 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)
Management of tree canopies. Physiological response of trees
to pruning and light interception. Strategies to maximize
orchard efficiency in pome and stone fruit production. 3
lectures, 1 laboratory. Prerequisite: FRSC 131.

FRSC 133 Pomology (4)
Effects of crop level on fruit species. Management strategies
for nuts and small fruits. 3 lectures, 1 laboratory.
Prerequisite: FRSC 132.

FRSC 202 Enterprise Project (1–4) (CR/NC)
Beginning field experience in management of orchards and
vineyards or honeybees, under faculty supervision. Project
participation is subject to approval by the department head
and the Cal Poly Foundation. Degree credit limited to 4
units. Credit/No Credit grading only. Prerequisite: CRSC 201,
or consent of instructor.

FRSC 230 California Fruit Growing (4) GEB F.2.
Interrelationship of climate and cultural techniques on
orchard productivity. California’s place in the international
production-marketing scheme. 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)
Understanding of internal and external factors affecting vine
productivity. Historical and international perspectives on
grape growing. Vineyard production strategies. 3 lectures, 1
laboratory.

FRSC 331 Advanced Viticulture (4)
New research findings related to vine physiology and
vineyard productivity. Use of emerging technologies in grape
production. 3 lectures, 1 laboratory. Prerequisite: FRSC 231.

FRSC 332 Fruit Plant Propagation (4)
Physiology of fruit crop reproduction. Use of sexual and
asexual propagation techniques for fruit crops. Integration of
new research into tissue culture, rootstock selection, and
commercial fruit and 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)
World citrus and avocado production and marketing. Grove
management techniques. Relationship of environment to
species, cultivar, and rootstock selection. 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 402 Enterprise Project (1–4) (CR/NC)
Advanced experience in production of orchards and
vineyards. Development of a plan for field operations, a
marketing plan, and a budget. Management decision-
making. Project participation is subject to approval by the
department head and the Cal Poly Foundation. Degree credit
limited to 4 units. Credit/No Credit grading only. Prerequisite:
FRSC 202, and consent of instructor.

FRSC 421 Postharvest Technology of Horticultural Crops
(4) (Also listed as VGSC 421)
Respiration, respiratory constituents, ripening, and chilling
injury; harvesting methods and procedures; current handling
and packaging techniques; precooling and refrigeration;
modified and controlled atmosphere storage; relative
humidity; and transportation of horticultural crops. Field trip
to major California production areas required plus local
grower visits. Miscellaneous course fee may be required—see
Class Schedule. 3 lectures, 1 laboratory. Prerequisite: One
production class in either fruits, vegetables or ornamentals,
or consent of instructor.

FRSC 422 Tropical Crop, Fruit and Nut Production (4)
(Also listed as CRSC 422)
Production, distribution and utilization of major agronomic,
vegetable, fruit and nut crops of economic importance in
tropical areas. 3 lectures, 1 laboratory. Prerequisite: CRSC,
FRSC or VGSC 100/200-level course, or consent of instructor.

FRSC 436 Advanced Production Problems (4)
Production problem analysis. Effects of labor and new
technology introductions on existing field practices. 3
lectures, 1 laboratory. Prerequisite: FRSC 421.

FRSC 581 Graduate Seminar in Crop/Fruit Production (3)
(also listed as CRSC 581)
Group study of current problems, trends and research results
pertaining to production or marketing of field, vegetable or
fruit crops. 3 seminars. Prerequisite: Graduate standing.

FSN—FOOD SCIENCE AND NUTRITION

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 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.

FSN 170 Introductory Food Science (4)
Principles of basic food science. Chemical, physical, and
microbiological properties of foods. Ingredient properties,
preservation, and unit processing operations. Overview of
the commercial food processing industry at state and national
levels. Miscellaneous course fee required—see Class Schedule. 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 201 Enterprise Project (1–4) (CR/NC)**

Post-harvest processing of a high quality food product. Project participation is voluntary and subject to approval by the department head and the Cal Poly Foundation. Total degree credit for FSN 201 and FSN 401 combined limited to 12 units. Credit/No Credit grading only. Prerequisite: FSN 170, FSN 209, FSN 211 or FSN 230 and consent of instructor.

**FSN 209 Procurement and Use of Muscle Foods (3)**

Composition of muscle-based foods in relation to cost, yield, quality, meal preparation and nutritional value. Buying, storing, handling and preservation. Uniform retail and food service identity standards for fresh cuts. Classification and methods of making processed meat products. Credit not allowed for students having completed FSN 211. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory.

**FSN 210 Nutrition (3)**

Nutrition as it relates to health throughout the life cycle, with emphasis on the young adult. 3 lectures.

**FSN 211 Muscle Food Science (3)**

Muscle food processing methods and operations. Meat inspection, grading, composition, curing, preservation and related topics. Carcass beef, pork, and lamb will be processed into consumer ready products. Credit not allowed for students having completed FSN 209. Miscellaneous course fee required—see Class Schedule. 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. Relationship between unit operations and processes. Calculations dealing with basic fundamentals of food processing operations. 3 lectures, 1 laboratory. Prerequisite: FSN 170, MATH 118, PHYS 104.

**FSN 230 Elements of Food Processing (4)**

Principles of unit operations in food processing covering canning, freezing, dehydration, fermentation and raw material handling. Food quality and spoilage. Miscellaneous course fee required—see Class Schedule. 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 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, and economic aspects of foods. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: FSN 121, FSN 210, or consent of instructor.

**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)**

Development, organization, management and operation of a food plant sanitation and waste disposal program. Chemistry of detergents, surfactants, and anti-microbial agents. Application of state and federal legal requirements. 3 lectures. Prerequisite: FSN 302; for non-majors 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. Emphasis on role of SQC in TQM (total quality management). Utilize statistical computer software in SQC processes. Calculator required. 3 lectures. Prerequisite: STAT 211, junior standing or consent of instructor.

**FSN 333 Quality Assurance in Food Industries (4)**

Chemical, microbiological and physical methods of analyses of foods used in the food plant quality assurance and product
development laboratory. Hazard analysis and critical control point principles for food production. Organization and management of quality control program. Development of food production standards. 3 lectures, 1 laboratory. Prerequisite: FSN 302, CHEM 326; for non-majors FSN 230 and consent of instructor.

FSN 336 Food Packaging (3)
Packaging materials, packages and packaging methods applicable to a variety of processed and prepared foods. Oral presentation required. Field trip may be required. 3 lectures. Prerequisite: FSN 302; for non-majors FSN 230 and consent of instructor.

FSN 338 Further Processing of Muscle Foods (3)
Science and technology of further meat processing, including curing, sausage manufacturing, intermediate moisture products and restructuring. Raw material selection, product formulation, yield calculations, packaging and use of equipment. Field trip required. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: FSN 209 or FSN 211 and CHEM 326 or consent of instructor.

FSN 339 Cereal Science and Processing (3)
Applied science of cereal-based products, bakery, sheeted, and extruded food products. Principles of cereal chemistry and physical-chemical and functional properties of cereal ingredients. Comparative nutritional evaluation of flours, grains, and finished products. Product development concepts. 3 lectures. Prerequisite: FSN 302; for non-majors 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 343 Institutional Foodservice I (3)
Principles of equipment selection and floor planning with emphasis on institutional food production and sanitation/safety. 2 lectures, 1 laboratory. Prerequisite: FSN 321 and junior standing.

FSN 344 Institutional Foodservice II (3)
Economic principles and problems involved in planning and preparing food using institutional equipment to meet specific product standards for large groups. 2 lectures, 1 laboratory. Prerequisite: FSN 343.

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 401 Advanced Enterprise Project (1-4) (CR/NC)
Leadership responsibility on enterprise projects. Lead students, under the supervision of instructor, will be accountable for all phases of the project: scheduling times, securing raw product, record keeping, and marketing of the product. Total degree credit for FSN 201 and FSN 401 combined limited to 12 units. Credit/No Credit grading only. Prerequisite: FSN 201 and junior standing and consent of instructor.

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 (4)
Characteristics of food color, consistency, texture and flavor. Sensory difference and consumer acceptance testing methods. Panel training and selection techniques. Problem solving, statistical analysis of data, and management reporting methods. 3 lectures, 1 laboratory. Prerequisite: FSN 302, STAT 211.

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. Miscellaneous course fee required—see Class Schedule. 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, EDUC 305, and senior standing.

FSN 416 Community Nutrition (3)
Introduction to federal, state, and local programs. Practice in developing culturally sensitive plans for community assessment, program interventions, and evaluations on behalf of population groups at nutritional risk. 3 lectures. Prerequisite: FSN 415.

FSN 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.

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. 3 lectures. Prerequisite: FSN 344, MGT 206, and senior standing.
FSN 429, 430 Diet Therapy I, II (3) (3)
Modification of normal food intake and dietary patterns, with emphasis on dietary adjustments necessitated by certain disease processes and conditions. 2 lectures, 1 laboratory. Prerequisite: FSN 328, FSN 329 and senior standing; 430: FSN 429.

FSN 431 Advanced Muscle Food Science (3)
Physical, chemical and functional properties of muscle foods. Quality assurance and special problems associated with raw materials, processing methods and finished product. 2 lectures, 1 laboratory. Prerequisite: Junior standing, FSN 209 or FSN 211, and CHEM 328 or consent of instructor.

FSN 435 Food Engineering (4)
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. 4 lectures. Prerequisite: FSN 302.

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 topics in processing operations with emphasis in heat transfer, physical and chemical changes in foods as a function of processing conditions. Oral presentation required. Field trip may be required. 3 lectures, 1 laboratory. Prerequisite: 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. 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 500 Individual Study (1–6)
Advanced independent study planned and completed under the direction of a member of the department faculty. Total credit limited to 6 units. Prerequisite: Graduate standing, consent of supervising faculty member and graduate adviser.

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.

FSN 599 Thesis (1–6)
Individual research in food science and nutrition under faculty supervision leading to a graduate thesis of suitable quality. Total credit limited to 6 units. Prerequisite: Graduate standing and consent of instructor.

GEOG—GEOGRAPHY

GEOG 150 Human Geography (3)
Introduction to the diversity, interrelationships, and spatial features of global cultures. Survey of the field with emphasis on characteristics and/or patterns of population, race, ethnicity, language, religion, government, and economic activity. 3 lectures.

GEOG 215 Human Impact on the Earth (3)
Global assessment of human impact on vegetation, animals, soil, 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 diverse patterns of climate, landforms, vegetation and soils. Seeks to account for their distribution and interrelationships with human cultures. 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 territorial-state, relationships between territorial-states. 3 lectures. Prerequisite: Junior standing.

GEOG 308 Global Geography (3)
Survey of principal elements of global geography; multicultural assessment of interrelationships and/or patterns of human activities and biophysical environments, especially in relation to international linkages and trends. Focus on selected regional examples from the developed and developing worlds. 3 lectures. Prerequisite: Junior standing.
GEOG 310 Urban Geography (3)
Overview of geographic concepts, principles, and generalizations related to urban functions, forms, distribution, and growth. Origin and spread of an urban tradition; cities and their hinterlands; internal structure of cities; neighborhoods and ethnicity in the city. 3 lectures. Prerequisite: Junior standing.

GEOG 315 Geography of Resource Utilization (3)
A multicultural, world view of the interconnections of the following resource systems: food, energy, water and nonfuel minerals. A pervading theme is the sustainability of these systems. 3 lectures. Prerequisite: Junior standing.

GEOG 325 Climate and Humanity (3)
Geographic perspective on the interrelationships between climate and human cultures. 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; ethnic patterns of settlement and landscape alteration; economic development; current problems. 3 lectures. Prerequisite: Junior standing.

GEOG 350 Geography of the United States (3)
The population (including origin, ethnicity, migrations, and distributions), 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 a selected world area. Cultural characteristics, land utilization, and economic development viewed against the background of the physical environment. 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.

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.

GEO–GERMAN

GER 101, 102, 103 Elementary German (4) (4) (4)
For beginners. Class practice in pronunciation, sentence structure, reading, writing and basic conversation using the communicative approach. 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 within a cultural context. 3 lectures, 1 activity. Prerequisite: GER 103 or consent of instructor.

GER 233 Critical Reading in German Literature (4) (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. 4 lectures. Prerequisite: GER 202 or equivalent.
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.

GER 302 Advanced German Conversation and Grammar (4)
Topics focus on culture and selected grammar points. Individual and group presentations and interaction using videos. 4 lectures. Prerequisite: GER 202 or consent of instructor.

GER 305 Significant Writers in German (4) GEB C.3.
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) 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 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 (4)
Graphic communication history, theory, processes, management and industry segments. Reproduction technology from a systems concept showing fundamental relationships between art and copy preparation and reproduction of print media. 4 lectures.

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 277 Computer Applications in Desktop Publishing (3) GEB F.1.
Computer applications, their relationship to print media and publishing. How desktop publishing is influencing and is influenced by society. Use and selection of personal computers, desktop publishing software, and output devices. Terminology, typography, creating, editing, transferring, merging text and graphics. Credit not allowed for GRC majors. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory.

GRC 300 Typography (4)
Typographic principles, practice and layout of high-end electronic display and text composition. Finer points of spacing and type arrangement. Type selection and mark-up. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: GRC 101.

GRC 301 Electronic Publishing Systems (3)
Significance, terminology, and components of electronic publishing systems. Current options for hardware and software used in the graphic communication industry and the advantages and disadvantages of the various options. PostScript and its role in electronic publishing. Evaluating and specifying an electronic publishing system. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: GEB area F.1. requirement and GRC 101.

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, digital imaging, integrated systems, non-impact printing, and related technologies. Technological transitions and how to manage technological change. Prerequisite: GRC 101 and 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)
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. Prerequisite: GRC 101.

GRC 312 Substrates and Ink: Applications (2)
Technical aspects of paper, other substrates, and ink used in the printing industry. Manufacture, applications, and interaction of these materials are examined in relation to particular processes and end use requirements. Credit not allowed for GRC majors. 2 lectures. Prerequisite: GRC 101.

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 300.

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 301.

GRC 324 Binding and Finishing Processes (3)
Imposition techniques, cutting, and folding. 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, 1 laboratory. Prerequisite: GRC 101.

GRC 325 Binding and Finishing Processes: Applications (2)
Imposition techniques, cutting, folding, book and publication binding. Stitch, case and adhesive binding techniques and applications. Technology and aesthetic uses of die cutting, scoring, creasing, foil stamping and embossing. Credit not allowed for GRC majors. 2 lectures. 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 101 and junior standing.

GRC 327 Graphic Arts Photography (4)
Optical and electronic methods of graphic arts photography. Photographic materials and equipment for the graphic arts. Densitometry, light sources, exposure and development control. Line halftone, and color separation theory and practice. Color scanners, color electronic prepress systems and desktop color. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: GRC 301.

GRC 328 Film Assembly and Platemaking (3)
Planning for lithographic plates. Conventional film assembly techniques including the preparation of supports for black and white and flat color stripping using manual methods. Step and repeat techniques. Film contacting and duplicating methods. Manual and computerized techniques for bookwork imposition. Lithographic platemaking theory and practice. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: GRC 301.

GRC 329 Prepress Methods and Procedures (3)
Introduction to graphic arts photography including photographic materials and equipment. Line, halftone and color separation theory and practice. Planning and preparation of film materials for lithographic stripping. Black and white color proofing. Preparation and use of various lithographic plates. Miscellaneous course fee required—see Class Schedule. Credit not allowed for GRC majors. 2 lectures, 1 activity. Prerequisite: GRC 101.

GRC 330 Print Reproduction Processes (3)
The functions of press departments in printing segments of commercial, books, advertising, catalogs, newspapers, business forms, magazines, packaging, quick printing. Standard contract language, press checks, quality assurance. Credit not allowed for GRC majors. 2 lectures, 1 activity. Prerequisite: GRC 101.

GRC 331 Color Quality Control (4)
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 inspection, process control, and quality measurement. Use of instruments to quantify color properties. 3 lectures, 1 laboratory. Prerequisite: GRC 311.

GRC 333 Printing 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 101 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 301.

GRC 357 Screen Printing Technology (2)
Methods and procedures 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 101.

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)
Printing marketing and sales management. Graphic communication market determination, market strategy, and implementation. Strategic sales management, personal selling, forecasting and planning for printed products. 2 lectures, 1 laboratory. Prerequisite: GRC 101.

GRC 403 Printing Estimating (4)
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: GRC 330 or GRC 416.

GRC 411 Pricing, Costing and Web Estimating (3)

GRC 414 Color Image Assembly (2)
Terminology, materials, equipment, facilities and methods used in manual and electronic color image assembly. Registration, masking, color-building, trapping, and screen angling. Film duplicating, contacting, composite film, PostScript output, and color proofing. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 laboratory. Prerequisite: GRC 328.

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. 4 lectures, 1 laboratory. Prerequisite: GRC 101 and CHEM 122.

GRC 416 Web Printing Technology (5)
Analysis of web press technology for lithography, gravure, flexographic and letterpress printing. Applications for newspapers, packaging, business forms, magazines, books, catalogs and commercial products. Applications of computers to the management and technical function of web technology. 4 lectures, 1 laboratory. 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 416.

GRC 421 Printing Production Management (4)
Production planning, scheduling, and control for printed products. Equipment and inventory planning, resource optimization, and the application of quality management principles to the printing industry. 3 lectures, 1 activity. Prerequisite: GRC 101, and MATH 117, MATH 118, or MATH 120.

GRC 422 Printing Supervision and Personnel Issues (4)
Supervising employees and its application to human factors in the graphic communication profession. A total quality management approach is utilized emphasizing policy development, training, safety, motivation, quality specifications, ergonomics, ethical and legal issues in the printing industry. 3 lectures, 1 laboratory. Prerequisite: GRC 101 and senior standing.

GRC 423 Printing Labor Relations (4)

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 101, GRC 327, 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 438 Electronic Art Preparation (4)
Preparation and evaluation of current and experimental graphic/typographic images for the major printing processes; pagination and graphic/typographic modification by electronic means. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: GRC 327.

GRC 439 Line and Halftone Media for Books and Publications (4)
Complex and experimental copy electronically generated and art preparation for use in line and halftone reproduction by gravure and offset lithography for book/quality paperback and journal reproduction. Mechanical requirements; production procedures, implemented through computer-controlled production equipment. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: GRC 416, GRC 438.

GRC 440 Advanced Copy Technology for Newspapers and Magazines (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 for magazine and newspaper production. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: GRC 439.

GRC 460 Research Methods in Graphic Communication (1)
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: ENGL 215 or ENGL 218, GRC 460, and 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 per quarter. Credit/No Credit grading only. 2 activities. Prerequisite: Consent of instructor.

GRC 485 Cooperative Education Experience (6) (CR/NC)
Part-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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

GRC 495 Cooperative Education Experience (12) (CR/NC)
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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

GSB—GRADUATE STUDIES—BUSINESS

GSB 502 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. This course may not be used for credit toward graduation. 4 seminars.

GSB 511 Financial Accounting (4)

GSB 512 Quantitative Analysis (4)
Introduction to matrices and 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. Use of computers to solve problems. 3 seminars, 1 laboratory. Prerequisite: GSB 502 or equivalent.

GSB 513 Organizational Behavior (4)
Examination of major organizational behavior (individual, interpersonal, group, and organizational) 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.

GSB 514 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 521 Managerial Accounting (4)
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 activity. Prerequisite: GSB 511.

GSB 522 Management Science (4)
Concepts and techniques of management science. Mathematical programming, decision theory, queuing models, network models, Markov analysis. Game theory. Dynamic programming. Use of computers to solve problems. 3 seminars, 1 laboratory. Prerequisite: GSB 521.

GSB 523 Managerial Economics (4)
Microeconomic analysis and its application to business decisions. Topics include the use of calculus and other quantitative techniques in economic analysis, market structures, pricing strategies, cost analysis and input selection. Examination of the economic impact of various governmental policies on the business firm. 4 seminars. Prerequisite: GSB 512.

GSB 524 Marketing Management (4)
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.
GSB 531 Managerial Finance (4)
Theories, practices and tools of financial decision making. Topics include financial statement analysis, financial forecasting, valuation, capital budgeting, capital structure, dividends, and an overview of financial markets and institutions. 4 seminars. Prerequisite: GSB 511 and GSB 512.

GSB 532 Information Systems (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. Prerequisite: GSB 511.

GSB 533 Aggregate Economics (4)
Theoretical framework and empirical dimensions of the aggregate economic environment in which business enterprise must operate. Understanding of national income accounting, monetary and fiscal policies, inflation, unemployment and balance of payments issues in static and dynamic contexts. Develops an ability to understand macroeconomic events in an evolving and interconnected world economy. 3 seminars, 1 activity. Prerequisite: GSB 523.

GSB 534 Production and Operations Management (4)
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. Prerequisite: GSB 522.

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. Satisfies comprehensive examination requirement. Prerequisite: Must be taken within last 24 units of graduation.

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. Prerequisite: GSB 513.

GSB 571 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. Prerequisite: GSB 513.

GSB 572 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: Second-year standing.

GSB 573 Market Research and Planning (4)
Makes the student a knowledgeable user of marketing research information to develop and implement marketing plans. Emphasis on development of ability for using research information to formulate marketing objectives and strategies and to analyze marketing problems in depth. 4 seminars. Prerequisite: GSB 524.

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. Prerequisite: GSB 513.

GSB 575 Legal Aspects of Business (4)
Managerial approach to important legal issues affecting business and the market system. Focus on those aspects of law which affect managers directly including contracts, products liability and corporations in perspective; principles of partnership authority, liability, and control; managerial duty and liability to the corporation; public control of managerial activity. 4 seminars.

GSB 576 Seminar in Quality and Performance Management (4)
Principles and techniques of quality and performance management as applied to organizations in the private and public sector. Emphasis on competitive implications. Integration of fundamental management techniques, existing improvement efforts, technical tools, and new management technologies focused on continuous organizational improvement. 4 seminars. Prerequisite: GSB 513.

GSB 577 Advanced Quantitative Business Analysis (4)
Case studies using the concepts of GSB 512 Quantitative Business Analysis and GSB 522 Management Science, 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 computers. 3 seminars, 1 laboratory. Prerequisite: GSB 522.

GSB 578 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. Prerequisite: GSB 513.

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.

GSB 580 Industrial Marketing (4)
Marketing of business goods and services to other businesses, governmental agencies and social institutions by the manufacturer. Market analysis, sales forecasting, product strategy, effective use of sales force and industrial advertising media. 4 seminars. Prerequisite: GSB 524.

GSB 581 Marketing Management Seminar (4)
Practice in the application of analytical tools and techniques to current and potential marketing problems. 4 seminars. Prerequisite: GSB 524.

GSB 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: GSB 524.

GSB 583 Management of Human Resources (4)
Major functional areas of human resource management, including human resource planning, job analysis, recruitment, selection, performance measurement, employee training and career development, compensation, legal compliance and employee rights. Emphasis on analysis of human resource problems as they arise in real-world settings. 4 seminars. Prerequisite: GSB 513.

GSB 584 Seminar in Financial Policy (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 decisions under conditions of risk, and financing and capital structure decisions. 3 seminars, 1 activity. Prerequisite: GSB 531.

GSB 585 Seminar in Investments (4)
Stock, bond and options market. Emphasis on operations of markets, the efficient markets hypothesis and portfolio theory. Setting investment objectives and managing portfolios given efficient capital markets. 4 seminars. Prerequisite: GSB 531.

GSB 586 Financial Institutions and Markets (4)
Structure of money and capital markets and the financial institutions that operate in these markets. Evaluation of contemporary thought on the evolving market and institutional arrangements. Emphasis on the management policies of the institution. 4 seminars. Prerequisite: GSB 531.

GSB 587 International Financial Management (4)
Analysis of the problems facing the financial manager of an international company. Topics include the international monetary system, mechanics of the foreign exchange market, determinants of exchange rates, financing and investment in foreign currencies, trade financing, international capital budgeting, and international working capital management. 4 seminars. Prerequisite: GSB 531.

GSB 588 Cooperative Education Experience (6) (CR/NC)
Advanced study analysis and part-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. A maximum of 8 units can be used toward graduation. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor and adviser.

GSB 589 Accounting Policy (4)
Role of management in establishing and directing accounting policy. Coverage includes the impact of management decisions on external reporting and taxes and the impact of financial reporting requirements on management decisions. 4 seminars. Prerequisite: GSB 521.

GSB 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 591 Industry Analysis (4)
In-depth study of major industry using analytical tools developed in first-year 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. Prerequisite: Second-year standing.

GSB 592 Cooperative Education Experience (12) (CR/NC)
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. A maximum of 8 units can be used toward graduation. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor and adviser.

GSB 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. 3 seminars, 1 laboratory. Prerequisite: GSB 532.

GSB 594 Future of Business (4)
Examination of the techniques and conclusions of representative future studies by research institutions such as the Rand Corporation, Hudson Institute and The Club of Rome. Analysis of the implications of those conclusions for the operations and role of business in society. 4 seminars. Prerequisite: GSB 514.
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: Second-year standing.

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. Use of computers in solving problems. 3 seminars, 1 laboratory. Prerequisite: GSB 533.

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. Prerequisite: GSB 533.

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. Minimum forty hours of work experience per two units of credit. A maximum of 8 units can be used toward graduation. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor and adviser.

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. Prerequisite: Second-year standing.

**HD—HUMAN DEVELOPMENT**

**HD 102 Human Development: Introduction to Issues and Applications** (3)
Introduction to Human Development as a multidisciplinary field and to Psychology and Human Development at Cal Poly. Illustrative applications of research and scholarship relating to individual, family, educational, and social issues. 3 lectures.

**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 Child, Family, and Community** (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. Not open to HD majors. 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 128 Program Planning for Infants and Toddlers** (3)
Creating an environment to meet the needs of the infant and toddler. Establishing communication in an atmosphere of trust and providing activities which enhance the emerging capabilities of the infant and toddler. 3 activities.

**HD 130 Supervised Study of Children** (4)
Faculty supervised experience with children ranging in ages from infancy to middle childhood. Participant observation, data collection skills, planning and conducting activities for individuals and groups in educational or childcare facilities. Prerequisite: HD 102, HD 128 or consent of instructor.

**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 209 Early Development: Conception through Childhood** (5)
Development and behavior of children from conception through age ten. Intellectual, physical, emotional, and social development of the growing child as it relates to the environment. 5 lectures. Prerequisite: PSY 201 or PSY 202, HD 102 or consent of instructor.

**HD 211 Early Childhood Learning: Applications for the Preoperational Period** (5)
Activities, organizational practices, and methods which promote the development of young children during the preoperational period. 5 activities. Prerequisite: HD 102, HD 128, HD 209, PSY 201 or PSY 202 or consent of instructor.

**HD 230 Supervised Study of Children: Early Childhood** (4)
Teaching experience with children in a preschool laboratory setting. Participant planning, execution and evaluation of age-appropriate activities. Use and assessment of a variety of observation and performance evaluation tools. 4 laboratories. Prerequisite: HD 130, HD 209, HD 211.

**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 209 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 311 Early Childhood Learning: Applications for the Transitional Period (5)
Activities, organizational practices and methods which promote children's development during the transitional period. 5 activities. Prerequisite: HD 211.

HD 324 Guiding Young Children (3)
Group process and guidance techniques for adults working with young children in family, community, and educational settings. Examination of cases which require the application of theory to practical situations typically encountered by adults working with young children. 3 lectures. Prerequisite: HD 130, HD 209, HD 311.

HD 330 Supervised Internship (4) (CR/NC)
Faculty-supervised internship. Role of professional apprentice is experienced and analyzed by each student. Credit/No Credit grading only. Prerequisite: HD 211, HD 230, PSY 323, PE 280, junior standing and consent of instructor.

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 Perspectives on Childhood Education (3)
Past, present and future perspectives in theory and practice of childhood education. Analysis of current research issues and applications. 3 seminars. Prerequisite: HD 330 or consent of instructor.

HD 404 Administration of Children's Programs (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 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. Credit/No credit grading only. Prerequisite: HD or Liberal Studies major, HD 330, and consent of instructor.

HD 461, 462 Senior Project (2) (2)
Selection and completion of a project under faculty supervision. Project must be related to human development field. Results of this project must be presented in a formal, written report. Minimum of 120 hours total time. Prerequisite: PSY 329, HD 330 or HD/PSY 453, HD major, completion of Graduation Writing Requirement, and consent of instructor.

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.

HIST—HISTORY

HIST 101, 102, 103 History of Western Civilization (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 United States History (3) GEB D.1.
Origins and development of the United States from the 15th century to the New Nation. 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. 3 lectures.

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 300 Research Methods (3)
Introduction to historical methodology. Emphasis will be upon formulating a research topic; choosing appropriate research strategies and methods; and interpreting primary and secondary sources. Project in lieu of final examination. 3 seminars.

HIST 301 Writing and Research Seminar in History (3)
Intensive writing and research to prepare a major historical essay with a strongly argued thesis and extensive historiographical context. Students prepare written and oral commentaries on papers presented in seminar. Completion of extensive paper in lieu of final examination. 3 seminars. Prerequisite: HIST 300, ENGL 114, and ENGL 125 or PHIL 125 or SPC 125.

HIST 302 Historiography (3)
Theory, interpretation and philosophies of history. 3 seminars. Prerequisite: HIST 300, HIST 301 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, African-Americans, 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. Contemporary issues of race, class and gender will be the central thematic focus. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 328  American Indian History (3)
Historical examination of Native American cultures; topics of cultural conflict, changing roles of women, and contributions emphasized. Contemporary race, class and gender issues will be examined. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 329  American Indian Thought (3)
Cultural, spiritual, and intellectual contributions of several Native American societies; the philosophical and religious influences of Indians upon U.S. society; their intellectual and cultural adaptation to White domination. Contemporary issues of race, class and gender will be a central focus. 3 lectures. Prerequisite: Junior standing.

HIST 331  Afro-American History (3)
Political, cultural and social history of African Americans from the early 17th century to the present. Historical contributions to American cultural and political life. Issues of race, class and gender will be a central focus. 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 Precolonial African History (3)
Survey of African history from earliest times. Ancient African civilizations, Moslem penetration, the rise of indigenous kingdoms and the continuous impact of trade, including the Atlantic slave trade. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 382 Modern African History (3)
Survey of African in the 19th and 20th centuries including European colonialism, African resistance, the rise of African nationalism and problems since independence. 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 404 The Era of Civil War and Reconstruction (3)
Exploration of the different patterns of life in the United States, in order to comprehend the emergence of sectionalism, the violent struggle of the Civil War, and the readjustments of the Reconstruction years. Emphasis on the experiences of ordinary Americans. 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 409 Vietnam War at Home and Abroad (3)
Interaction of revolutionary Vietnamese nationalism with U.S. foreign policy. Analysis of the war and its relationship to American society. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 410 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 415 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 416 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 417 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 424 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 434 American Women's History to 1870 (3)
Female ideology and experience from the colonial period to the creation of an independent women's movement after the Civil War. Considers how the history of women both reflects and shapes American culture and society. 3 seminars. Prerequisite: Junior standing or consent of instructor.

HIST 435 American Women's History from 1870 (3)
The female past in the more modern period of U.S. history. Considers how transformations in gender roles are reflective of other significant changes in American culture and society. Emphasis on class, race, and ethnic variations in women's experience. 3 seminars. 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 440 Topics and Issues in the History of the United States (3)
Selected topics and issues in United States history. Descriptive subtitles assigned to each course. May be repeated to six units. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 441 Topics and Issues in European History (3)
Selected topics and issues in European history. Descriptive subtitles assigned to each course. May be repeated to six units. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 442 Topics and Issues in Latin American History (3)
Selected topics and issues in Latin American history. Descriptive subtitles will be assigned to each course. May be repeated to six units. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 443 Topics and Issues in Asian History (3)
Selected topics and issues in Asian history. Descriptive subtitles will be assigned to each course. May be repeated to six units. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 444 Topics and Issues in African History (3)
Selected topics and issues in African history. Descriptive subtitles will be assigned to each course. May be repeated to six units. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 445 Topics and Issues in Comparative History (3)
Selected topics and issues in comparative history. Descriptive subtitles will be assigned to each course. May be repeated to six units. 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 300, HIST 301, HIST 302.

**HIST 463 Undergraduate Seminar (2)**
Historical analysis of selected problems and topics for undergraduates. 2 seminars. Prerequisite: HIST 300, 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 485 Cooperative Education Experience (6) (CR/NC)**
Part-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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

**HIST 495 Cooperative Education Experience (12) (CR/NC)**
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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and 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 361 Modernism (4) GEB C.3.**
Interdisciplinary survey of the nineteenth and early twentieth-century concepts and cultural movements known as modernism throughout Europe, North America and Latin America. Disciplines include architecture, art, drama, literature, music, philosophy, and photography. 4 lectures. Prerequisite: Junior standing and ENGL 215 or ENGL 218.

**HUM 362 Postmodernism (4) GEB C.3.**
Development, major characteristics, and social implications of this significant movement within twentieth-century thought. Works studied to be chosen from disciplines including art, architecture, literature, music, literary criticism and philosophy. 4 lectures. Prerequisite: 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.

**IME—INDUSTRIAL and MANUFACTURING ENGINEERING**

**IME 101 Introduction to Industrial and Manufacturing Engineering (1)**
Development of the industrial economy and the professions of industrial and manufacturing engineering. Concepts and principles of industrial organization and management. Survey of engineering techniques and areas of application in manufacturing and service systems. Career opportunities review. 1 laboratory.

**IME 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.

IME 122 Manufacturing Survey (1)
Overview of manufacturing processes relating to metals and plastics. Study of materials, including composites. Survey of net shape, materials joining, and material removal processes. Open to all majors. 1 lecture.

IME 141 Manufacturing Processes: Net Shape (1)
Metal casting as a net shape process in manufacturing. Properties of molding materials and methods of casting. Introduction to rapid prototyping. Pattern and casting design principles. Miscellaneous course fee required—see Class Schedule. 1 laboratory.

IME 142 Manufacturing Processes: Materials Joining (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. Introduction to adhesive bonding. Miscellaneous course fee required—see Class Schedule. Open to all majors. 1 lecture, 1 laboratory.

IME 143 Manufacturing Processes: Material Removal (2)
Uses, capabilities, and theoretical and operational characteristics of lathe and milling machine tools, including conventional, automatic and numerical control. 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. Open to all majors. 1 lecture, 1 laboratory.

IME 145 Manufacturing Processes: Machining (1)
Relationship between engineering design and production fabrication. Hole forming by drilling, boring, broaching, punching, piercing and nontraditional methods. Forming and assembly of gauge metal components. Engineering and economic significance of various production techniques. Miscellaneous course fee required—see Class Schedule. Open to all majors. 1 laboratory. Prerequisite: IME 143 or consent of instructor.

IME 155 Industrial Welding (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: IME 142.

IME 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 prototype from start to finish in 60 hours of project-oriented laboratory. Miscellaneous course fee required—see Class Schedule. Open to all majors. 1 lecture, 2 laboratories.

IME 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.

IME 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. Credit not allowed for Industrial Engineering or Manufacturing Engineering majors.

IME 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. Credit not allowed for Industrial Engineering or Manufacturing Engineering majors.

IME 222 Engineering Analysis (3)
Mathematical and statistical methods of evaluating and control of variability of engineering design parameters, predicting deviations from expected averages, grouping data for computations. Computer applications. Quality control concepts and applications. 2 lectures, 1 activity. Prerequisite: MATH 131. Credit not allowed for Industrial Engineering or Manufacturing Engineering majors.

IME 223 Work Design and Measurement (4)
Principles of work simplification and motion analysis. Recording of work flow and methods. Work measurement and standards, time study, synthetic data, predetermined time systems and work sampling. Allowances and performance rating, productivity measures. Work design improvement. Military standards. 3 lectures, 1 laboratory. Prerequisite: MATH 141, IME 141.

IME 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, IME 143, CSC 204 or CSC 251 or equivalent.

IME 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.)

IME 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. 3 lectures. Prerequisite: IME 223.

IME 240 Additional Engineering Laboratory (1-2)
Total credit limited to 4 units, with a maximum of 2 units per quarter. 1 or 2 laboratories.

IME 241 Process Design I (1)
Chip formation, tool geometry, feed and speed rates; producibility, machinability, part and tool materials, cutting fluids, and tool life testing. Finishes and measurement of surface roughness; instrumentation, analysis, and dynamometry; test report writing, documentation, and inspection methods. 1 laboratory. Prerequisite: IME 143, MATH 142.

IME 242 Process Design II (4)
Advanced turning and milling processes; grinding and non-traditional processes. Thread systems and manufacturing; gear manufacturing; tolerancing and fits; project management; manufacturing properties of materials. 2 lectures, 2 laboratories. Prerequisite: IME 241, PHYS 131.

IME 243 Process Design III (4)
Sheet metal fabrication, bend allowance calculations; coating processes, powder-metallurgy and ceramic processes. Deformation processes, sheet metal forming; plastics and composite processes. Finishing processes, fastening and joining by adhesive bonding and welding. 2 lectures, 2 laboratories. Prerequisite: IME 242.

IME 251 Introduction to Manufacturing Engineering Analysis (3)

IME 301 Operations Research I (4)
Introduction to operations research, matrix theory, linear programming formulation and solution. Simplex method, sensitivity analysis, transportation and assignment algorithms. Introduction to linear networks and goal programming. Existing computer programs utilized. 4 lectures. Prerequisite: MATH 242.

IME 303 Project Organization and Management (4)
Design, analysis and implementation of a major industrial/business systems problem. Emphasis on situations requiring resolutions and management decisions by groups representing various elements of an enterprise. Resource leveling and management under constraints. 4 lectures. Prerequisite: Junior standing. IME 239 or equivalent.

IME 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.

IME 305 Operations Research II (4)
Queueing models, dynamic programming and inventory models, Markovian processes, simulation modeling, computer programming in solution of problems. 4 lectures. Prerequisite: IME 301 or IME 304, STAT 321.

IME 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. 3 lectures. Prerequisite: IME 239, IME 314, CSC 204 or CSC 251.

IME 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, MATH 241.

IME 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.

IME 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: IME 233, ETME 143, CSC 251 or a course in a high level computer language.

IME 335 Computer-Aided Manufacturing I (4)
NC and CNC programming; benefits, limitations, and selection of CAD and CAM systems. Graphics-based and conversational language NC. CAD/CAM interface and configuration of software, post-processor generation, curve, surface, and solid model generation. Programmable controllers. 3 lectures, 1 laboratory. Prerequisite: IME 251, CSC 204.

IME 336 Computer-Aided Manufacturing II (4)
Data storage, transfer, distribution, and interchange standards. Interface between CAD/CAM and CIM. Automation strategies. Role of computers in CIM: manufacturing information systems, manufacturing data bases, functions of manufacturing operations, group technology, process planning, and production planning. Flexible Manufacturing Systems. 3 lectures, 1 laboratory. Prerequisite: IME 335.

IME 341 Tool Engineering (4)
Design and engineering of jigs, fixtures, molds, and dies; material selection. Field trips to manufacturing centers. 3
IME 419 Lectures, 1 laboratory. Prerequisite: IME 242, CE 204, MATH 242, PHYS 133, MATE 206.

IME 342 Manufacturing Systems Integration (3)
Survey of facilities layout, human factors, simulation, and production control to provide manufacturing engineering majors with background and aid in selection of technical electives. 3 lectures. Prerequisite: IME 223, IME 239.

IME 356 Manufacturing Automation (4)
Computers in the factory automation environment. Basic control theory including feedback and process synchronization. Programming and use of intelligent controllers, robotic arms, and industrial control systems. Interfacing of electro-mechanical systems; encoders and servo systems; programmable controllers. Computer process control. 3 lectures, 1 laboratory. Prerequisite: IME 233 or IME 335, EE 201, EE 321, ME 211.

IME 357 Advanced Electronic Manufacturing (4)
Electronic manufacturing 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: IME 157, ENGL 218, EE 321.

IME 358 Advanced Manufacturing (4)
Manufacturing 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: IME 157, ENGL 218, EE 321.

IME 361 Advanced Welding Processes (4)
Modern material joining processes, with emphasis on high energy density. Laser beam, electron beam, and plasma arc welding processes. Welding fixtures positions and power sources. Welding automation and control. Robotic arc welding. 2 lectures, 2 laboratories. Prerequisite: IME 142, PHYS 133.

IME 362 Welding Quality Control (4)
Weldability of engineering materials. Thermal effects of welding, including residual stresses and distortion. Weld defects, their examination, and correction. Mechanical properties and testing of weldments. 2 lectures, 2 laboratories. Prerequisite: IME 361, MATE 206, MATE 241, ME 313.

IME 363 Design for Welding (4)
Welding design, concepts and practices; connection design, and weld sizing. Welding codes and procedure qualification. Cost analysis of welding. 2 lectures, 2 laboratories. Prerequisite: IME 362.

IME 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. Prerequisite: Consent of department chair.

IME 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.

IME 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.

IME 407 Operations Research III (4)
Advanced linear programming as applied to problems in industrial systems. Integer and goal programming. Application of nonlinear, quadratic, dynamic programming concepts. Case studies of current topics in industrial engineering. 4 lectures. Prerequisite: IME 301, IME 305.

IME 408 Systems Engineering (3)
Systems, subsystems, static, dynamic, closed and open systems. Systems design requirements. Performance measures. Process control modeling and analysis, transform methods, linear systems analysis, digital, adaptive and steady state optimal control. Optimal search strategies. Manufacturing, maintenance, replacement and engineering applications. 3 lectures. Prerequisite: IME 305, IME 426, CSC 204 or CSC 251.

IME 409 Economic Decision Systems (3)
Economic evaluation of information for complex decisions. Analysis of risks and uncertainties. Bayes theory and models. Decision theory, sequential decisions, and value of information applied to financial evaluation and control. Major project justification procedures. 3 lectures. Prerequisite: IME 305, IME 314.

IME 410 Inventory Control Systems (4)
Inventory planning and control systems. Implementation of manufacturing resource planning including demand forecasting, production planning, master scheduling, bill-of-material, and inventory master file. Capacity requirements planning and shop floor control. 3 lectures, 1 laboratory. Prerequisite: IME 305, IME 312, or equivalent.

IME 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 simulation modeling. 2 lectures, 1 laboratory. Prerequisite: IME 410, or equivalent.

IME 413 Flexible Manufacturing Systems (3)

IME 416 Automation of Industrial Systems (3)
Automation in manufacturing and warehousing. Economic selection of automation systems. Projects in automation. 2 lectures, 1 laboratory. Prerequisite: IME 356, IME 335 or equivalent.

IME 418 Product-Process Design (4)
Unification of product design, process engineering, tool development, and product manufacturing; concurrent
engineering. Study of manufacturability constraints in terms of prototyping, designing, testing, pre-production support, processing, quality, delivery, and customer satisfaction. 3 lectures, 1 laboratory. Prerequisite: IME 314, IME 341, IME 356 or equivalent.

IME 420 Simulation and Expert Systems (4)
Design and analysis of manufacturing and service systems by simulation. Functions of random variables. Random number and function generators, programming, and characteristics of simulation languages. Introduction to rule-based expert systems. 3 lectures, 1 laboratory. Prerequisite: IME 314, PSY 201/PSY 202.

IME 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: IME 314, PSY 312.

IME 422 Manufacturability Engineering (4)
Manufacturability constraints in terms of issues related to prototyping, designing, testing, preproduction support, processing, quality, delivery, and customer satisfaction. Hands-on projects to discuss the experimental results in dealing with the process of casting, machining, plastic modeling, and electronic board manufacturing. 3 lectures, 1 laboratory. Prerequisite: IME 251, IME 426 or equivalent.

IME 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 experimental design, linear and nonlinear regression, ANOVA, and multifactor ANOVA. Utilization of existing computer software. 4 lectures. Prerequisite: IME 251, IME 426 or equivalent.

IME 429 Ergonomics Laboratory (1)
Investigation of various physiological, sensory, and cognitive capabilities and limitations of people in work and living environments through laboratory data collection and statistical analysis. 1 laboratory. Prerequisite: IME 319, IME 426.

IME 430 Quality Engineering (4)
Quality control, 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. 4 lectures. Prerequisite: IME 426 or equivalent.

IME 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: IME 223, IME 312, IME 426 or equivalent.

IME 435 Reliability Engineering I (3)
Reliability concepts and mathematical models, mechanical device reliability, electrical device reliability, systems reliability and maintainability, reliability data, assurance program elements. 3 lectures. Prerequisite: IME 305, IME 430.

IME 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 human-machine interface. Data and multi-variate analysis. 2 lectures, 1 laboratory. Prerequisite: IME 319, IME 426.

IME 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.

IME 441, 442 Engineering Supervision I, II (1,1)
Theory and principles of supervision. Application of fundamental concepts and techniques of supervision provided by assignment in engineering laboratories. 1 laboratory each. Prerequisite: IME 141, IME 251, IME 335 (or IME 233), and senior standing. Concurrent enrollment in IME 421 recommended.

IME 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. 3 lectures, 1 laboratory. Prerequisite: IME 251, IME 305, IME 335, or equivalent.

IME 455, 456 Manufacturing Design and Implementation I, II (3) (2)
A mix of industry and in-house structured group projects, using process, tool, computer control, quality knowledge, and societal considerations. Projects will progress through a complete manufacturing cycle from design through implementation. Field trips to manufacturing centers. 455: 3 laboratories, 456: 2 laboratories. Prerequisite: IME 418. Co-requisite: IME 430.

IME 461, 462 Senior Project (2) (3)
Faculty supervised projects typical of problems which graduates encounter in their professions 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 (within 3 quarters of graduation), IME 314, IME 443, or IME 418.

IME 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 and manufacturing engineering. 2 seminars. Prerequisite: Senior standing (within 3 quarters of graduation).
IME 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.

IME 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.

IME 485 Cooperative Education Experience (6) (CR/NC)
Part-time work experience in business, industry, government, and/or 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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

IME 495 Cooperative Education Experience (12) (CR/NC)
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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

IME 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 chair, graduate adviser and supervising faculty member.

IME 501 Graduate Survey I (3)
Survey of current issues in the design and analysis of the workplace. Methods analysis, work measurement, human factors, automation, cost estimating, and facilities planning issues are covered. Not available for graduate credit in Industrial Engineering. Not for undergraduate students. 3 seminars. Prerequisite: Graduate standing with approval of instructor.

IME 502 Graduate Survey II (3)
Survey of current issues in the mathematical analysis of systems. Industrial statistics, quality control, engineering economy, linear programming, integer programming, inventory theory, Markov processes, queuing theory, and dynamic programming. Not available for graduate credit in Industrial Engineering. Not for undergraduate students. 3 seminars. Prerequisite: Graduate standing or upper division with approval of instructor, MATH 242 or MATH 206, STAT 321.

IME 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: IME 305, IME 426, or equivalent and graduate standing.

IME 542 Reliability Engineering II (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 and failure rates. Methods of estimating, predicting, measuring, and testing for reliability and maintainability. 3 seminars. Prerequisite: IME 430, and graduate standing.

IME 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: IME 319 or equivalent, IME 426 or equivalent and graduate standing.

IME 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: IME 314, graduate standing.

IME 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: IME 420 and graduate standing.

IME 555 Computer-Integrated Manufacturing (4)
CIM and concurrent engineering concepts. 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 concurrent engineering. 3 seminars, 1 laboratory. Prerequisite: IME 335, IME 411 or equivalent, graduate standing.

IME 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: IME 421 or equivalent, graduate standing and experience using computers.

IME 557 Technological Assessment and Planning (4)
IME 558 Engineering Decision Making (4)
Principles, concepts, models, and case studies of decision making, both quantitative and nonquantitative. 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: IME 301, IME 314, STAT 321 or equivalent and graduate standing.

IME 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: IME 314 or equivalent and graduate standing.

IME 560 Quality Engineering II (4)

IME 570 Selected Advanced Topics (1–3)
Directed group study of selected topics for advanced students. Open to graduate students and selected seniors. Topic lists will be provided with class schedule outlines. 1–3 seminars. Prerequisite: Graduate standing and/or consent of instructor.

IME 585 Cooperative Education Experience (6) (CR/NC)
Advanced study analysis and part-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 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

IME 595 Cooperative Education Experience (12) (CR/NC)
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 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

IME 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 and consent of instructor.

IT-INDUSTRIAL TECHNOLOGY

IT 125 Industrial Wood Processes (3) GEB F.2.
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 126 Industrial Materials and Processes (4)
Characteristics, applications and limitations of industrial material systems, including organics, ceramics and metallics. Industrial material processing equipment and processes. 3 lectures, 1 laboratory. Prerequisite: CHEM 121.

IT 137, 138 Introduction to Industrial Electricity (4) (4)
Theory and application of AC and DC circuits. Theory, principles and industrial usage of generators, transformers, motors, inductive loads, conductors, distribution systems, and power generation. 3 lectures, 1 laboratory. Prerequisite: MATH 120.

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 including recycling. 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 150 Mechanical/Energy (4)
Introduction to energy sources, energy conversion and power. Fossil, atomic and solar resources. Application of laws of physics and thermodynamics to various mechanical systems. Conversion by current power technology including reactors, internal and external combustion and direct conversion. Power transmission systems and system maintenance including electrical, mechanical, pneumatic, refrigeration, and hydraulic systems. 4 lectures.

IT 200 Special Problems (1–4)
Individual investigations, research, studies or surveys of selected problems. Total credit limited to 8 units with a maximum of 4 units per quarter. Prerequisite: Consent of instructor.

IT 212 Introduction to Industrial and Technical Management (4)
Functions of a technical manager and management styles, relationships and interactions between departments in an industrial organization. Industrial communications and language of technical management. Characteristics, technical management fields, industry and leadership styles. 4 lectures.

IT 232 Introduction to C.A.D. and Other Computer Applications (4)
Drafting methods, geometric constructions, isometric and multiview projection. Introduction to mechanical CAD as well as architectural CAD, as a 3D design and drawing tool used by industrial managers in design, product development, facilities management, industrial communications, and numerical control. Fundamentals of analog and digital computers. Word processing and spreadsheets, number systems, logical and sequential circuits. 2 lectures, 2 laboratories.
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: ENGL/PHIL/SPC 125.

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: CHEM 121 or consent of instructor.

IT 303 Industrial Quality Control Management (4)
Introduction to quality management principles including TQM, ISO 9000, JIT and Quality Assurance. Statistical process control. The seven basic tools of quality. 4 lectures. Prerequisite: STAT 211.

IT 304 Product Quality Control (3)
Applications at the supervisory level of the overall quality plan for manufacturing. Quality assurance, testing, shop and field inspection techniques, material review, source inspection, vendor surveillance, and quality audit. 3 lectures. Prerequisite: IT 303.

IT 313 Industrial Cost Control (4)
Application of cost estimating techniques on materials and processes and labor analysis in industry. Utilization of techniques and procedures for budgeting, cost reduction and indirect burden calculations. Also covered are: investigate methods of reducing waste and inefficiency in business and industry via time value of money, direct labor and material costing, rate of return, sensitivity analysis and ethical finance and accounting practices. 4 lectures. Prerequisite: IT 212, or consent of instructor.

IT 320 Applied Metal and Ceramics Processes (4)
Application of industrial processes and testing using metals and ceramics. Emphasis on manufacturing methods, equipment use, safety and material standards. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: IT 126, CHEM 121 or consent of instructor.

IT 327 Plastics Technology (4)
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. Plastics and the environment. Recycling, reuse, source reduction. Hazardous waste. Laws and regulation pertaining to plastics. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: CHEM 121.

IT 330 Fundamentals of Packaging (4)
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. Packaging and the environment, recycling, reuse and source reduction, and laws affecting packaging. 3 lectures, 1 activity. Prerequisite: Consent of instructor.

IT 332 Industrial Electrical and Electronic Systems (4)
Continuation of IT 138. Application of electrical power distribution systems: conductors, circuitry, transformers, motors. Modular approach to the study of electronic control systems. Field trips. 3 lectures, 1 laboratory. Prerequisite: IT 138, MATH 131, PHYS 122.

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 345 Applied Production Management (4)
Production equipment and systems, tooling, safety, finishes, materials purchasing and acquisition. Production management, problem solving, organization systems and production computer program application. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: IT 126 or consent of instructor.

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 design 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 (1–4)
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 instructor.

IT 402 Technical and Management Presentations (4)
Methods, techniques and evaluation of presenting technical and management information to groups. Individual and group presentations using self produced aids including video tape, transparencies, slides, charts, and other media. Media development techniques including technical sketching and video tape editing. 2 lectures, 2 activities. Prerequisite: Junior standing, SPC 201 or SPC 202.

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 (4)**
Industrial work forces, resources and industrial management leadership knowledge, skills and methods. Utilization of techniques and procedures such as work simplification, work force profiling, corporate profiling and in-service training. Investigate methods of reducing waste and inefficiency in business and industry considering hiring practices, ethics, interaction analysis, motivation, discipline, labor processes, products, materials and systems. 4 lectures. Prerequisite: IT 212 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 Industrial Planning (4)**
Planning systems and technique for new products, process or other industrial situations. Team development, planning computer program application and planning phases. 3 lectures, 1 laboratory. Prerequisite: IT 212, IT 232, or consent of instructor.

**IT 411 Industrial Safety and Health Management (4)**
Industrial safety and health management: Worker safety and health legislation; worker's compensation, hazardous waste management requirements of industry; employer/employee responsibility and liability as related to the worker's safety and health and the environment. Hazards and their control in industrial facilities: mechanical, electrical, pressure, explosions/explosives, heat/temperature, falls/falling objects/impacts, radiation, vibration/noise, toxic substances, fire/fire suppression. 3 lectures, 1 activity. Prerequisite: ENGL/PHIL/SPC 125 or consent of instructor.

**IT 419 Industrial Internship (2-6) (CR/NC)**
Part-time industrial experience or 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 Corporate Training (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: ENGL/PHIL/SPC 125.

**IT 432 Energy Management (4)**
Energy sources, traditional and alternate; energy management including energy auditing and conservation methods and systems. Heat loss and gain through building components, comparison of materials and insulation systems. 3 lectures, 1 activity. Prerequisite: IT 150.

**IT 435 Packaging Development Management (3)**
Managing the development of industrial and consumer goods packaging from concept to marketplace. Interplay of marketing, economic, technical, production and distribution considerations in developing a package. Organizing the package function for best results. Case studies of package/product successes and failures. Class project for analysis and solution. 3 lectures. Prerequisite: IT 330.

**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 150, IT 432.

**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 332, 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 470 Selected Advanced Topics (1–3)**
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.
IT 471 Selected Advanced Activity (1–3)
Directed group study for advanced undergraduate and graduate students. Class Schedule will list topic selected. May be required with IT 470. Total credit limited to 6 units. 1 to 3 activities. Prerequisite: Consent of instructor.

IT 485 Cooperative Education Experience (6) (CR/NC)
Part-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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

IT 495 Cooperative Education Experience (12) (CR/NC)
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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

IT 500 Individual Study (1–6)
Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. 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 Historical and Philosophical Perspective of American Industry (3)
Study of significant historical and philosophical changes in American industry. 3 seminars. Prerequisite: Graduate standing.

IT 520 Organization and Administration of Industrial and Technical Environments (3)
Current industrial management principles, methods and tools in the administration and organization of industrial and technical environments. 3 seminars. Prerequisite: Graduate standing.

IT 521 Training in Industrial and Technical Systems (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)
Advanced study of current trends and issues relative to industrial and technical systems. 3 seminars. Prerequisite: Graduate standing.

IT 580 Graduate Research in Industrial and Technical Systems (3)
Study of basic research methodology relative to industrial and technical systems. Development of a thesis/project proposal. 3 seminars. Prerequisite: Graduate standing.

IT 599 Industrial and Technical Studies Thesis or Project (5)
Completion of a thesis or project involving individual research that is significant to the field of industrial and technical systems. Student must enroll each quarter in which advisement is received or facilities are utilized. Prerequisite: Graduate standing. IT 580 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. Contributions of women and minorities to American mass media. 3 lectures.

JOUR 203 News Writing and Reporting (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. Role of California minorities in agriculture. 3 lectures.

JOUR 223 Photojournalism (3)
Application of photographic techniques to journalism. Use of lighting, particularly electronic flash. Use of 35mm camera and other cameras in journalism. Application of darkroom techniques suitable for news media deadline requirements. Integration of photographic and writing skills. 2 lectures, 1 laboratory. Prerequisite: JOUR 203.

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 290 Multicultural Journalism (3)
Role of American journalism (both print and broadcast media) in the social, political, and economic integration into American society of racial and ethnic minorities and women. 3 lectures. Prerequisite: ENGL/SPC/PHIL 125.

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 Contemporary Issues (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 318 Mass Media in Society (4)
Traditional mass media and the emerging technologies, their methods, functions and dysfunctions. Responsibilities of journalists. The current status of ethnic media in the U.S. Importance of media in society. 4 lectures.

JOUR 331 Advertising (3)
Principles of advertising, advertising psychology, salesmanship, copy, layout, and production for print and broadcast media. Function of advertising in a free market society. Social responsibilities of advertising toward gender and ethnic minorities. Advertising in other cultures. 3 lectures.

JOUR 333 Broadcast News (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 and Methods (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 (3)
Radio and television announcing of news, public affairs, commercials and the dynamics of radio and television interviewing. 2 lectures, 1 laboratory. Prerequisite: JOUR 333, SPC 201 or SPC 202.

JOUR 351 Advanced Radio Reporting: KCPR (2) (CR/NC)
Broadcast lab for students holding news positions on radio station KCPR, or other similar supervised experience as determined by the department. Total credit limited to 4 units. Credit/No Credit grading only. 1 lecture, 1 laboratory. Prerequisite: JOUR majors—JOUR 304 and JOUR 333. Non-majors—consent of instructor.

JOUR 352 Advanced Newspaper Reporting: Mustang Daily (2)
Reporting lab for students holding editorial or photographic positions on Mustang Daily. Total credit limited to 4 units. 1 lecture, 1 laboratory. Prerequisite: JOUR 233 and JOUR 304.

JOUR 353 Advanced Television Reporting: CPTV (2)
Television lab for students involved in news and production on Cal Poly's campus station, CPTV. Total credit limited to 4 units. 1 lecture, 1 laboratory. Prerequisite: JOUR 333 or consent of instructor.

JOUR 385 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 318.

JOUR 405 Public Affairs Reporting (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 407 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 413 Public Relations Campaigns (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 342 or consent of instructor.

JOUR 432 Television News and Production (4)
Advanced 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 223 and JOUR 333 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 (3)
Application of techniques on daily basis with media under supervision of department faculty. Prerequisite: Junior standing in Journalism and consent of instructor.

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.

JOUR 487 Cooperative Education Experience (6)
Part-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 degree credit limited to 3 units. Prerequisite: Junior standing and 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 (4)
Elements of three dimensional perception/visualization with emphasis on freehand and mechanical perspective drawing methods. Methods will also include presentation and rendering techniques. 4 laboratories. Prerequisite: LA 110 or consent of instructor.

LA 114 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. Concurrent: SS 121.

LA 150 Graphics Fundamentals (6)
Elements of three dimensional perception/visualization with emphasis on freehand and mechanical perspective drawing methods. Exploration of two and three dimensional graphic techniques including presentation and rendering methods. 6 activities. Prerequisite: Transfer student status or consent of instructor.

LA 151 Design Fundamentals (7)
Exploration of design and planning projects on different scales and in different environmental settings including site, neighborhood, community, city, region. Introduction to principles of environmental design including basic elements and composition. Contextual understanding of landscape architecture and other environmental design disciplines; 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. 7 activities. Prerequisite: Transfer student status or consent of instructor.

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 212 Site Analysis (3)
Introduction to various inventory and analysis methodologies, case study reviews, mapping and overlay techniques, environmental ethics and an overall understanding of the function and structure of the natural landscape. Visual assessment, synthesis techniques and relating mapped analytical data with design program analysis for use in site planning. 2 lectures, 1 laboratory.

LA 213 Site and Terrain Analysis (4)
Introduction to various inventory and analysis methodologies, case study reviews, mapping and overlay techniques, environmental ethics and an overall understanding of the function and structure of the natural landscape. Visual assessment, synthesis techniques and relating mapped analytical data with design program analysis for use in site planning. 2 lectures, 2 laboratories. Enrollment limited to CRP and LA majors.

LA 231 Landscape Architecture Construction (3)
Introduction and application of formulas, principles, and criteria for grading and drainage. Horizontal and vertical road alignment. Cut and fill calculations. Runoff calculations. Miscellaneous course fee required—see Class Schedule. 3
laboratories. Concurrent: LA 252. Prerequisite: LA 114, AE 237, MATH 120.

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 251 Fundamentals of Design and Planning in Landscape Architecture (4)
Introduction to the principles of environmental design including basic design elements and composition. Exploration of landscape architectural design and planning projects in various scaled environmental settings including site, neighborhood, urban, regional. Contextual understanding of the 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. 4 laboratories. Prerequisite: LA 110, LA 111, LA 114.

LA 252 Fundamentals of Site Planning and Design (4)
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. Plant characteristics, forms, and ecological conditions as related to landscape architectural design. Miscellaneous course fee required—see Class Schedule. 4 laboratories. Prerequisite: LA 251.

LA 253 Applied Design and Planning Fundamentals (5)
Focus on the application of basic design fundamentals to the design of different environments. Included will be development of the skills necessary for solving of grading and drainage problems related to landform manipulation. 5 laboratories. Prerequisite: LA 252.

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 Landscape Architecture (2)
Introduction to computer software and hardware which is important to landscape architecture. Current issues and applications which can be used in the profession. Laboratory utilizes self-paced learning modules. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 laboratory. Prerequisite: GEB F.1. computer literacy elective 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 laboratories. Prerequisite: Upper division standing in ARCH, LA, CRP or related discipline.

LA 318 Applications of GIS in Natural Resources (2) (Also listed as FNR 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: Junior standing, AG 250 or CSC 110 or consent of instructor.

LA 320 Design Theory for Landscape Architects (3)
Complements the material and knowledge presented in the history of landscape architecture, architecture and art courses. "Design theory" and associated concepts as they are related to landscape architecture. Literature research and analysis of completed design projects. The artists/designers, materials and overall expressions of work are related to the social and economic issues of the time as well as their associations with the other arts and sciences. 3 lectures. Prerequisite: LA 311, LA 323, and permission of the 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 351, 352 Design for Landscape Architects (5) (5)
Process oriented site design with emphasis on identification of problems and opportunities, creative problem solving, spatial design site analysis, landform, plantform, builtform, circulation, detail design and graphic communication. Miscellaneous course fee required—see Class Schedule. 5 laboratories. Prerequisite for LA 351: LA 114, LA 253. For LA 352: LA 351.

LA 353 Design for Landscape Architects (6)
Completion of a comprehensive design project with sufficient complexity to encompass many fundamental design and
technical decisions common to landscape architectural
design and construction projects. Concept, design
development, and working drawings will be prepared as a
complete set. An emphasis on planting design, installation
and irrigation as related to design and composition.

Miscellaneous course fee required—see Class Schedule. 6 laboratories. Prerequisite: LA 352.

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 in Landscape
Architecture (2)
GIS applications using current software on advanced work
stations. Basic GIS concepts including topological data
structures, relational database concepts, data input
techniques and issues and spatial analysis techniques.
Miscellaneous course fee required—see Class Schedule. 1
lecture, 1 laboratory. Prerequisite: LA 451, LA/FNR 318 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 region and
California. One or more field trips required. 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 (6)
Emphasis on regional landscape assessment and design
techniques utilizing geographic information systems (GIS)
techniques. Land planning and design issues in regional
scale environments. Miscellaneous course fee required—see
Class Schedule. 6 laboratories. Prerequisite: LA 353 or
consent of instructor.

LA 452 Urban Design Collaborative 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 442, LA 451, LA
452.

LA 464 Senior Seminar (1) (CR/NC)
Identification and exploration of problems and opportunities
in the environmental design field. Intensive thinking,
research and discussion of issues relating to local, regional or
global significance. To be taken each quarter during fifth
year. Credit/No Credit grading only. 1 seminar. Prerequisite:
Fifth-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. Miscellaneous course fee required—see Class Schedule. 1–12 activities. Prerequisite: Fourth or fifth year standing.

**LA 485 Cooperative Education Experience (6) (CR/NC)**
Part-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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

**LA 495 Cooperative Education Experience (12) (CR/NC)**
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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

**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.

**LA 585 Cooperative Education Experience (6) (CR/NC)**
Advanced study analysis and part-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 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

**LA 595 Cooperative Education Experience (12) (CR/NC)**
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 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

**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 online 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.

**MATE—MATERIALS ENGINEERING**

**MATE 121 Introduction to Materials Engineering (1)**
A lecture series involving materials engineers from industry as well as Cal Poly faculty. 1 lecture.

**MATE 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.
MATE 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.

MATE 206 Materials Engineering (3)
Structure of matter. Physical and mechanical properties of materials including metals, alloys, ceramics, insulating materials, semiconductors, super semiconductors and polymers. Equilibrium diagrams. Heat treatments, material selection and corrosion phenomena. 3 lectures. Prerequisite: CHEM 125 or CHEM 128.

MATE 224 Metallography (3)
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, 2 laboratories. Prerequisite: MATE 206 and MATE 241.

MATE 226 Physical Metallurgy (4)
Physical metallurgy of major ferrous and nonferrous alloy systems. Mineral resources and economics of metal production. Crystal structure and bonding, equilibrium diagrams, phase diagrams, phase transformations, heat treatment. Casting, working and joining of metals. 4 lectures. Prerequisite: MATE 224 or consent of instructor; MATE 246 should be taken concurrently.

MATE 240 Additional Materials Laboratory (1)
Special assignments undertaken by students who need or wish to acquire abilities supplementary to their required course work. Assignments must be of a laboratory nature. Work is done by the student with a minimum of faculty supervision. 1 laboratory. Prerequisite: Consent of department head.

MATE 241 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: MATE 206.

MATE 246 Physical Metallurgy Laboratory (2)
Laboratory experiments designed to make the student familiar with the physical metallurgy of major ferrous and nonferrous alloy systems. Melting and casting, cold working and annealing, heat treatment, microstructures, mechanical testing, preparation of engineering reports. Miscellaneous course fee required—see Class Schedule. 2 laboratories. Prerequisite: MATE 206 and MATE 241. MATE 226 should be taken concurrently.

MATE 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.

MATE 401 Electronic Properties of Materials (3)
Basic concepts in electron theory of solids (quantum mechanics, energy band theory, Fermi energy, distribution and density of states), electrical properties and conduction in metals, semiconductors, polymers, ceramics, and superconductors, magnetic phenomena and optical properties in materials with applications in recording media. 3 lectures. Prerequisite: MATE 206, PHYS 133.

MATE 402 Mechanical Behavior of Materials (4)
Uniaxial and complex static stress, stress-strain elastic and plastic relationships. Mechanisms of plastic deformation, dislocation theory, strengthening mechanisms. Brittle, ductile and high temperature fracture. Fatigue, creep, stress-rupture. Strain rate and environmental effects. 4 lectures. Prerequisites: MATE 206, CE 204; MATE 412 should be taken concurrently.

MATE 403 Materials Inspection (3)
Special physical and mechanical techniques for non-destructive and destructive examination of materials, to determine their fitness for service. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories. Prerequisite: MATE 224.

MATE 404 Failure Analysis (3)
Procedures for analyzing failed materials. Actual failure analysis of a failed component by each student. Involves fracturing, fatigue, corrosion, overload, using metallography, electron microscopy, energy-dispersive x-ray spectroscopy, chemical analysis and heat treatments. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories. Prerequisite: MATE 226, MATE 402, MATE 403 (MATE 226 may be taken concurrently).

MATE 412 Mechanical Behavior of Materials Laboratory (2)
Tensile, fatigue, creep and impact testing of materials. Miscellaneous course fee required—see Class Schedule. 2 laboratories. Prerequisite: MATE 206, CE 204. Concurrent: MATE 402.

MATE 421, 422 Materials Thermodynamics I, II (3) (3)
Physical chemistry of metals. Thermodynamics of liquid and solid metallic systems. Material and energy balances, transport phenomena. Computer applications and simulations of thermodynamic processes. 3 lectures. Prerequisite: MATE 206, CHEM 305. MATE 422: MATE 421.

MATE 424 Ceramic Materials (3)

MATE 425 Corrosion Engineering (4)
Galvanic corrosion, thermodynamics of corrosion, polarization curves, corrosion testing, corrosion control, cathodic protection systems. 3 lectures, 1 laboratory. Prerequisite: CHEM 125 or CHEM 128.
MATE 426 Fracture of Materials (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 lectures, 1 laboratory. Prerequisite: MATE 402, MATE 412, CE 205.

MATE 427 Composites (3)
Molecular structures of composites. Properties, processing techniques and fabrication methods of composites, structure and property relationships. 3 lectures. Prerequisite: MATE 206, CE 204.

MATE 428 Polymers (3)
Molecular structures of polymers and polymer systems. Synthesis, processing techniques, properties and fabrication methods of polymeric materials. 3 lectures. Prerequisite: MATE 206.

MATE 429 Instrumental Analysis (3)
Basic theory and practice of current instrumentation and analytical techniques for the characterization of metallic and non-metallic materials. Laboratory experiments emphasize technique selection methods, specimen preparations for various applications and optimization of experimental parameters for data analysis. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratory. Prerequisite: MATE 206.

MATE 430 Microelectronic Materials Processing (3)
Introductory microelectronics materials processing, including integrated circuit fabrication, assembly and packaging. Crystal growth, epitaxial layer growth, diffusion, ion implantation, oxidation, chemical and plasma assisted etching, photolithography. 3 lectures. Prerequisite: MATE 206.

MATE 434 Welding Engineering I (3)
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 laboratory. Prerequisite: MATE 206.

MATE 435 Welding Engineering II (3)
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: MATE 206.

MATE 436 Welding Engineering III (3)

MATE 441, 442, 443 Advanced Materials Laboratory I, II, III (1) (1) (1)
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. MATE 441: Miscellaneous course fee required—see Class Schedule. 1 laboratory. Prerequisite: MATE 226.

MATE 446 Surface Chemistry of Materials (3) (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.

MATE 461, 462 Senior Project (1) (4)
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.

MATE 463 Undergraduate Seminar (1)
Developments, policies, practices and procedures discussed through regular seminar. 1 seminar. Prerequisite: Senior standing.

MATE 485 Cooperative Education Experience (6) (CR/NC)
Part-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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

MATE 495 Cooperative Education Experience (12) (CR/NC)
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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

MATE 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.

MATE 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. 4 seminars. Prerequisite: Graduate standing.

MATE 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 lectures, 1 laboratory. Prerequisite: Graduate standing.

MATE 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.

MATH–MATHEMATICS

Satisfactory completion of the Entry Level Mathematics (ELM) requirement is a prerequisite for enrollment in all mathematics courses except MATH 100 and MATH 104.

MATH 100 Beginning Algebra Review (3) (CR/NC)
Review of basic algebra skills at the beginning algebra level intended primarily to prepare students for MATH 104. Course open only to students who have taken the ELM examination and are not qualified for MATH 104. Not for baccalaureate credit. Credit/No Credit grading only. 3 lectures. Prerequisite: Two years of high school algebra.

MATH 104 Intermediate Algebra (3) (CR/NC)
Review of basic algebra skills at the intermediate algebra level intended primarily to prepare students for MATH 116. Not for baccalaureate credit. Credit/No Credit grading only. 3 lectures. Prerequisite: Two years high school algebra and appropriate score on the ELM examination, or credit in MATH 100.

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: Appropriate score on ELM examination, or an ELM exemption, or credit in MATH 104, 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)
Pre-calculus 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: Appropriate score on ELM examination, or an ELM exemption, or credit in MATH 104, and 3 years of 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. MATH 118 is equivalent to MATH 116 and MATH 117. Not open to students with credit in MATH 117 or MATH 120. 4 lectures. Prerequisite: Appropriate score on ELM examination, or an ELM exemption, and 3 years high school math including 2 years high school algebra, or equivalent.

MATH 119 Pre-Calculus Trigonometry (3) GEB B.2.
Rectangular and polar coordinates. Trigonometric functions, fundamental identities. Inverse trigonometric functions and relations. Complex numbers. Not open to students with credit in MATH 120. 3 lectures. Prerequisite: Appropriate score on ELM examination, or an ELM exemption, and MATH 117 or MATH 118, or equivalent.

MATH 120 Pre-Calculus Algebra and Trigonometry (5) GEB B.2.
An integrated review course in college algebra and trigonometry covering function concepts and symbols, rectangular coordinates, trigonometric functions, linear and quadratic functions, inequalities, analysis of trigonometric functions, inverse trigonometric functions, exponential and logarithmic functions, systems of equations and complex numbers. MATH 120 is equivalent to MATH 118 and MATH 119. Not open to students with credit in MATH 117, MATH 118, or MATH 119. 5 lectures. Prerequisite: Appropriate score on ELM examination, or an ELM exemption, and 3 years high school math including 2 years high school algebra, and trigonometry, or equivalent.

MATH 124 Finite Mathematics (3) GEB B.2.
Sets and counting problems. Probability theory including stochastic processes, probability distributions, and Markov Chains. Algebra of vectors and matrices, Gaussian elimination, and the inverse of a square matrix. Applications of matrices. 3 lectures. Prerequisite: ELM requirement, and passing score on Mathematics Placement Examination, or MATH 118, or equivalent.

1 MATH 131, 132, 133 Technical Calculus (4) (4) (4) GEB B.2.
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. Miscellaneous course fee may be required in sections with a computer component—see Class Schedule. 4 lectures. Prerequisite: ELM requirement, and passing score on Mathematics Placement Examination, or MATH 118 and MATH 119, or equivalent.

1 Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.
MATH 141, 142, 143 Calculus I, II, III (4) (4) (4) GEB B.2.

Limits, continuity, differentiation, integration. Techniques of integration, applications to physics, transcendental functions. Infinite sequences and series, vector algebra, curves. Miscellaneous course fee may be required in sections with a computer component—see Class Schedule. 4 lectures. Prerequisite: ELM requirement, and passing score on Mathematics Placement Examination, or MATH 118 and MATH 119, or equivalent.

MATH 151, 152, 153 Calculus Laboratories I, II, III (1) (1) (1) CR/NC

Facilitated study and discussion of the theory, problems, and applications of calculus. Credit/No Credit grading only. 1 laboratory. Prerequisite: Concurrent enrollment in the associated section of MATH 141, MATH 142, or MATH 143.

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 205 Programmable Calculators in Calculus and Linear Algebra (2)

Operation of programmable graphing calculators and their application to selected topics in calculus, differential equations and linear algebra. 2 lectures. Prerequisite: MATH 141 or consent of instructor.

MATH 206 Linear Algebra I (4) GEB B.2.

Matrices, inverses, linear systems, determinants, eigenvalues, eigenvectors, vector spaces, linear transformations, applications. Miscellaneous course fee may be required in sections with a computer component—see Class Schedule. 4 lectures. Prerequisite: MATH 143 or consent of instructor.

MATH 221 Calculus for Business and Economics (4) GEB B.2.

Polynomial calculus for optimization and marginal analysis. Partial derivatives and elementary integration. Not open to students with credit in MATH 142, MATH 132 or equivalent. 4 lectures. Prerequisite: ELM requirement, and passing score on Mathematics Placement Examination, or MATH 118, or equivalent.

MATH 222 Mathematical Analysis for Economics and Business (4) GEB B.2.

Multivariate calculus. Lagrange multipliers, linear algebra and determinants. Differential and difference equations. 4 lectures. Prerequisite: MATH 221 or equivalent.

MATH 241 Calculus IV (4) GEB B.2.

Partial derivatives, multiple integrals, introduction to vector analysis. Miscellaneous course fee may be required in sections with a computer component—see Class Schedule. 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. Miscellaneous course fee may be required in sections with a computer component—see Class Schedule. 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 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 113 or CSC 207, or consent of instructor.

MATH 304 Vector Analysis (4) GEB B.2.

Algebra of free vectors with applications. Differential and integral calculus of vectors. Development of theory and application of vector operations. Green's Theorem, Stokes' Theorem, and the Divergence Theorem. Miscellaneous course fee may be required in sections with a computer component—see Class Schedule. 4 lectures. Prerequisite: MATH 241 or consent of instructor.

MATH 306 Linear Algebra II (4) GEB B.2.

Inner product spaces, orthogonality, Fourier series and orthogonal bases, linear transformations and similarity, eigenvalues and diagonalization. Miscellaneous course fee may be required in sections with a computer component—see Class Schedule. 4 lectures. Prerequisite: MATH 206, MATH 242, and MATH 248, or consent of instructor.

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. Miscellaneous course fee may be required in sections with a computer component—see Class Schedule. 4 lectures. Prerequisite: MATH 206.

MATH 318 Advanced Engineering Mathematics (4) GEB B.2.

Power series solutions of differential equations and Bessel functions. Fourier series and transforms; matrices. Miscellaneous course fee may be required in sections with a computer component—see Class Schedule. 4 lectures. Prerequisite: MATH 242.

1 Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.
MATH 435

1 MATH 327, 328 Introduction to Modern Mathematics (4) (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: ELM requirement, and passing score on Mathematics Placement Examination, or MATH 118, or equivalent.

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 333 Numerical Analysis II (3) (Also listed as CSC 333)
   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.

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.

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) GEB B.2.
   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 350 Mathematica (4)
   Problem-solving using Mathematica in a UNIX environment. 4 lectures. Prerequisite: MATH 241.

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 (1-4)
   Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units. Prerequisite: Junior standing and consent of department chair.

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)
   Complex vector spaces, unitary and self-adjoint matrices, Spectral Theorem, Jordan canonical form. Selected topics in linear programming, convexity, numerical methods, and functional analysis. Miscellaneous course fee may be required in sections with a computer component—see Class Schedule. 4 lectures. Prerequisite: MATH 306 or consent of instructor.

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 Advanced Calculus I (4)
   Introduction to concepts and methods basic to real analysis. Topics such as the real number system, sequences, continuity, uniform continuity and differentiation. 4 lectures. Prerequisite: MATH 248 or consent of instructor.

MATH 413, 414 Advanced Calculus II, III (4) (4)
   A continuation of Advanced Calculus I covering such topics as integration, infinite series, uniform convergence and functions of several variables. Highly recommended for students planning to enter graduate programs or secondary teaching and those interested in applied mathematics. 4 lectures. Prerequisite: MATH 206 and MATH 412, or consent of instructor.

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)

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Liouville problem. Boundary value problems; nonhomogeneous techniques. Applications to heat flow, potential theory, vibrating strings and membranes. Miscellaneous course fee may be required in sections with a computer component—see Class Schedule. 4 lectures. Prerequisite: MATH 318 or equivalent, or MATH 306 or MATH 317 with consent of instructor.

MATH 419 Introduction to the History of Mathematics (4)
Evolution of mathematics from earliest to modern times. Major trends in mathematical thought, the interplay of mathematical and technological innovations, and the contributions of great mathematicians. Appropriate for prospective and in-service teachers. 4 lectures. Prerequisite: MATH 248 and at least one upper division course in mathematics, 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.

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: MATH 206 or consent of instructor.

MATH 433 Numerical Analysis III (3) (Also listed as CSC 433)
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: 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, triangles, 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 presentations by students on topics from mathematical modeling. 2 seminars. Prerequisite: MATH 206 and MATH 242.

MATH 461, 462 Senior Project (3) (2)
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: MATH 459.

MATH 470 Selected Advanced Topics (1-3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

MATH 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 485 Cooperative Education Experience (6) (CR/NC)
Part-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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

MATH 495 Cooperative Education Experience (12) (CR/NC)
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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

MATH 500 Individual Study (1-4)
Individual research or 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: Graduate standing and consent of department chair.

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

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graduate standing or consent of instructor. MATH 502: MATH 501.

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 520, 521 Applied Analysis I, II (4) (4)
Advanced mathematical methods of analysis in science and engineering, integrated with modeling of physical phenomena. Topics include applications of complex analysis, Fourier analysis, ordinary and partial differential equations. Additional topics to be drawn from perturbation methods, asymptotic analysis, dynamical systems, numerical methods, optimization, and the calculus of variations. 4 lectures. Prerequisite for Applied Analysis I: MATH 408, MATH 412, MATH 418 and graduate standing, or consent of the instructor. Prerequisite for Applied Analysis II: MATH 520 and graduate standing, or consent of the instructor.

MATH 522 Applied Analysis III (4)
Selected topics in applied analysis. 4 lectures. Prerequisite: MATH 521 and graduate standing, or consent of the instructor.

MATH 530, 531 Discrete Mathematics with Applications I, II (4) (4)
Advanced mathematical methods of discrete mathematics with applications. Topics will include probability theory with generating functions, difference equations and number theory. Additional topics to be drawn from the theory of algorithms, coding theory, set theory, and the relation of discrete mathematics to complex analysis. 4 lectures. Prerequisite for MATH 530: MATH 481, MATH 306 and graduate standing, or consent of instructor. Prerequisite for MATH 531: MATH 530 and graduate standing, or consent of the instructor.

MATH 532 Discrete Mathematics with Applications III (4)
Selected advanced topics in discrete mathematics. These topics may include foundations, numerical and computational methods of discrete mathematics, finite geometries or current problems in discrete mathematics. 4 lectures. Prerequisite: MATH 531 and graduate standing, or consent of the instructor.

MATH 540 Introduction to Topology (4)
Basic ideas of general topology, metric spaces, homeomorphisms and the separation axioms. 4 seminars. Prerequisite: Satisfactory completion of the Graduate Written Examination in Analysis or consent of the Graduate Committee.

MATH 550 Real Analysis (4)
Introduction to Lebesgue measure and integration, convergence theorems, $L_1$ spaces, Radon-Nikodym theorem and Fubini's theorem. 4 seminars. Prerequisite: Satisfactory completion of the Graduate Written Examination in Analysis or consent of the Graduate Committee.

MATH 560 Field Theory (4)
Polynomial rings, field extensions, normal and separable extensions, automorphisms of fields, fundamental theorem of Galois theory, solvable groups, solution by radicals, insolvability of the quintic. 4 lectures. Prerequisite: Satisfactory completion of the Graduate Written Examination in Algebra or consent of the Graduate Committee.

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.

ME–MECHANICAL ENGINEERING

ME 134 Mechanical Systems (3)
An introduction to analysis, synthesis, design, 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 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 of measuring temperature, pressure, and other thermal-fluid parameters. Measurement principles including error analysis. 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 (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.

ME 313 Heat Transfer (3)
Basic principles of heat transfer. Conduction, radiation, convection, and combined modes. 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 212. 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 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, ETME 143, MATE 206, CSC 251, ME 212.

ME 329 Intermediate Design (4)
Design of mechanical equipment and systems using various machine elements and components such as threaded fasteners, power screws, springs, gears, bearings, clutches, etc. Decision modeling based on technical and economic feasibility. 3 lectures, 1 laboratory. Prerequisite: ECON 201, ME 318 (or concurrent), ME 328.

ME 341, 342 Fluid Mechanics (3) (3)
Fluid statics. Conservation equations of fluid dynamics. Viscous flow, boundary layer concepts, lift and drag, compressible flow, turbomachinery. ME 341: 3 lectures. Prerequisite: ME 212. ME 342: 3 lectures. Prerequisite: ME 341, CSC 251 or equivalent.

ME 343 Thermal Science Laboratory (1)
Heat transfer and thermodynamic experiments covering combined free convection and radiation, forced convection, heat exchanger, polytropic blowdown, steam turbine, and refrigeration system. 1 laboratory. Prerequisite: ME 236, ME 313, ME 341.

ME 344 Thermal Engineering (4)
Power and refrigeration cycles. Ideal gas mixtures, psychrometry, combustion. Convection, condensation, boiling heat transfer. 4 lectures. Prerequisite: ME 313, ME 341.

ME 345 Fluid Mechanics Laboratory (1)
Planning, execution and reporting of fluid mechanics experiments involving flow measurement and control, conservation equations, pressure and velocity distributions, performance of turbomachines, dimensional analysis for lift and drag on airfoils or bearings. 1 laboratory. Prerequisite: ME 236, ME 342.

ME 400 Special Problems for Advanced Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

ME 401 Stress Analysis (4)
Advanced strength of materials: behavior of disks, plates, and shells. Theory of elasticity. Energy methods. 3 lectures, 1 laboratory. Prerequisite: CE 206, MATH 318, ME 328 or consent of instructor.

ME 405 Mechatronics (4)
Microprocessor applications in machine control and product design. Applied electronics. Drive technology; transducers and electromechanical systems. Real-time programming. Mechatronic design methodology. 3 lectures, 1 laboratory. Prerequisite: EE 321, EE 361, ME 329.

ME 410 Experimental Methods in Mechanical Design I (4)
Bonded resistance strain gages for static and dynamic measurements; rosettes, bridge circuits, lead wire effects, special gages. Photoelastic and moire fringe methods including birefringent coatings, shadow, and projection moire. Applications in mechanical design and metrology. 3 lectures, 1 laboratory. Prerequisite: ME 328.

ME 412 Composite Materials Analysis and Design (4)

ME 415 Energy Conversion (4)
Engineering aspects of energy sources, 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. 2 lectures, 2 laboratories. Prerequisite: ME 318, ME 328.

**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)**
Introduction to robots and their types. Homogeneous transformations. Kinematic equations and their solutions. Motion trajectories, statics, dynamics, and control of robots. Robot programming. Actuators, sensors and vision systems. 3 lectures, 1 laboratory. Prerequisite: ME 326, ME 422.

**ME 424 Design of Piping Systems (4)**
Pipe specifications and pertinent codes. Valves, fittings, pumps and compressors. The transportation function of piping as related to power plants, refineries, slurry systems, pumping systems and drainage. Philosophy of system design. 3 lectures, 1 laboratory. Prerequisite: CE 205, CE 206, ME 342, CSC 251, MATE 306.

**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 313, ME 329, ME 342, ENGL 218.

**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 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 341.

**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 342, ME 344.

**ME 435 Drilling Engineering (4)**
Theory and practice of oilwell planning, drilling, well logging, and completion applied to the development of new oil and gas production, from onshore and offshore fields. 4 lectures. Prerequisite: ME 329, ME 342.

**ME 436 Petroleum Production Engineering (4)**
Design and operation of surface and subsurface equipment required in oil production. Processes and systems involved are well pumping, gas lifting, acidizing, hydraulic fracturing, fluid gathering and storage, separation of oil, gas, water and sediment from produced fluid. Includes equipment used in enhanced oil recovery processes. 4 lectures. Prerequisite: ME 329, 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 313, ME 342.

**ME 440 Thermal System Design (4)**
Design and optimization of thermal systems. Engineering economics, thermal component sizing, steady-state simulation, and optimization techniques applied to the design and performance analysis of thermal systems. 3 lectures, 1 laboratory. Prerequisite: ME 342, ME 344.

**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 344.

**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 342, ME 344.

**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 313.

**ME 456, 457, 458 HVAC System Design (4) (4) (4)**
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. 2 lectures, 2 laboratories. Prerequisite: ME 341, ME 344 or ENVE 304, 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 344.

**ME 461, 462 Senior Project (2) (3)**
Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: Senior standing, ME 344 and ME 329 (or concurrent).

**ME 463 Undergraduate Seminar (1)**
New developments, policies, practices, and procedures discussed through seminar mode. Codes of ethics and case studies interpretation through panel discussions by students. 1 seminar. Prerequisite: Senior standing, ME 344 and ME 329 (or concurrent).

**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 487 Cooperative Education Experience (6)**
Part-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 16 units. Prerequisite: Sophomore standing and consent of instructor.

**ME 497 Cooperative Education Experience (12)**
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 16 units. Prerequisite: Sophomore standing and 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 with emphasis on the theory of the Finite Element Method. Rayleigh-Ritz approximate energy minimizations applied 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 lectures. Prerequisite: ME 318, MATH 318.

**ME 541 Advanced Thermodynamics (4)**
Selected modern applications of thermodynamics which may include topics from: 1) equilibrium and kinetics as applied to combustion and air pollution, analysis and evaluation of techniques used to predict properties of gases and liquids, and 2) improvement of modern thermodynamic cycles by second law analysis. 4 lectures. Prerequisite: ME 342, ME 461, 462 and graduate standing or consent of instructor.

**ME 542 Dynamics and Thermodynamics of Compressible Flow (4)**
Control volume analysis of fluid-thermo equations for one-dimensional, compressible flow involving area change, normal shocks, friction, and heat transfer. Two-dimensional supersonic flow including linearization, method of characteristics, and oblique shocks. One-dimensional constant area, unsteady flow, 4 lectures. Prerequisite: ME 342, ME 344, 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 Conduction Heat Transfer (3)**
Theory of steady-state and transient conduction in isotropic and anisotropic media. Development of differential equations, solutions by series, transforms, Duhamel's Method, variational methods. 3 seminars. Prerequisite: ME 342, ME 344, 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 342, ME 344, 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 587 Cooperative Education Experience (6)
Advanced study analysis and part-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 9 units. Prerequisite: Graduate standing and consent of instructor.

ME 597 Cooperative Education Experience (12)
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 9 units. Prerequisite: Graduate standing and 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.

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 131 or MATH 221, and STAT 211 or 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 Relations (4)
Union organizing. Negotiation and administration of collective agreements. Simulation of bargaining, grievance, and arbitration processes. 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. 3 lectures, 1 activity. 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)
Design and management of compensation systems. Job analysis, job evaluation, wage and salary surveys, incentive systems, gainsharing, benefit administration, pay equity and legal regulation. Simulation and case study development of a wage structure, pay level and individual raise policies, administrative controls, salary and program budgets. 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)
Application of behavioral science knowledge and process skills to the major functional activities of human resource management. Analysis of cost consequences and net utility of human resource programs and innovations. Case studies integrating theoretical and applied human resource concepts, strategies and organizational practices. Application of behavioral science research methods to conduct a field audit of an existing human resource system. 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. Placement in a part-time, supervised work experience program in a government agency or private organization (entrepreneurship, partnership or corporation) as approved by the department head. The intern will function as an employee subject to all the duties and responsibilities of employees engaged in comparable work. 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: 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 topic 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 487 Seminar in Quality Management (4)
Principles and techniques of quality and performance management as applied to organizations in the private and public sector. Emphasis on competitive implications. Integrations of fundamental management techniques, existing improvement efforts, technical tools, and new management technologies focused on continuous organizational improvement. 4 seminars. Prerequisite: Senior standing, MGT 301.

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, spreadsheets, database management, and expert systems. 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 process. 3 lectures, 1 activity. Prerequisite: CSC 120 and junior standing.

MIS 412 Information Management and Database Systems (4)
Overview of database management and modeling. Focuses on business applications. Treats flatfile, network, relational, and object-oriented systems. Provides analysis, design and implementation for flatfile, relational and object-oriented systems. 3 lectures, 1 activity. Prerequisite: CSC 203, CSC 345, MIS 321.

MIS 418 Advanced Quantitative Methods and Control in Business (4)
Quantitative controls and decision support as applied to the operations of business. For the senior student who needs operational knowledge for applications in business analysis and decision support. Development of decision support system. 3 lectures, 1 activity. Prerequisite: MIS 321.

MIS 419 Expert Systems Applications in Business (4)

MIS 422 Information Systems Analysis and Design (4)
System development methodology and logical database design. Determination of management information requirements. Hardware and software selection. Computer Aided Software Engineering (CASE), software development tools. System definition project. 3 lectures, 1 activity. Prerequisite: MIS 412.

MIS 425 Small Business Information Systems (4)
Information systems in a simulated small business environment. Collaborative learning with teams analyzing, designing and implementing accounting and management reporting software. Determine and implement organizational policies and procedures. Organizational productivity as contrasted to individual productivity. 3 lectures, 1 activity. Prerequisite: MIS 221; ACTG 224, ACTG 225 or consent of instructor.

MIS 432 Information Systems Design and Implementation (4)
Structured design techniques and database implementation. Input, process, and output control and presentation methods. Project management and control. Design and implementation of information systems. Computer Aided Software Engineering (CASE) tools and software quality and security assurance. Software implementation project. 3 lectures, 1 activity. Prerequisite: MIS 412, MIS 422.

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. Includes discussion of ethical issues in marketing. 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 301.

**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 301.

**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 301 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 302 and junior standing.

**MKTG 404 Services Marketing (4)**
Service organizations such as banks, hotels, and hospitals and the distinctive approach required for marketing strategy which is unique to service companies. 4 lectures. Prerequisite: MKTG 301 and senior standing.

**MKTG 405 Sales Management (4)**
Management of the field sales force, including staffing, training, directing, evaluating and control of sales personnel. 4 lectures. Prerequisite: MKTG 301 and senior standing.

**MKTG 406 Marketing Management (4)**
Policymaking and decisionmaking in marketing in the planning, organizing, operating, controlling and evaluating of individual products and brands. Miscellaneous course fee required—see Class Schedule. 4 lectures. Prerequisite: MKTG 302, MKTG 303, and 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 Mountaineering (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 226 Advanced Orienteering (2) (CR/NC)
Continuation of MSC 111. Skills will be enhanced with emphasis placed on practical application. Credit/No Credit grading only. 1 lecture, 1 activity. Prerequisite: MSC or consent of instructor.

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. 3 lectures. Prerequisite: Music major or minor status.

MU 104 Musicianship I (1)
Introductory sightsinging; rhythmic dictation and performance in simple meters; identification of melodic and harmonic intervals and root position triads; dictation of triadic major melodies. 1 activity. Prerequisite: Music major or minor status.

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. 3 lectures. Prerequisite: MU 103.
MU 106 Musicianship II (1)
Sightsinging in the minor mode; rhythmic dictation and
performance in compound meters; identification of intervals
beyond the octave and triad inversions; dictation of triadic
pure minor melodies. 1 activity. Prerequisite: MU 104 or
consent of instructor.

MU 120 Music Appreciation (4)
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 121 Introduction to World Music (3)
A survey of selected world musical cultures. Emphasis on
listening to and understanding music from different societies.
3 lectures. Prerequisite: Music majors or consent of
instructor.

MU 150 Applied Music (1)
Individual instruction in performance with emphasis on
repertoire, technical skills, style, and interpretation. Total
credit limited to 3 units. Specific areas of study are listed in
the Class Schedule. 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. For
non-music majors.

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. For non-music majors.

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 I (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 161 Piano Skills I (1)
Preparation for Piano Proficiency Examination. Study of
piano repertoire, sightreading, transposition, harmonization
or a melody, accompanying, improvisation of a melody. 1
activity. Prerequisite: Consent of instructor.

MU 162 Piano Skills II (1)
Continuation of MU 161. Preparation for Piano Proficiency
Examination. Study of piano repertoire, sightreading,
transposition, harmonization of a melody, accompanying,
improvisation of a melody. 1 activity. Prerequisite: MU 161
or consent of instructor.

MU 163 Piano Skills III (1)
Continuation of MU 162. Preparation for Piano Proficiency
Examination. Study of piano repertoire, sightreading,
transposition, harmonization of a melody, accompanying,
improvisation of a melody. 1 activity. Prerequisite: MU 162
or consent of instructor.

MU 170 University Jazz Band (1)
Limited to those who have had considerable experience
playing musical instruments. Students have an opportunity to
for 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 172 Band (1)
Study and public performance of music written for large wind
ensembles (woodwinds, brass, and percussion). Limited to
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 173 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 184 Music Production Workshop (2)
Preparation of a musical theatre production for public presentation. Includes acting and stage management. Total credit limited to 6 units. 2 laboratories. Prerequisite: By audition or consent of instructor.

MU 201 Music Theory III (3)
Compositional procedures employed by composers of the Classical and Romantic periods. Chromatic third-related harmony, ninth, eleventh and thirteenth chords. Chromatic modulation. 3 lectures. Prerequisite: MU 105.

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: Permission of instructor.

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 208 Musicianship III (1)
Sightsinging in the melodic and harmonic minor mode; rhythmic dictation in 2 parts; identification of triadic chord progressions and root position seventh chords; dictation of melodic and harmonic minor melodies. 1 activity. Prerequisite: MU 106 or consent of instructor.

MU 210 Musicianship IV (1)
Continuation of MU 208. Sightsinging with chromatic tones; rhythmic performance in irregular meters; chord progressions with triads and dominant seventh chords; seventh chord inversions; and 2-part diatonic dictation. 1 activity. Prerequisite: MU 208 or consent of instructor.

MU 211 Musicianship V (1)
Continuation of MU 210. Sightsinging with non-diatonic tones; rhythmic dictation in irregular meters; chord progressions with secondary dominant chords; modulatory progressions and dictations. 1 activity. Prerequisite: MU 210 or consent of instructor.

MU 212 Musicianship VI (1)
Continuation of MU 211. Emphasis on previously acquired skills, plus performance and dictation of complex beat divisions; identification of augmented and neapolitan 6th chords; and modulatory dictation in 2 parts. 1 activity. Prerequisite: MU 211 or consent of instructor.

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 250 Applied Music (1)
Individual instruction in performance with emphasis on repertoire, technical skills, style, and interpretation. Total credit limited to 3 units. Specific areas of study are listed in the Class Schedule. Prerequisite: 3 units of MU 150 and consent of instructor.

MU 251 Diction for Singers (1)
The study of diction as it applies to singing in English, French, German, Italian and Spanish. 1 activity. Prerequisite: 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. For non-music majors.

MU 255 Guitar II (1)
Fundamentals of guitar technique and performance including elements of both classical and folk guitar. Knowledge of basic chords and/or standard note reading on guitar required. 1 activity. Prerequisite: MU 155 or permission of instructor.

MU 259 Jazz Improvisation (1)
Application of scales and their relationship to chords, including modes, phrasing, blues progressions, and cycle of dominant seventh chords, melodic construction in improvisation. Basic jazz keyboard skills and ear training. Repeatable to 3 units. 1 activity. Prerequisite: Consent of instructor.

MU 261 Piano Skills IV (1)
Continuation of MU 163. Preparation for Piano Proficiency Examination. Study of piano repertoire, sightreading, transposition, harmonization of a melody, accompanying, and improvisation of a melody. 1 activity. Prerequisite: MU 163 or consent of instructor.

MU 262 Piano Skills V (1)
Continuation of MU 261. Preparation for Piano Proficiency Examination. Study of piano repertoire, sightreading, transposition, harmonization of a melody, accompanying, improvisation of a melody. 1 activity. Prerequisite: MU 261 or consent of instructor.

MU 263 Piano Skills VI (1)
Continuation of MU 262. Successful completion of this course represents fulfillment of the Piano Proficiency Examination. Study of piano repertoire, sightreading, transposition, harmonization of a melody, accompanying, improvisation of a melody. 1 activity. Prerequisite: MU 262 or consent of instructor.

MU 301 Counterpoint (3)
Counterpoint as a compositional technique. Modal, tonal, and post-tonal practices. 3 lectures. Prerequisite: MU 201.
MU 302 Music Theory IV (3)
Transition to the twentieth century. Expanded tonality, chromaticism, new tonal freedom, expanded chord vocabulary, parallelism and form in impressionism. 3 lectures. Prerequisite: MU 201.

MU 304 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: Permission of instructor.

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 205, MU 304 and consent of instructor.

MU 320 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 321 History of Music I (3)
Survey of the history of Western music from Antiquity through the Renaissance. 3 lectures. Prerequisite: MU 105 and MU 120.

MU 322 History of Music II (4)
Music of the Baroque, Classic and Romantic periods. 4 lectures. Prerequisite: MU 321.

MU 323 History of Music III (3)
Music of the 20th Century. 3 lectures. Prerequisite: MU 322.

MU 324 Music and Society (3)
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.

MU 325 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 326 Cultural Concepts and Structures in Music (3)
Concepts and structures of music in non-western and avant-garde musical cultures. Emphasis on understanding the theory and compositional procedures in selected musical genres. Projects in analysis and composition. 3 lectures. Prerequisite: MU 105.

MU 327 Concert Attendance (London) (1)
Concert attendance for Music and Society (MU 324) course taught in London. Must be taken in conjunction with MU 324. Miscellaneous course fee required—see Class Schedule. 1 activity. Prerequisite: Junior standing. MU 120 recommended.

MU 340 Conducting (3)
Principles and techniques of conducting with experience in score reading. 2 lectures, 1 activity. Prerequisite: MU 201.

MU 341 Choral Conducting (3)
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.

MU 342 Instrumental Conducting (3)
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.

MU 350 Applied Music (1)
Individual instruction in performance and composition. Total credit limited to 3 units. Specific areas of study are listed in the Class Schedule. Prerequisite: Consent of instructor.

MU 360 Music for Children (3)
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.

MU 361 Instruments (1)
Fundamentals of playing and teaching woodwind, brass, string, and percussion instruments. Separate sections arranged with instructor. Total credit limited to 6 units. 1 activity. Prerequisite: Junior standing and consent of instructor.

MU 365 Music in the Elementary School (3)
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.

MU 370 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: Junior standing and consent of instructor.

MU 371 Instrumental Ensemble (1)
Open to qualified musicians. Rehearsal and public performance in large and small ensembles. Total credit limited to 6 units. 1 activity. Prerequisite: Junior standing and consent of instructor.
**MU 372 Band (1)**
Study and public performance of music written for large wind band (woodwinds, brass and percussion). Limited to those students who have had experience with 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: Junior standing and consent of instructor.

**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: Junior standing and 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: Junior standing and 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: Junior standing and 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: Junior standing and 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: Junior standing and 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: Junior standing and 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: Junior standing and 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: Junior standing and consent of department head.

**MU 401 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 302.

**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 302 and permission of instructor.

**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 and composition. Total credit limited to 3 units. Specific areas of study are listed in the Class Schedule. Prerequisite: 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: Senior standing and 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.

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**OH-ORNAMENTAL HORTICULTURE**

**OH 110 Orientation to Environmental Horticultural Science (1) (CR/NC)**
Understanding the depth and breadth of the environmental horticulture industry, the department, and the University. Student and professional organizations, equipment safety and operation. Required of all students in the major. Credit/No Credit grading only. 1 laboratory.

**OH 121 Fundamentals of Environmental Horticulture I (4)**
Introduction to environmental horticulture. Growing operations; cultural practices, including soil, media, effect, and control of environment. Field trip required. 3 lectures, 1 laboratory.
OH 122 Fundamentals of Environmental Horticulture II (4)
Aesthetic aspects of environmental horticulture, including landscape drafting, landscape and floral design and history. Design in the use and presentation of environmental products. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: OH 110, OH 121.

OH 123 Landscape Installation and Maintenance (2)
Planting and maintenance of trees, shrubs, ground covers, and small turf areas. Site selection, cultural requirements, scheduling of maintenance activities, pruning and fertilizing. Equipment maintenance, safety and operation. 1 lecture, 1 laboratory. Prerequisite: OH 110, OH 121.

OH 124 Plant Propagation (4)
Plant propagation practices with emphasis on understanding why practices are used, how they work, and how applied in commercial horticulture. 3 lectures, 1 laboratory. Prerequisite: OH 110, OH 121.

OH 125 Florist Practices I (3)
Fundamentals of theory, techniques and skills currently practiced in the florist industry. Intended as consumer education for non-majors as well as initial preparation for pre-professionals. Includes applied art principles, post-harvest care and handling practices, and proper use of florist tools and materials in crafting basic designs. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories.

OH 126 Environmental Horticulture Construction (2)
Design, construction and repair of structures and facilities unique to the environmental horticulture industry. Materials, tools, equipment, and machinery used. 1 lecture, 1 laboratory.

OH 200 Special Problems for Undergraduates (1–4)
Individual investigation, research, studies, or surveys of selected problems. Total graduation credit limited to 4 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

OH 210 Enterprise Project I (1–4)
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 two units. Credit/No Credit grading only. Prerequisite: OH 110, OH 121, OH 124.

OH 221 Water Issues and Delivery Systems (3)
Water issues as they relate to the environmental horticulture industry. Water management, conservation, and quality. Methods and evaluation of water delivery. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisites: OH 121, OH 122, OH 123, OH 124, CHEM 121.

OH 222 Abiotic Plant Problems (3)
Diagnosing of plant problems associated with environmental, nutritional, and physiological factors. Particular emphasis on the systematic inquiry process. Case histories, multimedia use. 2 lectures, 1 laboratory. Prerequisite: OH 122, OH 123, OH 124, SS 221.

OH 225 Florist Practices II (3)
Expanded exploration and application of design theory to commercial products and services in the retail florist industry. Appropriate utilization of current sales and business practices in a florist setting. Advanced techniques and skills for construction of wedding, sympathy, holiday and gift floral designs. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories. Prerequisite: OH 125.

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 Plant Materials (4) (4)
Identification, habits of growth, cultural requirements, and use of ornamental plants in the landscape. Field trip required. 3 lectures, 1 laboratory. Prerequisite: BOT 121. OH 231 prerequisite for OH 232.

OH 243 Turf Management (4)
Turf propagation, irrigation, fertilizer and pest control methods and procedures. Turf grass varieties and uses. Turf equipment. 3 lectures, 1 laboratory. Prerequisite: OH 123, OH 221, SS 121.

OH 301 Principles of Landscape Horticulture (3)
Introduction to principles and elements of residential landscape horticulture, 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 drafting skills and development of computer-aided design skills. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories. Prerequisite: OH 122, OH 123, OH 126, OH 231 and AG 250 or CSC 110.

OH 302 Wholesale Marketing Systems for Ornamental Horticulture Crops and Services (3)
Types of environmental horticulture marketing channels. Concepts, principles and practices in sales, service and marketing of environmental horticulture products at wholesale levels. The role of customer relations. Forms of advertising. Inventory control and gross margins. International wholesale marketing. Field trip required. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 activity. Prerequisite: OH 121, OH 122, OH 123, ACTG 211.

OH 310 Enterprise Project II (2–4) (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 two units. Maximum degree credit for OH 210 and OH 310 limited to four units. Credit/No Credit grading only. Prerequisite: OH 210 or consent of instructor.
OH 315 Advanced Plant Materials (3)
Identification, habits of growth, cultural requirements and use of specialty plant groups. Testing for knowledge of plants covered in required prerequisites. Field trip required. Miscellaneous course fee required—see Class Schedule. 3 lectures. Prerequisite: OH 231, OH 232.

OH 320 Horticultural Presentation Techniques (4)
Computer Assisted Design Drafting (CADD) applications for horticultural business. Exposure to various media essential to horticultural presentations. Expanded computer applications for plan, elevation, and perspective drawings. Exposure to estimating, plant materials database and plant selection programs. Required field trip. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: Computer literacy course; OH 122.

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. Computer assisted design applications emphasized. Required field trips. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: OH 231, OH 232, OH 301. Recommended: OH 320, OH 381, AE 237.

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 or 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 121, or consent of instructor.

OH 331 Landscape Contracting (4)
Practices in supervising personnel and applying standard techniques in landscape construction. Cost finding and estimating for landscape trades. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: OH 122, OH 126, OH 301.

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. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: OH 331.

OH 333 Sport and Recreational Turf (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, SS 221.

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 340 Principles of Greenhouse Environment (4)
Analysis of problems and practices affecting the contemporary commercial horticulturist. Analysis and operation of greenhouses and related equipment stressing the effect of environment on plant growth. Field trip required. 3 lectures, 1 laboratory. Prerequisite: OH 121, 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 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 340 or consent of instructor.

OH 381 Native Plants for California Landscapes (3)
Horticultural investigation of the California flora with emphasis on landscape use and potential. Plant recognition, identification, propagation and culture. Utilization of native plants in landscape design and habitat restoration. Field trip required. 2 lectures, 1 laboratory. Prerequisite: BOT 121, junior standing or consent of instructor.

OH 400 Special Problems for Advanced Undergraduates (1-4)
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 121.

OH 402 Retailing Horticultural Products (4)
Economics of operating and managing retail horticulture outlets. Location, selection, layout, and demographic studies. Personnel management, merchandising, advertising, pricing strategies and selling techniques, cooperative buying and industry contributions. 3 lectures, 1 laboratory. Field trip required. Prerequisite: OH 121, OH 122, 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 123, OH 231, OH 232, or consent of instructor.

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 421 and consent of instructor.

OH 424 Nursery Crop Production (4)
History and overview of the nursery industry. Types of wholesale nurseries and their products. Plant production systems, scheduling, marketing. Emphasis on the wholesale nursery industry in the western U.S. Field trip required. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: OH 124, OH 221, OH 222, SS 221, senior standing, or consent of instructor.

OH 425 Tissue Culture Propagation (3)
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. 2 lectures, 1 laboratory. Prerequisite: OH 124 and BOT 322 or CRSC 410.

OH 427 Disease and Pest Control Systems for Ornamental Plants (4)
Recognition, prevention and control of diseases and insect/mite pests that impact commercial ornamental plantings. Integrated pest management strategies presented including biological, cultural, and safe and proper pesticidal controls. Laboratory emphasizes hands-on approach to disease and pest control procedures. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: OH 121, CRSC 311, BOT 324 and senior standing.

OH 428 Plant Growth Regulators and Weed Control for Ornamental Plants (4)
Plant growth regulation and weed control materials and methods used in environmental horticulture production and landscape systems. Methods and materials, including selection, calculation, calibration, application and evaluation of results. 3 lectures, 1 laboratory. Prerequisite: Senior standing and OH 121, OH 122, OH 123, OH 124, OH 221, OH 222, OH 231, OH 232 or consent of instructor.

OH 434 Landscape Management (3)
Maintenance procedures and operations. Estimating scheduling, recordkeeping and implementation of landscape maintenance projects. Interior landscape maintenance. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: OH 123, OH 126, 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 301 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 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 463 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: OH 461.

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. Service course for, and topics chosen by, Agriculture Education Department. Not available for credit for OH majors. Repeatable for credit up to 9 units. 3 seminars.
PE-PHYSICAL EDUCATION

Number Fields for Physical Education Courses

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<tr>
<th>Coed</th>
<th>Men</th>
<th>Women</th>
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<td>(PE)</td>
<td>(PEM)</td>
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Basic Instructional
Program .................... 100-165
Intramural activities .......... 174
Competitive athletics .......... 181-199 181-199 181-199
Professional activities (PE majors or related concentration students only) .............. 206-229
Academic courses .............. 240 up

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 physical activities.

The beginning course or its equivalent is prerequisite to the intermediate, and the intermediate to the advanced. Prerequisite may be waived by consent of the instructor.

No more than two different activity courses nor more than one section of an individual activity course may be taken for credit in any one quarter. A student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course. Any level of an activity course can be repeated only once for credit.

Students not majoring in physical education may apply a maximum of 12 units of credit earned in general and intramural activity courses toward the bachelor's degree.

All 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 102 Tumbling and Vaulting
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 Stretch, Flex and Relax
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 143 Swimming for Non-Swimmers
PE 144 Swimming, Advanced Beginner
PE 145 Swimming, Int.
PE 146 Swimming, Adv.
PE 147 Swim Conditioning
PE 148 Tennis, Beg.
PE 149 Tennis, Int.—Adv.
PE 151 Volleyball, Beg.
PE 152 Volleyball, Int.—Adv.
PE 154 Weight Training
PE 156 Aqua-Aerobics
PE 159 Wrestling
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

PEM 182 Baseball
PEM 183 Basketball
PEM 184 Cross Country
PEM 185 Football
PEM 189 Soccer
PEM 191 Swimming
PEM 192 Tennis
PEM 193 Track and Field
PEM 196 Wrestling

Women

PEW 183 Basketball
PEW 184 Cross Country
PEW 190 Softball
PEW 191 Swimming
PEW 192 Tennis
PEW 193 Track and Field
PEW 194 Volleyball

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.

PE 206 Gymnastics (2)
PE 208 Golf (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 optimal physical fitness. 1 lecture. Prerequisite: Concurrent enrollment in PE 110, PE 116, PE 125, PE 131, PE 145, PE 146, PE 147, PE 154 or PE 156.

**PE 242 Pre-WSI (1) (CR/NC)**
Designed to offer certification in American Red Cross Emergency Water Safety (EWS) and Instructor Candidate Training (ICT). Teaching methods as related to American Red Cross courses; cognitive and skill acquisition relating to emergency water rescue methods. Credit/No Credit grading only. 1 activity. Prerequisite: PE 145 or equivalent.

**PE 243 Lifeguard Training (3)**
Lifeguarding theory, knowledge, techniques and skills. Students completing course will be eligible for American Red Cross Lifeguard Certification exam. 1 lecture, 2 activities. Prerequisite: Successful completion of Red Cross swimming skills test, consent of instructor.

**PE 250 Health Education (2)**  GEB E.2.
Introductory health course geared to bridge the gap between scientific health discoveries and one's application of these discoveries in the daily living pattern. 1 lecture, 1 recitation.

**PE 252 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: GEB B.1.b.

**PE 270 Orientation 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. Prerequisite for non-majors: Consent of instructor.

**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 276 Athletic Coaching Theory (3)**
Basic concepts, methods, practices, strategies and philosophies as they apply to competitive athletics. 3 lectures.

**PE 277 Coaching Practicum (2)**
Practical experience through the actual coaching of a competitive sports team. 2 activities; minimum of 2 hours per week per unit. Total credit limited to 6 units. Prerequisite: PE 276 and consent of adviser.

**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 238 and ZOO 239. 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 238 and ZOO 239.

**PE 310 Concepts in Elementary 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. 2 lectures, 1 activity. Prerequisite: GEB E.2. (See page 77 for GEB requirements.)

**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 217 and GEB F.1. (See page 77 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.

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 113, or PE 318, 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 296, or consent of instructor.

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. 1 lecture, 2 activities. Prerequisite: Pass swimming skills test.

PE 385 Lifeguard Instructor (2)
Analyzing lifeguard skills with emphasis on techniques and methods for teaching advanced aquatic rescue skills. Upon successful completion of this course, American Red Cross Lifeguard Instructor certification will be issued. 1 lecture, 1 activity. Prerequisite: PE 242 and PE 243 or equivalent certifications.

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: GEB F.1. and PSY 201 or PSY 202.

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: Two physical education Basic Instructional Program courses (PE 101-165) and senior standing.

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. Prerequisite: PE 354.

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. Prerequisite: PSY 201 or PSY 202.

PE 411 The Human Element in Sport (3)
Principles of sport psychology and sport sociology. The effect of sport on individuals and groups in American society. 3 lectures. Prerequisite: GEB D.4.a. and PSY 201 or PSY 202.

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 6 units. 3 lectures.

PE 416 Physical Education/Recreation Facilities (3)
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 419 Curriculum and Program Content in Elementary Physical Education (3)
Cognitive and psychomotor competencies required to design a developmental physical education program for elementary aged school children. 2 lectures, 1 activity. Prerequisite: PE 296. Recommended: PSY 210/202, PE 206.
PE 420 Administration of Aquatic Programs (3)
Preparation for national certification as a pool operator. Health and sanitation in swimming facilities; state swimming codes; pool chemistry; filtration systems; safety; liability; instructional programming; facility design; and equipment. 3 lectures. Prerequisite: PE 384 or consent of instructor.

PE 421 Strategies for Teaching Physical Education (3)
Systematic analysis and refinement of teaching skills within the discipline of physical education. 2 lectures, 1 activity. Prerequisite: PE 296, PE 419, and 2 activity classes.

PE 422 Teaching Elementary Physical Education (2)
Implementation of a developmental physical education program for elementary aged children. The program will complement that conducted in the local public schools. 1 lecture, 1 activity. Prerequisite: PE 296, PE 419, and PE 421.

PE 423 Teaching Secondary Physical Education (3)
Techniques for teaching physical education in junior high school. Emphasis on class organization, lesson plan development and evaluation, class management and control, and understanding the junior high school setting. 3 activities. Prerequisite: PE 206, PE 296 and PE 421.

PE 424 Organization and Implementation of a K-12 Physical Education Program (3)
Organization, selection, presentation, strategy, application, and presentation of K-12 subject matter in physical education. 3 seminars. Prerequisite: PE 296, PE 419, PE 422 and 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 non-PE majors; PE 252 and senior standing for PE 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) (CR/NC)
Practical work experience in related phases of physical education under qualified supervision. Total credit limited to 9 units. Credit/No Credit grading only. Minimum of 2 laboratory hours per week per unit. Prerequisite: Senior standing or consent of adviser.

PE 438 Adaptive Physical Education Fieldwork (1-3) (CR/NC)
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. Credit/No Credit grading only. Prerequisite: PE 307, consent of instructor.

PE 439 Commercial/Corporate Fitness Internship (3)
Practical experience at approved site which provides fitness and wellness programs. Students participate in program administration under direct supervision of on-site coordinator. Prerequisite: Senior standing and successful completion of all undergraduate requirements except PE 439.

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. 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 238, ZOO 239, or consent of instructor.

PE 450 Lifestyle Management (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. Design and implementation of workplace health promotion programs. 3 lectures. 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/FSN 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/FSN 210, PE 303, PE 445 or consent of instructor.

PE 461 Senior Project (2)
Senior project topic selection and development. Research methodology leading to design of the project. Project background, delimitation, literature search, and data collection techniques. 2 lectures. Prerequisite: PE 302, PE 303, PE 319, PE 402 and junior level writing course.

PE 462 Senior Project (1-3)
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. The number of units is based upon the complexity of the project as determined by the
adviser. Minimum 30 hours total time per unit of credit. 
Prerequisite: PE 461 and consent of adviser.

**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 485 Cooperative Education Experience (6) (CR/NC)**
Part-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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

**PE 495 Cooperative Education Experience (12) (CR/NC)**
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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

**PE 500 Individual Study (1-3)**
Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Only 6 units may be applied to degree requirements. Prerequisite: PE 517 and consent of department head, graduate adviser, and supervising faculty member.

**PE 502 Current Trends and Issues in 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 504 Cardiopulmonary Physiology, Pathology, and Exercise (3)**
Selected cardiovascular and pulmonary disease problems, their etiology, symptoms, diagnosis, physical limitations, and physiology as affected by exercise in therapy and rehabilitation. 3 seminars. Prerequisite: ZOO 331, ZOO 332, PE 303.

**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 514 Health Education Planning (3)**
Resolution of health problems in the workplace and community requires constant involvement in the systematic process of planning. Included in this course is the investigation of planning forces and processes that move toward specification of actions to address health problems. 3 seminars. Prerequisite: PE 250 and PE 401 or consent of instructor.

**PE 515 Communication and Behavior Within a Health and Physical Education Setting (3)**
Communication and behavioral theories integrated into activities or programs for the purpose of changing, encouraging, and maintaining healthful behavior. 3 seminars. Prerequisite: PE 250, PE 401 or consent of instructor.

**PE 516 Management of Health Promotion in the Workplace (3)**
Application and development of principles, procedures and concepts for managing and facilitating promotion in various health and fitness settings. 3 seminars. Prerequisite: PE 401 and PE 450.

**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 519 Evaluation of Current Studies (3)**
Analysis and evaluation of published studies in physical education, health education and recreation. 3 seminars. Prerequisite: PE 517.

**PE 522 Biomechanics (3)**
Advanced biomechanical concepts applied to human movement, examination of research, and biomechanical analyses of movement activities. 2 seminars, 1 laboratory. 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 (4)
Physiological determinants of physical work capacity and
sports performance. 3 seminars, 1 laboratory. Prerequisite: PE 303.

PE 536 Advanced Electrocardiography (4)
Theory and application of electrocardiography and other
techniques for cardiovascular assessment and treatment of
cardiac disease and other abnormalities. 3 seminars, 1
laboratory. 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. Student must be
advanced to candidacy.

PE 539 Development, Observation and Analysis of
Teaching Physical Education (3)
Development of effective teaching strategies and observation
and analysis of teaching with special emphasis in sport
pedagogy systems. 2 seminars, 1 activity. Prerequisite:
Undergraduate methods and/or instructional process class.

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 585 Cooperative Education Experience (6) (CR/NC)
Advanced study analysis and part-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 9 units. Credit/No Credit grading only.
Prerequisite: Graduate standing and 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 519, consent of
graduate committee and supervising faculty member.

PHIL—PHILOSOPHY

PHIL 125 Critical Thinking (3) (Also listed as ENGL 125
and SPC 125)
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 170 Problems of Philosophy (3)
Main problems and basic concepts of philosophy. Methods
of philosophical analysis and argumentation. Oral and
written expression of philosophical ideas using a case mode
presentation. 3 lectures. Prerequisite: PHIL 125 or ENGL 125
or SPC 125.

PHIL 225 Symbolic Logic (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 311 Greek Philosophy (3)
Beginnings of Western philosophy and science. Presocratics,
Socrates, Plato, and Aristotle. Greek philosophies in the
Roman world. 3 lectures. Prerequisite: PHIL 230 or PHIL
231.

PHIL 312 Medieval Philosophy (3)
Development of Western philosophy from Augustine to
Ockham, including the philosophies of Anselm, Abelard,
Roger Bacon, Bonaventure, Aquinas and Duns Scotus. 3
lectures. Prerequisite: PHIL 230 or PHIL 231.

PHIL 313 Continental Philosophy:
Montaigne to Leibnitz (3)
Development 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)
Development 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, 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 322 Philosophy of Cognitive Science (3)**

Systematic study of the problems and issues of the self and consciousness, of mental states and events and of human action; and of the relation of the philosophy of mind to such areas as psychology, linguistics and computer science. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

**PHIL 327 Inductive Reasoning (3)**

Introduction to inductive reasoning. The traditional problem of induction. Mill's methods for discovering causes. Induction and the concept of probability. 3 lectures. Prerequisite: PHIL 125 or ENGL 125 or SPC 125.

**PHIL 331 Ethics (3)**

Inquiry into the problems of the principles of right action and justice, of moral character and motivation, and of the good life. Examination of traditional and contemporary answers to these problems and the implications of those answers. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

**PHIL 332 History of Ethics (3)**

History of ethics from the Greeks to the 20th Century. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

**PHIL 333 Political Philosophy (3)**

Philosophic foundations 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)**


**PHIL 335 Social Ethics (3)**

Critical examination of ethical problems connected to issues of social justice for ethnic minorities in contemporary American society. These issues include racial and sexual discrimination, racial and sexual harassment, preferential hiring, and the relation of capital punishment to ethnicity. Related individual rights and public policy issues will also be examined. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

**PHIL 337 Professional Ethics (3)**

Critical examination of ethical problems arising in the professions. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

**PHIL 339 Biomedical Ethics (3)**

Critical examination of ethical problems arising in biology, biotechnology and medicine. Concepts of health and disease, ethical issues of human experimentation, informed consent, behavior control, genetic intervention, new birth technologies. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

**PHIL 340 Environmental Ethics (3)**

Ethical analysis of various positions on the status of non-human entities and the most reasonable approaches to environmental problems such as pollution, species preservation, global warming and others. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

**PHIL 342 Philosophy of Religion (3)**

Inquiry into the nature of religious experience and claims, naturalism and supernaturalism, arguments for the existence of God, the problem of evil, miracles, revelation, faith, human nature and destiny, verification and refutation of religious claims. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

**PHIL 351 Traditional Theories of Aesthetics (3)**

Critical examination of philosophical views of art from Plato through Kant to Collingwood and Dewey. Special emphasis given to the relationship among art, truth and reality, and to the nature of aesthetic experience. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

**PHIL 352 Contemporary Problems in Aesthetics (3)**

Critical examination of philosophical issues related to art, with emphasis on problems affecting aesthetics with the rise of modern art. Topics covered include the problem of defining art, the problem of determining standards for interpreting art, and the relation of aesthetic values to moral, social and political values. 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 411 Metaphysics (3)**

Traditional and current ideas and arguments about substance, the relation of universals to particulars, space and time, events, causation and necessity, the self and free will. 3 lectures. Prerequisite: PHIL 230.

**PHIL 412 Epistemology (3)**

Traditional and current ideas and arguments about the possibility of knowledge, the limits and powers of perception, reason and memory as ways of knowing, and the nature of necessary and contingent truth. 3 lectures. Prerequisite: PHIL 230.

**PHIL 460, 461 Senior Project (3) (3)**

Selection and completion of a thesis under faculty supervision. Minimum of 180 hours total time. Prerequisite: Prior consent of instructor.

**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--PHYSICS**

**PHYS 104 Introductory Physics (4)**

Fundamental principles of mechanics, heat, light and electricity. Not to be taken by students who have taken
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) GEB B.1.a.
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) GEB B.1.a.
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 engineering and architecture students, and for students majoring in the physical sciences. 3 lectures, 1 laboratory. Prerequisite: MATH 131 or concurrent enrollment in MATH 142. High school physics recommended.

PHYS 132 General Physics (4) GEB B.1.a.
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) GEB B.1.a.
Charge and matter, electric field, electric potential, dielectrics, capacitance, current and resistance, electromotive force and circuits, magnetic fields, magnetic field of a moving charge, induced emf. 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 (3)
Introduction to microcomputer tools for physics. Graphics, plotting, use of spreadsheets, integration, differential equations, simulations, statistical techniques, non-linear equations. Applications to problems in physics. 3 lectures. Prerequisite: PHYS 133, GEB F.1. elective, and concurrent enrollment in MATH 242.

PHYS 206 Instrumentation in Experimental Physics (3)
L-R-C circuits and electronic circuit elements emphasizing the applications of analog and digital electronics to instrumentation in modern physics. 3 lectures. Prerequisite: PHYS 133, MATH 143, GEB F.1. elective, and concurrent enrollment in PHYS 256.

PHYS 211 Modern Physics I (4) GEB B.1.a.
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 123 or PHYS 133, and MATH 133 or MATH 241.

PHYS 212 Modern Physics II (3) GEB B.1.a.
Applications of quantum physics to atoms, nuclei, and elementary particles. Nuclear reactions, 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 Modern Physics Laboratory (1) GEB B.1.a.
Experiments in modern physics, including atoms and techniques of nuclear radiation detection. Properties of alpha, beta and gamma radiation. 1 laboratory. Prerequisite or concurrent: PHYS 212, PHYS 256 or equivalent.

PHYS 256 Electrical Measurements Laboratory (1)
Experimental studies of circuit analysis and electronics; introduction to digital techniques; instrumentation. 1 laboratory. Prerequisite: PHYS 133, MATH 143, and concurrent PHYS 206.

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 211, MATH 241.
PHYS 302 Analytical Mechanics I (3) GEB B.1.a.

PHYS 303 Analytical Mechanics II (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 usage, 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) GEB B.1.a.
Interaction of radiation with matter, theory of laser action, characteristics and modification of laser output, types of lasers. Holography and other applications. 3 lectures. Prerequisite: PHYS 133, or 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 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 I, II (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 357 Advanced Instrumentation in Experimental Physics (3)
Advanced analog and digital electronics, computer interfacing to experiments, robotics. 2 lectures, 1 laboratory. Prerequisite: PHYS 206 and PHYS 256.

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 and Particle Physics (3)

PHYS 405 Quantum Mechanics I (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: PHYS 212, MATH 304.

PHYS 406 Quantum Mechanics II (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 I, II (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, reflection from an accelerated charge. 4 lectures, 3 lectures. Prerequisite: MATH 304, PHYS 206 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 412 Solid State Physics (3)
Physics of the solid state of matter. Relationship between atomic bonding and the structural, mechanical, thermal, optical, and electronic properties of solids. Emphasis on those properties that influence electronic behavior and processes in metals, insulators, and semiconductors. 3 lectures. Prerequisite: PHYS 211, MATH 242.

PHYS 413 Advanced Topics in Solid State Physics (3)
Semiconducting devices, including junction and field-effect transistors, LED's, and diode lasers. Magnetic properties of solids. Superconductivity, including discussion of high-temperature superconductors. Other topics of current interest in solid state physics. 3 lectures. Prerequisite: PHYS 412.
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 (4)
Lens aberrations, interference and diffraction, Fourier optics, quantum optics, image formation and holography, non-linear optics. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. 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: PHYS 133, MATH 304, MATH 318.

PHYS 452 Solid State Physics Laboratory (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.

PHYS 485 Cooperative Education Experience (6) (CR/NC)
Part-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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

PHYS 495 Cooperative Education Experience (12) (CR/NC)
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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

PM–POULTRY MANAGEMENT

PM 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.

PM 230 Poultry Industry Survey (3)
Modern poultry production and marketing. Survey of consumption trends, breeds and consumer grades. Application of management skills, health care, behavior and processing techniques. 3 lectures.

PM 240 Poultry Business Management (3)
Organization and management of vertically integrated poultry operations. Structuring of staffing, cost and profit centers and financial statements. Managing the finance, public relations, production scheduling, product distribution and sales. 3 lectures.

PM 250 Poultry Processing (3)
Processing, value added further 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. Prerequisite: PM 230.

PM 290 Poultry Management Enterprise (2–4) (CR/NC)
Introduction to management techniques of the poultry enterprise. Providing health, nutritional and physical care to a representative group of birds. Planning, budgeting and marketing. Instructor approval required. Total degree credit for 290/490 limited to 9 units. Credit/No Credit grading only. Prerequisite: Consent of instructor.

PM 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.

PM 330 Poultry Production Management (4)
Modern production techniques for the commercial poultry industry. Management of hatcheries, replacement pullets, egg production, and broiler and turkey meat production enterprises. 3 lectures, 1 laboratory. Prerequisite: PM 230.

PM 340 Poultry Anatomy, Physiology and Diseases (4)
Structure, function and pathology of the principal organ systems of domestic poultry. Prevention and control of poultry diseases and parasites. Planning and management of poultry flock health maintenance program. 3 lectures, 1 laboratory. Prerequisite: PM 230.

PM 350 Applied Poultry Feeding and Nutrition (3)
Nutritional requirements, feeding principles and practices as applied to commercial poultry flocks. Least-cost ration formulation, feed manufacturing principles and governmental regulations applicable to the poultry feed manufacturing
POLS—POLITICAL SCIENCE

POLS 100 Political Inquiry (4)
Introduction to the scope, language, concepts and
approaches employed in political science and the social
sciences. Includes emphasis on basic methodological and
research strategies for assessing political issues, events, and
the dynamics of political change. 4 lectures.

POLS 105 Introduction to International Relations (4)
Introduction to the evolution, dynamics and substance of the
international system; consideration of such subjects of
conflict and accommodation, power and weakness,
perception and reality, prosperity and poverty, and war and
peace in international relations. 4 lectures.

POLS 200 Special Problems for Undergraduates (1–4)
Individual investigation, research, study, or survey of
selected problems under faculty supervision. Total credit
limited to 4 units. Prerequisite: Consent of department head.

POLS 204 Basic Concepts of Political Thought (4)
Introduction to such concepts as: law, justice, community,
right, citizen, and constitution, which are fundamental to
political discourse, as developed in the works of Plato,
Aristotle, Augustine, Thomas Aquinas, Machiavelli, and other
illustrious thinkers from classic to modern times. 4 lectures.
Prerequisite: POLS 210.

POLS 210 American and California
Government (3)
Study of governmental institutions, politics, issues and
political behavior in the United States and California in
constitutional, historical, social and cultural perspectives.
Contemporary political problems. Satisfies the United States
government and California state and local government
requirement. 3 lectures.

POLS 250 Model United Nations (2) (CR/NC)
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 2 units. Credit/No Credit grading only. 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 (4)
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, 1 activity. Prerequisite: POLS 100 and STAT 211.

POLS 306 Modern Political Thought (3)
Theories of political participation and the relationship between
man and the state as developed in the works of
influential thinkers such as Locke, Rousseau, Mill and Marx.
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. 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 (4)
Development of the management functions in government. Survey of administrative concepts and cases. Attention given to national, state and local administrative systems. Case studies and simulations. 4 lectures. Prerequisite: POLS 210.

POLS 321 American Constitutional Law (4)
United States Constitution as interpreted by the Supreme Court. Decisions in the areas of taxation, separation of powers, nature of congressional presidential powers. Emphasis on social, economic and political factors. 4 lectures. Prerequisite: POLS 210.

POLS 322 Civil Liberties (4)
Role of Supreme Court as interpreter of Constitutional rights and liberties, freedom of expression, religion and the press, search and seizure, due process of law. 4 lectures. Prerequisite: POLS 210.

POLS 323 Civil Rights in America (4)
Case-based examination of race, ethnic and gender discrimination in the United States. The course emphasizes the response of the Supreme Court to issues of equality including affirmative action and abortion. 4 lectures. Prerequisite: POLS 210.

POLS 331 Political Parties and Interest Groups (3)
Makeup and major functions of political parties. Role of political parties and interest groups in a democracy. Degree of consensus and conflict between present day political parties and 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) (GEB C.3)

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 336 Judicial Process (4)
Examines legal processes, emphasizing political influences on law. Topics may include: types of law, legal culture, state and federal courts, criminal trials, the role of police, judges, attorneys in the legal system. 4 lectures. Prerequisite: POLS 210.

POLS 340 Government Internship (2-12) (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. 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) (CR/NC)
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 2 units. Credit/No Credit grading only. 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 382 Comparative Politics (4)
Comparative study of the government of the United Kingdom and other selected Western European and non-Western countries. Emphasis given to comparison of democratic and non-democratic models and traditions. Case studies. 4 lectures. Prerequisite: POLS 105 or 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 (1-4)
Individual investigation, research, study, or survey of selected problems. Total credit limited to 4 units. 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 case studies, simulations and/or computer research exercises. 4 lectures. Prerequisite: POLS 210.

POLS 403 Municipal Government (4)
Concepts, policies and politics in urban governments and organization and power-structure issues of modern American municipalities. Inter-governmental relations, finance, and planning problems in city government. 4 lectures. Prerequisite: POLS 210.

POLS 404 Science, Technology and Public Policy (4)
Techniques for performing technical assessment and impact analysis in communication, transportation, health technologies, aerospace, electronics and other new technologies. Case studies on contemporary problems stemming from the relationship of technology and politics. 4 lectures. Prerequisite: POLS 210.

POLS 405 Politics of Finance and Planning (3)
Economic and political factors affecting federal, state and local governments. Intergovernmental relations and policy considerations in finance, debt management and tax administration. Appropriations and audits in government departments, commissions and agencies. 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 Russian Politics (3)
Analysis of political, economic, and social institutions of the former Soviet Union. Emphasis placed on Russia. 3 lectures. Prerequisite: POLS 105 or junior standing.

POLS 425 Public Policy Analysis (4)
Methods of analyzing the intent and action 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. Project results presented in a formal paper. Prerequisite: Senior standing (completion of 135 quarter hours), completion of required core courses and concentration. May not be taken CR/NC.

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 (1-4)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. 1-4 lectures. Prerequisite: POLS 210, junior standing.

POLS 485  Cooperative Education Experience (6) (CR/NC)
Part-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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

POLS 495  Cooperative Education Experience (12) (CR/NC)
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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

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 application 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 application 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 Weapon Proliferation in the Post Soviet World (3)  GEB B.1.a.
Science and technology of fission and fusion weapons, effects of nuclear weapons and nuclear radiation, nuclear proliferation. Nuclear arms treaties and the technology of verification. Nuclear reactor technology. 3 lectures.

PSC 201  Introduction to Physical Oceanography (3)  GEB B.1.a.

PSC 205  Traces Through Time (3) (Also listed as BIO 205)  GEB B.1.a. or B.1.b.
Survey of evidence supporting evolution including origin of the universe, radiometric dating, structure of Earth and plate tectonics. Evolutionary evidence from chemistry, biology, fossils, and the geographical distribution of life. Fundamental differences between science and creationism will be explored. 3 lectures.

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 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) GEB E.1.
Introduction to the psychological study of human beings; applications of research in psychobiology, perception, learning, motivation, consciousness, cognition, personality, emotion, development, psychological assessment, social behavior, psychopathology, and psychotherapy. A student may enroll for credit in either PSY 201 or PSY 202, but not both. 3 lectures.

PSY 202 General Psychology (3) GEB E.1.
Introduction to the psychological study of human beings. Applications of research in psychobiology, perception, learning, motivation, consciousness, cognition, personality, emotion, development, psychological assessment, social behavior, psychopathology, and psychotherapy. A student may enroll for credit in either PSY 202 or PSY 201, but not both. 2 lectures, 1 recitation.

PSY 205 Human Sexuality (3) (CR/NC)
Understanding development of personal sexuality. Sexual identity, biological aspects of sexuality, homosexuality, intimate relationships, communication, sexually transmitted diseases, sexual dysfunction, family planning, abortion. Emphasis on maintaining psychological and physical wellness. Credit/No Credit grading only. 3 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 252 Social Psychology (4)
How attitudes, beliefs, and behavior are affected by the social situation. Gender roles, prejudice, aggression, altruism, attitudes and persuasion, liking and loving, and group behavior. Use of social psychology to reduce racism and sexism and international conflict, improve relationships, and communicate persuasively. 4 lectures. Prerequisite: PSY 201 or PSY 202.

PSY 254 Family Psychology (4)
Examination of methodology, theory, and domains of family psychology with emphasis on family behavior as related to clinical, public policy, and professional issues. 4 lectures. Prerequisite: PSY 201 or PSY 202.

PSY 256 Developmental Psychology (4)
Introduction to the scientific study of development with emphasis on the lifespan, from conception to death. Basic research and concepts in development. Application of developmental principles to individuals and their interactions with others in the environment. 4 lectures. Prerequisite: PSY 201 or PSY 202.

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 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 or PSY 254, junior standing.

PSY 304 Physiological Psychology (3) GEB E.2.
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 305 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 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. Miscellaneous course fee required—see Class Schedule. 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 319 Motivation (3)
Physiological, sociobiological, behavioral, humanistic and cognitive theories of motivation. Practical applications of each theory to personal and societal behaviors. Research evaluating each theory. 3 lectures. Prerequisite: PSY 201 or PSY 202 and junior standing.

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. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: Junior standing, Ethnic Studies course, HD 102, HD 130, or consent of instructor.

PSY 327 Human Dimension of Leisure (3) (Also listed as REC 327)
Philosophical, psychological, and cultural aspects of leisure wellbeing and behavior. Cultural diversity as it relates to recreation and leisure. Needs, interests, barriers, values and patterns explored. 3 lectures. Prerequisite: REC 252.

PSY 329 Research Methods in Psychology and Human Development (5)
Introduction to research methods used in psychology and human development. Topics include experimental, correlational, survey, designs, library search procedures, basic statistical procedures, writing the research paper, and matching statistics to the research design. 3 lectures, 2 activities. Prerequisite: PSY 201 or PSY 202, or consent of instructor.

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 351 Group Dynamics (4)
Dynamics of small groups. Topics include functions of groups, group structure, power, leadership, intragroup conflict, personal space and territoriality, groups as agents of societal and personal change. Demonstrations emphasizing experiential learning in groups. 2 lectures, 2 activities. Prerequisite: PSY 252 and PSY 323.

PSY 359 Applied Psychology Research Methods (4)
Methods of testing hypotheses and evaluating social interventions in real-world settings. Interview, survey, correlation, field experimental, and quasi-experimental methods. Program evaluation. Experience with data collection and computer analysis. 3 lectures, 1 activity. Prerequisite: PSY 329.

PSY 380 Issues in Family Psychology: Past, Present, Future (4)
Examination of the role that historical change has played in the shaping of today's family. Analysis of the implications for family psychologists. 4 seminars. Prerequisite: PSY 254 or HD 203.

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 405 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 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: PSY 256 or HD 209, junior standing.

PSY 419 Development of Self and Individuality (3)
Concepts, theories, and research related to the development of the self across the lifespan. Examination of the influence of temperament, individuation, ego strengths, self-awareness, roles and identity on the development of individuality. 3 seminars. Prerequisite: PSY 256 or consent of instructor.

PSY 420 Social and Emotional Development (3)
Analysis of the development of social interaction and emotional processes across the lifespan. Research and theories on such behaviors as attachment and love, empathy and altruism, competition and aggression, peer relations and cooperation. 3 seminars. Prerequisite: PSY 256 or consent of instructor.

PSY 421 Cognitive Development (3)
Examination of significant processes in the development of cognition across the lifespan. Theory and research regarding Piagetian theory, information processing, problem solving, creativity, and language development. Educational and counseling applications. 3 seminars. Prerequisite: PSY 256 or HD 209 or consent of instructor.

PSY 422 Lifespan 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 (4)
Research methodology and experimental design. Application of descriptive and inferential statistics to data from various content areas including development, animal and human learning, memory, cognition, and psychophysical processes. 3 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 444 The Atypical Infant (4) (Also listed as EDUC 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, PSY 256 or HD 209, and EDUC 440 or consent of instructor.

PSY 450 Family Therapy and Crisis Intervention (4)
Basic elements of marriage and family therapy and crisis intervention. Emphasis on concepts, goals, and techniques of various family therapy approaches and family crisis intervention. 4 lectures. Prerequisite: PSY 254, PSY 405, or graduate standing.

PSY 453, 454 Supervised Fieldwork (6) (6) (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: PSY 323, HD majors, junior standing in Human Development, 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, psychosis, anxiety disorders, biological dysfunctions, and retarded social and cognitive development. 3 seminars. Prerequisite: PSY 201 or PSY 202, junior standing.

PSY 457 Memory and Cognition (3)
Principles and theories of memory and cognition including serial versus parallel processing models of memory, memory stores, metamemory, concept formation, language, expert-novice differences in cognition, social cognition; applications to areas such as eye witness testimony, education and aging. 3 lectures. Prerequisite: PSY 201 or PSY 202, junior standing.

PSY 458 Learning (3)
Principles of classical, operant and avoidance conditioning; complex learning processes including choice and stimulus control. Theoretical basis for behavior therapy techniques such as contingency management, response elimination and extinction, punishment and aversion procedures. 3 seminars. Prerequisite: PSY 201 or PSY 202, junior standing.

PSY 459 Lifespan Theories (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 209 or PSY 256, or consent of instructor, senior standing.

PSY 460 Child Abuse and Neglect (3)
Issues in child maltreatment, including definitions and forms, causes, consequences, assessment, reporting, treatment, and prevention. Possible links among research, intervention, and public policy will be emphasized. 3 seminars. Prerequisite: PSY 201 or PSY 202 and junior standing.

PSY 461 Senior Project Seminar (1)
Discussion of occupational and graduate school opportunities and of current issues in psychology for the purpose of defining professional objectives and individual projects for PSY 462. Senior project progress reports with class critique. 1 seminar. Prerequisite: PSY 329, PSY 453, Graduation Writing Requirement, and consent of instructor.

PSY 462 Senior Project (3)
Design and completion of a faculty-supervised project in psychology. The project must be presented in a formal,
written report. Minimum of 90 hours total time. Prerequisite: PSY 329, PSY 453, Graduation Writing Requirement, and consent of instructor.

**PSY 465 Cross-Cultural Issues in Psychology (3)**

Psychological, biological and ecological influences on human development in different cultural settings. Focuses on: 1) cognitive development/teaching and learning; 2) attitudes and belief; 3) health and growth; and 4) social and psychological aspects of cultural patterns. Course will have a focal cultural area for each quarter. Class Schedule will list topic selected. 3 seminars. Prerequisite: PSY 201 or PSY 202 and junior 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 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.

**PSY 485 Cooperative Education Experience (6) (CR/NC)**

Part-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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and 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 495 Cooperative Education Experience (12) (CR/NC)**

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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

**PSY 496 Applied Social Psychology (4)**

Survey of methods of applied social psychology and applications to education, business and industry, environmental problems, health systems, law, mass communication, politics, and international relations. Oral and written reports of student investigation and analysis of social and organizational problems. 4 seminars. Prerequisite: PSY 252, PSY 302, PSY 329.

**PSY 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. Only 6 units may be applied to degree requirements. Prerequisite: Consent of department head, graduate major adviser and supervising faculty member.

**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 555 Counseling and Communication (4) (Also listed as EDUC 555)**

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 or consent of instructor.

**PSY 560 Counseling Theories and Assessment (4) (Also listed as EDUC 560)**

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: EDUC/PSY 555, PSY 305 or consent of instructor.

**PSY 561 Group Counseling (3) (Also listed as EDUC 561)**

Theory and practice of group counseling, client selection, group structure, process and termination. Application of theories to specific developmental groups. Communication and facilitation skills emphasized with relevant ethics and law. 2 seminars, 1 activity. Prerequisite: EDUC/PSY 555, EDUC/PSY 560 or consent of instructor.

**PSY 564 Ethics and the Law: MFC Counseling (3)**

Ethics, client rights, and laws related to individual, child, family and group therapy counseling. 3 seminars. Prerequisite: EDUC/PSY 560, EDUC/PSY 561, PSY 450 or consent of instructor.

**PSY 565 Diagnosis and Treatment: Psychopathology (4)**

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: EDUC/PSY 560, PSY 405, PSY 432, or consent of instructor.

**PSY 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: EDUC/PSY 560, EDUC/PSY 561 or consent of instructor.
PSY 567 Counseling the Elderly and Their Families (3)
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: EDUC/PSY 555, PSY 419, PSY 420, PSY 421 or PSY 459 or consent of instructor.

PSY 568 Advanced Psychotherapies (3)
Theory and application of advanced approaches in psychotherapy, including: cognitive-behavioral therapies, psychodynamic therapies and humanistic/existential therapies. Class schedule will list therapy selected. Total credit limited to 9 units. 3 seminars. Prerequisite: PSY 560 or consent of instructor.

PSY 569 Counseling Clinic Practicum (6)
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 18 units. A maximum of 12 units may be applied to the Master of Science in Psychology. Prerequisite: EDUC/PSY 560, PSY 405, PSY 450, 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)
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: PSY 450, EDUC/PSY 555 or consent of instructor.

PSY 572 Child and Adolescent Therapy (4)
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: EDUC/PSY 560, EDUC/PSY 561, PSY 405, PSY 456 or consent of instructor.

PSY 573 Field Experience: Counseling (6)
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. Prerequisite: EDUC/PSY 555, EDUC/PSY 557 and consent of M.S. program committee.

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.

PSY 575 Sexual Dysfunction Therapy (3)
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: EDUC/PSY 560 and PSY 450.

PSY 576 Field Experience: Marital and Family Counseling (6)
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. Weekly seminar with on-site and university supervisors. 30 hours work experience per unit of credit. Prerequisite: PSY 569, consent of instructor and M.S. program committee.

PSY 585 Research Methods for Counseling Psychology (4)
Research methods relevant to practitioners in counseling psychology and human services. Develop the ability to design, carry out and evaluate pertinent psychological research. Basic understanding of descriptive and inferential statistics and the use of computers in the analysis of data. 2 seminars, 2 activities. Prerequisite: PSY 573 or PSY 576 or consent of instructor.

PSY 586 Cooperative Education Experience (6) (CR/NC)
Advanced study analysis and part-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 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

PSY 590 Research Applications in Psychology and Human Services (4)
Application of research techniques to problems in psychology and human services. Emphasis on the design of data collection instruments, data collection and data analysis in an applied research project. 2 seminars, 2 activities. Prerequisite: PSY 585.

PSY 596 Cooperative Education Experience (12) (CR/NC)
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 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

PSY 599 Thesis or Project (3)
Completion of a thesis or research project pertinent to the fields of psychology and human services. Supervision. Prerequisite: PSY 590.
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. 1 lecture, 1 recitation.

REC 101 Introduction to Recreation and Leisure Services (3)
History, philosophy, theory, and organization of recreation and leisure services. Emphasis upon functions, areas, facilities, clientele, and career opportunities. Field visits required. 3 lectures.

REC 105 Recreation Leadership (3)
Recreation leadership with small and large groups. Emphasis upon leadership skill development, appropriate theories and techniques for specific clientele. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory.

REC 110 Career Development and Planning in Recreation Administration (1) (CR/NC)
Development and application of philosophy, learning strategies, and problem solving for career planning in Recreation Administration. Credit/No Credit grading only. 1 activity. Prerequisite: consent of instructor.

REC 210 Introduction to Program Design (4)
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 in social recreation, cultural arts, health and fitness and sport/games areas. 2 lectures, 2 activities. Prerequisite: REC 101, REC 105 or consent of instructor.

REC 252 Leisure and Special Populations (3)
Introduction to special populations. Exploration of disability rights issues. Specialized leadership and communication techniques. Modification requirements for programs, areas, facilities, equipment, and supplies. Introduction to Americans With Disabilities Act and its implications for recreation and leisure services. Field visits required. 3 lectures. 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 302 Environmental Education (3)
Environmental education and teaching techniques that apply to learning experiences in an outdoor environment. Impact of natural resource usage that affects biological and physical resources. Educational strategies for presenting environmental learning to grades K-12 and selected learning environments. 2 lectures, 1 activity. Prerequisite: REC 210, BOT 121.

REC 310 Program Administration in Leisure Services (4)
Management of special events delivery system in a variety of settings. Needs assessment, program selection, program promotion, and evaluation analyzed. Special event program design developed. Field trips required. 4 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.

REC 314 Travel and Tourism Planning (4)
The history and development of tourism. Emphasis on the impact of tourism activity on individual cultures and the natural environment. Environments examined include urban, rural, and National and local park systems. Travel motivations, travel research and planning models. Field visits required. 4 lectures. Prerequisite: REC 210.

REC 317 Conventions and Meeting Management (3)
Role of conventions and meeting management in the area of tourism. Factors involved in meeting planning for small and large groups to include committees, amenities, logistics of operations and evaluation. 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: REC 210.

REC 327 Human Dimension of Leisure (3) (Also listed as PSY 327)
Philosophical, psychological, and cultural aspects of leisure wellbeing and behavior. Cultural diversity as it relates to recreation and leisure. Needs, interests, barriers, values and patterns explored. 3 lectures. Prerequisite: REC 252.

REC 330 Directed Field Experience (3) (CR/NC)
Practical work experience in related phases of recreation administration in organization or agency under qualified supervision. Minimum of nine hours per week. Credit/No Credit grading only. Total credit limited to 9 units. Prerequisite: REC 210 and consent of instructor.

REC 400 Special Problems For Advanced Undergraduates (1–3)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Consent of curriculum coordinator.

REC 424 Financing Recreation and Leisure Services (4)
Financing leisure products and services in public, private, commercial and voluntary settings. Emphasis on sources and methods of financing; grant development; operational/financial cost analysis; forecasting, budgeting, pricing and fiscal master planning through use of computer technology. 2 lectures, 2 laboratories. Prerequisite: ACTG 211, REC 324.
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 seminars. Prerequisite: CSC 113 or AG 250, SOC 333 or PSY 329, 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 460.

REC 464 Organization and Development of Commercial Leisure Services (4)
Historical and contemporary development of the domains of commercial recreation and related services. Role of entrepreneurial activity. Procedures for creating and managing a socially responsible commercial leisure service. 3 lectures, 1 laboratory. Prerequisite: ACTG 211, and senior standing.

REC 465 Internship (6) (CR/NC)
400 hours of full-time concentration-specific practical work experience over a ten-week period in an approved agency. Comprehensive involvement in agency program. Not open to TR Concentration students. Credit/No Credit grading only. Prerequisite: Minimum GPA of 2.0; 1,000 verified hours of adviser-approved paid and/or volunteer experience subsequent to high school; completion of all university coursework other than Internship; approval of Curriculum Coordinator.

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.

REC 485 Cooperative Education Experience (6) (CR/NC)
Part-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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

REC 495 Cooperative Education Experience (12) (CR/NC)
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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

RELS—RELIGIOUS STUDIES

RELS 304 Judaism (3) GEB C.3.
Origin, beliefs and practices of Judaism and central themes in the Hebrew Bible. The relation of Judaism to other religions in the ancient Near East, such as the Zoroastrian and Egyptian traditions. The emergence of modern Judaism and Zionism. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125, and PHIL 230 or PHIL 231 or permission of the instructor.

RELS 305 Christian Origins (3) GEB C.3.
Origin, belief and practices of Christianity. Its early roots in the Messianic idea in Judaism. The Gospels, the life and ministry of Jesus, the letters of Paul, the development of the Catholic Church, heresies, and apocalypticism will be emphasized. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125, and PHIL 230 or PHIL 231 or permission of the instructor.

RELS 306 Hinduism (3) GEB C.3.
Origin, beliefs and practices of the Veda and the Upanisads. The teachings of the Bhagavad Gita. The six systems of Hindu philosophy. Modern Hindu institutions and social philosophy. Encounter with heterodox religions, such as the Jains and Sikhs. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125, and PHIL 230 or PHIL 231 or permission of the instructor.

RELS 307 Buddhism (3) GEB C.3.
Origin, beliefs, and practices of Buddhist traditions. The life of Gautama, the historical Buddha. Philosophies of Theravada, Mahayana and Tantrism. Development of Buddhism in China, Tibet, Japan, Southeast Asia. American encounter with Taoist, Shinto and Confucian traditions. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125, and PHIL 230 or PHIL 231 or permission of the instructor.

RELS 308 Islam (3) GEB C.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, and PHIL 230 or PHIL 231 or permission of the instructor.

SCM—COLLEGE OF SCIENCE AND MATHEMATICS

SCM 100 Orientation to the College 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)  GEB D.4.a.
The groups and societies humans build and how these affect our behavior. Special attention is given to the analysis of how factors such as gender, race or ethnicity, income, and occupation interact with the five basic social institutions of society: family, economy, government, religion and education. 3 lectures.

SOC 106 Social Problems (3)
Description and analysis of the social problems facing contemporary society; includes such topics as ethnic and gender inequality, poverty, pollution, and warfare. 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. Emphasis on the dynamic nature of family interaction and its correlates: social class, ethnicity, 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 The World System and Its Problems (3)  GEB D.4.b
Analysis of the historical background, structure, and dynamics of the world system; examines such issues as the origins of Third World poverty, the changes in the world's dominant economic powers, and possible strategies for the economic development of the Third World. 3 lectures.

SOC 310 Self, Organizations and Society (3)
Analysis of the nature and development of the self. Includes the emotions, drives and other biological influences on behavior, socialization and social interaction, social and gender roles, and the reciprocal influences between individuals, organizations, and society. 3 lectures. Prerequisite: Junior standing, or consent of instructor.

SOC 311 Sociology of Gender (3)
Description and analysis of the impact of gender definitions on men and women in society. Special attention is given to the learning process; the creation and perpetuation of gender stereotypes and the way these affect individual life chances and social structure, explored in the areas of work, education and family. Focus on media presentation of gender and effects of ethnicity and class. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

SOC 313 Urban Sociology (3)
An examination of the history of the city. The causes and effects of urbanization; analysis of the physical structure of the community, patterns of social class, power, and segregation and their effects. Changing patterns of urban community life. 3 lectures. Prerequisite: One sociology course or consent of instructor.

SOC 315 Race and Ethnic Relations (3)  GEB D.4.b.
Diverse structures of unequal relationships among racial and ethnic groups in several countries including the U.S. Theories about sources of economic and social discrimination and colonialism. Focusing on the concept of ethnicity. Evaluation of methods to restructure race and ethnic relations. International case histories. 3 lectures. Prerequisite: Junior standing.

SOC 316 American Ethnic Minorities (3)
Exploration of the issues and problems affecting the four major ethnic minorities in American society: Native Americans, Afro-Americans, Hispanics and Asian Americans. Dynamics of intergroup relations focusing on the concepts of ethnocentrism, stereotyping, pluralism and assimilation. Sources and manifestations of economic and social discrimination patterns and how they affect the individual's life course. 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 and ethnicity, gender, family systems, crime and delinquency. 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)
The basics of how to do social research with an emphasis on formulating research questions and collecting data. Includes such topics as sampling and interview techniques. 3 lectures. Prerequisite: Two sociology courses and STAT 211 with a grade of C or better, or consent of instructor.

SOC 334 Social Research Methods II (3)
The basics of how to do social research with an emphasis on the analysis of data. Includes training in the use of statistical computer programs. 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, and gender and race or ethnic differences in organizational patterns. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

SOC 402 Crime and Delinquency (3)
Crimes and delinquent behavior, by age, sex, social class, race and ethnicity of offenders and victims. Specific crime patterns including murder, assault, robbery, burglary, sex crimes, substance abuse, white collar and organized crime. Biological, psychological, sociological and other theories of crime causation. 3 lectures. Prerequisite: Junior standing.

SOC 412 Criminal Justice (3)
Approaches to the control and rehabilitation of adult and juvenile offenders; philosophy of prevention and treatment strategies, with attention to factors of race and ethnicity; history and issues concerning police, the courts, prisons, parole and community-based correction. 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)
Analysis of world population trends using the basic demographic processes of fertility, mortality and migration. Includes the effects of population growth on food supply, pollution, energy resources and the economy. 3 lectures. Prerequisite: One sociology course and STAT 211 or consent of instructor.

SOC 470 Selected Advanced Topics in Sociology (1–3)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

SOC 500 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.

SOC 508 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 processes. Discussion of case material and available literature. 3 seminars. Prerequisite: ENGL 215 or ENGL 218 or consent of instructor.

SOC 509 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.

SOC 510 Organizing and Teaching Social Sciences (3)
Organization, selection, presentation, application, and interpretation of social science subject matter for teaching at the secondary level. 3 lectures. Prerequisite: Senior standing and/or consent of instructor.

SOC 511 Internship (3–6)
Supervised training, research, and work in public and private organizations. 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.

SOCS 485 Cooperative Education Experience (6) (CR/NC)
Part-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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

SOCS 487 Cooperative Education Experience (6)
Part-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 16 units. Prerequisite: Sophomore standing and consent of instructor.

SOCS 495 Cooperative Education Experience (12) (CR/NC)
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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

SOCS 497 Cooperative Education Experience (12)
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 16 units. Prerequisite: Sophomore standing and consent of instructor.

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 using the communicative approach. 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 within a cultural context. 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. 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.

SPAN 303 Hispanic Culture (3)
Aspects of cultures of the Spanish-speaking peoples. History, society, political movements, art, music, and literature are discussed. Topic of instruction varies to provide specific focus. 3 lectures. Prerequisite: SPAN 202, equivalent, 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 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 340 Chicano/a Authors (4) GEB C.3.
Introduction to Chicano/a literary accomplishments to facilitate appreciation of Chicano/a literary aesthetics and increase understanding of Chicano/a cultural values and lifestyles. 4 lectures. Prerequisite: SPAN 233 or equivalent.

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, persuade, and 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 relationships. 4 lectures. Prerequisite: SPC 201 or SPC 202.

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. Prerequisite: SPC 201 or SPC 202.

SPC 217 Small Group Communication (4)
Basic principles and techniques of small group communication. 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. Prerequisite: SPC 201 or SPC 202.

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. Prerequisite: SPC 201 or SPC 202.

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. Prerequisite: ENGL 215 or ENGL 218.

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.

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 Storytelling: The Oral Tradition (4)
Resources and techniques to perform oral literature in primary and secondary classrooms. Focus on stories with genesis in the oral tradition. Analytical and performance components of art of storytelling are stressed equally. Topics covered include function of storytelling, techniques, audience analysis, story memory. 4 lectures. Prerequisite: SPC 201 or SPC 202.

SPC 312 Communication Theory (4)
Concepts and theories of the human communication process from a social science perspective. 4 lectures. Prerequisite: PSY 201 or PSY 202, SPC 212.

SPC 316 Intercultural 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.

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. Critical analysis of persuasive discourse. 4 lectures. Prerequisite: SPC 201 or SPC 202.

SPC 325 Argumentation (4)
Techniques of argumentation, logic and reasoning. Fallacies of reasoning. Experience in and analysis of 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 Political Advocacy and Contemporary Rhetoric (4)
Rhetoric's role in contemporary culture. Issues: political advocacy; science, technology and mass persuasion; ethics and rhetoric. Representative theorists: Burke, Weaver, Richards, Toulmin and McLuhan. 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 370 Gender and Communication (4)
Examination of gender in a variety of communication contexts. Concepts presented will help students understand the theory and practice of communication with members of the same and opposite sex. 4 lectures. Prerequisite: SPC 201/202.

SPC 380 Media Effects (4)
Effects of media on the individual. Influence of mediated message producers, production technologies, and message content. Empirical approaches to data collection using experimental and survey techniques. 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 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 and SPC 312, junior standing. For majors only.

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. Prerequisites: Junior standing, SPC 213 and SPC 301.

SPC 424 Classroom Communication (4)
Exploration of classroom communication development. Student-teacher-parent interaction. Communication style, environmental stimuli, dialectal differences and bilingualism, measurement of communication competence. 4 lectures. Prerequisite: Junior standing, ENGL 215 or ENGL 218.

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.

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 330.

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. For majors only.
SS 479 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. For majors only.

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. ENGL 215 or ENGL 218.

SS--SOIL SCIENCE

SS 110 Orientation in Soil Science (1) (CR/NC)
Understanding the depth and breadth of soils as a science. Examine potential career opportunities. Introduction to both student and professional organizations. Credit/No Credit grading only. 1 activity.

SS 121 Introductory Soil Science (4) GEB F.2.
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 in mineral and rocks and minerals. Parent materials as related to the nature and properties of soils. 3 lectures, 1 laboratory. Prerequisite: SS 121, CHEM 122 or CHEM 128.

SS 300 Enterprise Project (2–4) (CR/NC)
Soil, water, and plant testing for fertilizer recommendations and general diagnostic work. Project participation is voluntary and subject to approval by the enterprise project adviser and the Cal Poly Foundation. Degree credit limited to 12 units. Credit/No Credit grading only. Prerequisite: CHEM 127, SS 221.

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. Miscellaneous course fee required—see Class Schedule. 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 (4)
Investigation and evaluation of the nutrient supplying ability of soils. Conditions and transformations involved in the transfer of mineral nutrients from soils to plants. Effects of cultural treatments on soil fertility. Diagnostic techniques and data interpretation in soil and plant analysis. 3 lectures, 1 laboratory. Prerequisite: SS 221, CHEM 122 or CHEM 128.

SS 339 Soil Science Internship (1–12) (CR/NC)
Selected students will spend up to 12 weeks with an approved firm or agency engaged in work and study related to their major. A detailed written proposal and written interim and final reports required. One unit of credit may be allowed for each full week of internship. Credit/No Credit grading. Prerequisite: Consent of internship instructor.

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)
Chemical processes governing weathering, soil mineral formation and stability, common solubility equilibria. Use of chemical principles to explain surface chemical properties of
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, CHEM 122 or CHEM 131, CHEM 122 or CHEM 128, MATH 118 or MATH 131, 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 adviser. Statement of problems, subproblems, assumptions, objectives, hypothesis, methods of analysis and statistical design. Development of literature review and budget of time and finances. Proper format and presentation of tabular and graphic information. 1 activity. Prerequisite: MATH 118 or MATH 131, STAT 211 or STAT 321 or CRSC 411.

SS 462 Soils Senior Project (3)
Implementation of materials and methods. Collection, analysis and interpretation of data. Completion of formal written report under adviser 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 Research Planning (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 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. Total credit limited to 3 units. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

SS 582 Advanced Land Management (3)
Development of plans and practices for the management of crop, range, and wood land. 2 seminars, 1 laboratory. Prerequisite: Graduate standing, SS 433.
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. Credit not allowed for students with previous statistics course. 3 lectures. Prerequisite: Intermediate algebra, appropriate score on ELM.

STAT 200 Special Problems for Undergraduates (1–2)
Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

STAT 211 Elementary Probability and Statistics (3) GEB B.2.
Classification of statistical data. Calculation and uses of various averages, measures of variability, elementary probability. Binomial and normal distributions. Random sampling, confidence intervals. Introduction to hypothesis testing. 3 lectures. Prerequisite: Intermediate algebra, appropriate score on ELM.

STAT 212 Statistical Methods (3) GEB B.2.
Tests of hypotheses, and confidence intervals on common parameters. Linear regression and correlation, multiple regression. Analysis of variance and enumerative data. Nonparametric methods. 3 lectures. Prerequisite: STAT 211.

STAT 217 Statistical Methods (4) GEB B.2.
Sampling and experimentation, descriptive statistics, confidence intervals, two-sample hypothesis tests for means and proportions, Chi-square tests, linear and multiple regression, analysis of variance. 4 lectures. Prerequisite: Intermediate algebra, appropriate score on ELM.

STAT 251 Statistical Inference for Management I (4) GEB B.2.

STAT 252 Statistical Inference for Management II (4) GEB B.2.
Regression, correlation, multiple regression, time series, and forecasting. Single factor analysis of variance. Statistical quality control. Experience with statistical computer packages in analyzing data sets. Use of computers assumed throughout course. 4 lectures. Prerequisite: STAT 251 and CSC 120 or one course in computer programming.

STAT 312 Statistical Methods for Engineers (3) GEB B.2.

STAT 313 Applied Experimental Design and Regression Models (3) GEB B.2.
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 Statistical Analysis I (3) GEB B.2.
Descriptive statistics, probability, probability distributions for discrete and continuous random variables, expected value, sampling distributions, large sample estimation procedures. 3 lectures. Prerequisite: MATH 132 or MATH 142.

STAT 322 Statistical Analysis II (4) GEB B.2.
Confidence intervals, hypothesis testing, one and two-factor analysis of variance, simple linear regression, nonlinear and multiple regression, chi-square tests, introduction to statistical quality control. 4 lectures. Prerequisite: STAT 321.

STAT 323 Analysis of Variance (3) GEB B.2.
Single and two-factor analysis of variance, multiple comparisons, fixed and random effects. Randomized complete block, balanced incomplete block and Latin square designs. Factorial and nested designs. Analysis of covariance. 3 lectures. Prerequisite: STAT 322.

STAT 324 Applied Regression Analysis (3) GEB B.2.
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 412 Applied Probability Models (3)
Discrete and continuous Markov chains. Poisson processes and generalizations, birth and death processes. Applications of renewal theory. Queuing models, branching processes, Markovian decision processes. 3 lectures. Prerequisite: STAT 321 and MATH 242, or consent of instructor.

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 206 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 206 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 approach to various applied methods. Estimability. Advanced topics in statistical design, including split plot, fractional factorial and repeated measures designs. Response surface methods. 3 lectures. Prerequisite: STAT 323, MATH 206.

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 transformations. 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 430 Statistical Computing (3)
Design and use of statistical software in programming, statistical applications, efficiency and numerical accuracy of algorithms, object oriented statistical languages, random number generation, simulation, resampling, bootstrapping, linked and dynamic graphics, smoothing algorithms. 3 lectures. Prerequisite: STAT 322 and STAT 330.

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 485 Cooperative Education Experience (6) (CR/NC)
Part-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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

STAT 495 Cooperative Education Experience (12) (CR/NC)
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 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

STAT 512 Statistical Methods (4)
Statistical methods in research for graduate students not majoring in mathematical sciences. Probability distributions, confidence intervals, hypothesis testing, contingency tables, linear regression and correlation, multiple regression, analysis of variance. Use of computer packages. 4 seminars. Prerequisite: Intermediate algebra or equivalent.

TH—THEATRE

TH 210 Introduction to Theatre (3)
Play production process and approach to the theatre including theatrical terminology, methods, dramatic literature, aesthetics and technology. 3 lectures.

TH 327, 328 Theatre History and Literature (3) (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 350 Advanced Playwriting (3)**
Examines dramatic structure, techniques of dialogue, and means of characterization in variety of plays. Relates dramatic writing to technical, design, directorial and acting demands. Composition of monologues, scenes and one-act play; works read and critiqued in class. 3 seminars. Prerequisite: TH 210, ENGL 114 and ENGL 215 or ENGL 218.

**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 Advanced 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 head.

**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 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.

**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 202 Enterprise Project (1–4) (CR/NC)**
Beginning field experience in production and marketing of a vegetable crop, under faculty supervision. Project participation is subject to approval by the department head and the Cal Poly Foundation. Degree credit limited to 4 units. Credit/No Credit grading only. Prerequisite: CRSC 201, or consent of instructor.

**VGSC 230 Introduction to Vegetable Science (4) GEB F.2.**
Environmental and cultural principles involved in the production of California vegetable crops; temperature, daylength and fertility effects on production and yield, use of plastic mulches and row covers, use of transplants, and pests and diseases affecting vegetables. Harvest principles, precooking methods and packaging. Survey of vegetable production for other than crop science majors. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory.

**VGSC 232 California Vegetable Production (4)**
History, botany, growth characteristics and climatic adaptation, pests, and harvesting methods for the most important vegetable crops grown in California. Use of transplants, plastic mulches and row covers in vegetable production. Current topics in agriculture important to the vegetable industry. Field trip to a major California vegetable production area required. Survey of vegetable production for crop science majors. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: CRSC 133.

**VGSC 250 Vegetable Science for the Urban Gardener (3)**
Seedbed preparation, mulching, composting, manures and fertilizers, transplanting, seeding, irrigation and pest control in an urban garden. Merits of organic, low-input and conventional vegetable production, including organic methods of pest control. Instructional plots may be grown completely organically. Miscellaneous course fee may be required—see Class Schedule. 2 lectures, 1 laboratory.

**VGSC 402 Enterprise Project (1–4) (CR/NC)**
Advanced experience in the production of vegetable crops. Development of a plan for field operations, a marketing plan, and a budget. Management decision-making. Project participation is subject to approval by the department head.
and the Cal Poly Foundation. Degree credit limited to 4 units. Credit/No Credit grading only. Prerequisite: ZOO 202, and consent of instructor.

**VGSC 421 Postharvest Technology of Horticultural Crops (4) (Also listed as FRSC 421)**
Respiration, respiratory constituents, ripening, and chilling injury; harvesting methods and procedures; current handling and packaging techniques; precooling and refrigeration; modified and controlled atmosphere storage; relative humidity; and transportation of horticultural crops. Field trip to major California production areas required plus local grower visits. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: One production class in either fruits, vegetables or ornamentals, or consent of instructor.

**VGSC 423 Advanced Vegetable Science (4)**
Studies of production systems utilizing the most advanced cultural practices including integrated management of all inputs and pests. Field trip to desert vegetable production regions required. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: VGSC 232.

**VGSC 424 Vegetable Crop Management (4)**
Vegetable production systems from an organizational viewpoint. Management, organization and general commercial operations, including planning, budgeting, and managing personnel. 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 521 Advanced Crop Production (4) (Also listed as CRSC 521)**
Production and management of crops under intensive and extensive cultural systems and low-input agriculture. Interaction between growth factors at various levels of production and interaction of cultural practices and plant requirements. Miscellaneous course fee may be required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: Graduate standing and consent of instructor.

**VS—VETERINARY SCIENCE**

**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 312 Production Medicine (3)**

**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 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: WS 301; WS 401 or WS 411 or HIST 434 or HIST 435 or PSY 314; and consent of Women's Studies director.

**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 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 or BIO 153.

**ZOO 238, 239 Human Physiology I, II (3) (3) GEB B.1.b.**

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 for ZOO 238: ZOO 237 and CHEM 121 or CHEM 124 or CHEM 127. Prerequisite for ZOO 239: ZOO 238.

**ZOO 321 Mammalogy (4) GEB B.1.b.**

Biology and economic importance of mammals. Classification and identification of mammals, with emphasis on California species. 2 lectures, 2 laboratories. Prerequisite: BIO 153.

**ZOO 322 Ichthyology (4) GEB B.1.b.**

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: BIO 153.

**ZOO 323 Ornithology (4) GEB B.1.b.**

Classification and identification of birds, with emphasis on California species. Anatomy, physiology, ecology and behavior. Saturday field trips required. 2 lectures, 2 laboratories. Prerequisite: BIO 153.

**ZOO 324 Zoo Biology (3) GEB B.1.b.**

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) GEB B.1.b.**

Comparative structure of chordate organ systems. Laboratory emphasis on dissection techniques. 3 lectures, 2 laboratories. Prerequisite: BIO 153.

**ZOO 329 Vertebrate Field Zoology (4) GEB B.1.b.**

Identification and natural history of terrestrial vertebrates, with emphasis on field studies and local species. 2 lectures, 2 laboratories. Prerequisite: BIO 153.

**ZOO 335 General Entomology (4) GEB B.1.b.**

Introduction to the study of insects. Structure, major orders and families of insects, life histories, medical and economic importance. Insect collection required. 2 lectures, 2 laboratories.

**ZOO 336 Invertebrate Zoology (4) GEB B.1.b.**

Invertebrate groups of animals with emphasis on taxonomy, morphology, distribution and economic importance. 2 lectures, 2 laboratories, and fieldwork. Prerequisite: BIO 153 or consent of instructor.

**ZOO 340 Human Muscle Anatomy (2) GEB B.1.b.**

Muscles of a human cadaver. 1 lecture, 1 laboratory. Prerequisite or concurrent: ZOO 237.

**ZOO 341 Herpetology (4) GEB B.1.b.**

Living and extinct reptiles and amphibians; an adaptive approach to their diversity, biology, and classification. 2 lectures, 2 laboratories. Prerequisite: BIO 153.

**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: BIO 153.

**ZOO 405 Vertebrate Development (5) GEB B.1.b.**

Events and mechanisms of embryonic development, including fertilization, morphogenesis, cell differentiation, and organogenesis, with emphasis on vertebrates. 3 lectures, 2 laboratories. Prerequisite: BIO 153 and BIO 303.

**ZOO 422 Functional Histology (4) GEB B.1.b.**

Functional microscopic anatomy of principal tissues and organs of vertebrates. Structural studies to determine mechanisms underlying physiological processes. 2 lectures, 2 laboratories. Prerequisite: BIO 153.

**ZOO 425 Parasitology (4) GEB B.1.b.**

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: BIO 153 and BACT 221 or BACT 226.

**ZOO 426 Serology and Immunology (4) GEB B.1.b.**

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) GEB B.1.b.**

Formation, composition, function and destruction of blood in health and disease. Methods for examination of blood. Designed for preparing laboratory technologists. 2 lectures, 2 laboratories. Prerequisite: BIO 153 or ZOO 131, and consent of instructor. Recommended: ZOO 426.

**ZOO 432 Physiology II: Comparative Systems (4) GEB B.1.b.**

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) GEB B.1.b.**

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 436  Functional Invertebrate Zoology (4)
Comparative study of the functions of organ systems of the invertebrate groups of organisms. Emphasis on strategies utilized in accomplishing the function of the organ systems in adapting to different environmental demands. 2 lectures, 2 laboratories. Prerequisite: ZOO 336 or consent of instructor.

ZOO 437  Animal Behavior (4)
Behavioral adaptations of animals to their environment and way of life. Analysis of behavior patterns, use of patterns in clarifying evolutionary and ecological relationships. 3 lectures, 1 laboratory. Prerequisite: BIO 153. Recommended: BIO 325.

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 414.
UNIVERSITY ADMINISTRATION

OFFICE OF THE PRESIDENT

President ........................................ Warren J. Baker
Executive Assistant to the President .... Position Vacant
Affirmative Action Director .......... Anna J. McDonald

ACADEMIC AFFAIRS

Vice President for Academic Affairs .... Robert D. Koob
Associate Vice President for Academic Affairs and
University Dean .......................... Glenn W. Irvin
Academic Program Planner .......... Position Vacant
Coordinator, Writing Skills .................. Mary Kay Harrington
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Resources ........................................ A. Charles Crabb
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Support Services ............................ Euel W. Kennedy
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Director, Financial Aid ............ L. Diane Ryan
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Records ........................................ Thomas L. Zuur

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Faculty Development .................. Carol E. Barnes
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Programs ....................................... Susan Opava-Stitzer
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COLLEGE OF AGRICULTURE

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Director of Farm Systems, Phillip M. Doub

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Agricultural Education ................. Glen R. Casey
Agricultural Engineering .............. Edgar J. Carnegie
Animal Science ............................... Phillip Doub (Interim)
Crop Science ................................. George G. Gowgani
Dairy Science ................................. Edwin H. Jaster
Food Science and Nutrition .......... Joseph Montecaldo
Military Science .......................... Major John E. Bachmann
Natural Resources Management .... Norman H. Pillsbury
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Soil Science ........................................ Terry L. Smith

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Dean, Paul R. Neel
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Construction Management .......... James A. Rodger
Landscape Architecture ................. Walter D. Bremer

COLLEGE OF BUSINESS

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Associate Dean, Position Vacant

Accounting .......................................................... John C. Robison
Business Administration ............ John C. Rogers
Economics .............................................. Artemis Papakyriazis
Industrial Technology ............ Fred Abilla
Management ...................................... Abraham B. Shani

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Computer Engineering Program ...... James Harris
Computer Science ........................ James L. Beug
Electronic and Electrical Engineering ...... Saul Goldberg
Industrial and Manufacturing
Engineering ............................................. H. Jo Anne Freeman
Materials Engineering ................. Robert H. Heidersbach
Mechanical Engineering ............ Ronald L. Mussulman

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Interim Associate Dean, Susan Currier

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Journalism ........................................... Nishan R. Havandjian
Liberal Studies Program ............. Robert S. Cichowski
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Political Science ......................... Allen K. Settle
Psychology and Human Development .... Patrice L. Engle
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Theatre and Dance ................. Alvin J. Schnupp
Women's Studies Program ............ Carolyn Stefanco

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Mathematics ........................................... Stephen T. Weinstein
Physical Education and Kinesiology . Dwayne G. Head
Physics .............................................. Robert H. Dickerson
Statistics ............................................. Roxy L. Peck

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Director, Robert F. Gish

UNIVERSITY CENTER FOR
TEACHER EDUCATION

Director, Susan Roper
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Associate Vice President, Administration and Finance: Position Vacant
Administration and Finance Associate: Vicki Stover

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Director, Facilities Planning: Robert E. Kitamura
Director, Facilities Services: Edward M. Naretto
Director, Fiscal Services: Robert Dignan
Director, Human Resources: Robert Dignan
Human Resources Manager: Barbara Melvin
Staff Development and Training Manager: Joan Lund
Director, Public Safety Services: Joseph C. Risser
Director, Support Services: Ray Macias

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Director, Academic Computing Services: Robert C. Clover
Director, Administrative Systems: Position Vacant
Director, Communication Services: Norman E. Johnson
Director, Computing Services: Ken Burton

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Associate Vice President, Student Affairs: Position Vacant
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Judicial Affairs: W. Carl Wallace
Director, Career Services: Richard M. Equinoa
Director, Health and Psychological Services: Kerry T. Yamada
Test Officer: George Stanton
Director, Residential Life and Education: Preston C. Allen
Director, Student Academic Services: Amado A. Pezo-Silva
Coordinator, Academic Skills Center: Patricia A. Stewart
Coordinator, Disabled Student Services: Harriet Clendenen
Director, Minority Engineering Program: David Cantu
Director, Student Support Services: Gregory Roberts
Director, Upward Bound: Samuel Cortez
Director, Student Life and Activities: Kenneth B. Barclay
Coordinator, Community Services: Patricia (Sam) Lutrin
Coordinator, Greek Affairs: Walter M. Lambert

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Executive Director, University Relations and Development: Charles R. Allen
Director, Alumni Relations: Steven B. Shockley
Director, Communications: Darlene Slack
Communications Officer: C. Robert Anderson
Publications Editor: Ginny Monteen
Director, Corporate and Foundation Relations: Robert J. Carroll
Director, Gift Planning and Endowments: Ronald D. Nordeen
Director, Major Gifts: Susan E. Childers-Kraft
Manager, University Development Services: Denise Mendonca

AUXILIARY ORGANIZATIONS

Associated Students, Inc.
Interim Executive Director: Pauline W. Harrigan
Director, ASI Children's Center: Haila Halley
Director, Finance: James Towles
Director, Galerie: Jeanne LaBarbera
Director, Operations: John Stipicich
Director, Program Management: Rod Neubert
Director, Recreational Sports: Rick Johnson
Foundation
Executive Director: Alfred W. Amaral
Associate Executive Director: Robert E. Griffin
Director, Campus Dining: Nancy Williams
Director, El Corral Bookstore: C. Court Warren
Director, Financial Services: Don Shemenske
Interim Human Resources Manager: Joanne Petree
Sponsored Programs Administrator: Don Prout
Director, Vocational Education Production: Patrick Smith

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)
Robert E. Kennedy (1967 to 1979)
Dale W. Andrews (acting) (1979)
Warren J. Baker (1979 to 1987)

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
Olive M. Andersen (1957–1972) ..... Mathematics
Elizabeth B. Anderson (1958–1980) ..... English
Richard A. Anderson (1947–1983) ..... Physical Education
Roy E. Anderson (1949–1978) ..... Business
David M. Grant (1950-1980) . English and Academic Affairs
C. Herold Gregory (1950-1970) ............ Architecture
Lester W. Gustafson (1947-1971) .... Aeronautical Engineering
Richard E. Hall (1946-1977) ............ Engineering Technology
Barbara M. Hallman (1973-1991) ........... History
Phyllis J. Hansen (1963-1990) ............. Library
F. Sheldon Harden (1948-1987) ......... Physical Education and Recreation Administration
Leroy M. Harris (1954-1986) .............. Animal Sciences and Industry
Harry Hazebrook (1968-1990) ............... Electronic and Electrical Engineering
Anatol Helman (1957-1974) .......... Aeronautical Engineering
Harold J. Hunter (1952-1978) ............... Electronic and Electrical Engineering
Donald W. Hensel (1960-1990) .......... History
Charles A. Herald (1958-1975) ............ Electronic and Electrical Engineering
Earl R. Hesch (1956-1983) ................. Engineering Technology
William R. Hicks (1957-1983) ............. Physical Education
Robert Hill (1976-1991) ................. Accounting
George E. Hoffman (1956-1979) .......... Industrial Engineering
Wilbur C. Horgan (1959-1973) .......... Philosophy
Roy B. Hollsten (1973-1988) ............... Computer Science
Ray J. Holt (1955-1978) ................... Physics
A. L. Houk (1946-1972) .................. Chemistry
Emest R. Houston (1957-1983) .......... Ornamental Horticulture
LeRoy B. Hughes (1950-1971) .......... Physical Education
Robert J. Huot (1963-1986) .......... English
C. Dennis Hynes (1957-1990) .......... Biological Sciences
Corwin M. Johnson (1967-1987) .......... Crop Science
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
Edward J. Jorgensen (1947-1976) .......... Physical Education
Roger A. Kecho (1965-1983) .......... Aeronautical and Mechanical Engineering
Helen P. Kelley (1966-1985) .......... Art
Paul Kenyon (1957-1982) .......... Business Administration
Donald Koberg (1962-1992) .......... Architecture
Lloyd H. Lamouria (1965-1987) .......... Agricultural Engineering
James A. Langford (1955-1976) .......... Education
Paul S. Lansman (1964-1979) .......... Mathematics
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
Willard B. Loper (1955-1983) .......... Agricultural Engineering
Barnice B. Loughran (1958-1980) .......... Art
Thomas M. Lukes (1962-1983) .......... Food Science
Hans Mager (1949-1985) .......... Architectural Engineering
Leon W. Magur (1958-1983) .......... Physics
Ena L. Marston (1946-1970) .......... English
Angelina Martinez (1966-1991) .......... University Library
Scott J. Maughan (1965-1980) .......... History
John W. McCombs (1960-1991) .......... Electronic and Electrical Engineering
Michael E. McDougall (1972-1992) .......... City and Regional Planning
James M. McGrath (1946-1975) .......... Engineering Technology
Malcolm McLeod (1973-1988) .......... Biological Sciences
George H. McMeen (1960-1977) .......... Mathematics
Mac McRobbie (1962-1979) .......... Industrial Technology
Thomas O. Meyer (1955-1979) .......... Food Science
Sixto E. Moreira (1972–1991) ................ Architecture
Donald Morgan (1968–1988) ............... Industrial Engineering

Carl F. Moy (1968–1984) ..................... Dairy Science
Richard F. Nelson (1960–1989) .......... Biological Sciences
Loren L. Nicholson (1956–1979) ............... Journalism
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

Philip H. Overmeyer (1959–1972) .... Business Administration
Pratapsinha C. Pendse (1966–1993) .......... Biological Sciences
Richard A. Pimentel (1952–1983) .......... Biological Sciences

Derek Price (1957–1989) .......... Mechanical Engineering
Peter Rabe (1967–1986) .......... Psychology and Human Development

R. Howell Reece (1946–1964) .......... Mechanical Engineering
Howard Rohods (1956–1983) .......... Crop Science
Glenn W. Rich (1953–1979) .......... Agricultural Engineering
Carlos C. Richards (1946–1971) .......... Engineering Technology

Aryan I. Roest (1955–1990) .......... Biological Sciences
David Rollings (1968–1987) .......... English

Patricia Saam (1966–1992) .......... Food Science and Nutrition
Leo E. Sankoff (1942 and 1946–1980) .......... Agricultural Education
Paul E. Scheffer (1964–1983) .......... Industrial Engineering
Walter P. Schroeder (1957–1980) .......... Education
Glenn E. Seeber (1954–1979) .......... Engineering Technology

M. Eugene Smith (1946–1974) .......... History
Shirley R. Sparling (1963–1991) .......... Biological Sciences
Verlan Stahl (1968–1987) .......... Foreign Languages
William D. Stansfield (1963–1992) .......... Biological Sciences

John W. Thomas (1968–1992) .......... Biological Sciences
David H. Thomson (1946–1979) .......... Biological Sciences
William Thurmond (1951–1989) .......... Biological Sciences
Pearl Turner (1951–1974) .......... Library
Robert G. Valpey (1972–1983) .......... Dean of Engineering and Technology

Herman C. Voeltz (1965–1983) .......... History
Ralph M. Vorhies (1946–1980) .......... Crop Science
Isaac N. Walker (1967–1983)..............English
Sue McBride, Education
Phillip K. Ruggles, Graphic Communication

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
Ema 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

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

1981–82 Christina A. Bailey, Chemistry
Kenneth E. Ozawa, Physics

1982–83 Thomas L. Richards, Biological Sciences
James Bermann, Agricultural 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
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Phillip K. Ruggles, Graphic Communication
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<td>Jay L. Devore</td>
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<td>Linda H. Halisky</td>
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(STAFF EMERITI)

(Dates indicate period of service)

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Outstanding Staff Employee Award Recipients

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 coworkers, faculty, and students; and make contributions to both the university and the community. Nominations are solicited from staff employees, faculty members, and 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.
(Number in parentheses indicates year of appointment)

Listed as of March, 1994


AGRONSKY, STEVEN .................................................. Mathematics B.A., University of California, Santa Barbara, 1970; M.S., 1972; Ph.D., 1974. Professor.


ANGLEY, STEPHEN F. (1982) ........................................... Ornamental Horticulture B.S., Berea College, 1969; M.S., Clemson University. Professor and Interim Department Head.


ASCOLI, RICHARD V. (1986) .......................................... Health Services B.S., College of William and Mary, 1963; M.D., Medical College of Virginia, 1974; Internship and Residency in Emergency Medicine, University of Southern California–Los Angeles County General Hospital, 1982. Physician.


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.


AVER, RENNY J. (1973) .................................................. Agribusiness B.S., California Polytechnic College, 1969; M.S., Oregon State University, 1972; Ph.D., University of Hawaii, 1974. Professor.


BACHMANN, JOHN E., MAJ. (1987) .......................... Military Science

BAGNALL, JAMES R. (1969) ................................. Architecture
B.A., Occidental College, 1957; M.Arch., University of California, Berkeley, 1974. Professor and Director.

BAILEY, CHRISTINA ANNE (1978) ...................... Chemistry
B.S., College of Saint Elizabeth, New Jersey, 1964; Ph.D., Purdue University, 1970. Professor.

BAILEY, PHILIP S. (1969) ................................. College of Science and Mathematics
B.S., University of Texas, 1964; Ph.D., Purdue University, 1969. Professor and Dean.

BAKER, EDWARD H. (1968) ................................... Mechanical Engineering
B.S., Northwestern University, 1938; M.S., University of California, 1963; Ph.D., Northwestern University, 1965. Professor.

BAKER, WARREN J. (1979) .................................. President
B.S., University of Notre Dame, 1960; M.S., 1962; Ph.D., University of New Mexico, 1966. President.

BALASUBRAMANIAN, K. N. (1987) ......................... Industrial and Manufacturing Engineering

Baldwin, Mary Lud (1982) ............................... University Center for Teacher Education
A.B., Wilson College, 1967; M.Ed., Virginia Commonwealth University, 1973; Ph.D., University of California, Berkeley and San Francisco State University, 1983. Professor.

Balgley, Kathleen A. (1989) .............................. English
B.A., University of Illinois, 1974; M.A., University of California, San Diego, 1980; Ph.D., 1986. Assistant Professor.

Ball, R. Wayne (1960) ..................................... Health Services
A.B., Westminster College, Missouri, 1957; M.D., University of Missouri School of Medicine, 1961; Internship, Mercy Hospital, Des Moines; Residency, General Practice, Santa Barbara General Hospital; Board Certified Family Practice, 1974. Associate Director.

Ball, Stephen W. (1983) ................................... Philosophy

Balthaser, Lawrence H. (1969) ........................... Physics

Barata, Antonio G. (1985) ............................... Music
B.A., Towson State University, 1977; M.M., Northwestern University, 1979; D.M.A., University of Illinois, 1985. Associate Professor.

Barclay, Kenneth B. (1979) ................................... Student Life and Activities
B.A., Bowling Green State University, 1967; M.A., University of Massachusetts, 1969; Ph.D., Kent State University, 1975. Director.

Barnes, Carol E. (1993) ................................... Extended Education and Faculty Development

Barnes, Timothy M. (1969) ............................... History

Barthels, Katharine M. (1978) ........................... Physical Education and Kinesiology
B.S., University of California, Los Angeles, 1961; M.S., University of California, Santa Barbara, 1964; Ph.D., Washington State University, 1973. Professor.

Bass, Estelle L. (1976) ..................................... Mathematics
B.A., University of California, Santa Cruz, 1969; Ph.D., 1975. Professor.

Battenburg, John (1989) .................................. English
B.A., Andrews University, 1982; M.A., Ohio University, 1984; Ph.D., Purdue University, 1988. Assistant Professor.

Batterson, Ronald E. (1971) ............................... Architecture

Baum, Lawrence E., Jr. (1965) .......................... Accounting

Beardsley, George L., Jr. (1975) ......................... Economics

Beason, Steve B. (1985) .................................. Intercollegiate Athletics
B.S., Emporia State University, 1979; M.S., 1983. Head Coach.

Becker, Lloyd N. (1960) .................................. History

B.Arch., Kansas State University, 1967; M.Arch., University of Texas at Austin, 1989. Assistant Professor.

Bennett, Darrell F. (1971) ................................. Health Services

Berger, Lorraine M. (1983) ............................... Health Services

Bermann, James (1964) .................................. Agricultural Engineering
B.S., California State Polytechnic College, 1959; M.S., Michigan State University, 1971; Ed.D., Brigham Young University, 1979. Professor.

Berrio, Margaret M. (1989) ............................... Psychology and Human Development

Berrio, Mark (1986) ......................................... Architectural Engineering
B.S., University of El Salvador, 1953; B.S., University of Guatemala, 1963; M.S., University of Michigan, 1965; Ph.D., Michigan State University, 1971. Professor. Registered Engineer, Guatemala.

Bertozzi, Dan R. (1974) ................................. Business Administration

Bethel, A. C. W. (1968) .................................. Philosophy

Beurl, James L. (1973) .................................. Computer Science
B.A., Northwestern University, 1962; Sc.M., Ohio State University, 1971; Ph.D., 1974. Professor and Department Chair.

B.S., University of Illinois, 1958; M.S., Purdue University, 1963; Ph.D., 1964. Professor.

Bezaid, Daniel J. (1990) ................................. Aeronautical Engineering
B.S., Illinois Institute of Technology, 1966; M.S., Air Force Institute of Technology, 1972; Ph.D., Purdue University, 1984. Associate Professor.

B.S.B.A., Ohio State University, 1968; M.B.A., University of Missouri, Kansas City, 1971; Ph.D., Ohio State University, 1975. Professor.

B.A., California State University, Fresno, 1978; M.A., Sophia University, Tokyo, Japan, 1982; Ph.D., University of Oregon, 1988. Associate Professor.

Bishop, Ursula (1990) ................................. College of Science and Mathematics

M.S., Swiss Federal Institute, Zurich, 1953. Professor. Registered Professional Engineer, Utah.

Block, Daniel W. (1983) ................................. Agribusiness
B.S., California Polytechnic State University, San Luis Obispo, 1977; M.S., 1987. Associate Professor.

Bledget, Robert L. (1974) .......................... Psychology and Human Development
B.A., Willamette University, 1965; Ed.D., University of Massachusetts, 1973. Associate Professor.

Blum, Michael L. (1984) .............................. Graphic Communication
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.

BOMSTAD, LINDA (1994) .............................. Philosophy
B.A., University of California, Davis, 1974; M.A., 1976; Ph.D., 1982. Assistant Professor.

BOONE, JOSEPH C. (1968) ............................. Physics

BORIN, NORM. A. (1992) ............................ Business Administration
B.S., University of California, Davis, 1981; M.B.A., California State University, Sacramento, 1987; Ph.D., University of Virginia, Charlottesville, 1992. Associate Professor.

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.

BOYER, LISA (1986) ........................................ Intercollegiate Athletics

BOYTON, WILLIAM C. (1985) ......................... Accounting

BRADY, LOIS (1988) ................................. Computer Science

BRADY, MARY L. (1968) ............................. University Library

BRUNICER, ANDREA L. (1986) ....................... Health Services

BREAZEALE, CONNIE R. (1966) ...................... Food Science and Nutrition

BRECKENRIDGE, PATRICIA HANER (1975) ............. Ornamental Horticulture
B.S., California State Polytechnic College, 1970; M.L.A., California State Polytechnic University, Pomona, 1979. Additional graduate study, California Polytechnic State University, San Luis Obispo. Professor.

BREITENBACH, JEROME R. (1986) .................... Electronic and Electrical Engineering
B.S., California State Polytechnic University, Pomona, 1977; M.S., California Institute of Technology, 1978; Ph.D., University of California, Los Angeles, 1983. Professor.

BREITENBACH, STACEY M. (1981) ................. College of Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1989. Director of Advising Center.

BREWER, WALTER D. (1981) ........................ Landscape Architecture

BRODIE, DAVID A. (1970) .............................. Architecture

BROWN, C. ANDREA (1987) ........................... Physical Education and Kinesiology

BROWN, CARL R.V. (1982) ............................ English

BROWN, J. WYATT (1990) ......................... Crop Science
B.S., Louisiana State University, 1978; M.S., 1985; Ph.D., Cornell University, 1990. Assistant Professor.


BROWN, KENNETH J. (1991) ......................... English
B.A., Xavier University of Louisiana, 1971; M.A., University of Iowa, 1975; Ph.D., 1987. Associate Professor.

BROWN, KENNETH L. (1980) ................... Industrial and Manufacturing Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1980; Ph.D., Colorado State University, 1988. Associate 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

BUCCOLA, VICTOR A. (1962) ..................... Physical Education and Kinesiology

BUCKALEW, W. CHRIS (1990) ......................... Computer Science
B.S., North Texas State University, 1980; M.S., 1984; Ph.D., 1990. Associate Professor.

BUFFA, ANTHONY J. (1970) ........................ Physics
B.S., Rensselaer Polytechnic Institute, 1964; M.S., University of Illinois, 1966; Ph.D., 1969. Professor.

BURGUNDER, LEE B. (1983) ....................... Business Administration

BURN, SHAWN (1990) .............................. Psychology and Human Development

BURRELL, SHEL A. (1973) .......................... Career Services
B.A., University of California, San Diego, 1971; M.A., California Polytechnic State University, San Luis Obispo, 1981. Associate Director.

BURROUCHS, 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. Registered Professional Engineer, Utah.

B.S., California Polytechnic State University, San Luis Obispo, 1979. Director, Computing Services.

BURTON, ROBERT E. (1968) ........................ History

BUSSELEN, HARRY J., JR. (1975) ............... Psychology and Human Development
B.S., California State College, Sacramento, 1959; M.S., 1962; Ph.D., Florida State University, 1970; additional graduate study, University of Oregon. Professor.

BUTLER, J. KENT (1977) ............................ Industrial and Manufacturing Engineering

CAANO, RAUL J. (1974) ........................... Biological Sciences

CANTU, R. DAVID (1980) ......................... Student Academic Services
B.S., California Polytechnic College, 1969; M.S., 1974; M.A., 1975. Director, Minority Engineering Program.

CARDOSO, MARGARET (1981) .................... Research and Graduate Programs

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. (1981) ....... Accounting
B.S., California State University, Northridge, 1971; M.S., 1975; Ph.D., Arizona State University, 1985. Associate Professor. Certified Public Accountant.

Carrick, Robert J. (1993) .... University Relations and Development
B.A., University of California, Berkeley, 1984. Director, Corporate Foundation Relations.

Carter, Clay (1991) ....... Journalism
M.J., Carleton University, Ottawa, Canada, 1990. Associate Professor.

Carter, Lark P. (1981) ............... Crop Science
B.S., Iowa State University, 1953; M.S., 1956; Ph.D., 1960. Professor.

Carter, Marlene A. (1985-88) .... Academic Records
B.A., California State University, Los Angeles, 1976. Associate Director.

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 Department Head.

Castellano-Girón, Hernán (1986) ....... Foreign Languages and Literatures
B.A., University of Chile, 1960; M.A., University of Rome, 1981; Ph.D., Wayne State University, 1986. Assistant Professor.

Cavalletto, Richard A. (1990) ....... Agricultural Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1981; M.S., University of California, Davis, 1983; Ph.D., 1987. Associate Professor. Registered Mechanical Engineer, California.

B.S., Villanova University, 1969; Ph.D., Pennsylvania State University, 1975. Professor.

Cere, Douglas C. (1990) ............... Accounting

Chapman, Arthur J. (1972) ............... Architecture
B.S., B.Arch., California State Polytechnic College, 1970; M.S., Pennsylvania State University, 1971; additional graduate study, University of California, Los Angeles. Professor.

Chatziioanou, Alynios E. (1993) ....... Civil and Environmental Engineering
B.S., Athens Polytechnic, 1980; M.S., University of California, Berkeley, 1982; Ph.D., 1984. Assistant Professor. Registered Professional Engineer, Greece.

B.S., University of California, Santa Barbara, 1969; M.S., University of California, Santa Barbara, 1988. Professor. Registered Professional Engineer, California.

Cheek, Donald K. (1973) ... University Center for Teacher Education
B.S., Seton Hall University, 1953; M.S.W., Fordham School of Social Service, 1955; Ph.D., Temple University, 1971. Professor.

Chep, Kenneth (1990) ............... Student Academic Services

Chew, Marie (1976) ............... Health Services

Childers-Kraft, Susan E. (1988) ....... University Relations and Development

Chipping, David H. (1971) ............... Physics
COLEMAN, WILLI M. (1980) .................................................. Ethnic Studies
B.A., San Francisco State College, 1966; M.S.W., University of California, Berkeley, 1971; Ph.D., University of California, Irvine, 1982. Associate Professor.

COLOMÉ, JAIMÉ S. (1972) ....................................................... Biological Sciences

COLE, JAYME S. .................................................. Mathematics

COOK, BARBARA E. (1972) .................................................. Social Sciences

COOK, RANDY R. .................................................. Administration and Finance

CORNELL, RICHARD ............................................. Aeronautical Engineering

CORY, DAVID .................................................. Computer Science

DAVIES, THOMAS H. (1983) .................................................. History

DAVIES, JANICE .................................................. Social Sciences
B.S., University of California, Berkeley, 1983; M.S., Northwestern University, 1960; Ph.D., University of Oklahoma, 1966. Professor. Registered Professional Engineer, California; Diplomat of the Academy of Environmental Engineers.

DAWSON, 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, DONNA (1984) .................................................. Business Administration

DAVIS, M. LeROY (1976) .................................................. Agricultural Economics
B.S., California Polytechnic State College, 1966; M.S., Iowa State University, 1968; Ph.D., Colorado State University, 1973. Professor and Department Head.

DAVIS, M. LeROY (1976) .................................................. Health Services
B.S., University of Oklahoma, 1966; C.I.T., M.T., A.S.C.P., P.H. Microbiologist, Clinical Laboratory Technologist.

DAVIS, MARJORIE A. (1976) .................................................. Health Services
B.S., University of Oklahoma, 1966; C.I.T., M.T., A.S.C.P., P.H. Microbiologist, Clinical Laboratory Technologist.

DAVIES, JAMES .................................................. Civil and Environmental Engineering
B.S., University of California, Berkeley, 1959; M.S., Northwestern University, 1960; Ph.D., University of Oklahoma, 1966. Professor. Registered Professional Engineer, California; Diplomat of the Academy of Environmental Engineers.
DAVIS, STEVEN C. (1987) ........................................... Physical Education and Kinesiology
B.S., University of California, Davis, 1979; M.S., San Diego State University, 1983; Ph.D., Pennsylvania State University, 1986. Associate Professor.

DAWSON, MADOKA (1993) ..................................... Food Science and Nutrition

DAY, LINDA L. (1993) ........................................... City and Regional Planning

DeJONG, ALVIN A. (1974) ...................................... Biological Sciences

DEKLEINE, GLORIA J. (1983) ............................... Health Services
B.A., Western Michigan University, 1964; School of Medical Technology, Borgess Hospital, 1965. M.T., A.S.C.P., California Licensed Clinical Laboratory Technologist. Clinical Laboratory Technologist.

DEKLEINE, H. ARTHUR (1974) ............................. Mathematics
B.S., Western Michigan University, 1964; M.A., 1965; Ph.D., University of California, Riverside, 1968. Professor.

DELANY, JAMES E. (1970) .................................... Mathematics

DELEY, WARREN W. (1971) .................................... Social Sciences

DEMERS, GERALD (1989) ..................................... Physical Education and Kinesiology
B.S., Mankato State College, 1971; M.S., 1972; Ph.D., University of Utah, 1979. Associate Professor.

DENATALE, JAY S. (1988) ..................................... Civil and Environmental Engineering
B.S., University of California, Davis, 1977; M.S., 1979; Ph.D., 1983. Professor.

DENEL, M. BELGI (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. Professor. Registered Architect, Turkey.

DENSHAM, ROBERT S. (1980) ................................. Art and Design

DETREE, JOANNE (1991) ...................................... University Foundation
B.S., California Polytechnic State University, San Luis Obispo, 1987. Interim Human Resources Manager.

DETLOFF, ERLAND G. (1967) ............................... University Center for Teacher 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) .......................................... Psychological Services

DICKERSON, ROBERT H. (1970) ............................ Physics
B.S., University of Arizona, 1959; M.S., 1963; Ph.D., 1964. Professor and Department Chair.

DIETTERICK, BRIAN C. (1994) .............................. Natural Resources Management
B.A., University of Pennsylvania, 1980; M.S., University of Arizona, 1982; Ph.D., Penn State University, 1994. Assistant Professor.

DIGNAN, ROBERT J. (1974) ................................. Administration and Finance

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.

DINGUS, DELMAR D. (1973) .............................. Soil Science
B.S., Berea College, 1966; M.S., West Virginia University, 1968; Ph.D., Oregon State University, 1973. Professor.

DIRKES, LOIS M. (1973) ................................. Psychological Services
B.S., University of California, Los Angeles, 1958; M.S., University of Maryland, 1963; Ph.D., 1973. Professor and Counselor.

DOBSON, JOHN (1990) ......................................... Business Administration

DOMINGUES, ANTHONY (1985) ................................. Admissions
B.S., California Polytechnic State University, San Luis Obispo, 1979. Senior Admissions Officer.

DOMPKE, JOANNE (1982) ...................................... Health Services

DONALSDON, DOUGLAS D. (1968) ........................ Biological Sciences
A.B., University of California, Berkeley, 1962; M.A., California State College, Los Angeles, 1964; Ph.D., Oklahoma State University, 1969. Professor.

DONNELL, ROSEMARY T. (1977) .......................... Health Services
R.N., St. Anthony's School of Nursing, Oklahoma, 1967; N.P., California State University, Los Angeles, 1976; B.S., California Polytechnic State University, San Luis Obispo, 1992. Nurse Practitioner.

DOUB, PHILLIP M. (1985) .................................. College of Agriculture, Agribusiness, and Animal Science
B.S., California State Polytechnic College, 1966; M.B.A., College of William and Mary, 1971. Professor and Director of Farm Systems.

DOYLE, ELAINE M. RAMOS (1972-73) (1976) .................... Institutional Studies

DRUCKER, HOWARD (1980) ................................. University Center for Teacher Education

DUARTE, ARTHUR C. (1965) .................................. Agribusiness
B.S., California Polytechnic College, 1964; M.S., Oregon State University, 1965; Ph.D., Washington State University, 1975. Professor.

DUBBINK, DAVID T. (1989) .................................... City and Regional Planning
B.F.A., University of Illinois, Urbana-Champaign, 1960; M.C.P., University of California, Berkeley, 1965; Ph.D., University of California, Los Angeles, 1983. Associate Professor.

DUKIRK, DONNA (1981) ....................................... Architecture


DUFFY, D. JAN (1980) ......................................... Business Administration
B.A., Stanford University, 1972; J.D., Case Western Reserve University, 1976. Professor.

DUFFY, SUSAN (1988) ......................................... Speech Communication

DWYER, GARY COLBURN (1973) .............................. Landscape Architecture

EARLY, MARK M., MAJ. (1987) .................................. Military Science
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.

EDMISTEN, JOHN W. (1968).............................Architectural Engineering
B.S., California State Polytechnic College, 1965; M.E., University of
California, Berkeley, 1967. Professor. Registered Civil Engineer, California;
Registered Architect, California.

EHRENBERG, JAMES R. (1977)............................Engineering Technology
B.S., Gonzaga University, 1960; M.S., Seattle University, 1969; Ed.D.,
Brigham Young University, 1982. Professor. Registered Professional Engineer, California.

ELFRINK, T. LEIGH (1980)............................Administration and Finance
Manager, Administrative Services.

ELIJAII, MATHEWS M. (1980)..........................Administration and Finance
B.S., California Polytechnic State University, San Luis Obispo, 1984; M.S.,
1990. Supervising Custodian.

ELIMMIANN, ISAAC (1992)..............................English
B.A., Lagos University, 1969; M.A., Texas Christian University, 1974;
Ph.D., Howard University, 1978. Assistant Professor.

ELLIS, REBECCA (1987)...............................Management
Ph.D. 1984. Associate Professor.

ELZROTH, THOMAS E. (1967)......................Ornamental Horticulture
B.S., Ohio State University, 1965; M.S., 1966. Professor.

ENDRES, IELAND S. (1969)..............................Chemistry
A.B., Middlebury College, 1958; M.A., University of Oregon, 1963; Ph.D.,
University of Arizona, 1966. Professor.

ENGLE, PATRICE L. (1980)......................Psychology and Human Development
B.A. Wellesley College, 1966; Ph.D., Stanford University, 1971. Professor
and Department Chair.

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.

EQUINOCH, RICHARD M. (1973).........................Career Services
B.S., California State Polytechnic College, San Luis Obispo, 1967; M.S.,
1970. Director.

ESTES, ANGELA M. (1987).............................English
Ph.D., 1985. Associate Professor.

FABRICIUS, EUGENE DAVID (1970)............Electronic and Electrical Engineering
B.S., Missouri School of Mines, Rolla, 1956; M.S., 1958; D.Sc., Newark

FAHIS, MICHAEL L. (1983)..........................Speech Communication
A.B., California State University, Long Beach, 1972; M.A., University of
Southern California, 1974; Ph.D., 1976. Professor.

FANCHON, PHILIP (1991)..............................Economics
D.U.E.S. University of Paris, 1969; B.A., University of California, Santa

FARKYE, NANA Y. (1990).............................Dairy Science
B.Sc., University of Ghana, 1980; M.S., Utah State University, 1985; Ph.D.,

FARRELL, GERALD P. (1970)........................Mathematics
A.B., San Diego State College, 1961; M.S., 1963; Ph.D., University of
California, Los Angeles, 1968. Professor.

FARUQUE, OMAR (1989)...............................Landscape Architecture
Registered Architect and Landscape Architect.

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, 1963; M.A.T., Reed College, 1970; Ph.D.,
University of Oregon, 1981. Associate Professor.

FIELD, GARY G. (1984)..............................Graphic Communication
Certificate of Printing, Melbourne College of Printing and Graphic Arts,
Australia, 1966; Diploma in Printing Technology, Trent Polytechnic,

FIERSTINE, HARRY L. (1966)..........................Biological Sciences
B.S., Long Beach State College, 1957; M.A., University of California, Los
Angeles, 1961; Ph.D., 1965. Professor.

FIORITO, BASIL A. (1977).............................Psychology and Human Development
B.A., Marist College, 1968; M.S., New York University, 1970; M.A., 1975;
Ph.D., Syracuse University, 1977. Professor. Licensed Marriage, Family and
Child Counselor, California.

FIRMAN, RICHARD (1987)...........................Intercollegiate Athletics
B.S., California State College, Bakersfield, 1986. Head Coach.

FISHER, GENE (1991)..............................Computer Science
B.S., University of California, Irvine, 1973; Ph.D., 1985. Associate
Professor.

FLANAGAN, JAMES ROBERT (1959)....................Animal Science
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. Professor.

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, BARRY (1990)...............................Management
B.S., Michigan State University, 1973; M.S., 1974; M.B.A., University of
Michigan, 1983; Ph.D., 1985. Associate Professor.

FLOYD, DONALD R. (1974)..............................Social Sciences
Professor.

FORD, SUSAN (1990)..............................Student Academic Services
B.A., Mills College, Oakland; M.A., Antioch University, 1982. Program
Coordinator/Academic Advisor, Student Support Services.

FORGENG, WILLIAM D. (1980)........................Materials Engineering
B.S., University of California, Berkeley, 1958; Ph.D., Purdue University, 1962.
Professor.

FORODHAR, MANZAR (1987).........................History
B.A., National University of Iran; M.A., California State University,
Northridge, 1973; Ph.D., University of California, Los Angeles, 1978;
Ph.D., 1984. Associate Professor.

FOSTER, THEODORE G. (1970)..........................Physics
B.S., University of Minnesota, 1961; M.S., University of Washington, 1963;

FOUNTAIN, H. PAUL (1965)..............................Crop Science
B.S., California State 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.

FRAYNE, COLETTE (1992)............................Management
B.S., University of Delaware, 1980; M.B.A., University of San Diego, 1981;
Ph.D., University of Washington, 1986. Associate Professor.

FREBERG, LAURA A. (1987)............................Psychology and Human Development
B.A., University of California, Los Angeles, 1974; M.A., 1975; Ph.D., 1979.
Associate Professor.

FREEMAN, CAROL A. (1985)............................Health Services
B.A., Aurora University, 1978; R.N., Ventura College, 1982; N.P., Family
FREEMAN, H. JO ANNE (1974) ........................................... Industrial and Manufacturing Engineering B.I.E., Georgia Institute of Technology, 1966; M.S., University of Southern California, 1974; Ph.D., Stanford University, 1982. Professor and Department Chair. Registered Professional Engineer, California.


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.


GEOCHAGEN, LOCKSLEY (1977) .................................... Student Life and Activities B.A., University of California, Los Angeles, 1970; M.A., California Polytechnic State University, San Luis Obispo, 1976; A.B.D., University of California, Santa Barbara; additional graduate study. Associate Director.


GLASS, L. JOE (1970) ............................................... Agricultural Engineering B.S., Purdue University, 1962; M.S., Texas A & M University, 1965; Ph.D., 1971. Professor. Registered Civil Engineer, California.


GRANT, DONALD P. (1967) ................................ Architecture
B.Arch., University of Oklahoma, 1961; M.Arch., University of Utah, 1964;
Ph.D., University of California, Berkeley, 1974. M.A., California Polytechnic
State University, San Luis Obispo, 1985. Professor. Registered Architect,
California, New York. Licensed General Contractor, California.

GREENWALD, HARVEY C. (1973) ......................... Mathematics
B.S., Massachusetts Institute of Technology, 1964; M.A., Washington
University, 1966; Ph.D., 1970. Professor.

GREJEL, JAMES S. W. (1986) ............................. Crop Science
B.S., California State Polytechnic College, 1967; M.S., University of Nevada,

GRIFIN, ROBERT E. (1976) .............................. University Foundation
B.S., University of Southern California, 1966; J.D., Western State University,
1974. Associate Executive Director.

GRIMES, JOSEPH E. (1973) ............................... Computer Science
B.A., St. Ambrose College, 1963; M.S., Illinois State University, 1968;
Ph.D., Iowa State University, 1973. Professor.

GRINDE, DONALD A., Jr. (1977) ......................... History
B.A., Georgia Southern College, 1966; M.A., University of Delaware, 1968;
Ph.D., 1974. Professor.

GRINNELL, ROBIN R. (1967) ............................ Agricultural Engineering
B.S., Purdue University, 1955; M.S., University of Minnesota, 1961; Ph.D.,
Purdue University, 1976. Professor.

GROVES, JOHN E. (1968) ............................... Statistics
B.A., Pasadena College, 1963; M.A., University of California, Riverside,
1965; Ph.D., Kansas State University, 1972. Professor.

HAFEMESTER, DAVID W. (1969) ........................... Physics
B.S., Northwestern University, 1957; M.S., University of Illinois, 1960;
Ph.D., 1964. Professor.

HALEY, HAILA (1991) ............................................ Associated Students, Inc.

HAGEN, CHARLES T. (1980) ............................. Philosophy
B.A., Harvard University, 1968; M.A., University of Michigan, 1977; Ph.D.,
1981. Professor.

HALE, ALLEN (1993) ......................................... College of Business
A.B., University of Nebraska at Omaha, 1959; M.S., University of Southern
California, 1966; Diploma, Aeronautics and Space Vehicle Systems, Air
Force Institute of Technology, 1967; M.P.A., University of Southern
California, 1970; Ph.D., 1971. Dean.

HALE, RUTH E. (1984) ................................. Administration and Finance
B.S., California Polytechnic State University, San Luis Obispo, 1974.
Assistant Director, Fiscal Services-Accounting Systems.

HALE, THOMAS E. (1966) ............................... Mathematics
B.S., Indiana State University, 1960; M.S., 1963; M.S., St. Louis University,

B.A., Whitler College, 1968; M.A., University of California, Riverside,

HALL, KELLIE G. (1990) .............................. Physical Education and Kinesiology
B.S., Rocky Mountain College, 1977; M.S., Eastern Washington University,
1987; Ph.D., Louisiana State University, 1990. Assistant Professor.

HALL, MICHAEL H. (1974) ............................. Animal Science
B.S., California Polytechnic State University, San Luis Obispo, 1973; M.S.,
Kansas State University, 1975. Professor.

HALLOCK, BRENT G. (1979) .......................... Soil Science
B.S., University of California, Davis, 1970; M.S., 1972; Ph.D., 1976.
Professor. Certified Professional Soil Scientist; Certified Professional Soil
Erosion and Sediment Control Specialist.

HAMPSEY, JOHN C. (1992) ............................. English
B.A., Holy Cross College, 1976; Ph.D., Boston College, 1982. Assistant
Professor.

HAMPSON, BRYAN C. (1991) ......................... Food Science and Nutrition
B.S., University of Illinois at Champaign-Urbana, 1981; M.S., 1983; Ph.D.,
1988. Assistant Professor.

HANDSHY, PATRICIA A. (1984) .......................... Health Services
B.S.N., N.P., Purdue University, 1982. Nurse Practitioner.

B.S., Auburn University, 1972; M.S., Cornell University, 1974. Professor.

HANSON, MICHAEL T. (1978) ......................... Biological Sciences
B.S., Idaho State University, 1970; M.A., University of Missouri, 1973;
Ph.D., Texas A & M University, 1976. Professor.

HARATANI, JOYCE T. (1986) .......................... Administration and Finance
B.S., University of California, Los Angeles, 1974; B.S., California Polytechnic
State University, San Luis Obispo, 1979. Employment and Benefits Manager.

HARGRAVE, TERRY C. (1979) .......................... Architecture
B.Arch., Washington State University, 1965; M.Arch., Massachusetts

B.S., Fordham University, 1955; M.S., 1964; Ph.D., New York University,
1969. Professor.

HARPER, LOUIS W. (1977) ............................. Crop Science
B.S., Montana State University, 1958; M.S., 1964. Professor.

HARRIGAN, JOHN E., JR. (1969) ...................... Architecture
B.A., University of California, Berkeley, 1959; M.A., San Jose State College,
1962; Ph.D., Colorado State University, 1966. Professor.

B.A., University of Massachusetts, 1979; M.S.W., University of Connecticut,
1981. Interim Executive Director.

HARRINGTON, JOHN F. (1976) ....................... English
B.A., Washington State University, 1964; M.A., 1966; Ph.D., University of

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.; Ph.D., Utah State University,
1972. Professor.

HARRIS, WALTER L. (1973) ........................... Admissions
B.S., California Polytechnic State University, San Luis Obispo, 1973; M.A.,
1975. Associate Director, Admissions.

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.

HASSELIN, GEORGE J. (1949) ........................... Architecture
B.Arch., University of Southern California, 1945. Professor. FAIA.

HAVANDBIAN, NISHAN (1980) ...................... Journalism
B.A., Haigazian College, Beirut, Lebanon, 1972; M.A., University of
Georgia, 1975; 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.

HAYDEN, JILL E. (1977) ................................. Career Services
B.A., University of California, Riverside, 1972; M.A., California Polytechnic

HAYNES, RAY M. (1989) ............................... Management
B.S., University of Arizona, 1967; M.B.A., 1970; Ph.D., Arizona State
University, 1988. Associate Professor.

HAYNES, ROY (1989) ................................. Student Academic Services
B.S., Austin Peay State University, 1980. Academic Adviser, Minority
Engineering Program.

HEAD, DWAYNE G. (1966) .......................... Physical Education and Kinesiology
B.S., Jamestown College, 1958; M.S., South Dakota State University, 1963;
Ed.D., University of Oregon, 1967. Professor and Department Head.

HEESCH, HENRY J. (1989) ............................ Graphic Communication
B.F.A., California School of Fine Arts, 1958; B.S., California State
Polytechnic College, 1965; M.T., Arizona State University, 1988. Assistant
Professor.
HEIDERSBACH, ROBERT (1986) ........................................... Materials Engineering

HELLEY, GEORGE J. (1980) ............................................. Agribusiness

HENDRICK, STANLEY L. (1990) ........................................ Dairy Science
B.S., Iowa State University, 1973; M.S., Southern Illinois University, 1976; Ph.D., Utah State University, 1990. Associate Professor.

HENRY, DAVID (1970) .................................................. Speech Communication
A.B., University of California, Berkeley, 1970; M.A., University of California, Davis, 1974; Ph.D., Indiana University, 1976. Professor.

HENSLER, BEVERLY J. (1972) ......................................... College of Business

HERLITZ, GABRIEL (1976) ............................................. Mathematics
B.S., California Polytechnic State University, San Luis Obispo, 1976. Associate Professor.

HEWITT, CLARIBA (1976) ............................................. Art and Design

HEIMSTRA, KRIS (1984) .................................................. Career Services

HILL, PATRICK D. (1975) .............................................. Architecture

HINNEKE, MARY ANN (1978) ......................................... Financial Aid
B.S., California State Polytechnic College, San Luis Obispo, 1969. Loan Program Manager.

HINRICH TS, MEREDITH (1986) ...................................... Financial Aid

HITCHCOCK, VAUGHAN D. (1962) ................................. Physical Education and Kinesiology

HOCKADAY, STEPHEN L.M. (1982) ............................... Civil and Environmental Engineering
B.S., London University, 1965; M.S., University of California, Berkeley, 1968; Ph.D., 1969. Professor. Registered Professional Engineer, California, Oregon, Great Britain.

HOFFMAN, KENNETH A. (1974) ..................................... Physics

HOFFMAN, JON A. (1968) ............................................ Aeronautical Engineering
B.S., University of Wisconsin, 1964; M.S., 1966; additional graduate study, Wisconsin State University. Professor. Registered Professional Engineer, California.

HOLLAND, V. L. (1972) ............................................ Biological Sciences


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, 1963; 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.
JANOWICZ, ROSEMARIE (1993) .................................. Health Services
B.S., California Polytechnic State University, San Luis Obispo, 1979. Administrative Assistant.

JANSSON, A. KIRBY (1985) ........................................ College of Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1979.

JASTER, EDWIN H. (1992) ........................................ Dairy Science

JEFFERSON, DOROTHY (1982) ..................................... Student Academic Services

JELINEK, CYNTHIA J. (1976) ..................................... College of Science and Mathematics
B.S., Marietta College, 1967. Director of Advising Center.

JEN, JOSEPH (1992) ................................................... College of Agriculture
B.S., National Taiwan University, 1960; M.S., Washington State University, 1964; M.B.A., Southern Illinois University, 1986; Ph.D., University of California, Berkeley, 1969. Dean.

JENNINGS, CHARLES W. (1968) ..................................... Art and Design

JERCH, GEORGE D. (1976) .......................................... Art and Design

JOHNSON, BROOKS (1992) .......................................... Intercollegiate Athletics

JOHNSON, ERIC B. (1980) .......................................... Art and Design

JOHNSON, ERIC V. (1969) .......................................... Biological Sciences

JOHNSON, JANE (1980) ............................................ Career Services

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) ............................................. Associated Students, Inc.

JOHNSON, WILLIAM V. (1966) ..................................... Music

JOHNSTON, HAROLD A. (1988) ................................... Construction Management

JOHNSON, LAURA E. (1989) ......................................... Architecture

JONES, CAROLYN (1973) .............................................. Career Services

JONES, DANE R. (1976) .............................................. Chemistry
B.A., University of Utah, 1969; Ph.D., Stanford University, 1974. Professor.

JUNCO, MARIA L. (1989) .......................................... Theatre and Dance

KALATHIL, JAMES S. (1965) ......................................... Physics

KALISKI, MARTIN E. (1986) ....................................... Electronic and Electrical Engineering
B.S., Massachusetts Institute of Technology, 1966; M.S., 1968; Ph.D., 1971. Professor.

KAMINAKA, M. STEPHEN (1984) ................................. Agricultural Engineering
B.S., University of California, Davis, 1968; M.S., University of Hawaii, 1973; Ph.D., Cornell University, 1977. Professor.

KANN, DAVID J. (1969) ............................................ English

KATO, CORO C. (1981) .............................................. Mathematics
B.S., Shizuoka University, Japan, 1972; M.A., West Virginia University, 1974; Ph.D., University of Rochester, 1979. Professor.

KEELING, DAVID L. (1975) ........................................ Chemistry
B.S., Arizona State University, 1969; Ph.D., University of Hawaii, 1974. Professor.

KEEP, ROGER L. (1968) .......................................... Industrial Technology
B.S., Brigham Young University, Hawaii, 1967; M.S., Stout State University, 1968; Ed.D., Utah State University, 1972. Professor. Licensed General Contractor.

KEESEY, DOUGLAS (1988) ........................................ English

KEETCH, BRENT H. (1967) .......................................... English
B.A., Utah State University, 1965; M.A., 1966; Ph.D., University of Utah, 1971. Professor and Department Chair.

KEIL, DAVID J. (1976) .............................................. Biological Sciences
B.S., Arizona State University, 1968; M.S., 1978; Ph.D., Ohio State University, 1973. Professor.

KELLER, EARL C. (1987) .......................................... Accounting

KELLER, ELMO A., JR. (1963) .................................... Computer Science
B.A., Brigham Young University, 1959; M.A., 1961; Ph.D., Iowa State University, 1972. Professor.

KELLERMAN, MARTIN A. (1968) ................................ Chemistry
B.S., Polytechnic Institute of Brooklyn, 1953; Ph.D., University of Washington, 1966. Associate Professor.

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. Professor.

KENNEDY, EUEL W. (1974) ...................................... Enrollment Support Services
B.S., East Central State University, 1962; M.S., University of Utah, 1964; Ph.D., 1972. Associate Vice President of Enrollment Support Services and Professor of Mathematics.

KERBO, HAROLD R. (1977) ...................................... Social Sciences
B.A., University of Oklahoma, 1970; M.A., 1972; Ph.D., Virginia Polytechnic Institute and State University, 1975. Professor and Department Chair.

KERSTEN, TIMOTHY W. (1971) .................................... Economics

KESNER, BRIAN L. (1980) .......................................... Architecture

KHAIL, HANY M. (1987) ............................................ Food Science and Nutrition

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.

KITAMURA, ROBERT E. (1978) .................................... Administration and Finance
B.Arch., California Polytechnic State University, San Luis Obispo, 1975; M.S., 1993. Director, Facilities Planning.
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. Professor.

KOCHEN, KEN (1983) ................................................... Architecture

B.S., Cairo University, Egypt, 1969; M.S., University of Cincinnati, 1978; Ph.D., Louisiana State University, 1982. Professor. Registered Professional Engineer, Egypt.

KOOB, ROBERT D. (1990) ................................................. History

KUBINSKI, A. MARK (1976) .............................................. Economics

KRANTZDOFF, RICHARD B. (1971) ......................... Political Science

KREJSA, RICHARD (1968) ................................................. Art

KREIER, DANIEL E. (1971) ................................................. English

KRISSHNA, R. (1987) ............................................... Business Administration

KUBISKI, A. MARK (1975) ............................................. Biological Sciences
B.S., Gonzaga University, 1968; M.S., Washington State University, 1971; Ph.D., 1974. Professor.


LABARD, LEZLIE A. (1967) ........................................... Home Economics
B.A., University of California, Davis, 1965; M.S., 1967. Professor.

LAKEMAN, SANDRA DAVIS (1981) ......................... Architecture

LAMB, STEPHAN R. (1979) ............................................. Residential Life and Education

LAMBERT, ROYCE L. (1969) ........................................... Soil Science

LAMBERT, WALTER M. (1975) ............................................. Student Life and Activities

LANDWEHR, ALFRED W. (1970) ......................... English

LANG, MARTIN T. (1969) ............................................. Mathematics

LANG, ROBERT J. (1991) ........................................... Civil and Environmental Engineering
B.S., University of California, Davis, 1978; M.S., 1982; Ph.D., 1989. Associate Professor. Registered Professional Engineer, California, National Council of Examiners for Engineering and Surveyors.

LANCE, JOHN H. (1975) ........................................... Architecture

LANCE, KAREN F. (1991) ............................................ Home Economics
B.A., California Polytechnic State University, San Luis Obispo, 1980; M.Arch., Columbia University, 1982. Assistant Professor.

LANT, KATHLEEN MARGARET (1983) ......................... English

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. Registered Professional Engineer, California.

LASCOLA, RUSSELL A. (1970) ................................ Philosophy

LASSANES, DANIEL E. (1975) ................................ Ornamental Horticulture

LAU, FREDERICK C. (1991) ........................................... Music

LAZERE, DONALD P. (1977) ........................................... English


LEE, PETER Y. (1981) ................................................... College of Engineering
B.S., National Taiwan University, 1961; M.S., Tulane University, 1965; Ph.D., 1968. Professor and Dean. Registered Professional Engineer, Louisiana.

LEONG, KINGSTON L. (1970) ..................................... Biological Sciences
B.S., University of Hawaii, 1963; M.S., 1966; Ph.D., Oregon State University, 1970. Professor.

LERNER, NORMAN (1986) .............................................. Art and Design

LEVISON, HARVEY R. (1983) ................................ Graphic Communication
B.S., Rochester Institute of Technology, 1967; M.S., South Dakota State University, 1968; Ph.D., University of Pittsburgh, 1980. Department Head.

LEVY, DANIEL J. (1983) ........................................... Psychology and Human Development
B.A., Lehigh University, 1973; M.S., University of Arizona, 1979; Ph.D., 1981. Associate Professor.

LEVY, MICHAEL J. (1994) ........................................ Management

LEVISON, ROBERT L. (1969) .................................... University Center for Teacher Education

LEWIS, GEORGE M. (1967) ........................................ Mathematics

B.Commerce, National Chengchi University, Taiwan, 1975; M.S.B.A., Texas Tech University, 1978; Ph.D., 1981. Professor.

LINDVALL, JOHN R. (1973) .................................... Business Administration
LITTLE, WILLIAM T. (1983) ........................................ Foreign Languages and Literatures

LIU, HONG-TING (1984) .............................................. Architectural Engineering
B.S., Zhejian University, 1952; Ph.D., University of Minnesota, 1984. Professor.

LO, CHIEN-KUO (1983) ............................................. Civil and Environmental Engineering
B.S., National Cheng Kung University, Taiwan, 1969; M.S., 1973; Ph.D., University of Iowa, 1981. Professor.

LOCASIO, JAMES CASCARE (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

LOFTUS, ROBIN L. (1978) ......................................... Financial Aid

LOH, ALICE C. (1974) ............................................. Landscape Architecture

LOH, LARRY (1979) ................................................. Architecture

LONDON, BLAIR (1993) .......................................... Materials Engineering
B.S. Drexel University, 1981; M.S., Stanford, 1983; Ph.D., 1986. Associate Professor.

LONG, DIANE N. (1982) ............................................ Political Science

LORD, DAVID (1985) ................................................ Architecture

LORD, SARAH (1986) ............................................... Agricultural Education

LUCAS, NANCY (1977) ............................................. English

LUNA, GEORGE W. (1977) ..................................... Mathematics

LUND, JOAN (1977) ................................................ Administration and Finance

B.S., North Dakota State University, 1970; M.S., 1981. Associate Professor.

LUTHRA, 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) ....................................... University Center for Teacher Education

MacCARLEY, C. ARTHUR (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., Southwestern at Memphis, 1972; M.A., University of South Carolina, 1975; Ph.D., 1980. Associate Professor.

MACIAS, RAY (1980) .............................................. Administration and Finance

MAKSoudian, Y. LEON (1963) ..................... Statistics
B.S., California State Polytechnic College, 1957; M.S., University of Minnesota, 1961; Ph.D., University of Minnesota, 1970. Professor.

MALKIN, MICHAEL R. (1974) .................. Theatre and Dance

MALLAREDDY, H. (1981) ..................................... Civil and Environmental Engineering
B.S., Mysore University, India, 1958; M.E., University of Oklahoma, 1966; Ph.D., 1968. Professor. Registered Professional Engineer, California, Indiana and Louisiana.

MALMBOURG, FREDRICK B. (1969) ..................... Mechanical Engineering
B.S., New York University, 1953; M.S., Columbia University, 1963. Associate Professor.

MARAVIGLIA, JAMES L. (1991) ................... Admissions
B.S., Elmhurst College, 1976; M.S., Chicago State University, 1984. Director of Admissions.

MARK, WALTER R. (1972) .................................. College of Agriculture
B.S., Utah State University, 1968; M.S., Colorado State University, 1970; Ph.D., 1972. Professor and Associate Dean. Registered Professional Forester, California.

MARLIER, JOHN F. (1981) .................................. Chemistry
B.S., University of Wisconsin, Stevens Point, 1972; Ph.D., University of Wisconsin, Madison, 1978. Professor.


MARPLE, DEBBIE L. (1976) .......................... Administration and Finance
B.A., California Polytechnic State University, San Luis Obispo, 1976. Associate Director, Budget Planning and Administration.

MARTIN, W. MIKE (1985) .................................. Architecture

MARTINEZ, WILLIAM (1984) ...................... Foreign Languages and Literatures

MARTINEZ-UNUNZA, EVERARDO (1982) ............ Admissions
B.S., California Polytechnic State University, San Luis Obispo, 1980; M.S., 1983. Assistant Director, Admissions.

MARX, STEVEN R. (1988) .................................. History

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., Whitworth College, 1966; Ph.D., Colorado State University, 1979. Professor and Department Chair.

MAYO, EDWARD L. (1968) .................................. History

McBRIDE, SUSAN L. (1979) ..................... University Center for Teacher Education
B.S., University of Akron, 1953; M.S., 1972; Ph.D., 1979. Professor.

McBURNey, KATHLEEN A. (1991) ...................... Food Science and Nutrition
B.S., Michigan State University, 1965; M.P.H., University of Michigan, 1972; Dr.P.H., University of California, Berkeley, 1989. Assistant Professor. Registered Dietitian.

McCORKLE, ROBERT E. (1962) ..................... Agriculture
B.S., California State Polytechnic College, 1960; M.S., University of California, 1962; additional graduate study, Oregon State University, University of Wisconsin. Professor.
McCLUTCHEON, JOHN (1992) ........................................................................... Intercollegiate Athletics

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.

McDONALD, ANNA J. (1991) .............................................................. Affirmative Action
B.A., Lincoln University, 1967; M.A., California State University, Fresno, 1980; A.M., Stanford University, 1986; Ph.D. candidate. Director.


McDONALD, MARGOT (1992) ............................................................... Architecture

McDOWELL, ERIC (1992) ............................................................... Intercollegiate Athletics

McFARLAND, STEVE (1983) ............................................................... Intercollegiate Athletics
B.S.C., California Polytechnic State University, San Luis Obispo, 1972. Head Coach.

B.S., Brigham Young University, 1979; M.S., 1980; Ph.D., Washington State University, 1984. Professor.

McKIBBNIN, 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

MCLEMORE, ALYSON (1991) ................................................................. Music

MCNORRAN, 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.

MEACHER, JAMES M. (1988) ................................................................. Mechanical Engineering
B.S., University of Akron, 1978; M.S., 1981; Ph.D., University of California, Berkeley. 1987. Associate Professor.

MEHZADEH, AMROLLAH (1984) ................................................................. Mechanical Engineering
B.S., Abadan Institute of Technology, 1978; M.S., University of Southern California, 1980; Ph.D., 1984. Professor.

MELEN, BARBARA A. (1973) ................................................................. Administration and Finance
B.S., California Polytechnic State University, San Luis Obispo, 1973; M.P.A., University of San Francisco, 1981. Human Resources Manager.

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 and Manufacturing Engineering

METCALF, LYNN E. (1986) ................................................................. Business Administration
B.A., University of Oregon, 1978; M.M.M., American Graduate School of International Management, 1981; Ph.D., University of South Carolina, 1986. Professor.

MICHELFELDER, DIANE P. (1981) ................................................................. Philosophy
B.A., Bryn Mawr College, 1975; Ph.D., University of Texas, 1982. Professor and Department Chair.

MIKLOWITZ, PAUL S. (1988) ................................................................. Philosophy
B.A., University of California, Santa Cruz, 1977; M.A., University of Chicago, 1979; M.Phil., Ph.D., Yale University, 1988. Associate Professor.

MILLER, CHARLES R. (Tad) (1987) ................................................................. Accounting

MILLER, SANDRA D. (1984) ................................................................. Architecture

MOAZZAMI, SARA (1991) ................................................................. Civil and Environmental Engineering
B.S., George Washington University, 1981; M.S., University of California, Berkeley, 1982; Ph.D., 1987. Assistant Professor.

MOIR, NEL L. (1970) ................................................................. Chemistry

MONTICALVO, 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 and Development

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) ................................................................. Career Services

MORENO, J. KELLY (1991) ................................................................. Psychology and Human Development
B.S., University of California, Santa Barbara, 1980; M.S., University of Utah, 1985; Ph.D., 1988. Assistant Professor. Licensed Psychologist, California.

MOREY, KRISHNAKUMAR (KRSS) 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.

MORCAN, 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.

MORROBEL-SOSA, ANNY (1990) ................................................................. Materials Engineering
B.Sc., University of Puerto Rico, 1976; M.Sc., State University of New York, Stony Brook, 1980; Ph.D., University of Southern California, 1985. Associate 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.

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.

MUELLER, GERRY K. (1984) ............................... Office of the President

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. Associate Professor.

MULLIGAN, PATRICIA A. (1988) ........................ University Center for Teacher Education

MULLLEN, RONALD S. (1977) ............................. Mechanical Engineering
B.S., California State Polytechnic College, 1969; M.Eng., 1976; Ph.D., Colorado State University, 1983. Professor. Registered Professional Engineer, California.

MUNROE, PATRICK A. (1980) ............................. Graphic Communication

MURPHY, JAMES L. (1981) .................................. Industrial Technology

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, RANDALL L. (1977) ............................. Journalism
B.S., Ohio University, 1960; M.S., 1961; Ph.D., University of Minnesota, 1973. Professor.

MUSULMAN, RONALD (1986) .............................. 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 (1967) .............................. Electronic and Electrical Engineering
B.S., University of Teheran, 1959; M.S., University of Michigan, 1963; Ph.D., Massachusetts Institute of Technology, 1967. Professor.

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

NARETTO, EDWARD M. (1979) ......................... Administration and Finance
B.S., California State Polytechnic College, 1967. Director, Facilities Services.

NEEL, PAUL R. (1962) ................................. College of Architecture and Environmental Design

NEGRANTI, ROBERT M. (1974) .......................... Student Affairs
B.S., San Jose State College, 1967. Employee Assistance Program Specialist.

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, LINDEE L. (1970) ............................. Psychology and Human Development
B.A., University of Northern Iowa, 1966; Ph.D., University of California, Los Angeles, 1970. Professor.

NEUBERT, ROD (1978) ................................. Associated Students, Inc.
B.S., California State Polytechnic College, 1971; M.A., California Polytechnic State University, San Luis Obispo, 1979. Director, Program Management.

NICOVICH, RALPH R. (1978) .......................... Enrollment Support Services
B.S., California Polytechnic State University, San Luis Obispo, 1975; M.S., 1983. Systems Specialist and OLAN Administrator.

NIKU, SAED B. (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.

NOBLE, WILLIAM E. (1973) ............................ Ornamental Horticulture
B.S., University of Maryland, 1964; M.S., 1965; Ph.D., University of Florida, 1974. Professor.

NORDEN, RONALD D. (1991) ........................... University Relations and Development

NOVAK, MATTHEW S. (1989) ........................... English
B.S., Cleveland State University, 1974; B.A., 1976; M.A., 1978; Ph.D., Case Western Reserve University, 1989. Associate Professor.

NOWATZKI, EDWARD A. (1989) ......................... Civil and Environmental Engineering
B.A., St. Joseph's College, 1957; B.C.E., Manhattan College, 1962; M.S.C.E., University of Arizona, 1965; Ph.D., 1966. Professor and Department Chair. Registered Professional Engineer.

NOYES, O. ROBERT (1974) ............................. Food Science and Nutrition

NULMAN, DENNIS M. (1977) ............................ University Center for Teacher Education
B.A., University of San Diego, 1970; M.Ed., 1972; Ph.D., University of Southern California, 1977. Professor.

OCHS, NANCY C. (1977) ............................... Agribusiness

OFFERMAN, 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 C. (1983) ......................... Natural Resources Management

OLDs, ALEXIS S. (1988) ............................... Speech Communication
B.A., San Jose State University, 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'NEIL, THOMAS D. (1973) ............................. Mathematics

O'NEILL, GERTRUDIS M. (1972) ..................... University Library
B.A., Inter-American University, Puerto Rico, 1955; M.F.A., University of Cincinnati, 1959; M.I.L.S., Western Michigan University, 1967; additional graduate study, Art Academy of Cincinnati. Senior Assistant Librarian.

OPAVA-STITZER, SUSAN (1993) ...................... Research and Graduate Programs
B.S., College of St. Vincent, New York, 1968; Ph.D., University of Michigan, 1972. Dean.

ORROCK, JLL (1983) ................................. Intercollegiate Athletics

B.A., University of California, Santa Barbara, 1959; M.A., San Francisco State College, 1963; Ph.D., Claremont Graduate School, 1974. Professor.

ORTIZ, MARIA E. (1972) .............................. Biological Sciences
B.S., Southwest Texas State University, 1968; M.A.; 1970; Ph.D., Texas Woman's University, 1973. Professor.
OSBALDESTON, ROGER J. (1972) ........................................ Landscape Architecture

O'TOOLE, FREDERICK J. (1972) ........................................ Philosophy

OWENS, ANN (1992) ...................................................... Philosophy

OZAWA, KENNETH ...................................................... Philosophy

PAGE, BRIAN, CPT. (1994) ........................................... Military Science

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 ..................................................... University Library
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.

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 and Department Head.

PAPAKYRIAZIS, PANACHIOTIS A. (1971) ............................. Economics

PARKER, LEE R. (1974) ................................................... Biological Sciences
B.S., Brigham Young University, 1966; M.S., 1968; Ph.D., Michigan State University, 1976. Professor.

PATTEE, ROBERT K. (1991) ............................................ Administration and Finance

PATTERSON, ANDRE (1994) ........................................... Intercollegiate Athletics

PATTERSON, WILLIAM B. (1977) ..................................... Mechanical Engineering

PATTON, LINDA J. (1991) ............................................. Mathematics

PAUTZ, ROLAND K. (1959) ............................................ Animal Science
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 and Department Chair.

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.

PEREZ, MARINA E. (1975) ............................................ Health Services

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.

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) ........................................... Administration and Finance
B.S., California State Polytechnic College, 1959. Architectural Coordinator.

PIRTO, 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.

PILLSBURY, NORMAN H. (1974) .................................... Natural Resources Management
B.S., Humboldt State College, 1968; M.S., Humboldt State University, 1972; Ph.D., Colorado State University, 1976. Professor and Department Head. Registered Professional Forester, California.

PINARD, LEO W., II (1970) .......................................... Social Sciences

PLUMB, TIMOTHY R. (1981) ........................................ Natural Resources Management
B.S., Oregon State University, 1954; M.S., University of California, Berkeley, 1939; Ph.D. University of California, Riverside, 1970. Professor. Registered Professional Forester, California.

PLUMMER, WILLIAM E. (1979) ...................................... Animal Science
B.S., North Carolina State University, 1970; M.S., 1976; Ph.D., Utah State University, 1979. Professor.

POHL, JENS G. (1973) ................................................... Architecture

POKORYNY, 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) .......................................... Career Services

POURAGHABACHER, A. REZA (1979) ............................... Industrial and Manufacturing Engineering
B.S., 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, ELLEN 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 Kinesiology

RAGSDALE, DAVID O. (1991) ........................................ Administration and Finance
B.S., California Polytechnic State University, San Luis Obispo, 1984. Registered Environmental Health Specialist, Environmental Safety Officer.
RAINEY, PAUL E. (1987) .................................. College of Engineering
B.S.M.E., Purdue University, 1967; M.S., Massachusetts Institute of Technology, 1968; Ph.D., Texas A & M University, 1981. Professor, Materials Engineering, and Associate Dean. Registered Professional Engineer, Texas.

RAMIREZ, RICHARD M. (1975) .................................. Administration and Finance
B.B.A., New Mexico State University, 1971. Director, Budget Planning and Administration.

RANDAZZO, ANTHONY JAMES (1977) .................................. Industrial Technology

RAWLINGS, DON (1980) .................................. Arts
B.A., Humboldt State University, 1968; M.S., 1971. Director, Stage Management.

RAWLINGS, JOANNE BEAULE (1973) .................................. Fine Arts

REGAN, CYNTHIA L. (1989) .................................. Business Administration
B.S., California State Polytechnic College, 1970; M.S., University of Wisconsin, Stout, 1985. Assistant Professor.

REGIER, RONALD (1987) .................................. College of Arts and Sciences

REIF, GARY D. (1967) .................................. Agriculture
B.S., Kansas State University, 1962; M.S., University of Nebraska, 1964; Ph.D., Iowa State University, 1967. Professor.

REYNOLDS, NANCY J. (1986) .................................. Administration and Finance
B.S., California Polytechnic State University, San Luis Obispo, 1977.

REYNOLDS, ROBERT G. (1963) .................................. Architecture

REYNOso, WENDY DEMKO (1978) .................................. College of Liberal Arts

RICE, MARYLYNN F. (1977) .................................. Social Sciences
B.A., University of California, Los Angeles, 1960; M.Ed, California State University, Northridge, 1969; Ph.D., University of California, Santa Barbara, 1977. Professor. Licensed Psychologist, California.

RICE, THOMAS J., Jr. (1981) .................................. Science
B.S., University of Wisconsin, Madison, 1974; M.S., Montana State University, 1976; Ph.D., North Carolina State University, 1981. Professor. Certified Professional Soil Scientist.

RICE, WALTER E. (1964) .................................. Business Administration

RICHARDS, THOMAS L. (1969) .................................. Biological Sciences

RIELDSPERGER, MAX E. (1969) .................................. History

RIENER, KENNETH (1983) .................................. Business Administration
B.S., University of Idaho, 1968; M.S., Purdue University, 1969; Ph.D., 1976. Professor.

RIFE, WILLIAM C. (1977) .................................. Chemistry

RIGGINS, RHONDA L. (1972) .................................. Biological Sciences
B.S., Austin Peay State College, 1966; M.S., Iowa State University, 1969; Ph.D., 1972. Professor.

RHAL, 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.

RISER, JOSEPH C. (1982) .................................. Administration and Finance

ROACH, DAVID M. (1966) .................................. Physics
B.S., South Dakota School of Mines and Technology, 1961; M.S., 1963; Ph.D., Oregon State University, 1974. Professor.

ROBERTS, GREGORY T. (1980) .................................. Student Affairs

ROBINSON, JOHN C. (1985) .................................. Accounting

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, San Luis Obispo, 1978; Ph.D., University of California, Santa Barbara, 1985. Librarian and Interim Associate Dean.

RODER, JAMES A. (1976) .................................. Construction Management

RODRIGUEZ, LUCY (1987) .................................. Academic Records

ROGERS, JOHN C. (1986) .................................. Business Administration
B.S., Point Park College, 1970; M.B.A., Pennsylvania State University, 1972; Ph.D., Virginia Polytechnic Institute and State University, 1979. Professor and Department Head.

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.

ROGERS, ROBERT L. (1974) .................................. Engineering Technology
B.S., California Maritime Academy, 1969; M.S., Stanford University, 1972. Professor. Registered Professional Engineer, California.

ROGERS, ROLF E. (1975) .................................. Management

ROJAS-OVIEDO, RUBEN (1991) .................................. Aeronautical Engineering
B.S., Instituto Politecnico Nacional, 1976; M.S., North Carolina State University, 1981; Ph.D., Auburn University, 1987; M.S., 1989. Assistant Professor.

ROME, KEVIN D. (1991) .................................. Business Administration

ROPER, SUSAN S. (1991) .................................. University Center for Teacher Education
B.A., University of California, Berkeley, 1963; M.A., Stanford University, 1968; Ph.D., 1971. Professor and Center Director.

ROSENFELD, STANLEY (1979) .................................. Administration and Finance
B.A., Occidental College, 1970. Assistant Director, Fiscal Services-Payment Management.

ROSENTHAL, BIANCA (1971) .................................. Foreign Languages and Literatures

ROSSI, RICHARD J. (1991) .................................. Statistics
B.A., California State University, Sacramento, 1978; M.S., Iowa State University, 1980; Ph.D., Oregon State University, 1988. Assistant Professor.

ROWELL, ROBERT (1991) .................................. Intercollegiate Athletics
B.S., California Polytechnic State University, San Luis Obispo, 1990. Assistant Athletic Director, Business Operations.

B.A., Ohio State University, 1966; M.S., Iowa State University, 1970; Ph.D., Colorado State University, 1976. Professor.

RUGGLES, JOANNE BEAULE (1973) .................................. Art and Design

RUGGLES, PHILIP K. (1966) .................................. Graphic Communication
B.S., West Virginia Institute of Technology, 1965; M.S., South Dakota State University, 1966. Professor.

RUSSELL, JOHN G. (1968) ......................................................... Music  
B.A., Fresno State College, 1959; M.A., California State University, Chico, 1968. Professor.

RUTHERFORD, ROBERT T. (1974) ........................................... Animal Science  
B.S., University of California, Davis, 1970; M.S., California Polytechnic State University, San Luis Obispo, 1976. Professor.

RYAN, KATHLEEN A. (1981) ................................................. Psychology and Human Development  

RYAN, L. DIANE (1973) ..................................................... Financial Aid  

RYUJIN, DONALD H. (1989) .................................................. Psychology and Human Development  
B.A., Alfred University, 1985; M.S., 1987. Assistant Professor.

SABOL, JOSEPH E. (1972) .................................................... College of Agriculture  
B.A., California Polytechnic State University, 1965; Ph.D., Colorado State University, 1976. Professor and Director of Outreach Services.

SCHAEFFER, CAROLE L. (1987) ............................................. Residential Life and Education  

SCHAEFFNER, 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. Associate Professor and Department Head.

SCHULTZ, NED W. (1976) ..................................................... Psychology and Human Development  

SCHUMANN, THOMAS G. (1971) ............................................ Physics  

SCOTT, JACK F. (1967) ..................................................... Agribusiness  

SCOTT, KENNETH C. (1975) .................................................. Agribusiness  
B.S., Brigham Young University, 1970; Ph.D., Washington State University, 1975. Professor.

SCOTTO, KENNETH C. (1970) .................................................. Animal Science  
B.S., California Polytechnic College, 1966; M.S., University of Nevada, 1969. Professor.

SCRIVEN, TALMAGE ERNEST (1980) ...................................... Philosophy  

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.

SELBY, MICHAEL J. (1991) .................................................. Psychology and Human Development  
B.S., University of California, Santa Barbara, 1971; M.S., California Polytechnic State University, San Luis Obispo, 1981; Ph.D., Memphis State University, 1988. Assistant Professor. Licensed Psychologist, California.

SENA, JAMES (1987) .......................................................... Management  

SENNETT, ROBERT E. (1970) .............................................. Civil and Environmental Engineering  
B.S., University of Pennsylvania, 1959; M.S., 1961; Ph.D., 1964. Professor. Registered Professional Engineer, California.

SETTLE, ALLEN K. (1970) .................................................... Political Science  

SHEU, ANNA B. (1993) ....................................................... Information Systems  
B.A., University of Southern California, 1972. Director, Multimedia Development.

B.S., University of Tripoli, 1974; M.S., University of Southern California, 1978; Ph.D., Oregon State University, 1985. Associate Professor.

SHAFFER, MARY K. (1980) .................................................. Information Systems  
B.A., Sonoma State University, 1974. Assistant to the Vice President.

SHAFFNER, RICHARD A. (1974) .......................................... Social Sciences  

SHAH, RAMESH T. (1969) ................................................... Mechanical Engineering  
B.E., Maharaja Satsang Banarasiya University of Baroda, India; Dr. Ing., Fachhochule Fur Schwarzmachinenbau, Magdeburg, East Germany, 1959. Professor. Registered Professional Engineer, California.

SHANI, ABRAHAM (1983) ..................................................... Management  
B.A., University of Tel Aviv, 1972; M.A., 1978; Ph.D., Case Western Reserve University, 1981. Professor and Department Head.

SHANK, CAROLYN B. (1974) ............................................... Natural Resources and Management  
B.S., California State Polytechnic College, 1969; M.S., 1975; Ed.D., University of Utah, 1981. Professor.

SHARP, HARRY, JR. (1975) .................................................. College of Liberal Arts  
A.B., College of the Pacific, 1959; M.S., Purdue University, 1961; Ph.D., 1967. Professor and Associate Dean.

SHEIK, HABIB (1967) ....................................................... English  
B.S., Fresno State College, 1959; A.B., M.A., California State Polytechnic College, 1961; M.A., University of California, Los Angeles, 1966; Ph.D., University of Nebraska, 1979. Professor.

SHELTON, MARK D. (1982) .................................................. Crop Science  
B.S., University of Idaho, 1977; M.S., Purdue University, 1980; Ph.D., Utah State University, 1989. Professor. Registered Professional Entomologist.

SHENESKE, DONALD (1982) ............................................... University Foundation  

SHIBATA, MARTIN (1990) ................................................... Career Services  
B.A., University of California, Los Angeles, 1975; M.P.A., California State University, Los Angeles, 1983; additional graduate work, University of Southern California, 1985. Assistant Director.

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 and Development  
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.

SIM, JIN-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  

SLEEPER, CHARLES (1992) Intercollegiate Athletics B.S., Grand Valley State University, 1983; M.S., St. Thomas University, 1986. Assistant Athletic Director, Athletic Development.


SMITH, BRENDA (1989) Crop Science B.S., University of California, Davis, 1983; M.S., California State University, Fresno, 1986; Ph.D., Oklahoma State University, 1989. Assistant 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, 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.


SULES, MICHAEL H. (1975) Faculty Affairs B.S., California Polytechnic State College, San Luis Obispo, 1970; M.S., 1971; additional graduate study, Brigham Young University and La Verne University. Director.
VIX, MARLIN DALE (1977) ........................................ Agribusiness
B.S., San Jose State College, 1968; M.S., California Polytechnic State University, San Luis Obispo, 1977. Assistant Professor.

WADELL, JOSEPH JAMES (1976) ................................ University Library

WALCH, DAVID B. (1980) ........................................ University Library

WALKER, KENDRICK W. (1973) ................................ Biological Sciences

WALKER, ROBERT E. (1983) ................................ Agricultural Engineering
B.S., California Polytechnic State College, 1968; M.S., Utah State University, 1978. Professor. Registered Professional Engineer, California and 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

WALACE, WILLIAM CARL (1970) ............................. Student Affairs
B.S., California Polytechnic State College, 1967; California Polytechnic State University, San Luis Obispo, M.A., 1973. Additional graduate study, University of California, Santa Barbara. Director, Campus Student Relations/Judicial Affairs.

WALLER, JULIA R. (1983) ..................................... Biological Sciences

WALSH, DANIEL W. (1986) ................................... College of Engineering
B.S., Rensselaer Polytechnic Institute, 1973; M.S., 1976; Ph.D., 1985. Professor, Materials Engineering, and Associate Dean.

WALTERS, ROBERT W. (1970) .................................. Student Life and Activities

WATERFIELD, DAVID L. (1975) ............................... Crop Science

WASSEL, GUSTAV N. (1980) .................................. Electronic and Electrical Engineering

WATERBURY, ARCHIE M. (1973) ......................... Biological Sciences

WATKINS, HARRY S. (1992) .................................. Business Administration
B.S., Willamette University, 1972; M.B.A., University of Arizona, Tucson, 1978; Ph.D., University of Oregon, 1992. Associate Professor.

WEATHERBY, JOSEPH N., JR. (1968) ...................... Political Science
B.A., Baylor University, 1958; B.F.T., American Institute for Foreign Trade, 1961; M.A., Baylor University, 1962; Ph.D., University of Utah, 1968; additional graduate study, Baldwin Wallace College, Ohio; Hamline University, Minnesota; American University, Cairo; Cambridge University. Professor.

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 Kinesiology

WEINSTEIN, STEPHEN T. (1969) ............................... Mathematics
B.A., University of Southern California, 1960; M.A., 1965; Ph.D., 1972. Professor and Department Chair.

WEISENHAL, 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.

WESTOVER, JAMES D. (1971) ............................... Chemistry

WHEATLEY, JO ANN C. (1980) ............................... Crop Science
B.A., Southeastern Louisiana University, 1961; M.S., California Polytechnic State University, San Luis Obispo, 1978; Ph.D., Louisiana State University, 1990. 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.

WHITE, DONALD E. (1987) .................................. Industrial and Manufacturing Engineering
B.S., University of California, Berkeley, 1965; M.S., Stevens Institute of Technology, 1967; Ph.D., Case Western Reserve University, 1971; M.B.A., Pepperdine University, 1980. Professor.

WHITEFORD, MARY A. (1982) ......................... Academic Programs

WILK, EDWARD A. (1966) .................................. University Library

WILLIAMS, D. F. G. (1993) .................................. City and Regional Planning

WILLIAMS, DOUGLAS W. (1983) ......................... Agricultural Engineering
B.S., Kansas State University, 1967; M.S., Iowa State University, 1969; Ph.D., University of California, Davis, 1973. Professor. Registered Mechanical Engineer, California.

WILLIAMS, NANCY (1988) .................................. University Foundation
B.S., Illinois State University, 1973; M.A., Ball State University, 1980. Director, Campus Dining.

WILLIAMSON, DANIEL P. (1970) ............................. Economics
B.A., University of California, Santa Barbara, 1966; Ph.D., University of California, San Diego, 1973. Professor.

WILLIAMSON, DAVID G. (1968) ............................... Chemistry
B.A., University of Colorado, 1963; Ph.D., University of California, Los Angeles, 1966; postdoctoral fellow, National Research Council of Canada. Professor.

WILLS, MAX T. (1967) ..................................... Chemistry

WILSON, JACK D. (1976) .................................. Mechanical Engineering
B.S., Michigan State University, 1956; M.S., 1958; Ph.D., 1968. Professor. Registered Professional Engineer, California and Georgia.

WILSON, WALTER D. (1969) .................................. Physics
B.S., University of California, Berkeley, 1957; Ph.D., 1966. Professor.

WILT, PETER J. (1983) .................................. Theatre

WILVERT, CALVIN H. (1973) ............................... Social Sciences

WINHERBEN, TERRENCE C. (1983) .................. Speech Communication
B.S., Southwest Missouri State University, 1971; M.A., 1972; Ph.D., Ohio State University, 1985. Associate Professor.


WU, SING-CHOU (1969)...................................... Statistics B.A., National Taiwan University, 1959; M.S., Utah State University, 1966; Ph.D., Colorado State University, 1970. Professor.


YANG, TAO H. (1987)........................................ Industrial and Manufacturing 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 Chiao-Tung University, Taiwan, 1964; M.E., McMaster University, Canada, 1966; Ph.D., 1969. Professor.


ZAMMIT, RONALD E. (1986)................................. Physics B.S., Louisiana State University, 1969; M.S., Purdue University, 1971; Ph.D., 1975. Professor.

ZETZSCHE, JAMES B., JR. (1968)............................ Agricultural Engineering B.S., Texas Technological College, 1962; M.S., 1967. Professor. Registered Agricultural Engineer, California.


"STUDENT-RIGHT-TO-KNOW" DISCLOSURE OF GRADUATION RATE

In 1991-92, the graduation rate for Cal Poly freshman who entered the university in Fall 1984, was 64%. For more detailed information, please contact Institutional Studies at 805 756-2204.

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 St. 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 to 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. Disclosure may also be made to other persons or organizations under certain conditions (e.g., as part of accreditation or program evaluation; in response to a court order or subpoena; in connection with financial aid; to other institutions to which the student is transferring).

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 Code of Regulations. These sections are as follows:

Article 1.1, Title 5, California Code of Regulations
41301. Expulsion, Suspension and Probation of Students. Following procedures consonant with due process established pursuant to Section 41304, any student of a campus may be expelled, suspended or placed on probation...
or given a lesser sanction for one or more of the following causes which must be campus related:

(a) Cheating or plagiarism in connection with an academic program at a campus.

(b) Forgery, alteration or misuse of campus documents, records, or identification or of knowingly furnishing false information to a campus.

(c) Misrepresentation of oneself or of an organization to be an agent of a campus.

(d) Obstruction or disruption, on or off campus property, of the campus educational process, administrative process, or other campus function.

(e) Physical abuse on or off campus property of the person or property of any member of the campus community or of members of his or her family or the threat of such physical abuse.

(f) Theft, of, or non-accidental damage to, campus property, or property in the possession of, or owned by, a member of the campus community.

(g) Unauthorized entry into, unauthorized use of, or misuse of campus property.

(h) On campus property, the sale or knowing possession of dangerous drugs, restricted dangerous drugs, or narcotics as those terms are used in California statutes, except when lawfully prescribed pursuant to medical or dental care, or when lawfully permitted for the purpose of research, instruction or analysis.

(i) Knowing possession or use of explosives, dangerous chemicals or deadly weapons on campus property or at a campus function without prior authorization of the campus president.

(j) Engaging in lewd, indecent, or obscene behavior on campus property or at a campus function.

(k) Abusive behavior directed toward, or hazing of, a member of the campus community.

(l) Violation of any order of a campus President, notice of which had been given prior to such violation and during the academic term in which the violation occurs, either by publication in the campus newspaper, or by posting on an official bulletin board designated for this purpose, and which order is not inconsistent with any of the other provisions of this Section.

(m) Soliciting or assisting another to do any act which would subject a student to expulsion, suspension or probation pursuant to this Section.

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

(I) 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, slingshot, billy, sandclub, sandbag, metal knuckles, any dirk, dagger, switchblade knife, pistol, revolver, or any other firearm, any knife having a blade longer than five inches, any razor with an unguarded blade, and any metal pipe or bar used or intended to be used as a club.

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

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

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

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

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

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

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

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

41304. Student Disciplinary Procedures for the California State University. The Chancellor shall prescribe, and may from time to time revise, a code of student disciplinary procedures for the California State University. 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 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 212, 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 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 212, 756-2927:

1. fees and tuition (where applicable);

2. estimated costs of books and supplies;

3. estimates of typical student room and board costs and typical commuting costs; and

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 222, 756-2541.

Information concerning Cal Poly policies regarding any refund due to the federal Title IV student assistance programs as required by the regulations is available from the Director, Financial Aid, Administration 212, 756-2927.

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 has expressed interest; and

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 1993/94 (including capital outlay funding in the amount of $240,459,000) is $1,723,703,000. However, the total cost of education for CSU is $2,081,064,210, which must provide support for a projected 247,494 full-time equivalent students (FTES). The number of full-time equivalent students is determined by dividing the total academic student load by 15 units per term (the figure used here to define a full-time student's academic load).

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 and lottery funds. 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, the average cost of education per FTE student is $8,408. Of this amount, the average student fee support per FTE is $1,978. (The State University Fee, application fee, and nonresident tuition are included in the average costs paid by the students; individual students may pay less or more than $1,978, depending on whether they are part-time, full-time, resident, or nonresident students.)

<table>
<thead>
<tr>
<th>Source</th>
<th>Amount</th>
<th>Cost Per FTE Student</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Cost of Education</td>
<td>$2,081,064,210</td>
<td>$8,408</td>
<td>100.0</td>
</tr>
<tr>
<td>State Appropriation</td>
<td>1,483,244,000</td>
<td>5,993</td>
<td>71.3</td>
</tr>
<tr>
<td>Student Fee Support</td>
<td>489,572,610</td>
<td>1,978</td>
<td>23.5</td>
</tr>
<tr>
<td>Support from Other Sources</td>
<td>108,247,600</td>
<td>437</td>
<td>5.2</td>
</tr>
</tbody>
</table>
Index

Absence, leave of, 81, 94.
Academic calendar, 19.
Academic freedom, statement on, 31.
Academic obligations, 85.
Academic placement, 70.
Academic probation or disqualification, 86.
   graduate students, 92.
Academic program changes, 74.
Academic programs, 22.
Academic renewal, 85.
Academic requirements and policies, 70.
   graduate students, 91.
Academic residence requirements, 73.
Academic Skills Center, 50.
Academic standards, 85.
Academic year, 19.
Accounting, 165.
Accreditation, 28.
Activity classes, 18.
Add/drop, 81.
Administration, university, 488.
   state board of trustees, 32.
Administrative-academic probation, 86.
Administrative services credential, 309.
Admissions, 54.
   graduate, 89.
   undergraduate requirements, 55.
Advanced placement, 71.
Adult students, 57.
Aeronautical engineering, 188.
   M.S. program, 192.
Aeronautics concentration, 188.
Agribusiness, 104.
   minor, 106.
   specialization, 163.
   Agribusiness finance and appraisal concentration, 104.
   Agribusiness marketing concentration, 104.
   Agribusiness policy concentration, 104.
Agricultural business, 104.
Agricultural education, 107.
Agricultural engineering, 110.
Agricultural engineering technology specialization, 102.
Agricultural enterprise projects, 99.
Agricultural mechanics concentration, 107.
Agricultural products and processing concentration, 107.
Agricultural resources management concentration, 107.
Agricultural science, 107.
Agricultural supplies and services concentration, 107.
Agricultural systems management, 110.
Agricultural teaching credentials, 107.
Agriculture, M.S. program, 101.
   college of, 98.
Alumni Association, 36.
Animal production concentration, 107.
Animal science, 115.
Anthropology-physiology concentration, 274.
Anthropology, 264.
Anthropology/geography minor, 264.
Application filing period, 54.
Application for graduation, 74.
   graduate students, 94.
Applied art and design, 231.
Applied developmental psychology concentration, 257.
Applied family psychology concentration, 257.
Applied social psychology concentration, 257.
Architectural engineering, 144.
Architectural management track, 148, 163.
Architecture, 146.
   M.S. program, 149.
   off-campus programs, 42, 146.
Architecture and Environmental Design, College of, 143.
Art, minor, 233.
Art and design, 231.
ASI Children's Center, 45.
Associated Students, Inc., 45.
Astronautics concentration, 188.
Astronomy, 342.
   in physical science major, 294.
Athletics, 52.
   eligibility, 86.
Attendance, 81.
Auditing of courses, 83.
Average annual cost of education, 522.
Bachelor's degree requirements, 73.
   definition, 17.
   second degree, 74.
Bacteriology, 38, 274, 342.
BCLAD, 307.
Bilingual crosscultural language and academic development (BCLAD), 307.
Biochemical engineering specialization, 184.
Biochemistry, 281.
Biological sciences, 274.
   M.S. program, 280.
Biology, concentration, 274.
Biotechnology minor, 273.
Botany, 274, 346.
Business administration, 167.
   master's program, 162.
Business and industrial economics concentration, 169.
Business minor, 161.
Business, College of, 160.
Calendar, academic, 19.
California State University, 32.
Cal Poly, 7.
Campus map, inside back cover.
Campus organizations, 45.
Campus student relations, 31.
CAPTURE, 81.
Career Services, 48.
Catalog, choice of, 73.
   guide to, 17.
Center for Teacher Education, 303.
<table>
<thead>
<tr>
<th>Change of major, 74.</th>
<th>Dean's list, 75.</th>
</tr>
</thead>
<tbody>
<tr>
<td>rules and policies, 2.</td>
<td>Debts owed to the university, 62.</td>
</tr>
<tr>
<td>Cheating and plagiarism, 31.</td>
<td>Definitions, 17.</td>
</tr>
<tr>
<td>Chemistry, 281.</td>
<td>Degree, definitions, 17.</td>
</tr>
<tr>
<td>Children's Center, 45.</td>
<td>programs, 22.</td>
</tr>
<tr>
<td>City and regional planning, 150.</td>
<td>requirements, 73.</td>
</tr>
<tr>
<td>M.C.R.P., 152.</td>
<td>Design reproduction concentration, 240.</td>
</tr>
<tr>
<td>Civil engineering, 193.</td>
<td>Dining halls, 49.</td>
</tr>
<tr>
<td>Civil and environmental engineering, M.S., 198.</td>
<td>Diploma regulations, 74.</td>
</tr>
<tr>
<td>CLAD, 307.</td>
<td>Disabled Student Services, 50.</td>
</tr>
<tr>
<td>Class attendance, 81.</td>
<td>Disciplinary procedures, 87.</td>
</tr>
<tr>
<td>College level examination program (CLEP), 72.</td>
<td>Discrimination, statement on racism and, 31.</td>
</tr>
<tr>
<td>Commencement, 75.</td>
<td>Dismissal, 86.</td>
</tr>
<tr>
<td>Commercial/corporate fitness concentration, 289.</td>
<td>Disqualification, 86.</td>
</tr>
<tr>
<td>Commercial/tourism management concentration, 135.</td>
<td>Distinguished teachers, 493.</td>
</tr>
<tr>
<td>Community service, 47.</td>
<td>Double majors, 74.</td>
</tr>
<tr>
<td>Comprehensive examination, 93.</td>
<td>Dropping a class, 81.</td>
</tr>
<tr>
<td>Computers and printing technology concentration, 240.</td>
<td>Early childhood education concentration, 257.</td>
</tr>
<tr>
<td>M.S. program, 207.</td>
<td>Economics, 169.</td>
</tr>
<tr>
<td>minor, 206.</td>
<td>minor, 171.</td>
</tr>
<tr>
<td>Concentrations, definition, 18.</td>
<td>Education, 303.</td>
</tr>
<tr>
<td>list of, 22.</td>
<td>M.A. program, 304.</td>
</tr>
<tr>
<td>Concurrent enrollment, 37.</td>
<td>Educational administration specialization, 306.</td>
</tr>
<tr>
<td>Conduct and discipline, 87.</td>
<td>Educational leave, 81.</td>
</tr>
<tr>
<td>Conservation, 278, 357.</td>
<td>Electrical engineering, 208.</td>
</tr>
<tr>
<td>Construction management, 154.</td>
<td>M.S. program, 211.</td>
</tr>
<tr>
<td>Continuing education in agriculture, 37.</td>
<td>Electronic and electrical engineering, 208.</td>
</tr>
<tr>
<td>Cooperative education, 48.</td>
<td>Electronics concentration, 294.</td>
</tr>
<tr>
<td>Counseling and guidance specialization, 305.</td>
<td>Electro-optics concentration, 294.</td>
</tr>
<tr>
<td>Course numbering system, 18.</td>
<td>Eligibility, athletic, 86.</td>
</tr>
<tr>
<td>Courses, definition, 17.</td>
<td>student activities, 87.</td>
</tr>
<tr>
<td>Courses of instruction, 311.</td>
<td>ELM (Entry level mathematics), 70.</td>
</tr>
<tr>
<td>Craft Center, 45.</td>
<td>Employment, students, 48.</td>
</tr>
<tr>
<td>Credit by examination, 72.</td>
<td>M.S. program, 183.</td>
</tr>
<tr>
<td>Credit cards, use of, 62.</td>
<td>Engineering management specialization, 164, 186.</td>
</tr>
<tr>
<td>Credit for, community college courses, 71.</td>
<td>Engineering science, 212.</td>
</tr>
<tr>
<td>military service, 71.</td>
<td>English, 234.</td>
</tr>
<tr>
<td>noncollegiate instruction, 71.</td>
<td>M.A. program, 237.</td>
</tr>
<tr>
<td>Credit/no credit grading, 83.</td>
<td>minor, 236.</td>
</tr>
<tr>
<td>graduate students, 93.</td>
<td>English placement test, 70.</td>
</tr>
<tr>
<td>Criminal justice concentration, 263.</td>
<td>Enrollment in programs, 26.</td>
</tr>
<tr>
<td>Crop science, 117.</td>
<td>Enterprise project, 99.</td>
</tr>
<tr>
<td>Cross-cultural language and academic development (CLAD), 307.</td>
<td>Entry level mathematics (ELM) requirement, 70.</td>
</tr>
<tr>
<td>Cross-cultural studies concentration, 263.</td>
<td>Environmental design, 143.</td>
</tr>
<tr>
<td>CSU, 32.</td>
<td>concentration, 156.</td>
</tr>
<tr>
<td>Culminating experience, 93.</td>
<td>specialization, 149.</td>
</tr>
<tr>
<td>Curriculum, change of, 74.</td>
<td>Environmental management concentration, 132, 139.</td>
</tr>
<tr>
<td>substitution, 74.</td>
<td>Environmental science and technology concentration, 139.</td>
</tr>
<tr>
<td>Curriculum and instruction specialization, 305.</td>
<td>Escape Route, 45.</td>
</tr>
<tr>
<td>Dairy products technology specialization, 102.</td>
<td>Ethics and society concentration, 252.</td>
</tr>
<tr>
<td>Dairy science, 123.</td>
<td>Ethnic Studies, 301.</td>
</tr>
<tr>
<td>Dance minor, 269.</td>
<td>minor, 301.</td>
</tr>
</tbody>
</table>
Evaluation for graduation, 74.
Examination, credit by, 72.
Expenses, 61, 63.
Experimental classes, 18.
Expulsion, 86.
Extended Education, 37.
Extension program, 37.
credit for courses, 37.

Facilities, 11.
Faculty, list of, 497.
emeriti, 489.
Fairness Board, 87.
Farm and ranch concentration, 104.
Financial aid, 63.
Financial management concentration, 167.
First class meeting, 81.
Fisheries, marine biology and, concentration, 275.
Food science, 124.
minor, 128.
Food science and nutrition, 124
specialization, 102.
Food service, 49.
Foreign languages, 238.
Foreign students, 57, 91.
Forest resources—management concentration, 132.
Forest resources—urban forestry concentration, 132.
Forest resources—watershed, chaparral, and fire management concentration, 132.
Forestry and natural resources, 131.
Formal study plan, 93.
Foundation, 37.
Fraternities, 45.
French minor, 238.
Freshman requirements, 55.
Fruit science, 117.

Galerie, 46.
Gender harassment, 30.
General agriculture specialization, 103.
General education-breadth requirements, 73, 77.
Geography, 264.
German minor, 238.
Gerontology minor, 258.
Grade point average, 73, 83.
graduate students, 94.
Grade requirements, 73, 83.
Grading, 83.
Graduate academic requirements, 91.
Graduate admission, 89.
Graduate courses taken by undergraduates, 75, 94.
Graduate programs, 89.
Graduate standing, 90.
Graduation, evaluation for, 74.
graduate students, 94.
Graduation requirements, 73.
graduate students, 92.
Graduation with honors, 75.
Graduation writing requirement, 74.
graduate students, 94.

Grants, 68.
Graphic communication, 240.
minor, 242.
Graphic design concentration, 231.
Grievance procedures, 87.
Guide to using Cal Poly catalog, 17.

Harassment, sexual, 29.
gender, 30.
Health education concentration, 289.
Health professions, 38.
services, 49.
screening, 82.
High school students, 57.
Higher education GPA, 83.
History, 243.
minor, 243.
History of Cal Poly, 13.
Holding records, 81.
Holidays, school, 19.
Honors, 75.
Housing services, 49.
Human development, 257.
Human resources management concentration, 176.
Humanities, 228.

Immunizations, 82.
Incomplete, grade of, 84.
Industrial and manufacturing engineering, 215.
Industrial and technical studies, M.A., 175.
Industrial engineering, 215.
specialization, 184.
Industrial technology, 172.
Institutional and financial assistance, 521.
Integrative technology minor, 172.
Intercollegiate athletics, 52.
eligibility, 86.
International agriculture specialization, 103.
International affairs concentration, 254.
International business management concentration, 176.
International (foreign) students, 57, 91.
International programs, 41.
International relations minor, 256.
International trade and development concentration, 169.
Italian, 238.

Japanese, 238.
Journalism, 245.
Judicial affairs, 31.

Laboratory classes, 18.
Land resources concentration, 139.
Landscape architecture, 156.
Late registration, 81.
Leave, of absence, 81, 94.
medical, 81.
planned educational, 81.
Lecture classes, 18.
Liberal Arts, College of, 228.
Liberal studies, 247.
Library, Robert E. Kennedy, 40.
Linguistics minor, 236.
Living expenses, 50, 63.
Loan funds, 67.
London study program, 42.

Majors, definition, 17.
  change of, 74.
courses, 17.
  list, 22.
Management, 176.
  concentration, 176.
Management information systems concentration, 176.
Manufacturing engineering, 215.
MAPE (Mathematics placement exam), 71.
Marine biology and fisheries concentration, 275.
Marketing management concentration, 167.
Marriage, family and child counseling license (MFCC), 262.
Master's degrees, 89.
Master of business administration (MBA), 162.
  MBA/MS Engineering, 164, 186.
Materials engineering, 221.
  specialization, 184.
Mathematics, 285.
  entry-level requirement (ELM), 70.
  minor, 287.
  M.S. program, 288.
  placement examination (MAPE), 71.
Maximum unit load, 81.
MCRP, 152.
MCRP/MS Engineering, 153, 187.
Meal plans, 49, 61.
Measles immunizations, 82.
Mechanical engineering, 224.
  specialization, 184.
Medical leaves of absence, 81.
Medical service, 49.
Microbiology, 274.
Military Science, 129.
Military service, credit for, 71.
Minority engineering program, 51.
Minors, 75.
  definition, 18.
  modes of instruction, 18.
Multicultural Center, 46.
Multiple subject teaching credential, 307.
Music, 250.
  minor, 251.

Natural resources management, 131.
Nondiscrimination policy, 29.
Nutritional science, 124.
  minor, 128.

Organizations concentration, 263.
Ornamental horticulture, 137.
  concentration, 107.
Outstanding staff, 496.
Overseas programs, 41.

Packaging minor, 173.
Paris study program, 42.
Parks and forest recreation concentration, 131.
Philosophy, 252.
  minor, 252.
Photography concentration, 231.
Physical education, 289.
  M.S. program, 292.
Physical science, 294.
Physics, 294.
Placement services, 48.
Placement tests, 70.
Plagiarism and cheating, 31.
Planned educational leave, 81.
Plant production concentration, 107.
Plant protection minor, 121.
Plant protection science, 117.
Policies on the rights of individuals, 29.
Political science, 254.
Polymers and coating concentration, 281.
Postbaccalaureate applicants, 90.
Poultry management minor, 115.
Prefixes, colleges, departments, and courses, 312.
Pre-law concentration, 254.
Pre-physical therapy concentration, 289.
Preprofessional preparation, health services, 38.
Prerequisites, 18, 81.
  graduate students, 95.
Presidents, past Cal Poly, 489.
  Honors list, 75.
Printing management concentration, 240.
Privacy rights, 519.
Probation, 86.
  graduate students, 92.
Production and operations management concentration, 176.
Professional practice specialization, 149.
Program board, 46.
Program changes, 74.
Project report, 95.
Psychological Services, 50.
Psychology, 257.
  minor, 258.
  M.S. program, 261.
Psychology and human development, 257.
Public administration concentration, 254.
  minor, 256.
Pupil personnel services credential, 309.
Quality hours, 83.
  points, 83.
Quantitative economics concentration, 169.
Quarter system, 18.
  units, 18.

Racism, statement on, 31.
Reading/language arts specialist credential, 309.
Reading specialization, 306.
Recreation administration, 135.
Recreational sports, 46.
Recreation and open space concentration, 156.
Recreation Center, 47.
Refund of fees, 62.
Regional landscape assessment concentration, 156.
Registration, 81.
  fees, 61.
Repeating a course, 84.
  graduate students, 95.
Requirements, general education, 77.
Requirements, graduation, 73.
Research and Graduate Programs, 89.
Research and project involvement, 40, 95.
Residence, academic requirements, 73.
  determination, 58.
halls, 49.
Residential Life and Education, 49.
Returning students, 57, 82.
Rights of the individual, 29.
Rose float, 47.
ROTC, 129.
Rules and policies, changes in, 2.
Satisfactory progress, 84.
Scholarships, 63.
Science and Mathematics, College of, 272.
Second, bachelor's degree, 74.
  master's degree, 95.
Senior project, 73.
Sexual harassment policy, 29.
Social sciences, 263.
Social security number use, 519.
Social services concentration, 264.
Sociology, 263.
Soil science, 139.
  specialization, 103.
Sororities, 45.
Spanish minor, 239.
Special education credential, 310.
  specialization, 306.
Specializations, 22.
  definition, 18.
Speech communication, 267.
  minor, 267.
Staff emeriti, 494.
State university fee, 61.
Statement of intent to register (SIR), 54.
Statement on academic freedom, 31.
Statement on racism and discrimination, 31.
Statistics, 298.
  minor, 298.
Student Academic Services, 50.
Student activities, 45.
  eligibility, 87.
Student classification, 72.
Student conduct and discipline, 87, 519.
Student employment, 48.
Student government, 45.
Student organizations, 45.
Student services, 48.
Students serving in the community, 47.
Student support services, 51.
Study abroad, 41.
Summer Institute, 51.
Support courses, 17.
Systematics concentration, 275.
Systemwide tests, 70.
Teaching credentials, 307.
  (Physical Education) concentration, 289.
  (Political Science) concentration, 254.
  (Social Sciences) concentration, 263.
Teaching English as a second language (TESL) certificate program, 236.
Technical communication certificate program, 236.
Testing office, 50.
Tests and examinations, admission, 57.
  English placement (EPT), 70.
  Entry level mathematics (ELM), 70.
  systemwide requirements, 70.
Theatre, and dance, 269.
  minor, 270.
Time limit, graduate students, 96.
TOEFL, graduate students, 91.
  undergraduate students, 57.
Transfer, credit, 71.
  requirements, 56.
Transportation planning specialization, 153, 187.
Travel Center, 47.
Tuition, determination of residence for nonresident tuition, 58.
  fees, 61.
Unit load, 81.
Units, definition, 18.
  number required, 73.
University Center for Teacher Education, 303.
University development, 43.
University union, 47.
University year, 18.
Upward Bound, 51.
Urban studies concentration, 254.
U.S. cultural pluralism requirement, 76.
Values, technology and society minor, 229.
Vegetable science, 117, 483.
Veterinary science, 38, 40, 484.
Vocational agriculture, 41.
Vocational education, 172.
Water engineering specialization, 185.
Water science minor, 100.
Week of welcome (WOW), 47.
Wildlife biology concentration, 275.
Withdrawal from courses, 85.
  for term, 85.
  from previous terms, 85.
Writing, graduation requirement, 74.
Women's programs and services, 48.
Women's Studies, 230.
Workshops, 37.
Zoology, 274, 484.
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