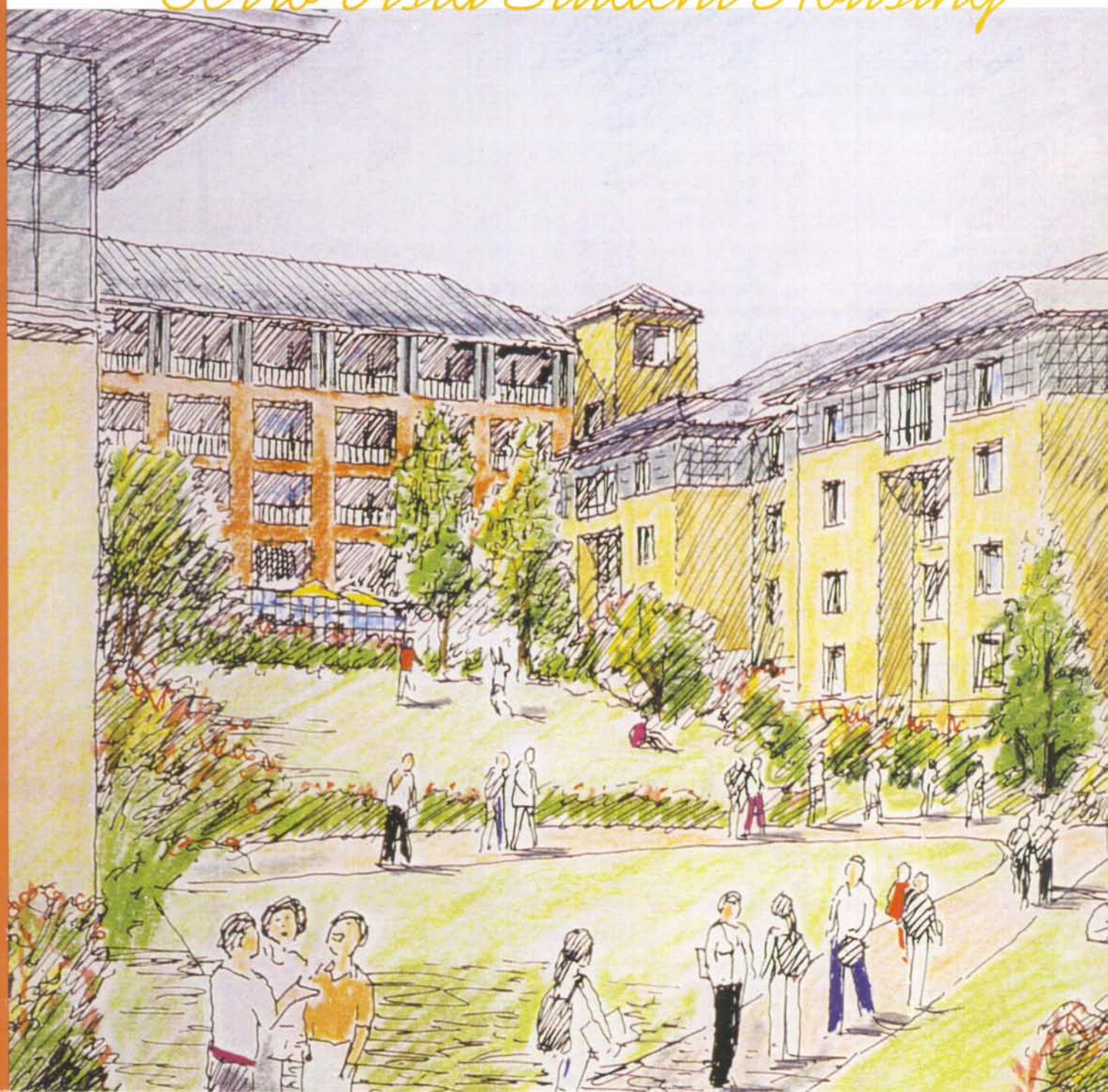


# CAL POLY CATALOG

2003-2005

## *Cerro Vista Student Housing*



**Cover:** See page 39 for more information about the new on-campus student housing, Cerro Vista Apartments. *Artist's renderings courtesy of Fisher-Friedman Associates, project architect; photos courtesy of Kevin Torell and Kay Jensen.*

#### **ACADEMIC RECORDS**

[www.ess.calpoly.edu/\\_records/](http://www.ess.calpoly.edu/_records/)

Administration (01-222)

756-2531

#### **Evaluations**

Admin. (01-218) 756-2396

#### **ADMISSIONS OFFICE**

[admissions@calpoly.edu](mailto:admissions@calpoly.edu)

Administration (01-213)

756-2311

FAX 756-5400

#### **ALUMNI ASSOCIATION**

<http://alumni.calpoly.edu>

Alumni House (28)

756-2586

#### **ATHLETICS**

[www.gopoly.com](http://www.gopoly.com)

Physical Education (42-207)

756-2924

#### **BOOKSTORE**

[www.elcorralbookstore.com](http://www.elcorralbookstore.com)

El Corral Bookstore

756-2838

#### **CAL POLY CONTINUING EDUCATION**

[www.continuing-ed.calpoly.edu](http://www.continuing-ed.calpoly.edu)

Jespersen Hall (116-101)

756-2053

#### **CAMPUS TOURS**

756-5734

#### **CAPTURE REGISTRATION**

756-7777; drop line 756-7888

#### **CAREER SERVICES**

[www.careerservices.calpoly.edu](http://www.careerservices.calpoly.edu)

Student Services (124-114)

756-2501

#### **COMPUTER HELP**

[www.calpoly.edu/](http://www.calpoly.edu/computing/computing.html)

[computing/computing.html](http://www.calpoly.edu/computing/computing.html)

Help Desk: 6-7000

ResNet 756-5600

#### **DISABILITY RESOURCES**

<http://sas.calpoly.edu/drc>

Student Services (124-119)

voice or tty, 756-1395

#### **FINANCIAL AID OFFICE**

[www.ess.calpoly.edu/\\_finaid](http://www.ess.calpoly.edu/_finaid)

Administration (01-212)

756-2927

#### **GENERAL EDUCATION PROGRAM**

[www.calpoly.edu/~acadprog/gened](http://www.calpoly.edu/~acadprog/gened)

756-2228

#### **GRADUATE PROGRAMS**

[www.calpoly.edu/](http://www.calpoly.edu/~rgp/graduate.programs.html)

[~rgp/graduate.programs.html](http://www.calpoly.edu/~rgp/graduate.programs.html)

Mathematics Bldg. (38-154)

756-1508

#### **HEALTH & COUNSELING**

[www.calpoly.edu/~hps](http://www.calpoly.edu/~hps)

Student Health Center (27)

756-1211

#### **HOUSING**

[www.housing.calpoly.edu](http://www.housing.calpoly.edu)

Residence Halls 756-1226

Off-campus information

756-5700

#### **INFORMATION**

University Union (65)

756-1154

Visitors Center, Grand Ave:

756-6699

#### **INTERNATIONAL EDUCATION & PROGRAMS**

[www.calpoly.edu/~iep](http://www.calpoly.edu/~iep)

Math (38-108), 756-1477

#### **LIBRARY**

[www.lib.calpoly.edu](http://www.lib.calpoly.edu)

Robert E. Kennedy Library (35)

756-2029

#### **MULTICULTURAL PROGRAMS**

[www.calpoly.edu/~mcculture](http://www.calpoly.edu/~mcculture)

University Union (65-217B)

756-1405

#### **MustangInfo**

[https://miserve.its.calpoly.edu/](https://miserve.its.calpoly.edu/prod.html)  
[prod.html](https://miserve.its.calpoly.edu/prod.html)

#### **MyCalPoly (Web Portal)**

<http://my.calpoly.edu/>

#### **PARKING**

RideShare, Univ. Police (74)

756-6680

#### **POLICE**

[www.afd.calpoly.edu/Police/index.htm](http://www.afd.calpoly.edu/Police/index.htm)

On-Campus Emergency 9-1-1

Non-Emergency (Voice/TDD)

756-2281

#### **POWER REGISTRATION**

<http://power.calpoly.edu/index.html>

#### **RECREATIONAL SPORTS**

[www.asi.calpoly.edu/recsports](http://www.asi.calpoly.edu/recsports)

Recreation Center (43)

756-1366

#### **STUDENT EMPLOYMENT**

[www.careerservices.calpoly.edu/](http://www.careerservices.calpoly.edu/Students/stuindex.htm)  
[Students/stuindex.htm](http://www.careerservices.calpoly.edu/Students/stuindex.htm)

Student Services (124-113)

756-5976

#### **STUDENT LIFE**

<http://studentlife.calpoly.edu/slal.html>

University Union (65-217)

756-2476

#### **TESTING SERVICES**

[www.testoffice.calpoly.edu/](http://www.testoffice.calpoly.edu/)

Student Services (124-121)

756-1551

#### **TICKETS, CAMPUS EVENTS**

Sports, Concerts 756-5806

Performing Arts Center

756-2787, [www.pacslo.org](http://www.pacslo.org)

#### **WOMEN'S PROGRAMS**

<http://womensprograms.calpoly.edu/>

University Union (65-217)

756-2600

Area Code 805

San Luis Obispo, CA 93407

[www.calpoly.edu](http://www.calpoly.edu)

*Cal Poly*



California Polytechnic State University

# *2003-2005 Catalog*

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## *Cal Poly On-Line*

For the most current information, students are encouraged to consult with campus advising centers, check the quarterly *Class Schedule*, and visit Cal Poly's web pages:

[www.calpoly.edu](http://www.calpoly.edu) (general information)

[www.calpoly.edu/~acadprog](http://www.calpoly.edu/~acadprog) (*Catalog*)

## *The 2003-2005 Cal Poly Catalog*

Copies of the *Catalog* and quarterly *Class Schedule* may be purchased at El Corral Bookstore on the Cal Poly campus, the Cal Poly Downtown store located at 959 Higuera Street in San Luis Obispo, or at Cal Poly Books University Square, 870 Foothill Boulevard. To order by mail, please call 805-756-0144 or 800-367-0771 toll free in California. You may fax your order to 805-756-5320 (after ascertaining shipping/handling) or order on the web at [www.elcorralbookstore.com](http://www.elcorralbookstore.com). The *Catalog* is also available on the web at <http://www.calpoly.edu/~acadprog> in downloadable format.

The *Catalog* is prepared in the office of the Vice Provost for Academic Programs and Undergraduate Education, W. David Conn. The Academic Programs Analyst is Mary Whiteford, and Catalog Editor, Kay Jensen.

*Special thanks to:* Shirley Howell, for cover design; Steven R. Marx, Professor of English, for Cal Poly Land Project; and Colleen Tschannen, Office of State Publishing.

## *Changes in Rules and Policies*

Although every effort has been made to assure the accuracy of the information in this catalog, students and others who use this catalog should note that laws, rules, and policies change from time to time and that these changes may alter the information contained in this publication. Changes may come in the form of statutes enacted by the Legislature, rules and policies adopted by the Board of Trustees of the California State University, by the Chancellor or designee of the California State University, or by the President or designee of the campus. It is not possible in a publication of this size to include all of the rules, policies and other information that pertain to students, the institution, and the California State University. More current or complete information may be obtained from the appropriate department, school, or administrative office.

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# Welcome to Cal Poly

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## *A Message from President Baker*

As Cal Poly embarks upon its second century, we are firmly committed to the values and traditions that distinguished our first century, while continually improving our programs to be sure our students are educated to respond thoughtfully to the complex and challenging needs of society.

**Undergraduate Emphasis:** As a predominantly undergraduate university, Cal Poly is known nationally for the quality of its baccalaureate degree programs in a variety of disciplines. We also offer outstanding masters degree programs.

**Residential Campus:** Cal Poly is a residential campus. Our students find that the campus environment affords them time, resources and settings in which to discover values and interests – whether in the classroom, clubs, residence halls, or other extracurricular activities.

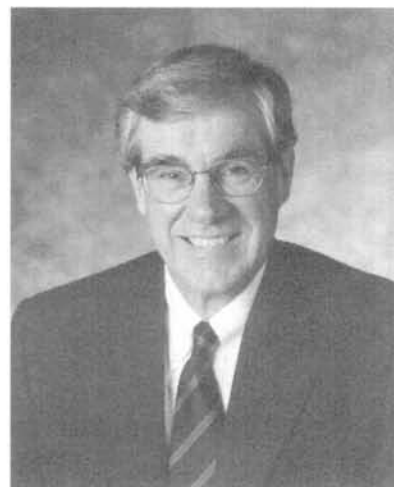
**Polytechnic Mission:** At Cal Poly, we recognize that the liberal arts and sciences provide a critical and indispensable foundation for education in all academic disciplines and for the broader life of the University, as a living and learning community. At the same time, from its inception, Cal Poly has given particular emphasis to instruction in polytechnic disciplines. We provide opportunities for students in all programs to become familiar with the worlds of science and technology. We also prepare many of our graduates for careers in applied, scientific and technological fields.

**Information Technology to Support Teaching and Learning:** Cal Poly is a leader in the use of information technology to enhance teaching and learning. Students and faculty have access to Internet resources, to course information, to library resources and to advanced software tools 24 hours a day. The Internet also permits us to offer courses to students temporarily off campus for various reasons and to provide continuing education for practicing professionals.

**Educational Philosophy:** Cal Poly is committed to excellence in teaching and learning. In all disciplines we seek to provide a student-centered, learner-focused education, facilitated by a low student-teacher ratio in classes conducted primarily by full-time, regular faculty. The phrase, "Learn by Doing," also captures an essential quality of a Cal Poly education. At Cal Poly, classroom instruction is complemented by practical, "hands-on" learning in the laboratory, the studio and out in the field.

**Diversity:** As a campus we welcome a diversity of ideas and cultures and we encourage international and multi-cultural education in order to prepare students for successful participation and competition in a diverse world and a global workforce. We believe that diversity of our students, faculty, and staff enlivens and enriches the University educational environment.

Cal Poly has at its core an educational philosophy that will sustain us far into the future. Of course, these values alone do not constitute our greatest strength. That strength rests in the quality of the students, faculty, staff, alumni, and friends—who make up, and who, indeed, are the University.



Warren J. Baker  
President

## *Quick Facts*

<http://calpolynews.calpoly.edu/quickfacts.html>

### **BASICS**

**Location:** San Luis Obispo - about 230 miles south of San Francisco, 200 miles north of Los Angeles, 10 miles from the Pacific Ocean

**Main Campus size:** 6,051 acres

**Affiliation:** Part of the 23-campus California State University System

**Emphasis:** Comprehensive undergraduate education – combining technical and professional curricula with the arts and humanities

**Guiding philosophy:** "Learn by Doing"

### **FACULTY**

**Faculty (including part-time):** About 1,115

**Student-faculty ratio:** 20 to 1

### **ACADEMIC UNITS**

College of Agriculture

College of Architecture and Environmental Design

Orfalea College of Business

College of Engineering

College of Liberal Arts

College of Science and Mathematics

University Center for Teacher Education

### **ACADEMICS**

**Terms:** Four 11-week quarters per year

**Accreditation:** Cal Poly is fully accredited by the Western Association of Schools and Colleges (WASC). 24 academic programs are accredited by discipline-related accrediting agencies.

**Programs offered:** 63 bachelor's, 23 master's, 63 minors, 8 credentials

**U.S. News & World Report:** Rated the No. 1 public, comprehensive undergraduate university in the West for the tenth consecutive year (2002)

**Competitive admissions:** More than 23,000 undergraduate applicants compete each year for approximately 3,500 spaces – a ratio that places Cal Poly among the most selective institutions in the United States (2002)

### **FEES (Fall 2003)**

**Fee range depending upon college:** Undergraduates with more than 6 units - \$795-\$995 per quarter

**Out-of-state tuition:** \$188 per unit

**Room & Board:** \$7,403 per academic year (fall, winter, spring quarters)

**Financial aid awarded 2000-2001:** \$60,034,145 to 9,712 students

### **HISTORY**

**Founded as:** Vocational high school

**Founding legislation signed:** March 8, 1901

**First day of class:** October 1, 1903

**First bachelor's degree awarded:** May 28, 1942

<http://calpolynews.calpoly.edu/quickfacts.html>

## Quick Facts

### STUDENT BODY, Fall 2002

**Student body:** Approximately 18,453

**Men:** 55%

**Women:** 45%

**Ethnic minorities:** 25.4%

**Average age:** 21.6 years

#### Geographic origin of students:

California resident status: 95%

Central Coast (San Luis Obispo, Santa Barbara, Monterey Counties): 19%

San Francisco Bay area: 24%

Los Angeles area: 16%

Central Valley: 14%

Outside California (USA): 5%

International students: 1.1%

### ANNUAL EVENTS

**Week of Welcome and Fall Conference:** September

**Homecoming:** October or November

**Commencement:** December and June

**Poly Royal Open House:** April

### FACILITIES

**Space:** 3.5 million sq. ft. in more than 100 major buildings with a replacement value of \$500 million

**Library holdings:** 650,000 books and other printed works, 99,700 bound periodicals, 417,700 government documents, 31,500 maps, 48,300 audiovisual items, 1,339,400 microforms, 5,400 online databases and other resources

**Instructional computers:** 1,800 student workstations in labs/classrooms. IBM 9672-R24 CMOS mainframe, various UNIX servers, 2,800 residence hall network connections, e-mail accounts, internet access

**Julian A. McPhee University Union:** 106,000 sq. ft., including Chumash Auditorium (seats 940)

**Food service outlets:** 14

**Cal Poly Theatre:** 497 seats

**Performing Arts Center's Christopher Cohan Center – Harmon Hall:** seats 1,298

**Mustang Stadium:** 8,500 seats

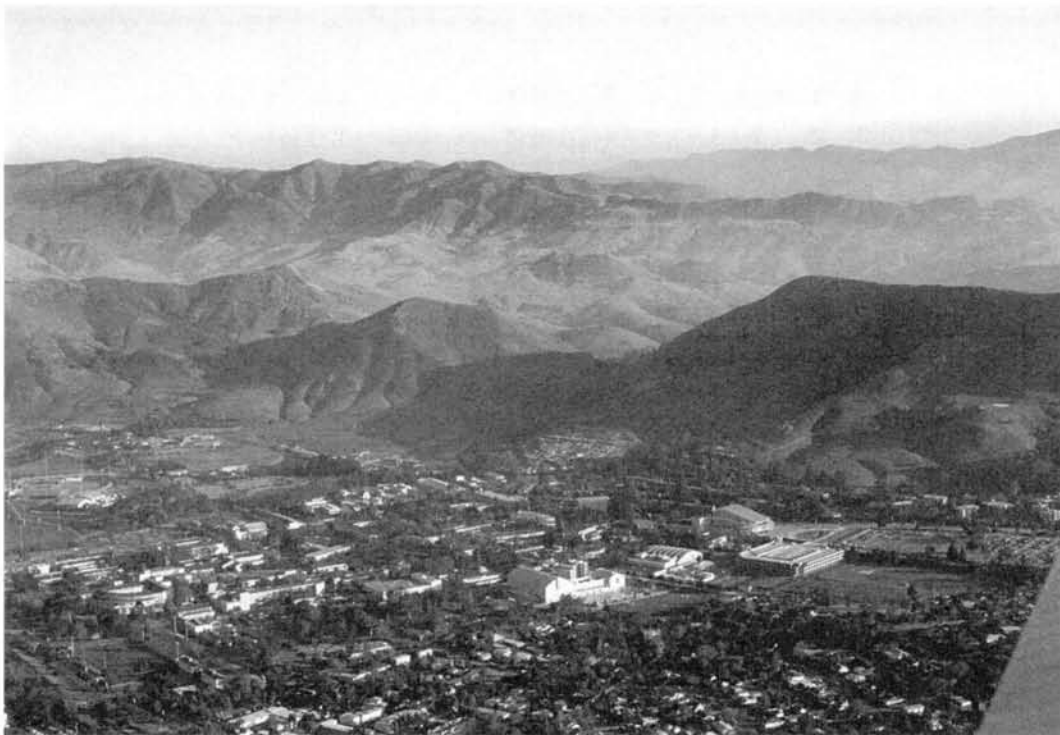
**Recreation Center:** 91,559 sq. ft. (main hall seats 4,000)

**Other points of interest:** Poly Canyon, agriculture units, Swanton Pacific Ranch



CAL POLY  
LAND

One of Cal Poly's most valuable assets is the ten thousand acres of University land acquired over its hundred-year history and central to its unique identity. A large parcel surrounds the central campus; another is located a few miles to the west, and the remainder, encompassing redwood forest and ocean beach, is situated in Santa Cruz County. A resource for education, applied research and conservation, Cal Poly Land provides laboratories, supports ecosystems and life forms, grows food and fiber, and serves for recreation and renewal.

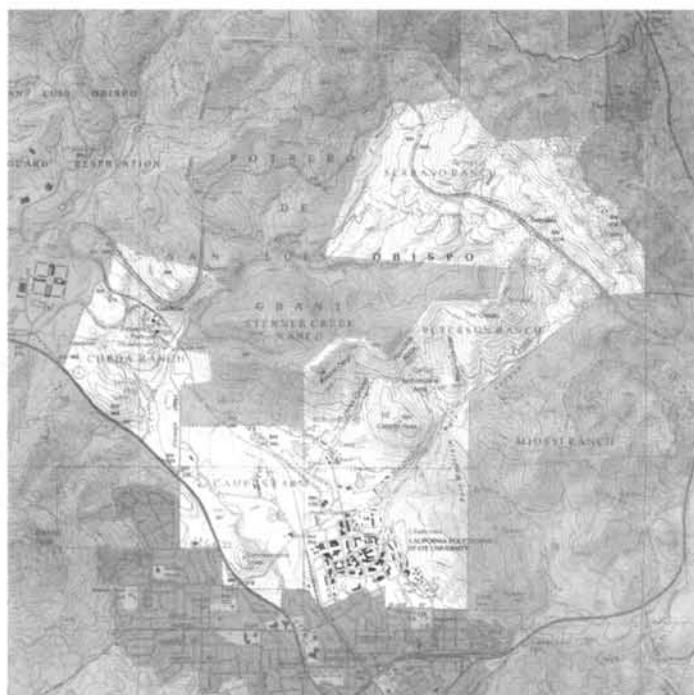


Aerial view of Main Campus and San Luis Creek Watershed Ranches  
*Photo by Sky Bergman*

The University's Centennial Celebration in 2000-2002 renewed attention to this land. An innovative Master Planning process for long-term development inventoried and classified its varied regions as "outdoor teaching and learning facilities." And the University Provost sponsored the creation of the Cal Poly Land Project, an ongoing endeavor to understand, conserve, and celebrate the place where we reside.



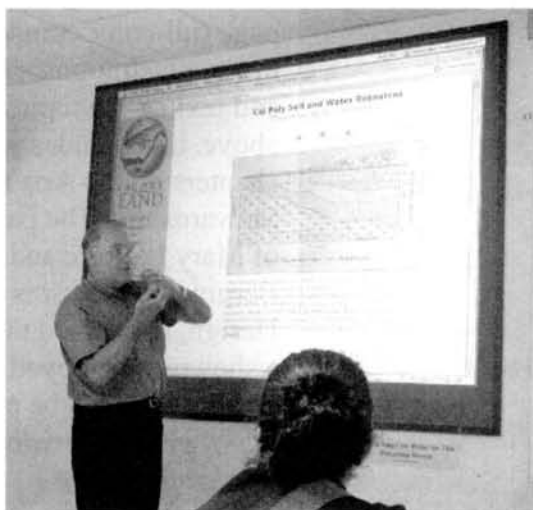
Student Enterprise Project at Experimental Farm  
*Photo by Steven Marx*



Map of Main Campus and San Luis Obispo Creek Watershed Ranches. *Map courtesy of Cal Poly Land Project.*

The Project began as a Seminar, which enlisted the University Architect and nineteen faculty members from fifteen departments to meet monthly and teach one another about aspects of the land in which they specialize. These included Geology, Climate, Vegetation, Wildlife, Hydrology and Soils, Archaeology and History, Agriculture, Natural Resource Management, Recreation Administration, and Land Use Planning.

With the help of the Kennedy Library's Multimedia Center, the Seminar participants created an extensive website –  
<http://polyland.lib.calpoly.edu>  
--to archive and display their research.



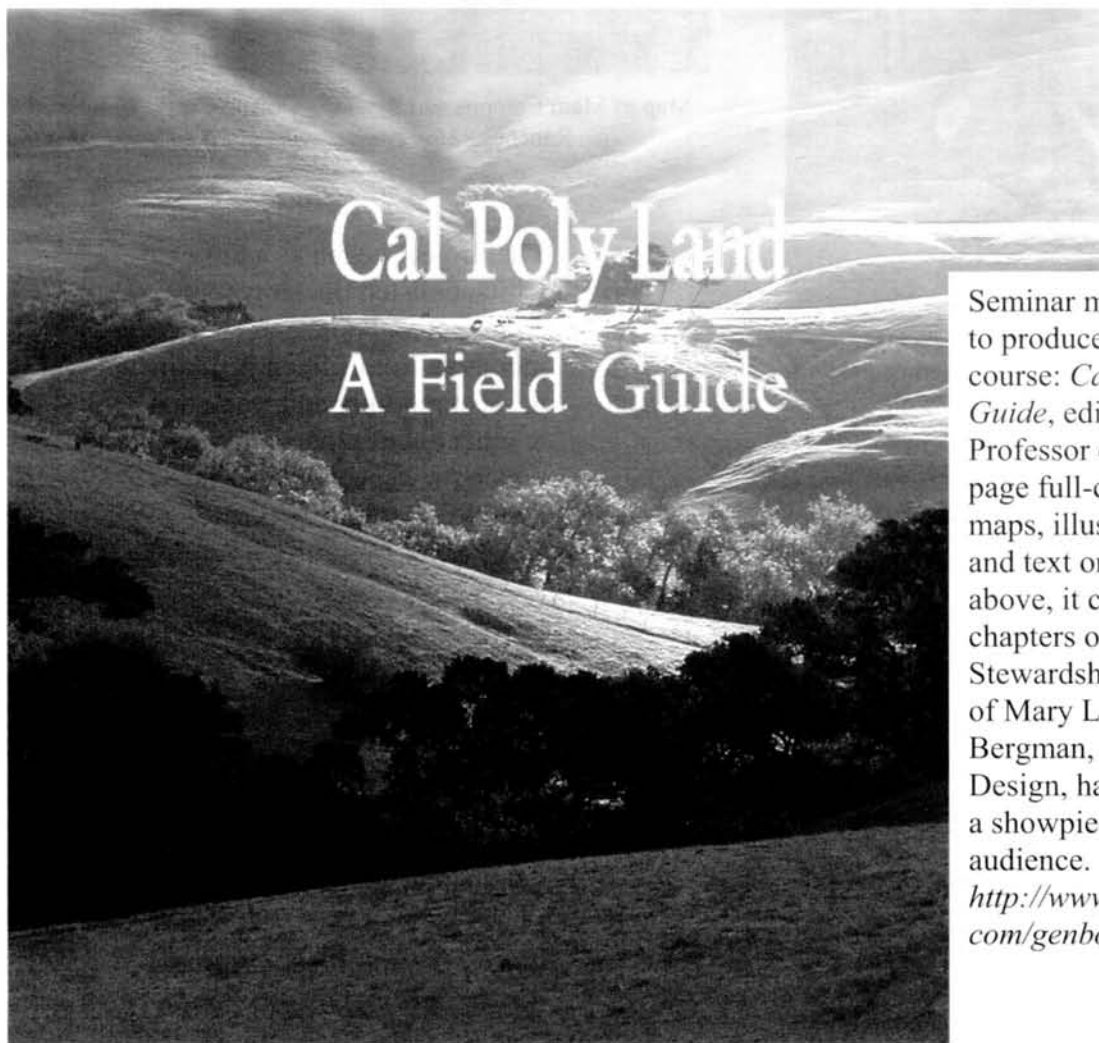
Professor Del Dingus with web page on Soil and Water Resources. *Photo by Steven Marx*

The seminar also developed a General Education course, Humanities 330, titled "Cal Poly Land: Nature, Technology and Society." Interdisciplinary and team taught, the course includes weekly lectures, discussions and hikes that result in student group contributions to the evolving Cal Poly Land website.



Professor V.L. Holland leading class on campus vegetation communities.

*Photo by Steven Marx*



Seminar members collaborated to produce a textbook for this course: *Cal Poly Land: A Field Guide*, edited by Steven Marx, Professor of English. A 270 page full-color compendium of maps, illustrations, photographs and text on the topics mentioned above, it concludes with chapters on the Arts and on Stewardship. The participation of Mary LaPorte and Sky Bergman, Professors of Art and Design, has turned the book into a showpiece enjoyed by a wide audience. It can be purchased at <http://www.elcorralbookstore.com/genbook.asp>

*Photo by Steven Marx*



Interior of antique barn at Cheda Ranch. *Illustration by Patrick Conception.*

The mission of the Cal Poly Land Project is summarized in this excerpt from the book's Preface, written by Paul J. Zingg, Provost and Vice President for Academic Affairs:

"What we are about through the agency of our lands is 'leaping a fence' of our own – that is connecting the formal curriculum of our lectures and laboratories, studios and seminars, to the informal curriculum of the land itself, a land that awaits exploration and study, discovery and consideration from the perspective of a myriad of academic disciplines that can be brought together for the task. ...The land, in other words, is both teacher and subject. It affords reason for our work, inspiration for its undertaking, and an opportunity to examine and shape personal, institutional and societal values in the verdant, sometimes rough or muddy, process."

Bull test arena and Caballo Peak. *Photo by Sky Bergman*



*Welcome to Cal Poly . . .*

# Academic Calendar

# 2003–2005

*Please note: This is not intended to be construed as an employee work calendar.*

## SUMMER TERM 2003

June 17, Tuesday	Beginning of university year Beginning of summer term – classes begin
June 30	End of second week of instruction Last day to drop a class
July 1	Last day to add a class Last day to register late and pay late registration fee
July 4	Academic holiday – Independence Day
July 8	End of third week of instruction – Census date
August 5	End of seventh week of instruction
August 22	Last day of classes
August 25–29	Final examination period
August 29	End of summer term
August 30 – September 14	Academic holiday

## FALL TERM 2003

September 15	Beginning of fall term (faculty only)
September 22	Fall term classes begin
October 3	End of second week of instruction Last day to drop a class
October 6	Last day to add a class Last day to register late and pay late registration fee
October 10	End of third week of instruction – Census date
November 7	End of seventh week of instruction
November 11	Academic holiday – Veterans' Day
November 26–30	Academic holiday – Thanksgiving
December 5	Last day of classes
December 8–12	Final examination period
December 13	Mid-Year Commencement End of fall term
December 14– January 4	Academic holiday

## WINTER TERM 2004

January 5	Beginning of winter term Winter term classes begin
January 16	End of second week of instruction Last day to drop a class
January 19	Academic holiday – Martin Luther King, Jr.'s Birthday observed
January 20	Last day to add a class Last day to register late and pay late registration fee
January 26	End of third week of instruction – Census date
February 16	Academic holiday – George Washington's Birthday observed
February 24	End of seventh week of instruction
March 12	Last day of classes
March 15–19	Final examination period
March 22	*Evaluation Day, End of winter term
March 23–28	Academic holiday

## SPRING TERM 2004

March 29	Beginning of spring term Spring term classes begin
March 31	Academic holiday – Cesar Chavez's Birthday observed
April 12	End of second week of instruction Last day to drop a class
April 13	Last day to add a class Last day to register late and pay late registration fee
April 19	End of third week of instruction – Census date
May 17	End of seventh week of instruction
May 31	Academic holiday – Memorial Day observed
June 4	Last day of classes
June 7–11	Final examination period
June 12	Commencement End of spring term End of university year (faculty only)
June 13–20	Academic holiday

\* Faculty work day; not a class day.

**SUMMER TERM 2004**

June 21	Beginning of university year Beginning of summer term – classes begin
July 2	End of second week of instruction Last day to drop a class
July 5	Academic holiday – Independence Day observed
July 6	Last day to add a class Last day to register late and pay late registration fee
July 12	End of third week of instruction – Census date
August 9	End of seventh week of instruction
August 27	Last day of classes
August 30– September 3	Final examination period
September 3	End of summer term
September 4–12	Academic holiday

**FALL TERM 2004**

September 13	Beginning of fall term (faculty only)
September 20	Fall term classes begin
October 1	End of second week of instruction Last day to drop a class
October 4	Last day to add a class Last day to register late and pay late registration fee
October 8	End of third week of instruction – Census date
November 5	End of seventh week of instruction
November 11	Academic holiday – Veterans' Day
November 24– 28	Academic holiday – Thanksgiving
December 3	Last day of classes
December 6–10	Final examination period
December 11	Mid-Year Commencement End of fall term
December 12– January 2	Academic holiday

**WINTER TERM 2005**

January 3	Beginning of winter term Winter term classes begin
January 14	End of second week of instruction Last day to drop a class
January 17	Academic holiday – Martin Luther King, Jr.'s Birthday observed
January 18	Last day to add a class Last day to register late and pay late registration fee
January 24	End of third week of instruction – Census date
February 21	Academic holiday – George Washington's Birthday observed
February 22	End of seventh week of instruction
March 11	Last day of classes
March 14–18	Final examination period
March 21	*Evaluation Day, End of winter term
March 22–27	Academic holiday

**SPRING TERM 2005**

March 28	Beginning of spring term Spring term classes begin
March 31	Academic holiday – Cesar Chavez's Birthday observed
April 11	End of second week of instruction Last day to drop a class
April 12	Last day to add a class Last day to register late and pay late registration fee
April 18	End of third week of instruction – Census date
May 16	End of seventh week of instruction
May 30	Academic holiday – Memorial Day observed
June 3	Last day of classes
June 6–10	Final examination period
June 11	Commencement End of spring term End of university year (faculty only)

\* Faculty work day; not a class day.

# A Guide to Using the Catalog

General Information: [www.calpoly.edu](http://www.calpoly.edu)

Catalog: [www.calpoly.edu/~acadprog](http://www.calpoly.edu/~acadprog)

General Education Requirements: [www.calpoly.edu/~acadprog/gened](http://www.calpoly.edu/~acadprog/gened)

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.

For the most current information, students are encouraged to visit the Cal Poly web pages shown above, to check the quarterly *Class Schedule*, and to consult with campus advising centers.

## College 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.

**Academic Programs.** Please refer to the following pages for a listing of academic programs.

## 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 (BA),
- \* Bachelor of Science (BS),
- \* Bachelor of Architecture (BArch), and
- \* Bachelor of Landscape Architecture (BLA).

**At the graduate level, Cal Poly grants the**

- \* Master of Arts (MA),
- \* Master of Science (MS),
- \* Master of Business Administration (MBA), and
- \* Master of City and Regional Planning (MCRP).

## 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 16.

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 *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 BArch and BLA).

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 and/or colleges, as well as on the information in this catalog.

**Academic Advising.** Information regarding academic advising is available on page 29.

## 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 *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 (GE)** courses provide a common foundation of knowledge for all undergraduate programs. GE requirements are described in detail on page 76.

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

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

**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 advisors and the appropriate instructor. The instructor may drop a student from the class if the prerequisites have not been met.

## 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 97.
- 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.

## 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.

Mode	Class meets weekly for:
<i>Activity</i>	2 hours per unit of credit.
<i>Laboratory</i>	3 hours per unit of credit.
<i>Lecture</i>	1 hour per unit of credit.
<i>Seminar</i>	1 hour per unit of credit.
<i>Supervision</i>	3 hours per week per unit of credit. Courses involve independent work done by students under the guidance of the faculty and do not meet regularly in a classroom.

## Concentrations

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.

## Specializations

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 and be shown on the diploma.

## Minors

A **minor** is an integrated, coherent group of courses designed to give a student knowledge in an academic area outside of the major field of study. The minor will be completed along with the requirements for the bachelor's degree. For more information and a list of available minors at Cal Poly, see pages 19 and 75.

## Quarters and Quarter Units

Cal Poly's academic calendar consists of four quarters – Fall, Winter, Spring and Summer (see page 12 for Academic Calendar).

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,

$$6 \text{ semester units} \times 1.5 = 9 \text{ quarter units.}$$

# Academic Programs

## DEGREE PROGRAMS, CONCENTRATIONS, SPECIALIZATIONS

**BA** Bachelor of Arts  
**BS** Bachelor of Science  
**BArch** Bachelor of Architecture  
**BLA** Bachelor of Landscape Architecture  
**b** Concentration within bachelor's program  
**MA** Master of Arts  
**MS** Master of Science  
**MBA** Master of Business Admin  
**MCRP** Master of City & Regional Planning  
**m** Specialization within master's program

**AGR** College of Agriculture  
**AED** College of Architecture & Environmental Design  
**BUS** Orfalea College of Business  
**ENG** College of Engineering  
**LA** College of Liberal Arts  
**SM** College of Science & Mathematics  
**CTE** University Center for Teacher Education

Program Title		Department or Program	College
Accounting Information Systems	<i>b</i>	BS Business Admin	BUS
Aerospace Engineering	<i>BS, MS</i>	Aerospace Engineering	ENG
Agribusiness	<i>MS, m</i>	MS Agriculture MBA	AGR BUS
Agricultural Business Ag Finance & Appr Ag Marketing Ag Policy	<i>BS b b b</i>	Agribusiness	AGR
Agricultural Education	<i>m</i>	MS Agriculture	AGR
Agricultural Engineering Technology	<i>m</i>	MS Agriculture	AGR
Agricultural Science Ag Mechanics Ag Products & Proc	<i>BS b b</i>	Agricultural Education & Communication	AGR
Agricultural Systems Management	<i>BS</i>	BioResource & Agric Engineering	AGR
Agriculture	<i>MS</i>	College of Agriculture	
American Politics	<i>b</i>	BA Political Science	LA
Anatomy-Physiology	<i>b</i>	BS Biological Sciences	SM
Animal Science	<i>BS</i>	Animal Sciences	AGR
Animal Science	<i>m</i>	MS Agriculture	AGR
Animal Science	<i>b</i>	BS Agricultural Science	AGR
Applied Microbiology and Biotechnology	<i>b</i>	BS Microbiology	SM
Applied Nutrition	<i>b</i>	BS Nutrition Science	AGR
Applied Social Psych	<i>b</i>	BS Psychology	LA
Architectural Engineering	<i>BS</i>	Architectural Engr	AED
Architecture	<i>BArch MS</i>	Architecture	AED
Art & Design	<i>BS</i>	Art & Design	LA
Astronautics	<i>b</i>	BS Aeronautical Engr	ENG
Biochemical Engr	<i>m</i>	MS Engineering	ENG
Biochemistry	<i>BS</i>	Chemistry & Biochem	SM

Program Title		Department or Program	College
Bioengineering	<i>b m</i>	BS General Engr MS Engineering	ENG
Biological Sciences	<i>BS, MS</i>	Biological Sciences	SM
Biomedical Engineering	<i>b m</i>	BS General Engr MS Engineering	ENG
BioResource & Agricultural Engineering	<i>BS</i>	BioResource & Agric Engineering	AGR
Business Administration	<i>BS MBA</i>	Business Admin Graduate Programs	BUS
Business & Industrial Economics	<i>b</i>	BS Economics	BUS
Chemistry	<i>BS</i>	Chemistry & Biochem	SM
Child Development	<i>BS</i>	Psychology & Child Development	LA
City & Regional Planning	<i>BS, MCRP</i>	City & Regional Planning	AED
Civil Engineering	<i>BS</i>	Civil & Environmental Engineering	ENG
Civil & Environmental Engineering	<i>MS</i>	Civil & Environmental Engineering	ENG
Clinical & Worksite Health Promotion	<i>b</i>	BS Kinesiology	SM
Commercial Recreation/Tourism Management	<i>b</i>	BS Recreation, Parks, and Tourism Administration	AGR
Computer Engineering	<i>BS</i>	Computer Engr	ENG
Computer Science	<i>BS, MS</i>	Computer Science	ENG
Construction Management	<i>BS</i>	Construction Mgt	AED
Counseling & Family Psychology	<i>b</i>	BS Psychology	LA
Counseling & Guidance	<i>m</i>	MA Education	CTE
Criminal Justice	<i>b</i>	BS Social Science	LA
Crop & Soil Science	<i>b</i>	BS Agric Science	AGR

**BA** Bachelor of Arts  
**BS** Bachelor of Science  
**BArch** Bachelor of Architecture  
**BLA** Bachelor of Landscape Architecture  
**b** Concentration within bachelor's program  
**MA** Master of Arts  
**MS** Master of Science  
**MBA** Master of Business Admin  
**MCRP** Master of City & Regional Planning  
**m** Specialization within master's program

**AGR** College of Agriculture  
**AED** College of Architecture & Environmental Design  
**BUS** Orfalea College of Business  
**ENG** College of Engineering  
**LA** College of Liberal Arts  
**SM** College of Science & Mathematics  
**CTE** University Center for Teacher Education

Program Title		Department or Program	College
Crop Science	<i>BS</i> <i>m</i>	Hortic & Crop Science MS Agriculture	AGR
Cross-Cultural Studies	<i>b</i>	BS Social Sciences	LS
Culinary Science and Mgmt in Nutrition	<i>b</i>	BS Nutrition	AGR
Curriculum & Instruction	<i>m</i>	MA Education	CTE
Dairy Products Tech	<i>m</i>	MA Agriculture	AGR
Dairy Science	<i>BS</i>	Dairy Science	AGR
Design Reproduction Technology	<i>b</i>	BS Graphic Communication	LA
Developmental Psych	<i>b</i>	BS Psychology	LA
Earth Sciences	<i>BS</i>	Earth & Soil Sciences	AGR
Ecology & Systematic Biology	<i>b</i> <i>BS</i>	BS Ecology & Systematic Biology Biological Sciences	SM
Economics	<i>BS</i>		BUS
Education	<i>MA</i>	University Center for Teacher Education	
Educational Admin	<i>m</i>	MA Education	CTE
Electrical Engineering	<i>BS</i> , <i>MS</i>	Electrical Engr	ENG
Electronic Publishing & Imaging	<i>b</i>	BS Graphic Communication	LA
Electronics	<i>b</i>	BS Physics	SM
Electro-Optics	<i>b</i>	BS Physics	SM
Elementary Education	<i>b</i>	BA Liberal Studies	LA
Engineering	<i>MS</i>	College of Engineering	
Engineering Management	<i>MBA</i> / <i>MS</i>	Graduate Programs Engineering	BUS ENG
English	<i>BA</i> , <i>MA</i>	English	LA
Enterprise Accounting	<i>b</i>	BS Business Admin	BUS
Environmental Design	<i>b</i> <i>m</i>	B Landscape Arch MS Architecture	AED
Environmental Engr	<i>BS</i>	Civil & Environ Engr	ENG
Environmental Horticultural Science	<i>BS</i> <i>m</i>	Horticulture & Crop Science MS Agriculture	AGR
Environmental Mgt and Protection	<i>BS</i> <i>b</i> <i>b</i>	Natural Resources Mgt BS Forestry & Nat Res BS Soil Science	AGR

Program Title		Department or Program	College
Environmental Science & Technology	<i>b</i>	BS Soil Science	AGR
Farm & Ranch Mgt	<i>b</i>	BS Agricultural Bus	AGR
Financial Mgt	<i>b</i>	BS Business Admin	BUS
Food Science	<i>BS</i>	Food Science & Nutrition	AGR
Forest Resources Mgt	<i>b</i>	BS Forestry & Nat Res	AGR
Forestry & Natural Resources	<i>BS</i>	Natural Resources Management	AGR
Forestry Sciences	<i>MS</i>	College of Agriculture	
Fruit Science	<i>BS</i>	Horticulture & Crop Science	AGR
General Agriculture	<i>m</i>	MS Agriculture	AGR
General Engineering	<i>BS</i>	General Engineering	ENG
General Microbiology	<i>b</i>	BS Microbiology	SM
Graphic Communication	<i>BS</i>	Graphic Communication	LA
Graphic Design	<i>b</i>	BS Art & Design	LA
Health Education	<i>b</i>	BS Kinesiology	SM
History	<i>BA</i>	History	LA
Human Resources Mgt	<i>b</i>	BS Business Admin	
Industrial & Technical Studies	<i>MS</i>		BUS
Industrial Engineering	<i>BS</i> , <i>MS</i>	Industrial & Manufacturing Engr	ENG
Industrial Engineering	<i>m</i>	MS Engineering	
Industrial Technology	<i>BS</i>		BUS
Integrated Technology Management	<i>m</i>	MS Engineering	ENG
International Affairs	<i>b</i>	BA Political Science	LA
International Agribusiness Management	<i>b</i>	BS Agricultural Business	AGR
International Business Mgt Trade & Develop	<i>b</i> <i>b</i>	BS Business Admin BS Economics	BUS
Irrigation	<i>m</i>	MS Agriculture	AGR
Journalism	<i>BS</i>	Journalism	LA
Kinesiology	<i>BS</i> , <i>MS</i>	Kinesiology	SM
Land Resources	<i>b</i>	BS Soil Science	AGR

<b>BA</b>	Bachelor of Arts
<b>BS</b>	Bachelor of Science
<b>BArch</b>	Bachelor of Architecture
<b>BLA</b>	Bachelor of Landscape Architecture
<b>b</b>	Concentration within bachelor's program
<b>MA</b>	Master of Arts
<b>MS</b>	Master of Science
<b>MBA</b>	Master of Business Admin
<b>MCRP</b>	Master of City & Regional Planning
<b>m</b>	Specialization within master's program

<b>AGR</b>	College of Agriculture
<b>AED</b>	College of Architecture & Environmental Design
<b>BUS</b>	Orfalea College of Business
<b>ENG</b>	College of Engineering
<b>LA</b>	College of Liberal Arts
<b>SM</b>	College of Science & Mathematics
<b>CTE</b>	University Center for Teacher Education

Program Title		Department or Program	College
Landscape Architecture	<i>BLA</i>	Landscape Arch	AED
Liberal Studies	<i>BA, BS</i>	Liberal Studies	LA
Literacy & Reading	<i>m</i>	MA Education	CTE
Management	<i>b</i>	BS Business Admin	BUS
Management Information Systems	<i>b</i>	BS Business Admin	BUS
Manufacturing Engineering	<i>BS</i>	Industrial & Manufacturing Eng	ENG
Marine Biology & Fisheries	<i>b</i>	BS Ecology & Systematic Biology	SM
Marketing Management	<i>b</i>	BS Business Admin	BUS
Materials Engineering	<i>BS, m</i>	Materials Engineering MS Engineering	ENG
Mathematics	<i>BS, MS</i>	Mathematics	SM
Mechanical Engineering	<i>BS, MS</i>	Mechanical Engineering	ENG
Mechatronics	<i>b</i>	BS Mechanical Engr	ENG
Medical and Public Health Microbiology	<i>b</i>	BS Microbiology	SM
Microbiology	<i>BS</i>	Biological Sciences	SM
Modern Languages & Literatures	<i>BA</i>	Modern Languages & Literatures	LA
Molecular and Cellular Biology	<i>b</i>	BS Biological Sciences	SM
Molecular Biology	<i>b</i>	BS Biochemistry	SM
Music	<i>BA</i>	Music	LA
Natural Resources Recreation	<i>b, b</i>	BS Forestry & Nat Res BS Rec, Parks, & Tourism Admin	AGR
Nutrition & Food Industries Science	<i>BS, b, b</i>	Nutrition & Food Science	AGR
Organizations	<i>b</i>	BS Social Sciences	LA
Ornamental Horticulture	<i>b</i>	BS Agricult Science	AGR
Philosophy	<i>BA</i>	Philosophy	LA
Photography & Digital Imagery	<i>b</i>	BS Graphic Communication	LA
Physical Educ-Teaching	<i>b</i>	BS Kinesiology	SM
Physical Science	<i>BS</i>	Physics	SM
Physics	<i>BA, BS</i>	Physics	SM

Program Title		Department or Program	College
Plant Protection Science	<i>BS</i>	Horticulture & Crop Science	AGR
Political Science	<i>BA</i>	Political Science	LA
Polymers & Coatings Science	<i>b, MS</i>	BS Chemistry	SM
Pre-Law	<i>b</i>	BA Political Science	LA
Pre-Physical Therapy/Health Care Professions	<i>b</i>	BS Kinesiology	SM
Printing & Imaging Management	<i>b</i>	BS Graphic Commun	LA
Professional Practice	<i>m</i>	MS Architecture	AED
Psychology	<i>BS, MS</i>	Psychology & Child Development	LA
Public Accounting	<i>b</i>	BS Business Admin	BUS
Recreation, Parks, & Tourism Administration Management	<i>BS, m</i>	Natural Resources Mgt MS Agriculture	AGR
Recreation & Open Space	<i>b</i>	B Landscape Arch	AED
Regional Landscape Assessment	<i>b</i>	B Landscape Architecture	AED
Social Sciences Social Services Teaching	<i>BS, b, b</i>	Social Sciences	LA
Software Engineering	<i>BS</i>	Computer Science	ENG
Soil Science	<i>BS, m</i>	Earth & Soil Sciences MS Agriculture	AGR
Special Education	<i>m</i>	MA Education	CTE
Speech Communication	<i>BA</i>	Speech Communication	LA
Statistics	<i>BS</i>	Statistics	SM
Studio Art	<i>b</i>	BS Art & Design	LA
Systematics & Biodivers	<i>b</i>	BS Ecology & Sys Bio	SM
Theatre	<i>BA</i>	Theatre & Dance	LA
Transportation Planning	<i>MCRP/MS</i>	City & Regional Plan Civil Engineering	LA ENG
Urban Forestry	<i>b</i>	BS Forestry & Nat Res	AGR
Water Engineering	<i>m</i>	MS Engineering	ENG
Watershed Hydrology	<i>b</i>	BS Forestry & Nat Res	AGR
Wildland Fire & Fuels Mgt	<i>b</i>	BS Forestry & Nat Resources	AGR
Wildlife Biology	<i>b</i>	BS Ecology & Sys Bio	SM

## Other Academic Programs

**AGR** College of Agriculture  
**AED** College of Architecture & Environmental Design  
**BUS** Orfalea College of Business  
**ENG** College of Engineering

**LA** College of Liberal Arts  
**SM** College of Science & Mathematics  
**CTE** University Center for Teacher Education

### MINORS

Program Title	Department	College
Agribusiness	Agribusiness	AGR
Agricultural Communication	College of Agriculture	
Anthropology-Geography	Social Sciences	LA
Art	Art and Design	LA
Biotechnology	College of Science & Mathematics	
Business	Orfalea College of Business	
Child Development	Psychology & Child Dev	LA
City and Regional Planning	City and Regional Planning	AED
Computer Science	Computer Science	ENG
Construction Management	Construction Management	AED
Crop Science	Horticulture & Crop Science	AGR
Dairy Science	Dairy Science	AGR
Dance	Theatre and Dance	LA
Economics	Orfalea College of Business	
English	English	LA
Environmental Design	College of Arch & Env Design	
Environmental Studies	College of Science & Mathematics	
Equine Science	Animal Science	AGR
Ethnic Studies	Ethnic Studies	LA
Food Science	Food Science & Nutrition	AGR
French	Modern Languages & Lit	LA
Fruit Science	Horticulture & Crop Science	AGR
Geographic Info Systems	College of Agriculture	
Geology	Physics	SM
German	Modern Languages & Lit	LA
Gerontology	Psychology & Child Dev	LA
Graphic Communication	Graphic Communication	LA
History	History	LA
Integrative Technology	Orfalea College of Business	
Integrated Project Delivery	College of Arch & Env. Design	
International Relations	Political Science	LA
Land Rehabilitation	College of Agriculture	
Law and Society	Political Science	LA
Linguistics	English	LA
Mathematics	Mathematics	SM
Meat Science & Processing	Animal Science	AGR
Microbiology	Biological Sciences	SM
Military Science	Military Science	AGR
Multidisciplinary Design	Aerospace Engineering	ENG
Music	Music	LA

Program Title	Department	College
Nutrition	Food Science & Nutrition	AGR
Ornamental Plant Production	Horticulture & Crop Science	AGR
Packaging	Orfalea College of Business	
Philosophy	Philosophy	LA
Physics	Physics	SM
Plant Protection	Horticulture & Crop Science	AGR
Poultry Management	Animal Sciences	AGR
Psychology	Psychology & Child Dev	LA
Rangeland Resources	College of Agriculture	
Real Property Development	College of Arch & Env Design	
Religious Studies	Philosophy	LA
Sociology	Social Science	LA
Soil Science	Earth and Soil Sciences	AGR
Spanish	Modern Languages & Lit	LA
Speech Communication	Speech Communication	LA
Statistics	Statistics	SM
Sustainable Environments	College of Arch & Env Design	
Theatre	Theatre and Dance	LA
Values, Tech and Society	Humanities	LA
Water Science	College of Agriculture	
Western Intellectual Tradition	College of Liberal Arts	
Wine and Viticulture	College of Agriculture	
Women's Studies	Women's Studies	LA

### CREDENTIAL PROGRAMS

University Center for Teacher Education
Adapted Physical Education Emphasis
Administrative Services
Agriculture Specialist
Multiple Subject Instruction
Pupil Personnel Services
Single Subject Instruction
Education Specialist (Mild/Moderate Disabilities)
Education Specialist (Moderate/Severe Disabilities)

### OTHER PROGRAMS

ROTC	Military Science	AGR
Technical Communication Certificate	English	LA
Teaching English as a Second Language (TESL) Certificate	English	LA

# Accreditation

The University is fully accredited by the Western Association of Schools and Colleges (WASC), which may be contacted at:

Western Association of Schools and Colleges  
985 Atlantic Avenue, Suite 100  
Alameda, California 94501  
(510) 748-9001

The California Commission on Teacher Credentialing (CCTC) has authorized the University to recommend for a number of teaching credentials as described in the catalog sections on "Teaching Credential Programs."

*The following degree programs are accredited by discipline-related accrediting agencies.*

Program	Accrediting Agency
Art and Design, BS	National Association of Schools of Art and Design
Architecture, BArch	National Architectural Accrediting Board
Business Administration, BS, MBA	American Assembly of Collegiate Schools of Business
City and Regional Planning, BS, MCRP	Planning Accreditation Board of the American Institute of Certified Planners
Computer Science, BS	Accreditation Board for Engineering and Technology, Computing Accreditation Commission
Construction Management, BS	American Council for Construction Education
Engineering Programs: Aeronautical Engineering, BS Architectural Engineering, BS BioResource and Agricultural Engineering, BS Civil Engineering, BS Computer Engineering, BS Electrical Engineering, BS Environmental Engineering, BS Industrial Engineering, BS Manufacturing Engineering, BS Materials Engineering, BS Mechanical Engineering, BS	Accreditation Board for Engineering and Technology, Engineering Accreditation Commission
Forestry and Natural Resources, BS	Society of American Foresters
Industrial Technology, BS	National Association of Industrial Technology
Landscape Architecture, BLA	American Society of Landscape Architects
Nutrition Science, BS	American Dietetics Association
Psychology, MS	Counsel for Accreditation of Counseling and Related Education Programs
Recreation, Parks, and Tourism Administration, BS	National Recreation and Parks Association/American Association of Leisure and Recreation

# Policies On The Rights Of Individuals

## NONDISCRIMINATION POLICY

Cal Poly is a community enriched by individual differences. The University is committed to respecting and protecting the rights of individuals, irrespective of race, color, national origin, disability, gender or sexual orientation.

This section of the Cal Poly Catalog presents a summary of University nondiscrimination policies and procedures for pursuing complaints under these policies. The Office of Campus Relations, working with the University Diversity Enhancement Committee, has been designated to oversee and coordinate implementation of campus nondiscrimination policies.

Specific protocols and procedures related to pursuing complaints of sexual harassment are presented in the section on "sexual harassment policy," below.

Except where otherwise indicated, procedures for reporting incidents of discrimination can be found in the section on **Implementation**, below.

## STATEMENT ON RACISM AND DISCRIMINATION

Cal Poly will not tolerate acts of racism or discrimination of any type. Diversity is valued and respected at Cal Poly and all members are entitled to live and work free from harassment, abuse, and discrimination.

### Race, Color, National Origin and Disability

As part of the California State University, Cal Poly complies with the requirements of Title VII of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, as amended, and the regulations adopted thereunder and the Americans with Disabilities Act. No person shall, on the basis of race, color or national origin be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination in any program of the California State University. The California State University also does not discriminate on the basis of disability in admission or access to, or treatment or employment in, its programs and activities.

### Sex

The California State University does not discriminate on the basis of sex in the educational programs or activities it conducts. Title IX of the Education Amendments of 1972, as amended, and the administrative regulations adopted thereunder prohibit discrimination on the basis of sex in education programs and activities operated by California

Polytechnic State University, San Luis Obispo. Such programs and activities include admission of students and employment. Inquiries concerning the application of Title IX to programs and activities of California Polytechnic State University, San Luis Obispo may be referred to Office of Campus Relations, Health Center (Bldg 27), Room 113, (805) 756-6770, or to the Regional Director of the Office of Civil Rights, Region IX, 50 United Nations Plaza, Room 239, San Francisco, California 94102.

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

## Sexual Orientation

By CSU Board of Trustees policy, the California State University does not discriminate on the basis of sexual orientation.

## 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 98-2. They are prohibited by federal, state, CSU and Cal Poly policies on discrimination.

## IMPLEMENTATION GUIDELINES

The following guidelines clarify how to make inquiries, file complaints, and resolve disputes under Cal Poly's Policies on the Rights of Individuals in cases other than those involving sexual harassment (see the policy on sexual harassment, above).

The processes described here are in place to help sort out the nature of discrimination complaints and to resolve them.

- \* Complaints from or about students may be directed to the office of the Vice President for Student Affairs

(805-756-1521), the Office of Campus Relations (805-756-6770) or the Disability Resource Center (805-756-1395).

- \* Complaints from non-represented employees may be directed to the Office of Campus Relations, Health Center Room 113 (805-756-6770).
- \* Complaints by or against employees who are covered by either collective bargaining agreements or system-wide procedures shall be processed in accordance with the applicable collective bargaining agreement or system-wide procedures, as amended from time to time. Questions regarding procedures to be followed under the collective bargaining agreements should be directed to: the office of the Associate Vice President of Academic Personnel, Administration Building, Room 314 (805-756-2844), for faculty matters; and the office of the Director of Human Resources, Administration Building, Room 110 (805-756-6564), for staff or management issues.
- \* Complaints by or against employees of the Cal Poly Foundation must follow the Foundation's **Procedures for Resolving Harassment Complaints**. Any such complaints should be directed to either her or his supervisor or the Advisor on Harassment Concerns in the Foundation, Building 15 (805-756-1151).
- \* Employees and students of Associated Students, Inc., comply with University policies. Employees of Associated Students, Inc., or others who believe that they have been discriminated against can file a complaint using the A.S. I.'s **Policy Prohibiting Harassment**.

If an act of discrimination is alleged to have occurred over the campus's information resources infrastructure — telephones, computers, network, etc.—redress may be through Instructional Technology Service's **Responsible Use Policy** <http://www.calpoly.edu/computing/policy.html>. Initial inquiries regarding violations should be directed to the office of the Vice Provost and Chief Information Officer, Building 14, Room 113 (805-756-5541).

Filing a complaint about discrimination with the University is not a prerequisite to filing a complaint with a federal or state agency.

Cal Poly provides two options for addressing a complainant's concern—**Informal** and **Formal**:

**Informal:** *When the complainant believes that the alleged behavior can be corrected informally, this route should be pursued.*

Except as otherwise indicated above, complainants should meet with the Director of the Office of Campus Relations or the designee of the Vice President for Student Affairs prior to or in lieu of meeting with a college or unit representative. The complainant completes the appropriate

form, indicating the nature of the complaint and how she or he was affected adversely. An informal meeting will be arranged to evaluate and clarify the nature of the claim and to facilitate a resolution. The resolution shall not be precedent-setting.

**Formal:** *If informal resolution is not pursued or is not successful, the complainant can file a formal complaint.*

A complainant must complete the appropriate form, indicating the nature of the complaint and how she or he was affected adversely. Except as otherwise indicated above, the complainant should meet with the Director of the Office of Campus Relations or the designee of the Vice President for Student Affairs, who (in cases involving students) may refer the case to the Office of Judicial Affairs, Room 217, Administration Building (805-756-2794). Formal complaints must be filed within forty-two (42) days of either the alleged incident or the complainant's awareness of it.

Except as otherwise indicated above, the Director of the Office of Campus Relations or the designee of the Vice President for Student Affairs will conduct the examination and make the report.

If the complaint is not settled, a complainant can file with the Chancellor's Office within fourteen (14) days of receiving notice of the decision.

## SEXUAL HARASSMENT POLICY

**Sexual harassment is**  
**unwelcome or unwanted**  
**attention of a sexual nature.**

Examples include:

- *Unwelcome sexual propositions, invitations, or solicitations;*
- *Unwelcome and inappropriate touching, patting, pinching, or obscene gestures;*
- *Requests for sex in exchange for grades, letters of recommendation, or employment;*
- *Unwelcome verbal expressions of a sexual nature, including graphic sexual comments about a person's body, dress, appearance, or sexual activities;*
- *Consensual sexual relationships where such relationships lead to favoritism of the student or subordinate employee with whom the professor or supervisor is involved;*
- *Threatening demands for sexual favors.*

If you experience sexual harassment, first state that it is *not* welcome and ask the harasser to stop the behavior. If the harassment continues, please report it to a sexual harassment advisor or to the department head/chair or program manager.

Cal Poly's Policy Prohibiting Sexual Harassment (AB98-2) provides a formal avenue of redress for sexual harassment offenses. Some incidents can be addressed through less formal steps that involve a discussion between the parties.

The policy and procedures are available from a sexual harassment advisor, the Office of Campus Relations, Human Resources, and the Student Affairs Office. The policy may also be viewed on the web:

<http://www.calpoly.edu/~ocr/eed/harassment.html>

### **Informal Procedures**

Complainant directly, or through an advisor, notifies the harasser to stop the offensive behavior; *or*

Complainant may attempt to resolve complaint with the alleged harasser's supervisor, department head/chair; *or*

Students may bring complaints directly to the office of the Vice President for Student Affairs (Administration Building Room 209, 756-1521).

Employees should contact the Office of Campus Relations, Health Center Room 113 (805-756-6770).

### **Formal Procedures**

Students file written charges with the office of the Vice President for Student Affairs (Administration Building Room 209, 756-1521) within 120 days of the alleged date of the harassment.

Employees and applicants for employment file written charges with the Office of Campus Relations, Health Center, Room 113 (805-756-6770).

Sexual harassment investigators endeavor to complete a review within 35 days and send a preliminary report of findings to the complainant and the respondent, who have 5 days to provide any additional information.

The investigators forward a final report to the President's designee who imposes corrective measures.

### **Sexual Harassment Advisors**

Cal Poly employees serving as sexual harassment advisors help complainants by providing information about sexual harassment. Advisors may assist in mediating a resolution between parties. Advisors are prepared to discuss sexual harassment concerns with any constituent who needs assistance. A list of advisors may be obtained from office of the Vice President for Student Affairs (805-756-1521), the Office of Campus Relations (805-756-6770), or viewed on the web at:

[http://www.calpoly.edu/~ocr/eed/sh\\_advisors.html](http://www.calpoly.edu/~ocr/eed/sh_advisors.html)

## **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.

## **STATEMENT ON STUDENT ACADEMIC RIGHTS AND RESPONSIBILITIES**

### **Academic Rights**

The classroom (including laboratories, field trips, independent study, etc.) is the essential part of any university where freedom to learn should flourish. The instructor has the responsibility for the manner of instruction and the conduct of the classroom. The instructor should not act in any way that denies the rights of students as set forth below:

Students are free to take reasoned exception to the data or views offered in courses. It is the responsibility of the instructor to take every precaution to ensure that what is presented is factual. If the instructor's presentation is in the area of opinion, belief, or debatable fact, it is the instructor's responsibility to make this clear to the students. Students may be required to know thoroughly the particulars set forth by the instructor, but they are free to reserve personal judgment as to that which is presented in the classroom.

The student has the right to substantial presentations appropriate to the course. Unjustified failure of the instructor to meet or prepare for classes, which results in incompetent performance, is a legitimate ground for student complaints against the instructor.

The student has the right to a statement at the beginning of each quarter providing: instructor's name, office location, office telephone number, and office hours; texts and supplementary materials required for the course; purpose of the course; prerequisites; requirements for grading;

frequency and types of tests; and other information to assure student's understanding of the nature and requirements of the course.

A **Fairness Board** has been established to hear grievances of students who believe their academic rights have been denied or violated. The process and procedure of evaluation in the course shall be the sole criterion for Fairness Board. Students may also contact the Office of Campus Relations (756-6770) for informal assistance with grade-disputes.

### Academic Responsibilities

Students enrolled in a class are responsible for meeting standards of performance and conduct established by the University and the instructor. Students are responsible for registering and "adding" and "dropping" classes in a timely fashion, to ensure that others will have an opportunity to take classes. Students are responsible for completing and submitting all class assignments, examinations, tests, projects, reports, etc., by scheduled due dates, or face penalties. If any problem arises regarding course work or attendance, the student will be held responsible for initiating communication and contact with the instructor. In addition, students will be held responsible for behavior and conduct adverse to the preservation of order as established by the University and the instructor. Students are responsible for meeting their degree requirements as provided in the university catalog.

### 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.*

## USE AND RELEASE OF STUDENT INFORMATION

[www.calpoly.edu/\\_records/ferpa\\_use.htm](http://www.calpoly.edu/_records/ferpa_use.htm)

The Family Educational Rights and Privacy Act (FERPA) affords students certain rights with respect to their educational records. This federal law applies to all schools that receive funding under most programs administered by the Department of Education. The primary rights afforded each student are the right to inspect and review his/her educational records, the right to seek to have the records amended, and the right to have some control over the disclosure of information from the records.

## STATEMENT ON RESPONSIBLE USE OF INFORMATION TECHNOLOGY RESOURCES

[www.calpoly.edu/computing/policy.html](http://www.calpoly.edu/computing/policy.html)

Information technology resources are provided to support the University's mission of education, research and service. To ensure that these shared and finite resources are used effectively to further the University's mission, each user has the responsibility to:

- use the resources appropriately and efficiently;
- respect the freedom and privacy of others;
- protect the stability and security of the resources; and
- understand and fully abide by established University policies and applicable public laws.

All students, faculty and staff are encouraged to review the policy, which covers authorized use/access, data security, confidentiality and privacy, network and system integrity, commercial use, copyright infringement, and more.

The full policy describes consequences of non-compliance and procedures for reporting and responding to complaints. It includes definitions and examples of responsible and irresponsible use. Information Technology Services is responsible for policy oversight and compliance. For more information, call 805-756-2966 or <http://www.it-policy@calpoly.edu>.

## FOR MORE INFORMATION

Individuals should contact the Office of Campus Relations (756-6770) or the Office of Judicial Affairs (756-2794) for more information on any University policies or procedures related to the rights of individuals.

# The California State University

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 the campuses of the CSU include comprehensive and polytechnic universities and, since July 1995, the California Maritime Academy, a specialized campus.

The oldest campus—San José State University—was founded in 1857 and became the first institution of public higher education in California. The newest—CSU Channel Islands—opened in fall 2002 with freshmen arriving in fall 2003.

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

The Trustees, the Chancellor, and the Presidents develop systemwide policy, with 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 CSU 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 1,800 bachelor's and master's degree programs in some 240 subject areas. Many of these programs are offered so that students can complete all upper-division and graduate requirements by part-time late after-noon and evening study. In addition, a variety of teaching and credential programs are available. A number of doctoral degrees are offered jointly with the University of California and with private institutions in California.

Enrollments in fall 2002 totaled nearly 406,896 students, who were taught by more than 21,225 faculty. The system awards more than half of the bachelor's degrees and 30 percent of the master's degrees granted in California. Nearly 2 million persons have been graduated from CSU campuses since 1960.

## Trustees of the California State University

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State Capitol, Sacramento 95814

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401 Golden Shore, Long Beach 90802-4210

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

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### Correspondence with Trustees should be sent:

c/o Trustees Secretariat  
The California State University  
401 Golden Shore  
Long Beach, CA 90802-4210

**OFFICE OF THE CHANCELLOR**

The California State University  
401 Golden Shore  
Long Beach, California 90802-4210  
(562) 951-4000

Dr. Charles B. Reed.....Chancellor – CSU System  
Dr. David S. Spence.....Executive Vice Chancellor and Chief Academic Officer  
Mr. Richard P. West.....Executive Vice Chancellor and Chief Financial Officer  
Mr. Louis Caldera.....Vice Chancellor, University Advancement  
Ms. Jackie McClain.....Vice Chancellor, Human Resources  
Ms. Christine Helwick.....General Counsel  
Dr. Gary Hammerstrom.....Associate Vice Chancellor, Academic Affairs

**CAMPUSES—THE CALIFORNIA STATE UNIVERSITY****California State University, Bakersfield**

Dr. Tomas A. Arciniega, President  
9001 Stockdale Highway, Bakersfield, CA 93311-1099  
(661) 664-2011

**California State University, Channel Islands**

Dr. Richard Rush, President  
One University Drive, Camarillo, CA 93012  
(805) 437-8400

**California State University, Chico**

Dr. Manuel A. Esteban, President  
400 West First Street, Chico, CA 95929-0150  
(530) 898-4636

**California State University, Dominguez Hills**

Dr. James E. Lyons, Sr., President  
1000 East Victoria Street, Carson, CA 90747-0005  
(310) 243-3300

**California State University, Fresno**

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5241 North Maple Avenue, Fresno, CA 93740  
(559) 278-4240

**California State University, Fullerton**

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800 N. State College Boulevard, Fullerton, CA 92834-9480  
(714) 278-2011

**California State University, Hayward**

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25800 Carlos Bee Boulevard, Hayward, CA 94542  
(510) 885-3000

**Humboldt State University**

Dr. Rollin C. Richmond, President  
Arcata, CA 95521-8299  
(707) 826-3011

**California State University, Long Beach**

Dr. Robert C. Maxson, President  
1250 Bellflower Boulevard, Long Beach, CA 90840-0115  
(562) 985-4111

**California State University, Los Angeles**

Dr. James M. Rosser, President  
5151 State University Drive, Los Angeles, CA 90032  
(323) 343-3000

**California Maritime Academy**

Dr. William B. Eisenhardt, President  
200 Maritime Academy Drive, Vallejo, CA 94590  
(707) 654-1000

**California State University, Monterey Bay**

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100 Campus Center, Seaside, CA 93955-8001  
(831) 582-3330

**California State University, Northridge**

Dr. Jolene Koester, President  
18111 Nordhoff Street, Northridge, CA 91330  
(818) 677-1200

**California State Polytechnic University, Pomona**

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

**California State University, Sacramento**

Dr. Donald R. Gerth, President  
6000 J Street, Sacramento, CA 95819  
(916) 278-6011

**California State University, San Bernardino**

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5500 University Parkway, San Bernardino, CA 92407-2397  
(909) 880-5000

**San Diego State University**

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5500 Campanile Drive, San Diego, CA 92182  
(619) 594-5000

**San Francisco State University**

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

**San José State University**

Dr. Robert L. Caret, President  
One Washington Square, San Jose, CA 95192-0001  
(408) 924-1000

**California Polytechnic State University, San Luis Obispo**

Dr. Warren J. Baker, President  
One Grand Avenue  
San Luis Obispo, CA 93407  
(805) 756-1111

**California State University, San Marcos**

Alexander Gonzalez, President  
333 S. Twin Oaks Valley Road  
San Marcos, CA 92096-0001  
(760) 750-4000

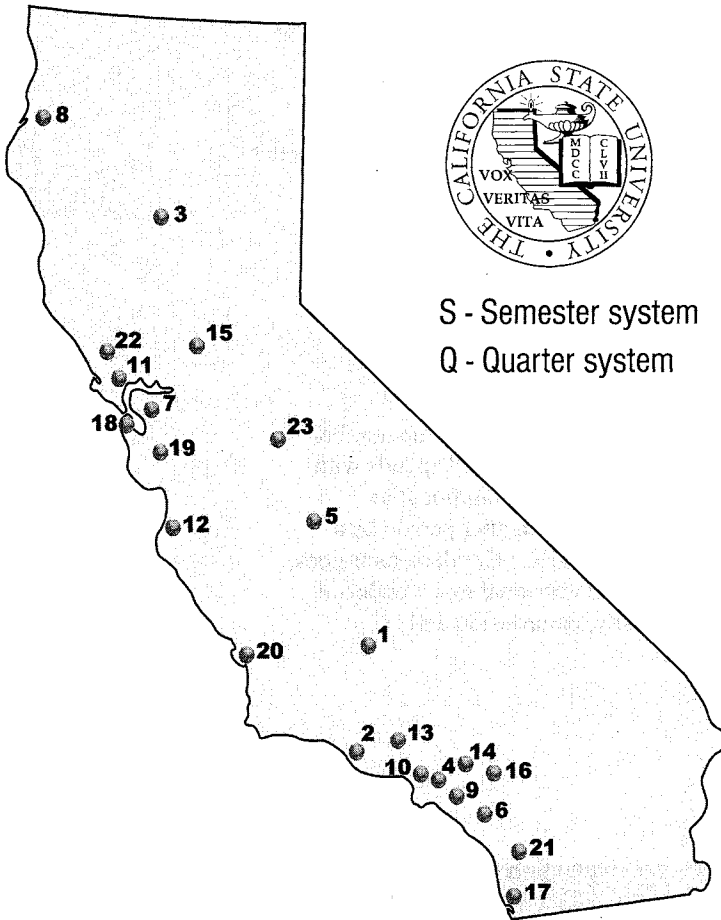
**Sonoma State University**

Dr. Ruben Armifiana, President  
1801 East Cotati Avenue, Rohnert Park, CA 94928-3609  
(707) 664-2880

**California State University, Stanislaus**

Dr. Marvalene Hughes, President  
801 West Monte Vista Avenue, Turlock, CA 95382-0299  
(209) 667-3122

# THE CALIFORNIA STATE UNIVERSITY



S - Semester system  
Q - Quarter system

**1 CALIFORNIA STATE UNIVERSITY, BAKERSFIELD • Q**  
9001 Stockdale Highway, Bakersfield, CA 93311-1099  
(661) 664-3036 • [www.csusbak.edu](http://www.csusbak.edu)

**2 CALIFORNIA STATE UNIVERSITY, CHANNEL ISLANDS • S**  
One University Drive, Camarillo, CA 93012  
(805) 437-8400 • [www.csuci.edu](http://www.csuci.edu)  
*Channel Islands will admit only upper division undergraduate transfer and postbaccalaureate credential students for 2002-03. A limited number of CSU Northridge courses will be available on the CSUCI campus.*

**3 CALIFORNIA STATE UNIVERSITY, CHICO • S**  
400 W. First Street, Chico, CA 95929-0150  
(530) 898-6321 • [www.csuchico.edu](http://www.csuchico.edu)

**4 CALIFORNIA STATE UNIVERSITY, DOMINGUEZ HILLS • S**  
1000 East Victoria Street, Carson, CA 90747  
(310) 243-3696 • [www.csudh.edu](http://www.csudh.edu)

**5 CALIFORNIA STATE UNIVERSITY, FRESNO • S**  
5150 North Maple Avenue, Fresno, CA 93740-0057  
(559) 278-2261 • [www.csufresno.edu](http://www.csufresno.edu)

**6 CALIFORNIA STATE UNIVERSITY, FULLERTON • S**  
800 N. State College Blvd., Fullerton, CA 92834-9480  
(714) 278-2300 • [www.fullerton.edu](http://www.fullerton.edu)

**7 CALIFORNIA STATE UNIVERSITY, HAYWARD • Q**  
25800 Carlos Bee Blvd., Hayward, CA 94542-3035  
(510) 885-2624 • [www.csuhayward.edu](http://www.csuhayward.edu)

**8 HUMBOLDT STATE UNIVERSITY • S**  
1 Harpst Street, Arcata, CA 95521-4957  
(707) 826-4402 • [www.humboldt.edu](http://www.humboldt.edu)

**9 CALIFORNIA STATE UNIVERSITY, LONG BEACH • S**  
1250 Bellflower Blvd., Long Beach, CA 90840-0106  
(562) 985-5471 • [www.csulb.edu](http://www.csulb.edu)

**10 CALIFORNIA STATE UNIVERSITY, LOS ANGELES • Q**  
5151 State University Drive, Los Angeles, CA 90032-8530  
(323) 343-3901 • [www.calstatela.edu](http://www.calstatela.edu)

**11 CALIFORNIA MARITIME ACADEMY • S**  
200 Maritime Academy Drive, Vallejo, CA 94590  
(800) 561-1945 • [www.csum.edu](http://www.csum.edu)

**12 CALIFORNIA STATE UNIVERSITY, MONTEREY BAY • S**  
100 Campus Center Drive, Seaside, CA 93955-8001  
(831) 582-3518 • [www.monterey.edu](http://www.monterey.edu)

**13 CALIFORNIA STATE UNIVERSITY, NORTHRIDGE • S**  
18111 Nordhoff Street, Northridge, CA 91330-8207  
(818) 677-3700 • [www.csun.edu](http://www.csun.edu)

**14 CALIFORNIA STATE POLYTECHNIC UNIVERSITY, POMONA • Q**  
3801 West Temple Avenue, Pomona, CA 91768-4003  
(909) 869-2000 • [www.csupomona.edu](http://www.csupomona.edu)

**15 CALIFORNIA STATE UNIVERSITY, SACRAMENTO • S**  
6000 J Street, Sacramento, CA 95819-6112  
(916) 278-6470 • [www.csus.edu](http://www.csus.edu)

**16 CALIFORNIA STATE UNIVERSITY, SAN BERNARDINO • Q**  
5500 University Parkway, San Bernardino, CA 92407-2397  
(909) 880-5200 • [www.csusb.edu](http://www.csusb.edu)

**17 SAN DIEGO STATE UNIVERSITY • S**  
5500 Campanile Drive, San Diego, CA 92182-8225  
(619) 594-0884 • [www.sdsu.edu](http://www.sdsu.edu)

**18 SAN FRANCISCO STATE UNIVERSITY • S**  
1600 Holloway Avenue, San Francisco, CA 94132-4002  
(415) 338-1113 • [www.sfsu.edu](http://www.sfsu.edu)

**19 SAN JOSE STATE UNIVERSITY • S**  
One Washington Square, San Jose, CA 95192-0009  
(408) 283-7500 • [www.sjsu.edu](http://www.sjsu.edu)

**20 CALIFORNIA POLYTECHNIC STATE UNIVERSITY, SAN LUIS OBISPO • Q**  
San Luis Obispo, CA 93407  
(805) 756-2311 • [www.calpoly.edu](http://www.calpoly.edu)

**21 CALIFORNIA STATE UNIVERSITY, SAN MARCOS • S**  
Office of Admissions, 333 S. Twin Oaks Valley Road  
San Marcos, CA 92096-0001  
(760) 750-4848 • [www.csusm.edu](http://www.csusm.edu)

**22 SONOMA STATE UNIVERSITY • S**  
1801 East Cotati Avenue, Rohnert Park, CA 94928  
(707) 664-2778 • [www.sonoma.edu](http://www.sonoma.edu)

**23 CALIFORNIA STATE UNIVERSITY, STANISLAUS • 4 - 1 - 4**  
801 West Monte Vista Avenue, Turlock, CA 95382  
(209) 667-3151 • [www.csustan.edu](http://www.csustan.edu)

## Outstanding Faculty Advisor



Professor Kathryn Rummell  
*Photo courtesy of Josef Kasperovich*

The Outstanding Faculty Advisor Award was developed to recognize outstanding achievement by a faculty member in the area of student advising. Nominations were solicited from faculty, staff, and students across campus.

The first award was presented in 2002 to Professor Kathryn Rummell, English Department. From the letter of nomination:

"Kathryn is Chair of English Advising, which means that she, in addition to advising a large number of English majors herself, also advises the other faculty advisors. She does an excellent job at both."

"Besides the amount of work and the number of hours that Professor Rummell spends with this job, she it all with a commitment to helping the individual, whether person be a student or another advisor. Her demeanor goes beyond the mere professional to a wonderful spirit of generosity, compassion and cooperation."

## Endowed Chair

Professor Raul Cano  
*Photo courtesy of Ken Chen*

Raul Cano is the Unocal Chair for Environmental Studies. He is also a professor of Biological Sciences and Director of the Environmental Biotechnology Institute.

Raul Cano and a student prepare specimens for analysis. Dr. Cano and his students were the first in the world to isolate DNA from insects encased in ancient amber.



Special

*Programs*  
*& Resources*

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# Special Programs and Resources

## ACADEMIC ADVISING

Academic advising for all students is essential for obtaining a high quality education. It is a partnership in which students and advisors work together to support and enhance student learning and decision making. Students should meet with their advisors regularly in order to plan an academic program, develop a career plan, and discuss issues related to a successful college experience. Each student is assigned, or can select, his or her own faculty advisor. College advising centers also offer a broad range of services.

### College Advising Centers

Agriculture.....	Contact Department Offices
Architecture & Env Design Advising Center ....	756-1325
<a href="http://www.calpoly.edu/~caed/the_CAED/Advising_Center/index.html">www.calpoly.edu/~caed/the_CAED/Advising_Center/index.html</a>	
Business Advising Center.....	756-2601
<a href="http://www.cob.calpoly.edu/advctr/index.htm">www.cob.calpoly.edu/advctr/index.htm</a>	
Engineering Advising Center .....	756-1461
<a href="http://www.ee.calpoly.edu/CENGAC/">www.ee.calpoly.edu/CENGAC/</a>	
Liberal Arts Advising Center.....	756-6200
<a href="http://cla.calpoly.edu/cla/advising/claadvising.html">cla.calpoly.edu/cla/advising/claadvising.html</a>	
Science and Math Advising Center .....	756-2615
<a href="http://www.calpoly.edu/~cosam/Advising/index.html">www.calpoly.edu/~cosam/Advising/index.html</a>	

### Other Academic Advising Services

Academic Skills Center .....	756-1256
<a href="http://sas.calpoly.edu/asc/">sas.calpoly.edu/asc/</a>	
Athletic Advising.....	756-2762
<a href="http://www.gopoly.com/academics/index.html">www.gopoly.com/academics/index.html</a>	
Disability Resource Center .....	756-1395
<a href="http://sas.calpoly.edu/drc/">sas.calpoly.edu/drc/</a>	
Educational Opportunity Program.....	756-2301
<a href="http://sas.calpoly.edu/eop/">sas.calpoly.edu/eop/</a>	
Entry Level Mathematics (ELM, MAPE) .....	756-2268
<a href="http://www.calpoly.edu/~math/elm.html">www.calpoly.edu/~math/elm.html</a>	
General Education Program.....	756-2228
<a href="http://www.calpoly.edu/~acadprog/gened/">www.calpoly.edu/~acadprog/gened/</a>	
Graduate Programs .....	756-1508
<a href="http://www.calpoly.edu/~rgp/graduate.programs.html">www.calpoly.edu/~rgp/graduate.programs.html</a>	
Health Professions .....	756-2615
<a href="http://www.calpoly.edu/~cosamac/health">www.calpoly.edu/~cosamac/health</a>	
Student Academic Services .....	756-2301
<a href="http://sas.calpoly.edu/">sas.calpoly.edu/</a>	
Student Support Services.....	756-1395
<a href="http://sas.calpoly.edu/sss/">sas.calpoly.edu/sss/</a>	
Writing Skills Program (EPT, GWR).....	756-2067
<a href="http://www.calpoly.edu/~wrtskills/">www.calpoly.edu/~wrtskills/</a>	

## ALUMNI ASSOCIATION

*Alumni Relations, Albert B. Smith Alumni and Conference Center, 805 756-2586*

Cal Poly's Alumni Association links the University with the more than 150,000 students who have attended Cal Poly since 1901. To keep in touch with former students, the Alumni Association coordinates a variety of functions including continuing education, university updates, and spirited programs both on and off campus and throughout California and across the nation.

The Alumni Association is governed by a president, a president elect, a secretary-treasurer, and a board that represents the association both regionally and by college. The Office of Alumni Relations coordinates the activities of the association. The association, with nearly 30 active regional alumni chapters, coordinates events in Alaska, Hawaii, Colorado, New England, Portland, Seattle, and throughout California. The association also coordinates activities of interest-based alumni chapters such as Vines to Wines, FANS, Rose Float and WOW Alumni Associations.

Active members of the Alumni Association enjoy unique benefits such as access to all CSU libraries, access to Cal Poly recreational facilities, group insurance programs, SLO merchant discounts, and special invitations to alumni-sponsored events such as Homecoming and Open House.

The Cal Poly Alumni Association has a special interest in student activities and enhancing the undergraduate experience. Sponsoring POLY REPS, a student alumni council, Senior Cabinet, Running Thunder, ASI Student Alumni Advisory Board, and many student scholarships and student club grants are just a few of the ways that the Alumni Association is positively impacting the student experience.

## BIOTECHNOLOGY PROGRAMS

Biotechnology is broadly defined as a fusion between natural sciences such as biology, microbiology, biochemistry, genetics and chemistry and technological fields such as engineering, manufacturing and computer science. Modern biotechnology has evolved over the last twenty years to exploit the power of molecular biology and genetic engineering technology to further develop microorganisms, as well as plants and animals, for improved manufacturing of products. Examples of today's biotechnology products range from the production of human insulin in bacterial cells to the development and use of genetically modified food crops as well as the use of microbes to help clean up the environment (bioremediation) or the use of computers to help decipher

complex genetic information (bioinformatics). Biotechnology is one of the fastest growing areas in genetics, agriculture, food production, environmental science, pharmaceuticals and biomedical engineering. Employment opportunities in California are at a premium with hundreds of biotechnology-related companies located in the San Francisco, Los Angeles and San Diego areas.

The biotechnology industry is highly interdisciplinary and involves people with backgrounds in biochemistry, biology, microbiology, agriculture, engineering, as well as business and law. Cal Poly offers a number of programs in the Colleges of Agriculture, Engineering and Science and Mathematics. For additional program information, please refer to the department's catalog description.

## College of Agriculture

### BS Animal Science

Dr. Jonathon Beckett, 756-7011, jbeckett@calpoly.edu.  
*Animal Science Department*

An applied approach to biotechnology with courses such as biotechnology in animal science and applied animal embryology.

### BS BioResource and Agricultural Engineering

#### BS Agricultural Systems Management

Dr. Doug W. Williams, 756-6153, wwillia@calpoly.edu.  
*BioResource and Agricultural Engineering Department*  
Courses in the bioconversion of agricultural wastes and renewable energy systems.

### BS Plant Protection Science, BS Crop Science, BS Fruit Science,

Dr. Scott Steinmaus, 756-5142, ssteinma@calpoly.edu.  
*Horticulture and Crop Science Department*  
The concepts, benefits, and risks of transgenic crop technologies and pesticide resistance.

### BS Environmental Horticultural Science

David Hannings, 756-2870, dhanning@calpoly.edu.  
*Horticulture and Crop Science Department*  
Study in the applied aspects of plant biotechnology through a tissue culture propagation course.

### BS Soil Science

Dr. Thomas Ruehr, 756-2552, truehr@calpoly.edu or  
Dr. Thomas Rice, 756-2420, trice@calpoly.edu.  
*Earth and Soil Sciences Department*  
Biotechnology-related courses in soil microbiology, soil and water chemistry, and vadose zone remediation.

## College of Engineering

### BS, MS Computer Science

Dr. Tim Kearns, 805 756-2876, tkearns@csc.calpoly.edu  
Dr. Gene Fisher, 805 756-2416, gfisher@calpoly.edu.  
*Computer Science Department*

The BS program offers courses in bioinformatics. Various NSF and industry sponsored research projects with faculty are available to graduate students.

### BS Environmental Engineering

#### MS Civil and Environmental Engineering

Dr. Nirupam Pal, 805 756-1355, npal@calpoly.edu.  
*Civil and Environmental Engineering Department*  
The BS program offers courses in environmental biotechnology for treatment of wastewater, as well as innovative bioremediation processes for cleaning up contaminated soil and groundwater. The MS program offers an emphasis in biotechnology with coursework in biochemical engineering and thesis research topics in environmental engineering applications of biotechnology.

### BS General Engineering

#### MS Engineering

Dr. Dan Walsh, 805 756-6400, dwalsh@calpoly.edu.  
*College of Engineering*  
Typical areas of study include: bioinstrumentation and medical devices, biomaterials, biomechanics, bioremediation, bioelectric signals and communications, and microbiological interaction with materials.

## College of Science and Mathematics

### BS, MS Biological Sciences

Dr. Peter Jankay, 756-2826, pjankay@calpoly.edu  
Dr. Elena Levine, 756-2175, elevine@calpoly.edu  
Dr. Dennis Frey, 756-2802, dfrey@calpoly.edu  
*Biological Sciences Department*  
The BS program offers courses in the areas of plant biotechnology, biochemistry, bioinformatics and microbial biotechnology, ethics and protein techniques. The MS program offers research opportunities in biotechnology or bioremediation. Elective courses in microbiology, molecular biology and cell biology allow for further development.

### BS Microbiology

Dr. Susan Elrod, 756-2875, selrod@calpoly.edu.  
*Biological Sciences Department*  
The BS program offers a concentration in Applied Microbiology and Biotechnology with coursework in the structure and function of microorganisms and their use in molecular biology, biotechnological and industrial applications. Elective courses allow students to explore the areas of bioinformatics, applied microbiology, cell biology, ethics and biochemistry.

### BS Biochemistry

Dr. John Goers, 805 756-1671, jgoers@calpoly.edu  
*Chemistry and Biochemistry Department*  
A concentration in Molecular Biology is available with coursework in the investigation of the chemical nature of biological molecules related to genes and their expressed products. Elective courses explore the fields of bioinformatics, industrial microbiology, pharmacology, and cell biology.

### Biotechnology Minor

The minor consists of courses in molecular biology, genetics, immunology, and protein techniques and elective courses in cell biology, industrial microbiology, and plant biotechnology. It is open to any major, except students

taking related concentrations in Biochemistry, Biology or Microbiology. *Contact:* Dr. John Goers, Chemistry and Biochemistry Dept., 805 756-1671, [jgoers@calpoly.edu](mailto:jgoers@calpoly.edu) or Dr. Susan Elrod, Biological Sciences Dept., 805 756-2875, [selrod@calpoly.edu](mailto:selrod@calpoly.edu).

### Other Biotechnology-Related Programs

The **Dairy Products Technology Center (DPTC)** conducts research that provides the scientific and technological basis for new and improved dairy food products and processes and trains students to enter careers in the dairy industry and allied fields. *Contact:* Dr. Rafael Jimenez-Flores, 756-6103, [rjimenez@calpoly.edu](mailto:rjimenez@calpoly.edu).

The **Environmental Biotechnology Institute (EBI)** focuses on advancing biotechnology research on the Central Coast. Faculty partnerships with major corporations and local laboratories carry out research efforts and offer learning experiences for students. Research projects include the study of microbial communities in the environment, genomics, bioremediation, fungal biotechnology, and microbial diversity and evolution. *Contact:* Dr. Raul Cano, Director, 756-1358, [rcano@calpoly.edu](mailto:rcano@calpoly.edu) or Dr. Chris Kitts, Associate Director, 756-2949, [ckitts@calpoly.edu](mailto:ckitts@calpoly.edu).

The **Renewable Energy Institute**, a multidisciplinary institute involving the Colleges of Agriculture, Engineering and Architecture, offers research and teaching opportunities in the development of renewable energy sources including biomass, wind, passive- and active- solar energy. *Contact:* Dr. Doug Williams, 756-6153, [ddwillia@calpoly.edu](mailto:ddwillia@calpoly.edu).

The **Advanced Technology Laboratory – St. Jude Bioengineering Laboratory** --symbolizes the dynamic partnership between academia, government and industry. Faculty and students pursue applied research projects such as bioinstrumentation, medical devices, biomaterials, biomechanics, bioremediation, prosthetic robotics and microbial interaction with materials. The largest projects currently underway include efforts to: develop micro-mechanical model for bone (NIH), develop a model for blunt trauma to tissue (US Army), and test and model the behavior of arterial stents (NSF). *Contact:* Dr. Dan Walsh, 756-6400, [dwalsh@calpoly.edu](mailto:dwalsh@calpoly.edu).

### CAL POLY CONTINUING EDUCATION

*Dennis Parks, Dean*

*Jespersen Hall (116), Room 101, 805 756-2053*

*[continuing-ed@calpoly.edu](mailto:continuing-ed@calpoly.edu) [www.continuing-ed.calpoly.edu](http://www.continuing-ed.calpoly.edu)*

Continuing Education furthers the academic and outreach mission of Cal Poly beyond the traditional undergraduate experience and is committed to developing and offering a wide range of innovative lifelong learning opportunities for the citizens of California and the nation. Educational programs are offered in a variety of learning formats including classroom instruction, distance learning, and client centered services both on- and off-campus.

Continuing Education publishes a quarterly catalog available to the public. It can also be found on our web site. To be placed on the mailing list, please call or email the office.

The department offers courses and programs for individuals ranging from the very young to retired seniors. These opportunities include both non-credit and credit programs in fields that reflect the mission and strength of Cal Poly. All programs are self-supporting through student enrollments or agency sponsorship.

**Open University.** This enrollment option enables members of the community to register for regular Cal Poly courses on a space available basis. Open University is a *non-degree* registration option. Limits as to the number of credits earned through Open University may apply when seeking admission to a degree program. Individuals wishing to take advantage of this option must secure permission of Continuing Education, the course instructor, and the Dean (or her/his representative) of the school offering the course. Enrollment forms may be obtained from Continuing Education two weeks prior to the beginning of each quarter.

**Certificate Programs.** Continuing Education offers certificate programs for those desiring to advance in their profession or make a career change. Currently offered certificate programs include: Management, Human Resources, Instructional Technology for Teachers, Paralegal Studies, Technical Communications, Wine Industry, Leading Nonprofit Organizations and Information Technology.

**Programs for Professionals.** For those desiring short courses, Continuing Education offers a wide range of shorter educational opportunities for those seeking to learn new skills or update existing knowledge. These programs may last a single evening or an entire quarter.

**Programs of Personal Enrichment.** These programs are designed to provide an introduction to new areas of knowledge. The length of each program will vary by its topic and target audience.

**Custom Made Learning.** Continuing Education will tailor a learning program to the unique needs of an organization. Starting with a needs assessment, through design, implementation and evaluation. This program will bring the intellectual resources of Cal Poly to the employees and members of corporations, unions, associations, educational institutions, non-profit organizations, government agencies and more.

**Conference Services.** The department develops and coordinates workshops, seminars, and conferences for both on- and off-campus organizations. As a full-service conferencing unit, Conference Services provides registration services, budget management, and logistical arrangements encompassing catering, housing, facility reservations, transportation, tours, etc.

## CAL POLY HOUSING CORPORATION

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

The Cal Poly Housing Corporation (CPHC) is a separate, nonprofit auxiliary organization, established in 2001 by the University. The corporation is responsible for developing, constructing and managing faculty and staff housing for rent and sale in order to help facilitate recruitment and retention of employees.

A board of directors, comprising faculty, staff, community members and university administrators, oversees the Housing Corporation's activities. CPHC undertakes initiatives that are requested and approved by the University. All CPHC financial transactions and its operations are audited each year.

## CAMPUS DINING

Campus Dining prepares nutritious and delicious meals for Cal Poly's 2,800 residence hall students and 6,000 other campus customers each day. With over a dozen outlets located throughout campus, Campus Dining has an extensive offering – from snacks to full meals to campus-grown produce. Light House, VG Cafe, and Sandwich Factory provide meal plan service. Other restaurants include BackStage Pizza, Julian's Gourmet Coffee, Tapangos, The Avenue Food Court, Lucy's Juice, Lucy's Juice Too, and Veranda Café. Vista Grande Restaurant offers full table service meals with a breathtaking view. The Campus Market, an on-campus convenience store, features Cal Poly products. Campus Catering is always available for special events.

Membership in the Campus Express Club, a value card program, is open to all Cal Poly students, faculty and staff. Members add value to their membership and then use their Poly Card to make purchases at restaurants on campus, El Corral Bookstore, Health Services, and for printing at campus computer labs. Membership also has its privileges, including special discounts offered at Campus Dining locations.

## OFFICE OF CAMPUS RELATIONS

*Health Center, Bldg. 27 Room 113, 805 756-6770*

A university is a place where you can develop intellectually and personally, gain perspective on life and expand your sense of self. You are encouraged to think logically, judge critically, communicate clearly and accept personal responsibility. The Office of Campus Relations is responsible for helping to maintain high academic standards, promote a safe and comfortable campus environment and ensure that every student has a fair opportunity to pursue academic and personal excellence.

The Office of Campus Relations provides an open and supportive venue for assisting members of the Cal Poly community to find appropriate resolutions to concerns and problems, and promotes communication and cooperation among students, faculty, and staff. The office provides information regarding Cal Poly's policies and procedures, students' rights and responsibilities, and appeal processes.

The Office of Campus Relations is also available to assist with concerns regarding harassment and discrimination.

## CENTER FOR TEACHING AND LEARNING

*Joseph E. Grimes, Director*

*Robert E. Kennedy Library (35) Room 510, 805 756-2088*

*<http://www.academics.calpoly.edu/ctl>*

The mission of the Center for Teaching and Learning is to enhance teaching and learning by providing resources and an environment to:

- \* create opportunities for faculty and staff to enhance teaching and learning skills;
- \* promote cross-disciplinary discussion and collaboration, sustain an interactive community of faculty and staff learners; and
- \* encourage awareness of issues that affect both the academic community and its disciplines, and help faculty and staff maintain currency in their chosen fields.

The Center for Teaching and Learning (CTL) is a multipurpose and multidisciplinary center that provides resources, training and support for the preparation, development and enhancement of teacher-scholars at Cal Poly. An advisory council comprised of faculty and staff provides the input that drives the activities of the CTL, while several faculty associates from a variety of academic departments are responsible for coordinating specific events and activities. Current focus areas are: a quarterly newsletter, a web site, teaching and learning workshops, courses and seminars, new faculty support, and integrating support for faculty using technology in their classrooms.

## COMMUNITY-BASED LEARNING

*Student Life, University Union, Bldg 65, Room 217,*

*805 756-2476*

Community-based learning provides students an opportunity to participate in a structured learning experience that combines service to the community with explicit learning objectives, preparation, reflection, and evaluation. Students enrolled in Community-Based Learning courses provide direct service in areas of need identified by the community, and learn about the context in which the service is provided, the connection between the service and their academic coursework, and their roles as citizens.

## COMMUTER & ACCESS SERVICES

*RideShare Office, Univ. Police, Bldg. (74), 805 756-6680*

The RideShare office is available to all students, faculty and staff to help them choose the best option for traveling to Cal Poly. Carpool partner matching services, special bus rates for the city and county buses, and vanpools for employees are a few of the convenient choices offered. Commuter and Access Services is committed to help reduce traffic, keep the air clean, solve parking congestion on campus, as well as to help students and employees save money and wear-and-tear on their cars.

## COMPUTING AT CAL POLY

*Information Technology Services (ITS)*

*Jerry Hanley, Vice Provost & CIO*

*Frank E. Pilling Bldg. (14), 805 756-7000*

*<http://its.calpoly.edu>*

*"Computing Resources" [www.calpoly.edu](http://www.calpoly.edu)*

Information technology plays an increasingly important role on campus, both in the academic programs and administrative services. Information 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 to provide a practical, "hands on" learning environment. Students frequently encounter computers in their classes, and are strongly encouraged to have access to a computer and the Internet in their residences.

ITS plans, coordinates, manages and supports campuswide information technology resources and services. These include shared administrative and instructional applications, databases and servers; computer processing; data, voice and video network services; open access student computing labs, mediated classrooms and other specialized facilities; online course management systems; remote access and web development strategies; policy development and compliance; and consulting and training on supported hardware, software, and network services.

### Resources and Facilities

Campuswide hardware systems include an IBM 9672-R24 CMOS mainframe computer, Sun and other UNIX servers, a network of Java workstations, various departmental servers, and advanced workstations. While some computers run specialized academic applications, many are available for use by all Cal Poly students.

Campuswide communication systems include an Ericsson digital telephone switch, a high-speed Ethernet network (including network connections in every campus residence hall room), Internet2 network connectivity, remote access support, and open access ports and wireless access in selected student study areas and classrooms.

These systems provide access to electronic mail, application software, the Internet and World Wide Web, on-line library resources and specialized databases, instructional materials, and other networks and information services. Cal Poly has several microcomputer lab/classroom facilities for instruction, independent study, research and development. Apple Macintosh, HP, IBM, Sun, Cisco and other systems are available to students. Extensive efforts are underway to make campus information technology resources accessible to persons with disabilities.

An integrated database on distributed servers facilitates administrative processes such as admissions and records, financial aid, class scheduling, fiscal operations and human

resource management. These resources are linked through the campuswide data communications network.

Cal Poly's web portal (<http://my.calpoly.edu>) facilitates access to campus online services and resources based on one's role (e.g., student, faculty, staff,) and personal preferences.

Cal Poly provides faculty access to specialized resources to design, produce and deliver mediated instructional materials as well as support to apply information technology in teaching and learning.

Other campus resources include smart classrooms, distance learning and videoconferencing facilities; digital video editing systems; media and presentation equipment checkout; on-line tools to facilitate easy access to and retrieval of information from university databases; photo identification card services; site-licensed software distribution; and a centrally-located help desk to advise students, faculty and staff on how to access and use these technologies.

Students, faculty, staff and others accessing Cal Poly's information technology resources agree to abide by the Responsible Use Policy and other policies posted at [www.calpoly.edu/computing/policy.html](http://www.calpoly.edu/computing/policy.html).

## ENDOWED CHAIRS AND PROFESSORS

Cal Poly has received generous corporate donations and grants that have created endowed chairs and professorships and helped support new faculty positions. Endowment funds support faculty research and provide opportunities for students to become involved in research. Examples include the Arthur C. Edwards Endowed Chair for Coatings Technology and Ecology, the Unocal Chair for Environmental Studies, and two Unocal Professors of Marine Science (College of Science and Mathematics); the J. G. Boswell Professorship (College of Agriculture); and a two-year grant from Lockheed Martin and funds from the Bert and Candace Forbes Endowment that provide support for three faculty members (College of Engineering).

## THE FOUNDATION

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

The Cal Poly Foundation is a separate, but closely linked auxiliary organization serving the University across several key support functions:

- Retail Operations – El Corral Bookstore, Cal Poly Downtown, Cal Poly Books, and Campus Dining
- Business Services – Sponsored Research and Grants, Conferences and Workshops
- Advancement Support – Gifts, Endowment and Trust Management Services
- Student Aid to Instruction – University Graphic Systems and Student Enterprise Projects
- Technology Transfer and Innovation – Financial Support and Administration

A Board of Directors comprising faculty, students, community leaders and university administrators oversees Foundation operations.

## HEALTH CAREERS: Preprofessional Preparation

*Health Professions Advising Center, 805 756-2615*

*[www.calpoly.edu/~cosamac/health](http://www.calpoly.edu/~cosamac/health)*

Cal Poly provides excellent preparation and resources for students interested in a career in the health professions. To find out about professional school prerequisites, internships, research opportunities, health professions experience, and other requirements, visit the Health Professions Advising Center in Bldg. 53, Room 219.

### Health Professions Peer Advising Program

*Peer Advisors, 805 756-6510*

Health professions peer advisors are upper-division students who advise students regarding health professions, including information about required coursework, gaining experience in health care, and application strategies.

### Health Professions Resource Committee

The Committee assists students, regardless of their major, in all phases of their career preparation. The Resource Committee consists of faculty and staff from the departments of Animal Science, Biological Sciences, Chemistry and Biochemistry, Food Science and Nutrition, Mathematics, Kinesiology, Health and Psychological Services, Career Services, the College of Science and Mathematics Advising Center, and the Health Professions Advising Center.

### 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. A major should be chosen on the basis of interest and as preparation for an alternate career. Professional schools are concerned with the overall quality and scope of the undergraduate work and not with the major course of study. Specific requirements vary for each professional school, so students should contact the schools directly.

### Special Programs and Services

Many special programs, events and academic courses are offered throughout the year for students interested in the health professions. To be well informed about the range of events and activities offered, Cal Poly students should sign up with the Health Professions Distribution List (contact the Health Professions office, 756-2615). Students should also purchase a copy of the *Health Professions Handbook* from El Corral Bookstore. For up-to-date information and links regarding health professions and various prerequisites, visit our website at [www.calpoly.edu/~cosamac/health](http://www.calpoly.edu/~cosamac/health).

## INTERNATIONAL EDUCATION & PROGRAMS

*International Education and Programs (IEP) Office*

*Bldg 38, Room 108, 805 756-1477; [www.calpoly.edu/~iep/](http://www.calpoly.edu/~iep/)*

The goal of International Education and Programs (IEP) is to match the student with the program best suited to meet his or her needs. Cal Poly graduates in the 21<sup>st</sup> century will be citizens of a world in which thinking and working across cultures will be a requirement for a successful

career. Many Cal Poly departments support the concept of international education and encourage students to investigate opportunities for overseas study.

Students interested in studying abroad should begin by stopping by the IEP office, Cal Poly's clearinghouse for information on all study abroad programs. An extensive resource center and library provide students with printed material and web sources on study abroad worldwide. A study abroad advisor is available for discussion.

## 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. More than 15,000 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 more than 50 recognized universities and institutions of higher education in 18 countries, the International Programs also offers a wide selection of study locales and learning environments.

Additional information about the specific programs and answers to questions regarding the application materials may be obtained from the IP Coordinator at Cal Poly (38-106). For additional information, visit [www.calstate.edu/ip](http://www.calstate.edu/ip).

### Fees

The CSU International Program 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.

### Admission

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 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 colleges. 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.

## Applications

For the academic year overseas, applications must be submitted by February 1. Australia and New Zealand are exceptions, having a deadline of May 1.

## Programs

**Australia.** Griffith University, Macquarie University, Queensland University of Technology, University of Queensland, Victoria University of Technology

**Canada.** The universities of the Province of Quebec, including: Université de Montréal, Concordia University, Université Laval, McGill University, Université du Quebec system, Bishop's University

**Chile.** Pontifica Universidad Católica de Chile (Santiago)

**China.** Peking University (Beijing)

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

**France.** Institut des Etudes Françaises pour Étudiants Étrangers, L'Académie d'Aix-Marseille (Aix-en-Provence). Universités de Paris III, IV, V, VI, VII, VIII, IX, X, XI, XII, XIII, the Institute of Oriental Languages and Civilizations, and Université Evry

**Germany.** Universität Tübingen and a number of institutions of higher education in the Federal state of Baden-Württemberg

**Israel.** Tel Aviv University, The Hebrew University of Jerusalem, University of Haifa

**Italy.** CSU Study Center (Florence), Università degli Studi di Firenze, La Accademia di Belle Arti di Firenze

**Japan.** Waseda University (Tokyo)

**Korea.** Yonsei University (Seoul)

**Mexico.** Instituto Tecnológico y de Estudios Superiores de Monterrey, Campus Querétaro

**New Zealand.** Lincoln University (Christchurch), Massey University (Palmerston North)

**Spain.** Universidad Complutense de Madrid, Universidad de Granada

**Sweden.** Uppsala Universitet

**Taiwan.** National Taiwan University (Taipei), National Tsing Hua University

**United Kingdom.** Bradford University, Bristol University, Hull University, Kingston University, Sheffield University, University of Wales, Swansea

**Zimbabwe.** University of Zimbabwe (Harare)

## Cal Poly's Exchange Programs

### Australia

Univ of Canberra ..... Landscape Arch & Architecture  
Swinburne U. of Technology ..... Business  
Univ of New South Wales ..... Architecture

### Brazil

Universidade Federal Do Rio De ..... Architecture

### Canada

Laval University ..... Agriculture  
University of Guelph ..... Landscape Architecture

### Costa Rica (Internship Exchange)

Escuela de Agricultura de la Región  
Tropical Humeda (EARTH) ..... All Majors

## Denmark

Aarhus School of Business ..... Business

Copenhagen Business School ..... Business

## France

Institute de Formation Internationale ..... Business

L'Ecole d' Architecture de Paris-Val-de-Marne ..... Architecture

## Germany

Fachhochschule München ..... Engineering

Fachhochschule Karlsruhe ..... Architecture and Engineering

## Honduras

Centro de Diseno Arquitect. Constr. .... City/Regional Plng

## India

Pune University: B.N. College of Architecture ..... Architecture

## Kenya

Farming Systems Kenya ..... Agriculture

## Korea

Korea University of Technology and Education ..... Engineering

## Norway

Agricultural University of Norway ..... Landscape Architecture

## Philippines

Mapua Institute of Technology ..... Engineering

## Sweden

Chalmers University of Technology ..... Mech Engrg, Arch

## Switzerland

HSR Hochschule für Technik,

Rapperswil ..... Landscape Arch, City and Regional Planning

## Taiwan (Republic of China)

Chaoyang University of Technology ..... Engineering

## United Kingdom

Leeds Metropolitan University ..... Landscape Architecture

## Exchange Programs in the United States

National Student Exchange (NSE) Consortium ..... All Majors

## Cal Poly Study Abroad Programs

In addition to The CSU International Programs and agreements for exchange programs, Cal Poly offers the following study programs:

### Cal Poly at Sea

Cal Poly at Sea is sponsored by Cal Poly and the California Maritime Academy. Participants live and study with cadets from CMA aboard their training ship, *The Golden Bear*. As members of the crew, students are required to participate in daily shipboard duties. During the day, Cal Poly students take course with Cal Poly professors to get Cal Poly credits toward their degree.

The charted course of the Cal Poly at Sea Cruise rotates according to a three-year cycle, each time visiting a different region of the Pacific. The Australia Cruise could include stops in Nuka Hiva, Tahiti, New Zealand, Australia; New Guinea, Fiji; and Hawaii. The South American Cruise could include stops in Mexico, Costa Rica, Panama, Cocos Island, Chile, San Felix Island, and then returns up the coast to Seattle. The Asian Cruise often visits Hawaii, the Philippines, China, Hong Kong, Vietnam, and Japan. Every participant is required to attend a weeklong safety and lifeboat-training program prior to departure at CMA in Vallejo, California, to earn his or her Merchant Mariner's Document.

### Japan Study Program

The Japan Study Program gives students an opportunity to visit Japan during the spring quarter with Cal Poly faculty and earn up to 16 units of Cal Poly credit. The program begins with three weeks of classes in Hiroshima, where students take Japanese language and participate in Japanese cultural activities. Then students spend three weeks in Kyoto, a truly unique city which masterfully combines traditional and contemporary, nature and technology. After Kyoto, students take a week's tour of Tokyo and surrounding areas. The last three weeks of the quarter are spent in the city of Iwaki, 75 miles northeast of Tokyo.

The Japan Study program provides an excellent foundation for the student who is looking for a challenging and rewarding educational experience in East Asia. Modern Japanese culture is based on traditional and more communal values, and offers American students a new perspective on our more individualistic Western values. Students have the opportunity to explore differences between Japanese and American educational, business, and family values.

### London Study Program

Since 1984, London Study has brought 2500 students and 130 faculty to live in the city that is culturally rich and historically relevant as a center of western tradition. Students and faculty alike immerse themselves in courses that use London as the laboratory for the subjects studied.

Both a fall and a spring term are available for students. A varied social and cultural program outside of the classes is built into the program. A wide selection of general education courses are offered, as well as a selected number of non-general education classes in a variety of majors are available. An optional Prague field trip is available in both terms. The terms are structured differently to meet different student needs. The spring program closely follows the fast-paced 10-week quarter timeframe. Students fly to London after winter quarter and return in time for summer quarter. For students who wish to extend their living-abroad experience, fall term is 14.5 weeks in length. The additional time allows for more travel.

### Thai Study and Internship Program

The Thai Study and Internship Program combines one quarter of study, offering a variety of courses for all majors, and an internship program for qualified seniors with U.S. corporations, the American Embassy, and universities. The program is offered during Spring Quarter and students may obtain up to 16 units of credit. Students with paid internships do coursework before entering company positions.

Thailand is an alluring country to visit. As the only Asian nation never to have been colonized or occupied by Western powers, Thailand retains a unique character and charm and offers an unusual blend of ancient culture and modern industry. Students focus on the cultural, economic, and social aspects of the area in order better to understand

and prepare for careers linked to a region that is likely to become increasingly important in the 21st century.

During the first month of study, which includes a week trip to Koh Tao Island for scuba diving lessons, students are at Silpakorn University in Bangkok. The remaining weeks are spent at First Global Community College (FGCC) in Nong Khai and Chiang Mai University in Chiang Mai.

### Affiliation Agreements

Cal Poly has a university-wide affiliation agreement with **AustraLearn: North American Center for Australian Universities** for providing direct enrollment study abroad opportunities in Australia and New Zealand. The 20 Australian and 4 New Zealand universities that are working with AustraLearn have unique academic programs with the highest standard of service. AustraLearn serves as the liaison with the host universities and Cal Poly regarding credit transfer, financial aid, and academic issues. The Australian and New Zealand universities issue the transcripts to Cal Poly. Cal Poly students receive transfer credit for pre-approved courses and are considered for AustraLearn scholarships. Cal Poly disburses financial aid to eligible students.

Cal Poly has a university-wide affiliation agreement with **Denmark's International Study Program (DIS)** that provides students from any major with the option of enrolling in any of the following academic tracks offered for a Semester or Summer program: Architecture & Design, Biology, Humanities & Social Sciences, International Business & Economics, and Medical Practice & Policy. DIS is affiliated with the University of Copenhagen and is recognized and supervised by the Danish Ministry of Education. Since 1959 DIS has provided a number of specialized academic fields, which focus on European topics and issues that are designed for upper-division undergraduate students. The classroom teaching is strongly enhanced by real-life insights through field studies, guest lectures, and study tours throughout Europe.

### INTERNATIONAL STUDENT PROGRAMS AND SERVICES

*International Education and Programs (IEP) Office  
Bldg 38, Room 108, 805 756-1477; [www.calpoly.edu/~iep/](http://www.calpoly.edu/~iep/)*

International Student Programs and Services (ISPS) offer a variety of comprehensive programs designed to assist international students as they pursue their academic goals. ISPS is committed to creating an academic environment that supports and emphasizes international and cross-cultural understanding. As advocates for international students, we liaison on behalf of international students concerns with the campus academic and administrative departments, the Bureau of Citizenship & Immigration Services (formerly known as the INS), the U.S. Department of State, local, state and federal government offices.

Individual immigration advising is available for international students to facilitate compliance with immigration regulations, maintaining visa status and timely application processing for transfer of schools, extensions, change of status and employment authorization. Cal Poly is SEVIS (Student & Exchange Visitor Information System) compliant and provides electronic updates to the Bureau of Citizenship & Immigration Services and the Department of State regarding student enrollment, change of name, address, or major, etc. as required by immigration law.

## **LIBRARY SERVICES**

*Hiram Davis, Dean, Robert E. Kennedy Library  
Bldg 35, 805 756-2598; [www.lib.calpoly.edu](http://www.lib.calpoly.edu)*

The Robert E. Kennedy Library provides a comfortable and attractive environment for study, research, and browsing. The building features an interior courtyard design, with open stack accessibility, and individual as well as group study areas. The library collection contains nearly five million bibliographic items. This includes over 650,000 volumes in the book collection; periodicals; journals; art prints; more than 1,000,000 microforms, senior projects, government documents, maps, audio visual materials, and various special collections.

One of the major activities of the library is teaching students how to locate, evaluate and apply knowledge. Individual instruction in the use of the library, and library tours for groups and individuals are available. Librarians give lectures to class groups at the request of instructors, and assist users in accessing electronic services available via the library's World Wide Web homepage. The Library also offers credit-bearing courses in the use of library materials to students.

## **Reference Department**

The Reference Department contains extensive holdings of reference materials, indexes and abstracts. The department also provides many electronic services that meet student and researcher needs. These include a wide range of electronic indexes and full text databases, the online catalog of the library's collections, and connections to a host of resources designed to facilitate research. Most of these electronic resources are available from stations throughout the library as well as remotely via the World Wide Web.

## **Government Documents and Maps**

The Library is a selective depository for United States and State of California documents. Also found in the government documents collections are the publications of the agricultural experiment stations and extension services for all the states and territories, California city and county documents, NTIS (National Technical Information Service) publications, Diablo Canyon Nuclear Power Plant documents, United Nations Official Reports on microfiche, and atlases and maps.

## **Learning Resources & Curriculum**

The Learning Resources & Curriculum Department (LR&C) works closely with the University Center for Teacher Education, county schoolteachers, and home schoolers to provide K-12 resources, and is home to the Learning Resources Display Center, #31, for the California State Department of Education.

Among its diverse collections are juvenile books, teacher's resource guides, curriculum guides, textbooks, study and fine art prints and multimedia. Its multimedia/computer lab provides a variety of equipment for students, faculty and staff. An adaptive computer station provides additional access to the collection and electronic resources.

## **Special Collections and University Archives**

This department offers more than 100 unique research collections on topics ranging from architecture to the early history of television. Many formats of rare materials are found in these collections, including manuscripts, correspondence, business records, architectural drawings, photographs and negatives, and audio and videotape. Collections accepted must relate to the University's curriculum.

Collection strengths include architectural records and drawings, fine printing and graphic arts, and local and California history. The University Archives houses materials that document the history, growth and development of the University. These materials include campus records, publications, photographs, plans, blueprints, and ephemera dating from the founding of the University in 1901 to the present.

## **Interlibrary Loan and Document Delivery**

Materials that are not available in the Library's collections can be requested electronically through the website at [www.lib.calpoly.edu/research/ill/electronic\\_service.html](http://www.lib.calpoly.edu/research/ill/electronic_service.html). These items may be obtained from one of the 23 CSU libraries, the University of California libraries, or from other cooperating libraries throughout the United States and the world.

The Library is committed to providing the campus community with access to the latest information technologies both within and beyond the walls of the library. Inside, patrons will find Polycat (the online catalog), computer workstations and printers, and network connections so laptops may access the Internet. Research can be done via the Web where Polycat, electronic journals and full text databases are accessed at [www.lib.calpoly.edu/research/all\\_databases/index.html](http://www.lib.calpoly.edu/research/all_databases/index.html)

## **PERFORMING ARTS CENTER**

### **San Luis Obispo**

*Ticket hotline: 805 756-2787,*

*Toll-free in California: 888 233-2787*

*Administrative office: 805 756-7222; [www.pacslo.org/](http://www.pacslo.org/)*

The Christopher Cohan Center is the result of a partnership and cooperation between Cal Poly, the City of San Luis Obispo, and the community's Foundation for the Performing Arts Center. Located on the campus, it features three performance venues: Sidney J. Harman Hall, Philips

Electronics Recital Hall, and the Pavilion. The Cohan Center and the 500-seat Cal Poly Theatre comprise the Performing Arts Center San Luis Obispo. The Center accommodates all types of cultural events, from student and local performances to major touring artists, including the annual Mozart Festival in late July and early August.

## **PREFACE: Cal Poly's Shared Reading Program**

*Patricia Ponce, Director*  
805 756-5932

PREFACE provides students the opportunity to read and discuss a meaningful book at the university level without the formal course structure (no grades). New students and others interested will read the book selection over the summer. In the fall, they will join small group discussions and share a common intellectual experience. Campus-wide activities related to the book, such as a visit by the author, lectures and movie screening, continue over the course of an academic year. Faculty, staff, administrators, and honor students volunteer their time to lead the discussion groups.

## **RESEARCH AND PROJECT INVOLVEMENT**

*Susan Opava, Dean, Research and Graduate Programs*  
Bldg. 38, Room 154, 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 who have ongoing projects, to explore becoming part of the project team.

## **UNIVERSITY ADVANCEMENT**

*Administration Bldg. (01), Room 413; 805 756-1445*

Donations from alumni and friends provide the "margin of excellence" for the University. Gifts from alumni, parents of students, faculty, staff, corporations, businesses, and foundations enhance ongoing programs, support scholarships, improve the learning environment and supplement state funds to maintain Cal Poly's margin of excellence.

Gifts can come to the University in many ways: major gifts, annual gifts, planned gifts (which often benefit donors during their lifetimes), endowments, equipment or other in-kind donations, scholarships, and partnerships between the University and corporations and foundations.

Donations can either be restricted to a particular college or program or be given without restrictions to be used where the need is greatest. Non-academic programs such as athletics and the campus library also benefit greatly from donors' generosity.

## **UNIVERSITY HONORS PROGRAM**

*Robert E. Kennedy Library, Bldg. 35, Room 207*  
805 756-7029; [www.honors.calpoly.edu](http://www.honors.calpoly.edu)

The University Honors Program provides our most academically motivated students with the opportunity to develop their potential by fully exploring the resources at Cal Poly. Intellectual creativity and exploration are the hallmarks of the program. In particular, it builds relationships between all colleges on campus and seeks to educate students in the connections between the disciplines, from engineering to English, agriculture to art, and business to biology.

Honors students have the opportunity to enjoy a varied educational experience, including courses in specially designed honors seminars, as well as learning experiences outside the classroom. Following Cal Poly's distinctive "hands-on" approach to education, students will participate in community projects and co-curricular activities to enhance their coursework. Students are required to take two honors courses per year and are taught in a seminar format affording close interaction between faculty and students. Courses are enriched with the interdisciplinary nature of knowledge, and instruction will move at a pace appropriate for highly motivated students. Analytical and interpretive study is encouraged and communication skills, written and oral, are developed. All courses fulfill graduation requirements.

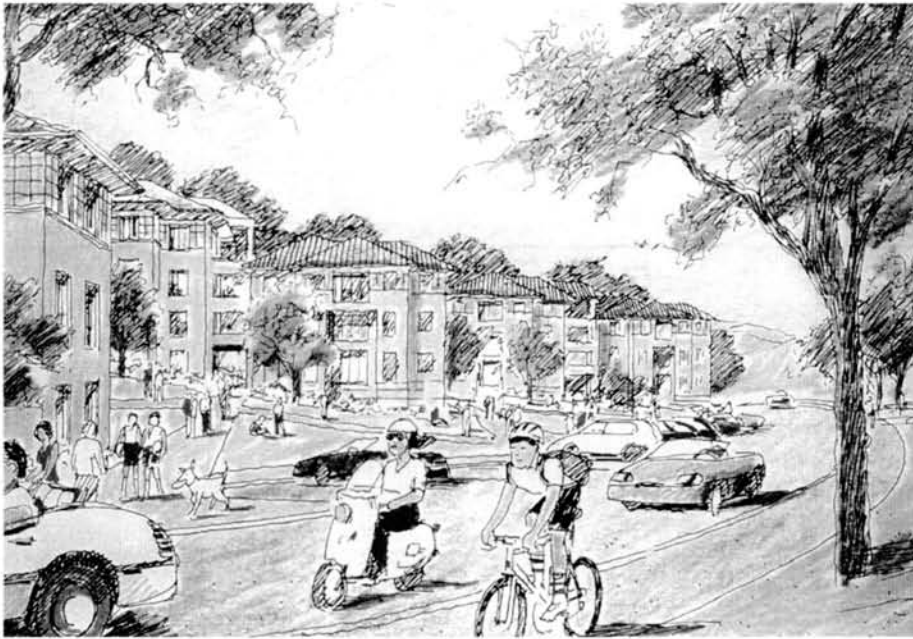
## **UNIVERSITY POLICE**

*Building 74, 805 756-2281, [www.afd.calpoly.edu/Police/](http://www.afd.calpoly.edu/Police/)*

The University Police Department offers safety and security services to the Cal Poly population.

In an **emergency**, dial **9 1 1** to reach University Police's Emergency Line. White campus phones are available in every Residence Hall and other campus facilities, and blue light emergency phones are also available for emergency calls. A star on campus maps marks blue light emergency phone locations available at the University Police Department. A button on the face of the emergency phone links the call to University Police's Emergency line. Activating the button establishes a direct telephone line to University Police dispatch for emergency information purposes. After activation, a police vehicle is immediately dispatched to the emergency phone location.

In **non-emergency** situations, use the University Police main line, 756-2281. This line is also for the campus Escort Service, a Cal Poly Police Community Service Officer Program. Escort service is offered daily from campus locations to off campus sites within one-half mile. Escort Service hours are available at the University Police Department.



The Cerro Vista Apartment complex consists of 201 apartment units located on a six-acre hillside at the intersection of Poly Canyon Road and Klamath Road. Each unit is 960 square feet and has four single-occupancy bedrooms, two bath suites, and a shared kitchen and living room. Bedrooms measure approximately 10' X 12' and are furnished with a desk, desk chair, bed, mattress, dresser and wardrobe.

Each apartment unit comes fully furnished with built in appliances (microwave oven, oven/range, garbage disposal, and refrigerator) and high speed Internet access in each bedroom. The common areas are furnished with a dining table, four chairs, two lounge chairs, a love seat, a coffee table, and two end tables. All 201 apartments are fully ADA adaptable and 14 of these apartments are fully ADA accessible.

The educational program focus of the complex will be geared toward second year "Student Success." Community programs will be offered with the goals of assisting students in making positive progress toward degree and to improving University retention rates of second year students in particular.

A commons building adjacent to the apartments is approximately 5000 sq. ft. and provides lounge space for community programs and activities, central mailbox area and office space for administrative and programmatic staff.

Cerro Vista is Spanish for "hill view" and individual sections of the new complex are named after the following San Luis Obispo sister peaks: Morro, Cabrillo, Hollister, Romauldo, Bishop and Islay.

## **New Student Housing-- Opening Fall 2003 Cerro Vista Apartments**



*Photo courtesy of Kay Jensen. Artist's rendering by Fisher-Friedman Associates, project architect.*

*Student  
Affairs*

# Student Affairs

Office of the Vice President for Student Affairs  
Administration Building (01) Room 209  
805 756-1521

The Office of the Vice President for Student Affairs oversees a division that provides services, leadership training, and learning experiences for all Cal Poly students. Through advocacy, program development, and serving as a liaison to student organizations on behalf of the University, Student Affairs is the key link to student life on campus. Dedicated to student learning, Student Affairs staff mentor students, encourage personal development, and support important initiatives to enhance retention and matriculation of students.

## Mission Statement

The mission of the Student Affairs Division is to advance and encourage the learning and personal development of students. Together with the University, the Student Affairs Division is committed to the principle of integrating Student Affairs programs and services into the student's total learning environment, in and out of the classroom, and fostering within each student respect and responsibility for self and members of the greater community.

Delivery of programs and services will be influenced by an ongoing assessment of student needs, the campus climate and established outcomes. It will be guided by:

- The scholastic achievements of our students;
- The residential nature of our campus;
- The high staff/faculty-to-student ratio of our departments;
- The selective standards of our admissions, which draw students from around the state; and
- The learn-by-doing focus of our curricular and co-curricular activities.

The mission will be carried out through teaching and personal instruction, advisement and counseling, community service learning, internships and experiential education, organized programming, and services. The mission is achieved through the following programs and services:

- Associated Students, Inc.
- Career Services
- Disability Resource Center
- Health and Counseling Services
- Housing and Residential Life
- Judicial Affairs
- Parent Program
- Student Academic Services
- Student Life and Leadership
- Testing Services

## ASSOCIATED STUDENTS, INC. (ASI)

University Union (65), Room 212, 805 756-1281

### Mission Statement

The mission of Associated Students, Inc. is to enrich the quality of student life and to complement the educational mission of Cal Poly through shared governance, student employment, student advocacy and a variety of diverse programs and services. Through the administration of the Julian A. McPhee University Union, Orfalea Family and ASI Children's Center, Recreation Center and Cal Poly Sports Complex facilities, ASI offers a broad spectrum of programming, services and opportunities for leadership and social interaction.

### Vision Statement

Associated Students, Inc., entrusted with the day-to-day oversight of the McPhee University Union, Orfalea Family and ASI Children's Center, Recreation Center and Cal Poly Sports Complex facilities, is owned and governed by Cal Poly students and strives to be a model auxiliary within the CSU system by developing and implementing effective policies and procedures to support student-centered programs and services. As a learning organization committed to the personal and academic advancement of the Cal Poly student, ASI programs and services will continuously improve based on student development philosophy, student input and quality assessment.

### ASI Student Government

University Union (65), Room 202,  
805 756-1291

Leadership opportunities are open to all interested students. These range from the elected College Council representatives who form the Board of Directors, to appointed positions on the University Union Advisory Board and the ASI Executive Staff. ASI student leaders represent the student body on community, campus and regional committees.

Four student officers guide the organization: ASI President, Chair of the Board, Executive Vice President, and Chair of the University Union Advisory Board. These officers and the Board of Directors are the recognized representatives of Cal Poly students. These positions are elected/appointed in spring quarter.

The Board of Directors oversees the policy development of ASI, a \$9 million nonprofit corporation. ASI collects

quarterly fees, commercial revenue and grants, which support a wide range of campus clubs as well as student programs and services.

## **PROGRAMS AND SERVICES OF ASI**

ASI operates a wide variety of programs and services in four facilities, the Julian A. McPhee University Union, Orfalea Family and ASI Children's Center, Recreation Center, and the Cal Poly Sports Complex.

### **ASI Business Office**

*University Union (65), Room 212  
805 756-1281*

The ASI Business Office provides internal business services to all ASI programs and services, including administrative support, fiscal services, human resources, graphics services, information technology and public relations and marketing.

### **JULIAN A. MCPHEE UNIVERSITY UNION (UU)**

**Information Desk:** *Second FloorLobby, University Union (65), 805 756-1154 (Voice or TDD)*

The Julian A. McPhee University Union is a central place for students, faculty, staff, alumni and guests to meet, relax and exchange ideas. Facilities include: UU Epicenter, Bishop's Lounge for television viewing, conference rooms, club programs and services, UU Gallery, ASI Events, Poly Escapes, ASI Craft Center, McPhees' Games Area, BackStage Pizza, Julian's, PostNet®, Insomniac U, SESLOC Credit Union, Student Community Services, Multicultural Center, Women's Center, ASI Student Government Office, Chumash Auditorium and UU Reservations.

### **Epicenter**

*University Union (65), Room 203, 805 756-5807*

The UU Epicenter is students' one-stop shop for "Events, Programs and Ideas." Students can obtain information, materials and resources on the following programs and services: ASI Events, Cal Poly Rose Float, ASI Craft Center, UU Gallery, Club Programs and Services, and Poly Escapes.

Cal Poly clubs also have access to a workspace with computers and printers, club mailboxes, club registration, leadership workshops and club advisor training.

### **Cal Poly Clubs**

There are more than 350 active clubs and organizations affording students the opportunity to become active in campus life. Clubs vary from academic-related and professional organizations, to hobby-interest clubs, honor societies, service clubs, sororities and fraternities, residential groups, multicultural organizations, and spiritually based groups.

A complete list of all clubs on campus, meeting dates, locations and contact information can be found on the ASI website at [www.asi.calpoly.edu/clubservices/](http://www.asi.calpoly.edu/clubservices/).

ASI fees directly support events sponsored by clubs and organizations including programs in partnership with the University: Cal Poly Leads, Retention and Outreach, Homecoming, the Multicultural Center, Open House and Student Community Services.

### **ASI Events**

*University Union (65), Room 203  
805-756-1112*

ASI Events provides on-campus entertainment programming in five different program areas: UU Gallery, concerts, event series, UU Hour and special events. These programs, in addition to our multicultural events and celebrations, comedy, artistic expression, education programs and speaker forums on social issues, have been identified to meet the diverse needs of a comprehensive university.

### **UU Gallery**

*University Union (65), Room 203, 805 756-5807*

Formerly Club 221, the UU Gallery is located in the Epicenter and is designed to give students opportunities to showcase student artwork with exhibits including painting, photography, sculpting and more.

### **ASI Craft Center**

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

The ASI Craft Center offers a wide variety of fun, non-academically related craft classes and workshops. The facility includes a black and white photo darkroom, ceramics area, bike repair room, woodworking power tools, glass bead making lab, poster making tables with pens and paper, library loft and lounge, and a retail store.

### **Poly Escapes and the Escape Route**

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

ASI's Poly Escapes is Cal Poly's student volunteer outdoor adventure program housed at the Escape Route in the University Union. Poly Escapes invites students to join the fun on the many exciting trips offered year round. A listing of trips planned can be found daily at the Escape Route. To aid in planning an adventure, Poly Escapes representatives are available for assistance, and the Escape Route serves as a resource center equipped with an extensive library of outdoor information including videos, topographic maps, and books. Resources on snow camping, bicycle touring, backpacking, canoeing, rock climbing and other activities are available. Students may also rent equipment such as tents, sleeping bags, backpacks, cross country skis and ice cream makers at reasonable prices. Located outside the Escape Route is a new climbing wall.

### **McPhee's Games Area**

*University Union (65), Room 118, 805 756-5523*

The facility offers 10 bowling lanes with automatic scoring, a large video arcade, and eight full-sized billiard tables. Physical education bowling classes are offered quarterly. The Games Area also houses a full-service Pro Shop where

all bowling equipment is expertly fitted and drilled on the premises.

### **Cal Poly Rose Float**

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

One of the most exciting activities on the Cal Poly campus is building the annual Rose Parade Float. Since 1949, a successful team effort between the San Luis Obispo and Pomona Cal Poly campuses has produced floats annually. For more than fifty consecutive years, students from all academic majors have enjoyed the thrill of watching a float that they designed, built and decorated make its way down Colorado Boulevard on New Year's Day in the Tournament of Roses Parade.

Not only is the Cal Poly float a one-of-a-kind building venture for college students, but it is also an opportunity for students to develop new innovations such as computer controlled animation, use of hydraulics systems for movement, and more. The partnership built with the counterpart students of the Pomona campus continues to be an invaluable experience for everyone involved.

### **ASI CHILDREN'S PROGRAMS**

*Orfalea Family and ASI Children's Center (133), 805 756-1267*

The Orfalea Family and ASI Children's Center is a nationally accredited program providing quality childcare services to children from 4 months to 6 years old. As an ASI sponsored program, student parents are given first priority for enrollment. Subsidized childcare is available for low-income student parents.

ASI Children's Programs is based on the belief that young children thrive in an environment that promotes understanding of themselves, others and the world around them. Teachers focus on facilitating children's development in the social-emotional, cognitive and physical domains. Activities are designed to meet the children's individual and age-appropriate needs. With the understanding that children learn through play, caregivers encourage them to explore, discover and have fun. Emphasis is placed on teaching children how to problem solve and make appropriate choices, while learning to interact within a group setting.

### **ASI RECREATIONAL SPORTS**

*Recreational Sports (43), 805 756-1366*

ASI Recreational Sports offers opportunities for all students to participate in intramural sports, collegiate sport clubs, fitness and instructional classes, informal recreation and special events.

Registered Cal Poly students have free access to the Recreation Center, which is open seven days a week when classes are in session. Facilities include 2 sand volleyball courts, a 7000-square-foot weight room, 9 racquetball courts, a 20-lane swimming pool and 4 indoor basketball courts.

The Recreational Sports Program employs more than 150 students each year.

### **Programs include:**

**Informal Recreation** provides non-structured opportunities to participate in a variety of activities such as table tennis, cardiovascular exercise, life cycles, step-climbers, 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. Some of the sports offered include: volleyball, basketball, soccer, inner tube water polo and ultimate Frisbee.

**Collegiate Sport Program** offers a unique combination of athletic competition and leadership development opportunities. Members compete against clubs from other universities, improve their skills through instruction and develop leadership skills through the management of their organization. Students of all skill levels are welcome.

**Formatted Fitness and Instructional** programs are designed for individuals to acquire new skills and participate in personal fitness programs in a relaxed and enjoyable setting. A few of the programs offered include an extensive aerobic schedule, massage, martial arts and belly dancing.

**Aquatics** programs are designed for all levels of swimmers ranging from beginning to masters swim classes. There is also a one-day swim stroke analysis class in which students receive a videotape and a water workout (aerobics).

### **Chumash Challenge**

*University Union (65), Room 212, 805 756-2628*

Chumash Challenge is one of the most unique and popular programs available through ASI. Since 1980, the program has offered exciting, unique, high-quality team building and personal empowerment workshops to the campus community. Workshops are offered seven days a week, with a capacity for more than 100 participants at a time. One-hour tours are also available. For students who wish to learn state-of-the-art experiential teaching techniques and/or are interested in employment, facilitator training classes are offered once every quarter.

### **CAREER SERVICES**

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

[www.careerservices.calpoly.edu](http://www.careerservices.calpoly.edu)

This centralized service is available to all students and alumni of the University. In conjunction with the six academic colleges and the University Center for Teacher Education, Career Services assists students with exploring career options, including graduate study and employment opportunities.

## Career Counseling

Through individual appointments and group workshops, students are guided through the exploration and formation of personal career plans. Students who are considering a change of major are particularly encouraged to utilize Career Services so that they may become better informed about career options. With the assistance of department staff, students may take advantage of interest inventories; utilize computerized career guidance systems, review current literature on career profiles, trends and work environments; attend career fairs, employer/industry information sessions, and graduate and professional school events. All events offer the opportunity to meet informally with representatives of companies and graduate programs, many of whom are Cal Poly alums.

## Student Employment

On-campus and off-campus, part-time and summer employment opportunities are available to all currently enrolled students. (Alumni and students taking a quarter off are also eligible.)

Part-time, local positions, both on campus and off, are posted in the office and are filled on a first-come, first-served basis.

A special effort is made to inform students of career-related part-time or seasonal employment. Summer, co-op, and seasonal positions throughout the United States are posted in the Student Employment Office and on Career Services' homepage. 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 a joint partnership between employers, Career Services and Cal Poly's academic programs. Students are able to secure professional level work experience related to their major, obtain professional contacts in industry, affirm career goals, obtain marketable skills, develop self-confidence, and integrate what is learned in the classroom within the world of work. Co-op assignments are primarily full-time paid positions, three to six months in duration, offered to junior and senior level students. Students earn academic credit for their participation.

## Career Employment and Graduate School Services

Through workshops and individual advisement, students are guided through the job search or graduate school application process, which includes clarifying the career objectives; identifying, researching and contacting potential employers and graduate programs; preparing resumes and personal statements; and preparing for interviews.

Employer contacts may be generated through the on-campus interview program, on-line job listings on the Career Services homepage, career symposiums 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 status of Cal Poly graduates, salary offer and trend information, an alumni network file, and student work stations allowing internet research and computer-assisted career exploration programs.

## DISABILITY RESOURCE CENTER

*Student Services (124), Room 119,  
805 756-1395, voice or tty*

Cal Poly is committed to providing qualified students with disabilities equal access to all University courses and programs. The Disability Resource Center (DRC) provides information and supportive services to students who have permanent or temporary disabilities.

Students wishing to utilize DRC services must provide documentation of their disabling condition *prior to the utilization of services.*

Disability-related support services may include disability management advising, accommodated testing, notetaking services, sign language interpreting, Braille and other alternate-text materials, taped textbooks, on-campus transportation and access to adaptive technology.

## HEALTH AND COUNSELING SERVICES

*Student Health Center (27), 805 756-1211*

The goal of Health and Counseling Services is to support the physical and psychological well-being of all students attending Cal Poly. A variety of services are offered for students including outpatient care, individual counseling, a pharmacy, and health education programs. Health and Counseling Services assist students by minimizing class time lost due to illness, injury, or stress of academic life.

## Health Services

*Student Health Center (27), 805 756-2511*

The following services are available to all students as part of the health services fee:

- **Outpatient medical services** are available, year-round, Monday through Friday, 8:00 a.m. to 4:30 p.m. except Wednesday, 9:00 a.m. to 4:30 p.m., and includes primary physician and nursing services, men's/women's health care, laboratory and routine x-ray procedures.
- **Health education** programs on nutrition, Educational Resources On Sexuality (EROS), and Thoughtful Lifestyle Choices (TLC) are provided by staff professionals and students trained as peer health educators. Programs include nutrition counseling, alcohol and drug awareness, sexuality and lifestyle wellness.

- **Additional health 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, orthopedic supplies and optometry.

**Major medical insurance** coverage for off-campus services is strongly recommended. Students are encouraged to have their own coverage for major medical, surgical and emergency expenses.

### Counseling Services

*Student Health Center (27), 805 756-2511*

Counseling Services offers individual and group counseling, crisis intervention, education and outreach, and internship training. The staff are available to assist with the normal adjustments of academic and social life, and such issues as confidence and self-esteem, stress management, anxiety and depression, body image and sexuality, as well as more serious personal concerns.

### HOUSING AND RESIDENTIAL LIFE

*Housing Office (29), 805 756-1226*

Living on-campus can be a unique and rewarding experience. For the majority of all entering first-year students, it is the first experience in a community living environment. Learning in the classroom is extended into the residence halls through educational programming, recreational activities, the First Year Connection and the Living/Learning Programs.

Returning students and new transfers have an opportunity to live in the North Mountain community or the new Cerro Vista apartments (opening Fall 2003). These communities have an emphasis that provides programmatic support with the goal of retention and academic success.

All students participate in a variety of social interactions and share the same community with diverse groups of individuals. Residents are provided with an environment that educates, challenges and supports their personal and academic development. Activities are coordinated by the residents and the hall staff. Most students make lifelong friends while residing on campus.

### Staff

Activities are administered by full-time professionals, Coordinators of Student Development, who 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 typically upper-division students who understand the challenges faced by new students and try to make living on campus a positive and memorable experience. The RAs are trained in advising, event planning, and crisis intervention to assist students through their first year.

### Residential Life Programs

#### First Year Connection

First Year Connection Residence Halls offer programs that support student transition into the residence hall community and University. This program is designed to provide incoming students with the information, resources and support needed to be personally and academically successful at Cal Poly. Participating students have the opportunity to get involved with leadership, community service and social activities in the halls.

#### Living/Learning Halls

Living/Learning Residence Halls are centered around Cal Poly's academic colleges. Faculty, administrators, and alumni 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 and events relating to the student's major and career planning. The "Honors Program" and "Respect House" are two special interest communities that are housed within the First Year Connection Program.

#### North Mountain Hall Community

This is a suite style community with larger rooms, located in a park-like setting which allows students to continue their on-campus experience for a second year. Programmatic support features academic success and retention themes.

#### Apartment Style Living

The Cerro Vista on-campus apartment complex is scheduled to open Fall 2003. These apartments are offered to returning residents through a lottery process. Student programming will support retention and academic success.

#### Community Involvement

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. Networks in student community services, recreational sports and multicultural issues provide additional opportunities for student involvement.

#### ResNet

All on-campus residence hall rooms have access to the Cal Poly Network and the Internet. Cal Poly ResNet is the residence hall networking project that provides dedicated high-speed network connections 24 hours a day. The Housing Computing Office provides this and other computing support programs for on-campus residents.

#### Applying for On-Campus Housing

<http://housing.calpoly.edu>

Cal Poly's on-campus housing allows the resident convenient access to classes, campus services and events.

Information about the on-campus housing program and timeline to apply can be found at our web site. Housing is offered to university-admitted students; however, spaces are limited. On-campus housing is secured on a first-come/first-served payment basis. Conditionally admitted students submit a housing application through the Housing website, printing the Housing License Agreement, and mailing it with payment to Cal Poly.

### **Living Expenses for Students in Campus Residence Halls and Apartments (Subject to Change)**

All Housing fees are payable in advance. Installment plans are available. All fees listed below reflect 2002-03 prices and are subject to change:

Residence Hall Rooms – Double Occupancy (academic year license) .....	\$4,058
Residence Hall Meal Plan (mandatory) .....	\$3,048
Apartments – Private Rooms (academic year license) .....	\$575/month

### **Off-Campus Housing Resources**

(805) 756-5700 and <http://housing.calpoly.edu>

The Housing Office maintains off-campus rental information of houses, apartments and an extensive list of private and shared rooms. If you wish to explore off-campus housing options, information is available twenty-four hours a day at our Web site. The University does not inspect, approve or disapprove of any housing offered through these rental resources.

### **JUDICIAL AFFAIRS**

Administration Building (01), Room 217, 805 756-2794  
[www.calpoly.edu/~saffairs/csrja/](http://www.calpoly.edu/~saffairs/csrja/)

The Office of Judicial Affairs administers the CSU student disciplinary process at Cal Poly. Judicial Affairs is responsible for ensuring a fair and impartial disciplinary process for students referred for allegedly violating the Student Code of Conduct, and providing for a safe and comfortable campus environment. Judicial Affairs addresses student behavioral problems, whenever possible, in a developmental and educational manner, to facilitate and encourage respect for the campus community, and to provide learning experiences for students who participate in the judicial process. Most cases are resolved in ways that seek to foster the ethical development and personal integrity of students.

### **PARENT PROGRAM**

Administration Building (01), Room 209, 805 756-6700

Behind every student is a caring parent, family member, or supporter. The Cal Poly Parent Program has a number of services and ways to help parents and families support their student's success and become involved. We provide:

### **Answers and Advice**

- Call our Parent Helpline at (805) 756-6700
- E-mail us at [calpolyparent@calpoly.edu](mailto:calpolyparent@calpoly.edu)
- Ask us to mail you a *Parent Handbook*
- Look for the *Parent Connection* newsletters in fall and spring

### **Resources and Information**

- Visit our web site at [www.parent.calpoly.edu](http://www.parent.calpoly.edu)
- Sign-up online to receive monthly e-communications
- Ask us to connect you with another Cal Poly parent

### **Reasons to Visit**

- WOW Parent Orientation Weekend
- Parents' Day
- Open House

### **Ways To Be Involved**

- Represent the parent voice as a Parent Advisory Council member
- Host and orient other parents at campus events
- Coordinate monthly parent e-communications
- Provide internships for Cal Poly students
- Support Cal Poly's programs with a gift to a program of your choosing

## **STUDENT ACADEMIC SERVICES**

Hillcrest (81), 805 756-2301

Student Academic Services (SAS) is a department which combines comprehensive programs offering transition and retention services to support academic excellence. These services include academic and personal advising, admissions and transition services, new student first year seminars, learning labs and study group assistance. Academic advisors work with each of the six colleges to provide academic and personal advising assistance to students with class scheduling, diagnosis of academic skills, graduation planning, career clarification and related learning and study skills.

Supplemental instruction, math workshops, and study groups are available for key content courses in first- and second-year curricula.

An additional emphasis of SAS is to offer support to students from backgrounds that have been traditionally underrepresented in the California State University System. The goal of SAS is to ensure that all students have equal opportunity to achieve academic success and graduation. Student Academic Services incorporates the following:

### **Academic Skills Center**

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

The Center offers a wide variety of retention programs and campus support services including study skills seminars, an ELM preparation course, math workshops, supplemental instruction, study sessions and tutor referral services.

**College Bound***Hillcrest (81), 805 756-2301*

The purpose of the program is to motivate and assist in the preparation of students from low-income, first generation college families for application and entrance to Cal Poly or another post-secondary institution of their choice. The program offers various educational outreach strategies to 8<sup>th</sup>-12<sup>th</sup> grade students.

**Connections for Academic Success (CAS)***University Union (65), Room 217A, 805-756-6774*

The mission of Connections for Academic Success is two-fold: to help increase the retention of new students by providing services in support of their academic success, and, through outreach efforts, provide educationally and/or economically disadvantaged students with information about Cal Poly and support their preparation for admission. The Center provides academic advising and/or referrals to other advising resources; assistance with obtaining tutoring and study session contacts; assisting students with identifying and overcoming obstacles to their academic success; and connecting students with other campus resources.

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

The Program provides admissions and academic support service programs for low-income, historically disadvantaged students. EOP offers academic and personal advising, study groups services, academic orientation courses, career and post-graduate advising, and referrals to campus resources.

**Educational Talent Search (ETS)***Hillcrest (81), 805 756-2301*

Educational Talent Search is a federally funded program designed to assist participants in reaching their academic potential. Cal Poly's program assists middle and high school students who meet federal low-income guidelines and may be the first in their family to attend college. The services of ETS support those offered through guidance offices at selected campuses in San Luis Obispo and Santa Barbara Counties on the Central Coast of California. While the staff is employed at Cal Poly, San Luis Obispo, the program is not used as a recruitment tool for the University; participants receive assistance in applying to any college, university or other qualified post-secondary institution..

**Student Support Services (SSS)***Student Services (124), Room 119, 805 756-1395*

This federally-funded program's purpose is to provide support services to low-income, first-generation or disabled college students to enhance their academic skills, increase their retention and graduation rates, and facilitate their entrance into graduate and professional school programs.

**Summer Institute***Hillcrest (81), 805 756-2301*

The Institute is an academic scholars program held annually at Cal Poly. Selected newly admitted freshman students have the opportunity to participate in this five-week residential program geared at helping make a successful transition from high school to the more rigorous environment of higher education.

**Upward Bound***Hillcrest (81), 805 756-2301*

A federally-funded program which provides a college preparatory program for low-income and/or potential first-generation college students. This program motivates and academically prepares local high school students for college. The academic program and residential summer school session at Cal Poly offers tutoring, career advisement, supplemental instruction, as well as cultural and recreational activities.

**STUDENT LIFE AND LEADERSHIP***University Union (65), Room 217, 805 756-2476*

The mission of Student Life is to advance and encourage the learning and personal development of students as related to their ability to be effective leaders and members of task-oriented groups. This mission is achieved through a myriad of programs and services.

**Community Service Programs**

Cal Poly's Center for Community Volunteerism and Service Learning represents the University's commitment to education for civic responsibility and leadership. The Center is dedicated to helping each individual student, as well as student clubs, to find meaningful and satisfying service experiences through both volunteer service and service related to academic classes.

**Volunteer service** programs include Student Community Services, Circle K Club, and Alpha Phi Omega, a coed national service fraternity. Over the years of their existence, they have served thousands of children, homeless individuals, and senior citizens, as well as taken on environmental clean-up projects. The **academically related service** program is called "Class and Community Connections." This program strives to demonstrate that integrating community involvement with classroom discourse enhances learning.

If one of these two programs does not meet a student interest, the Community Connection database of 300 community requests for help is a helpful tool. Students can search the database according to the clientele to be served or they can review a calendar of annual service events.

Cal Poly recognizes records of outstanding service in three ways. Students can have their service hours noted on their official university transcripts. Each year, the University

president presents the President's Award for Outstanding Service to an individual student and a student club. Also annually, each college presents a "Senior Recognition Award for Service to the Community" to a graduating senior who has been very involved in service.

### **Greek Organizations**

There are thirty-three fraternities, sororities, and cultural Greek organizations affiliated with Cal Poly. Many of the social sororities and fraternities own or lease housing near the campus. Some provide lodging and meals for their members and pledges. Students interested in seeking affiliation with a fraternity or sorority are welcome to contact this office for more information.

### **Leadership Program**

Cal Poly Leadership Education and Development for Students (Cal Poly LEADS) is a multidisciplinary program that offers education and training for all students. Leadership training can be an important asset to students in their future careers, organizational work, and community groups. Students can choose to earn a certification in leadership training by completing specific coursework, participating in experiential activities, attending workshops on an array of leadership skills, and being involved in a community service project. Students may also elect to simply attend workshops and seminars in order to enhance specific skills. All students, whatever their motivation, are welcome. The LEADS staff members are also available on a consultative basis for organizations and individuals. Staff members are committed to developing the leadership potential of everyone in the university community.

### **Multicultural Center**

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

The mission of the Multicultural Center (MCC) is to promote an environment where diversity is respected, celebrated, and alliances are built regardless of ethnic/racial membership or sexual orientation. The mission serves to complement the University's philosophy that affirms all students' identities which enhances the quality of university life for all students. The Center's mission prepares all students to become culturally competent citizens in a global society.

### **Pride Alliance: The Lesbian Gay Bisexual Transgender (LGBT) Center**

The LGBT Center is a resource center for the entire campus community. Its mission is to provide programming, networking and resources that will raise awareness and educate students of diverse backgrounds about lesbian, gay, bisexual, transgender and related issues.

### **Reentry Program**

New Directions is a formal orientation program for reentry students that is offered in conjunction with the Week of Welcome. In addition, there is a reentry club, drop-in advisement and referral service.

### **SAFER Program**

The SAFER (Sexual Assault-Free Environment Resources) Program is housed in the Cal Poly Women's Center.

SAFER seeks to promote education regarding community standards of behavior, decrease the number of incidents of sexual assault, increase the likelihood that these crimes will be reported when they occur, and provide immediate and comprehensive response options to those in need. SAFER trains students, staff and faculty in the Real Men/Real Women educational program and coordinates the annual Take Back the Night and REMEMBER week events.

### **Special Events**

The annual University Open House program provides an opportunity for prospective Cal Poly students to spend time on campus in a structured, educationally focused format of programs and activities.

### **Week of Welcome**

WOW stands for Week of Welcome – Cal Poly's unique orientation program. The program is coordinated by staff 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, and includes programs for re-entry students. The WOW experience is designed to assist new students with successful academic, social and emotional transition to university life.

### **Women's Programs and Services**

*University Union (65), Room 217, 805 756-2600*

The mission of Women's Programs and Services is to create and sustain a university environment that promotes the personal, educational and professional growth of women. Students, faculty and staff work together in The Women's Center to create activities and programs which highlight women's achievements and concerns. Such campus-wide programs include: Take Back the Night, Women's History, and varied conferences on political issues. Most programs are planned and produced in collaboration with diverse campus and community groups.

### **TESTING SERVICES**

*Student Services (124), Room 121, 805 756-1551*

Testing Services administers standardized tests of admission, proficiency, and certification, such as the California Subject Examination for Teachers, Law School Admissions Test, and Medical College Admissions Test, and coordinates the administration of the CSU English Placement (EPT) and Entry Level Math (ELM) test programs. In addition, Testing Services operates an ETS Computer-Based Testing center that offers such tests as the GRE, GMAT and TOEFL.

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# *Intercollegiate Athletics Department*

*Mott Gym/Physical Education Bldg. (42), Room 207  
(805) 756-2923*

*Athletic Advising: (805) 756-7036*

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## **John McCutcheon, Director**

Lisa Boyer  
Hugh Bream  
Scott Cartwright  
Alison Cone  
Lennis Cowell  
Terry Crawford  
Alex Crozier  
Richard Ellerson  
Rich Firman

Wolfgang Gartner  
Trevor Kronemann  
Mike LaPlante  
Larry Lee  
Faith Mimnaugh  
Tom Moos  
Markel Quarles  
Steve Schlick  
Phil Webb

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 Kinesiology Department.

All the teams compete at the NCAA Division I level. The football program competes as an NCAA Division 1-AA Independent, and wrestling competes in the PAC 10 Conference. The balance of the women's and men's programs are in the Big West Conference.

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

*Admissions*

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# Undergraduate Admissions

Office of Admissions and Recruitment  
Administration Building (01), Room 206  
(805) 756-2311 Fax: (805) 756-5400

[http://www.calpoly.edu/\\_admiss/](http://www.calpoly.edu/_admiss/)  
Tours/Admission Advising Sessions: 756-5734  
email: [admissions@calpoly.edu](mailto:admissions@calpoly.edu)

## ADMISSION REQUIREMENTS

### Cal Poly's Admission Requirements

Since Cal Poly is a campus of The California State University System, all applicants must meet CSU eligibility requirements as specified below. However, Cal Poly typically receives many more applications than it can accommodate. **Consequently, admission to Cal Poly is highly competitive, and meeting the CSU eligibility requirements is insufficient by itself to gain acceptance.** Cal Poly reserves the right to select its students and deny admission to the University or any of its programs as the University, in its sole discretion, determines appropriate based on an applicant's suitability and the best interests of the University.

Unlike most other universities, Cal Poly requires all students to take at least one course each term in their major program of study, starting immediately on entry. For this reason, all applicants, including first-time freshmen, are required to declare a major on their application for admission. Some students change their major after they have started at the University, but because competition for entry into most majors is strong, and because of Cal Poly's unusual curriculum structure, **transfer from one major to another cannot be guaranteed.**

In selection, Cal Poly looks for students who are accomplished academically and who have taken an active part in their education, in and out of the classroom. Because Cal Poly is unable to accept all of the well qualified applicants who apply, it seeks to be as fair as possible by using an objective, point-based admission selection process developed by the University's faculty. The criteria employed in this process are **in addition** to the CSU eligibility requirements.

Each applicant is screened and ranked by level within a specified major as either a freshman or a transfer applicant. **Freshman** candidates are evaluated in five separate categories, including GPA earned in specific CSU preparatory courses, overall GPA, CSU preparatory coursework, test scores, and work experience and/or extra-curricular activities.

**Transfer** candidates are evaluated in four categories, including major-specified coursework, general education coursework completed, GPA in completed coursework, and work experience and/or extra-curricular activities.

Each of the six academic colleges at Cal Poly has established a minimum score that candidates are required to meet to be qualified to proceed in the admissions process. The university community has also approved consideration for admission based on other factors deemed important to the campus.

Additionally, applicants to the majors of Art and Design and Music will be contacted by the major department and asked to submit supplementary information. Art and Design applicants will be requested to submit a portfolio based on specific criteria and Music applicants will be requested to audition either on tape or in person. Final selection for admission to Art and Design or Music will then be determined by the major department.

### CSU Eligibility Requirements

As mentioned above, CSU specifies *minimum* requirements for entry into Cal Poly. Meeting these requirements is necessary, but is generally insufficient by itself to gain acceptance.

### FRESHMAN REQUIREMENTS

Generally, applicants will qualify for regular admission to the CSU system as a first-time freshman if they:

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

### Eligibility Index

<http://www.csumentor.edu/>

The eligibility index is the combination of your high school grade point average and your score on either the ACT or the SAT. Beginning with admission for Fall 2004, your grade point average is based on grades earned in courses taken during your final three years of high school that satisfy the comprehensive pattern of college preparatory subject requirements, with bonus points for approved honors courses (excluding physical education and military science).

You can calculate the index by multiplying your grade point average by 800 and adding your total score on the SAT I. 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 2900

using the SAT I or 694 using the ACT; the Eligibility Index Table illustrates several combinations of test scores and averages that meet minimum eligibility requirements. If you neither graduated from a California high school nor are a resident of California for tuition purposes, you need a minimum index of 3502 (SAT I) or 842 (ACT). Graduates of secondary schools in foreign countries must be judged to have academic preparation and abilities equivalent to applicants eligible under this section.

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

GPA .....	2.00*	2.20	2.40	2.60	2.80	3.00**
ACT Score .	30	26	22	18	14	
SAT I Score	1300	1140	980	820	660	

*Example: If you have a GPA of 2.40 and an SAT I score of 980, then you meet minimum eligibility requirements.*

\* Below 2.00 does not qualify for regular admission.

\*\* 3.00 and above qualifies with any score.

If your grade point average is 3.00 or above (3.61 for non-residents), you are not required to submit test scores. However, you are urged to take the SAT I or ACT because campuses use these test results for advising and placement purposes and may require them for admission to impacted majors or programs. *(Note that Cal Poly evaluates test scores as part of its competitive admission process. You are unlikely to gain admission to Cal Poly if you do not submit test scores, regardless of your grade point average.)*

You will qualify for regular admission when the University verifies that you have graduated from high school, have a qualifiable eligibility index, have completed the comprehensive pattern of college preparatory subjects, and, if applying to an impacted program, have met all supplementary criteria.

### Honors Courses

Up to eight semesters of honors courses taken in the last two years of high school, including up to two approved courses taken in the tenth grade, can be accepted. Each unit of A in an honors course will receive a total of 5 grade points; B, 4 points; and C, 3 points. *(Note that Cal Poly's competitive admission process takes into account all honors courses taken in the 9th through 12th grade.)*

### Subject Requirements

CSU 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.

- 2 years of social science, including 1 year of U.S. history, or U.S. history and government.
- 4 years of English.
- 3 years of math (algebra, geometry, and intermediate algebra).
- 2 years of laboratory science (1 biological and 1 physical, both with labs).

- 2 years in the same foreign language (subject to waiver for applicants demonstrating equivalent competence).
- 1 year of visual and performing arts: art, dance, drama/theater, or music.
- 1 year of electives: selected from English, advanced mathematics, social science, history, laboratory science, foreign language, and visual and performing arts.

### Subject Requirement Substitution for Students with Disabilities

Applicants with disabilities are 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, alternate college preparatory courses may be substituted for specific subject requirements.

Substitutions may be authorized on an individual basis after review and recommendation by the applicant's academic advisor or guidance counselor in consultation with the director of Cal Poly's Disability Resource Center.

Although the distribution may be slightly different from the course pattern required of other students, students qualifying for substitutions will still be held for 15 units of college preparatory study.

Students should be aware that course substitutions may limit your later enrollment in certain majors, particularly those involving mathematics. For further information and substitution forms, please call the director of Disability Resource Center.

### TRANSFER REQUIREMENTS

You will meet the *minimum* requirements for admission to the CSU system 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 one or other of the following standards (depending on the number of units already completed):

1. **You are a lower division transfer student** (i.e., you have completed less than 56 transferable semester {84 quarter} units), and,
  - (a) You will meet the freshman admission requirements in effect for the term to which you are applying (see "Freshman Requirements"), **OR**,
  - (b) You were eligible as a freshman at the time of high school graduation except for the subject requirements, have made up the missing subjects, and have been in continuous attendance in an accredited college since high school graduation.
2. **You are an upper division transfer student** (i.e., you have completed at least 56 transferable semester {84 quarter} units) *and* you have made up any missing subject requirements (see "Making Up Missing College Preparatory Subjects"). Nonresidents must have a 2.4 grade point average or better. In addition:

*If you graduated from high school in 1988 or later, you must have completed at least 30 semester units*

of college coursework with a grade of C or better in *each course* to be selected from courses in English, arts and humanities, social science, science and mathematics at a level at least equivalent to courses that meet general education requirements. The 30 units must include all of the general education requirements in communication in the English language and critical thinking (at least 9 semester units) and the requirement in mathematics/quantitative reasoning (usually 3 semester units) **OR** you must have completed the Inter-segmental General Education Transfer Curriculum (IGETC) requirements in English communication and mathematical concepts and quantitative reasoning.

*If you graduated from high school prior to 1988, you should contact the Admissions Office to inquire about alternative admission programs.*

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

### **Making Up Missing College Preparatory Subject Requirements**

Lower division applicants who did not complete 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.

Please consult with the Admissions Office for further information about alternative ways to satisfy the subject requirements.

### **Hardship Consideration**

Cal Poly will give special consideration to place-bound, domiciled, upper-division transfer candidates who are not able to leave the local area and who have completed *all* lower-division and general education courses required for degree completion in their major. After having filed an on-time application for a fall term, and if not selected, qualified candidates can be evaluated for admission based on University Interest as a Hardship Consideration. To be reviewed for Hardship Consideration, a letter that includes official college transcripts from all institutions attended must be sent to the Assistant Vice President of Admissions, Recruitment & Financial Aid.

## **APPLICATION PROCEDURES**

<http://www.csumentor.edu>, [http://www.calpoly.edu/\\_admiss/](http://www.calpoly.edu/_admiss/)  
Cal Poly, San Luis Obispo requires all applicants to file on-time applications for admission consideration via the Internet at CSU Mentor.

All applications must be accompanied by a \$55 non-refundable application fee that should be submitted through CSU Mentor. The application fee may not be transferred or used to apply to another term.

### **Importance of Filing Complete, Accurate, Authentic Application for Admission Documents**

Cal Poly advises prospective students to supply complete and accurate information on the application for admission, residence questionnaire, and financial aid forms, as changes to the self-reported information will not be considered. Applicants must also submit authentic, official transcripts sent directly from the issuing institution of *all previous academic work attempted, including work in progress*, when requested to do so by the University. Failure to file complete, accurate, and authentic application documents may result in denial of admission, cancellation of academic credit, suspension, or expulsion (Section 41301 of Title 5, *California Code of Regulations*).

Because all majors at Cal Poly are competitive at the undergraduate level, it is necessary for all applications to be submitted by the application deadline.

## **TEST REQUIREMENTS**

All first time freshmen need to submit either ACT or SAT I test scores.

### **The College Board (SAT I)**

Registration Unit, Box 6200  
Princeton, New Jersey 08541-6200  
(609) 771-7588  
[www.collegeboard.org](http://www.collegeboard.org)

### **ACT Registration Unit**

P.O. Box 414  
Iowa City, Iowa 52240  
(319) 337-1270  
[www.act.org](http://www.act.org)

## **CAL POLY APPLICATION FILING PERIODS**

Under the Regular Decision process used by the vast majority of those applying, Cal Poly accepts new freshman applicants for the fall and summer terms and new transfer applicants for the fall, summer, and winter terms.

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

Applications must be submitted by the following dates:

Fall Quarter ..... November 30<sup>th</sup> of previous year  
Summer Quarter ..... Last Day of February of same year  
Winter Quarter ..... June 30<sup>th</sup> of previous year

Freshmen applicants seeking Early Decision must apply by October 31st of previous year (see below).

## Notification (Regular Decision)

### For a Fall Term:

- The student submits an admission application by November 30<sup>th</sup>.
- Notification of the admission decision is normally made by the second week in March. If accepted, the student must file an electronic Statement of Intent to Register (SIR).
- The SIR, together with other requested documents, must be returned or postmarked *no later than May 1st*.

## Confirmation of Admission

Any offer of admission to Cal Poly is conditional on completion of outstanding requirements and submission of transcripts or other supporting documents, as applicable. Once a student has been conditionally admitted to Cal Poly, it is the student's responsibility to verify that the terms of their conditional acceptance have been met. It is *mandatory* that selected students submit their SIR on-line (and any transcripts or other supporting documents requested by the Admissions Office) by the stated deadline in order to confirm formal admission and guarantee clearance for registration.

### Statement of Intent to Register Deadlines (SIR)

Fall ..... Submitted by May 1st  
 Summer ..... Not required  
 Winter ..... Not required

## Early Decision Option

Early Decision is an option offered to those first-time freshman applicants for whom Cal Poly is clearly their first choice. Applicants should have established strong and consistent academic records throughout secondary school and should have completed all the required standardized testing by October of their senior year.

Candidates are reviewed on their program of study in secondary school, academic performance in classes, standardized test scores, extra-curricular activities, and/or work experience.

Early Decision candidates must be committed to attend Cal Poly. Students admitted under this plan and who accept the terms of admission may be released only for compelling medical or financial reasons. Students who apply for Early Decision and are not selected will automatically be reviewed under the Regular Decision process.

For students who choose the Early Decision option:

- The student must submit an electronic application along with the required \$55 application fee, by a final deadline of October 31<sup>st</sup>.
- The student is notified of the admission decision by December 15<sup>th</sup>.
- The student's reply to an offer of admission by Cal Poly must be submitted electronically by January 15th.

## OTHER INFORMATION

### Returning Students in Same Major

Matriculated students who have not registered for one 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.

Matriculated students who have not registered for three consecutive quarters or more (counting Summer Quarter) and have not been on an approved leave of absence may return to the University without going through the competitive admissions process providing the following criteria are met:

1. The student must return in the same major.
2. The student must be in good standing (2.0 or better Cal Poly GPA) or have received permission to return from their Academic Dean.
3. A CSU paper application for readmission must be filed or postmarked before the deadline dates listed below. The application fee must accompany the application for readmission.

### Application Deadlines for Returning Students

Summer Quarter ..... April 1<sup>st</sup>  
 Fall Quarter ..... July 1<sup>st</sup>  
 Winter Quarter ..... October 1<sup>st</sup>  
 Spring Quarter ..... February 1<sup>st</sup>

### Returning Students Seeking a Different Major

Students wishing to return to Cal Poly in a different major must file an on-line application for admission, including the application fee, by the same application deadlines as new students. They will compete equally with new applicants for the available transfer openings in the new major.

## International Students -- General Admissions Requirements

### TOEFL Requirement

All undergraduate applicants whose native language is not English, and 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). Those opting to take the Computer Based Test of English as a Foreign Language must present a score of 213 or above. These are minimum CSU requirements, which may be exceeded in Cal Poly's selective admission process. Applicants should take the TOEFL at least six months prior to the term of application to ensure the test scores are received in time for full consideration in the selection process.

### Additional Admission Requirements

The CSU must assess the academic preparation of international students. For this purpose, "international students" include those who hold U.S. visas as students, exchange visitors, or those in other nonimmigrant classifications. The CSU uses separate requirements and application filing dates in the admission of international students. Verification of English proficiency (see TOEFL above), financial resources, and academic performance are all-important considerations for admission. Academic records from foreign institutions must be on file by the portfolio completion dates listed below, and if not in English, must be accompanied by certified English translations.

To be considered for admission to an undergraduate or graduate program, applicants 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 below. 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; confidential financial statement; health insurance promissory note; International Education Background form; and a Test of English as a Foreign Language with a score of 550 or more on the written exam or 213 or more on the computer exam. All official documents must be submitted in the native language and accompanied by a certified English translation. International applicants may also be required to submit a fee for an international credential analysis from a specified agency if requested by the Admissions Office.

### International Application and Portfolio Completion Deadlines for Undergraduates:

Fall Quarter.....	April 1st
Winter Quarter.....	August 1st
Spring Quarter .....	December 1st
Summer Quarter.....	February 1st

After all required forms and academic documents have been received, the University will determine the candidate's eligibility for admission and notify the applicant of the results. If admitted, students 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 (INS) for transfer to Cal Poly from another U.S. school. Other requirements may be imposed by INS. 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 an application to another term, applicants must make the request to Cal Poly in writing and another application fee may be required.

### Consistency with State Regulations

The philosophy of the Admissions Office is consonant with the mission of California Polytechnic State University, and is in accordance with Title 5, Chapter 1, Subchapter 3, of the California Code of Regulations. If you are unsure of these requirements, please view the Cal Poly Admissions website at [www.ess.calpoly.edu/\\_admiss/](http://www.ess.calpoly.edu/_admiss/) or call the Admissions Office.

### Graduate Admission Requirements

For information regarding graduate admission, see the "Graduate Programs" section.

### Determination of Residence for Nonresident Tuition Purposes

The campus Office of Admissions determines the residence status of all new and returning students for nonresident tuition purposes. Please refer to the "Appendix" for detailed information.

*Fees,  
Expenses,  
& Financial Aid*

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# Fees And Expenses

[www.fees.calpoly.edu](http://www.fees.calpoly.edu)

## 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. Mandatory systemwide fees are waived for those individuals who qualify for such exemption under the provisions of the California Education Code (see Student Fee Waivers).

## 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.

## Registration Fees Per Quarter

Registration Fees are the **sum of two types of fees**:

1) **Campus-Wide Fees** that are payable irrespective of college, and 2) **Campus Academic Fees**, which vary by college/academic unit. Campus-wide fees include: State University Fee, Associated Students Fee, Health Facilities Fee, Instructionally Related Activities Fee, Health Services Fee, University Union Fee, and Campus Services Card Fee. Nonresident and foreign students also pay tuition of \$188 per unit.

Fees listed here 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 by quarter. The total fees paid per term will be determined by the number of units taken and the college of attendance.

Cal Poly registration fees must be paid prior to registration and be **received at least two working days** before the students scheduled registration time. Students receiving financial aid will have their registration fees deferred. If the amount awarded is insufficient to pay fees in full, students will be billed for the balance.

If a check is returned by the bank for any reason, registration access may be cancelled and you will be charged a \$10.00 returned check processing fee. Your student account balance, registration access, and hold status can be checked online using MustangInfo.

Fees and tuition are subject to change upon approval by the President, the CSU Chancellor or Board of Trustees. Please consult the current *Class Schedule* "Fee Payment Instructions", and the Cal Poly fees website at [www.fees.calpoly.edu](http://www.fees.calpoly.edu) for the most current information on fees applicable to the quarter for which you are registering.

## Student Fee Waivers

The California Education Code includes provisions for the waiver of mandatory systemwide fees as follows:

- 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 (referred to as Alan Pattee Scholarships);
- Section 66025.3 – Qualifying children, spouses, or unmarried surviving spouses of a war period veteran of the U.S. military who is totally service-connected disabled or who died as a result of service-related causes; children of any veteran of the U.S. military who has a service-connected disability, was killed in action, or died of a service-connected disability and meets specified income provisions; qualifying dependents of a member of the California National Guard who in the line of duty and in active service of the state was killed or became permanently disabled or died of a disability as a result of an event while in active service of the state; and undergraduate students who are the recipient of or the child of a recipient of a Congressional Medal of Honor and meet age and income restrictions; and
- Section 68121 – Students enrolled in an undergraduate program who are the surviving dependent of any individual killed in the September 11, 2001, terrorist attacks on the World Trade Center in New York City, the Pentagon building in Washington, D.C., or the crash of United Airlines Flight 93 in southwestern Pennsylvania, if the student meets the financial need requirements set forth in Section 69432.7 for the Cal Grant A Program and either the surviving dependent or the individual killed in the attacks must have been a resident of California on September 11, 2001.

Students who may qualify for these benefits should contact the Admissions Office for further information and/or an eligibility determination.

**Fall 2003 Fee Schedule – Campus-Wide Fees plus Campus Academic Fees by College/Academic Unit**

<i>College/Academic Unit</i>	<i>Undergraduate Six Units or Less<sup>1</sup></i>	<i>Undergraduate More than Six Units</i>	<i>Graduate/2<sup>nd</sup> Degree Six Units or Less</i>	<i>Graduate/2<sup>nd</sup> Degree More than Six Units</i>
<b>College of Agriculture</b>				
Campus-Wide Fees	\$526.15	\$746.15	\$558.15	\$800.15
Campus Academic Fees	\$148.35	\$248.35	\$148.35	\$248.35
Totals, Agriculture	<b>\$674.50</b>	<b>\$994.50</b>	<b>\$706.50</b>	<b>\$1048.50</b>
<b>College of Architecture &amp; Environmental Design</b>				
Campus-Wide Fees	\$526.15	\$746.15	\$558.15	\$800.15
Campus Academic Fees	\$148.35	\$248.35	\$148.35	\$248.35
Totals, Architecture & Environmental Design	<b>\$674.50</b>	<b>\$994.50</b>	<b>\$706.50</b>	<b>\$1048.50</b>
<b>College of Business</b>				
Campus-Wide Fees	\$526.15	\$746.15	\$558.15	\$800.15
Campus Academic Fees	\$148.35	\$248.35	\$148.35	\$248.35
Totals, Business	<b>\$674.50</b>	<b>\$994.50</b>	<b>\$706.50</b>	<b>\$1048.50</b>
<b>College of Engineering</b>				
Campus-Wide Fees	\$526.15	\$746.15	\$558.15	\$800.15
Campus Academic Fees	\$148.35	\$248.35	\$148.35	\$248.35
Totals, Engineering	<b>\$674.50</b>	<b>\$994.50</b>	<b>\$706.50</b>	<b>\$1048.50</b>
<b>College of Liberal Arts</b>				
Campus-Wide Fees	\$526.15	\$746.15	\$558.15	\$800.15
Campus Academic Fees	\$110.85	\$175.35	\$110.85	\$173.35
Totals, Liberal Arts	<b>\$637.00</b>	<b>\$919.50</b>	<b>\$669.00</b>	<b>\$973.50</b>
<b>College of Science &amp; Mathematics</b>				
Campus-Wide Fees	\$526.15	\$746.15	\$558.15	\$800.15
Campus Academic Fees	\$148.35	\$248.35	\$148.35	\$248.35
Totals, Science & Mathematics	<b>\$674.50</b>	<b>\$994.50</b>	<b>\$706.50</b>	<b>\$1048.50</b>
<b>University Center for Teacher Education</b>				
Campus-Wide Fees	\$526.15	\$746.15	\$558.15	\$800.15
Campus Academic Fees	\$48.35	\$48.35	\$48.35	\$48.35
Totals, University Center for Teacher Educ.	<b>\$574.50</b>	<b>\$794.50</b>	<b>\$606.50</b>	<b>\$848.50</b>
<b>Undeclared</b>				
Campus-Wide Fees	\$526.15	\$746.15	\$558.15	\$800.15
Campus Academic Fees	\$48.35	\$48.35	\$48.35	\$48.35
Totals, Undeclared	<b>\$574.50</b>	<b>\$794.50</b>	<b>\$606.50</b>	<b>\$848.50</b>

<sup>1</sup> During summer quarter, the University may use an optional 8 unit cutoff.

**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* ..... \$188.00

**Room and Board (On-Campus)**

Regular Room, annual license, double occupancy.  
Academic year ..... \$4,259.00  
Summer quarter ..... 1,280.00

Meals (required for all students who live on campus)

Meal plan, academic year ..... \$3,144.00  
Meal plan, full summer quarter..... 950.00

**Parking Fees**

Motorcycles, quarterly ..... \$15.00  
Quarterly ..... \$60.00  
Quarterly pool (2 or more vehicles), each pool.... 60.00  
Daily permits ..... 2.50  
Weekly permits..... 7.00

**Miscellaneous Fees**

Application fee (nonrefundable)..... \$55.00  
Check returned for any cause ..... 20.00

**Refund of Fees Including Nonresident Tuition**

Regulations governing the refund of mandatory fees, including nonresident tuition, for students enrolling at the California State University are included in §41802 of Title 5, *California Code of Regulations*. For purposes of the refund policy, mandatory fees are defined as those systemwide fees and campus fees that are required to be paid in order to enroll in state-supported academic programs at the California State University. Refunds of fees and tuition charges for self-support programs at the California State University (courses offered through extended education) are governed by a separate policy established by the University.

In order to receive a full refund of mandatory fees, including nonresident tuition, a student must cancel registration or drop all courses prior to the first day of instruction for the term. Information on procedures and deadlines for canceling registration and dropping classes is available in the quarterly *Class Schedule*, "Fee Payment Instructions."

For state-supported semesters, quarters, and non-standard terms or courses of four weeks or more, a student who withdraws during the term in accordance with the University's established procedures will receive a refund of mandatory fees, including nonresident tuition, based on the portion of the term during

which the student was enrolled. No student withdrawing after the 60 percent point in the term will be entitled to a refund of any mandatory fees or nonresident tuition.

For state-supported semesters, quarters, and non-standard terms or courses of less than four (4) weeks, no refund of mandatory fees and nonresident tuition will be made unless a student cancels registration or drops all classes prior to the first day in accordance with the University's established procedures and deadlines. Students will also receive a refund of mandatory fees, including nonresident tuition, under the following circumstances:

- The tuition and mandatory fees were assessed or collected in error;
- The course for which the tuition and mandatory fees were assessed or collected was cancelled by the University;
- The University makes a delayed decision that the student was not eligible to enroll in the term for which mandatory fees were assessed and collected and the delayed decision was not due to incomplete or inaccurate information provided by the student; or
- The student was activated for compulsory military service.

Students who are not entitled to a refund as described above may petition the University for a refund demonstrating exceptional circumstances, and the chief financial officer of the University may authorize a refund if he or she determines that the fees and tuition were not earned by the University. Information concerning any aspect of the refund of fees may be obtained from the Academic Records Office or the University Cashier.

### **Fees and Debts Owed to the University**

Should a student or former student fail to pay a fee or 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). Prospective students who register for courses offered by the University are obligated for the payment of fees associated with registration for those courses. Failure to cancel registration in any course for an academic term prior to the first day of the academic term gives rise to an obligation to pay student fees including any tuition for the reservation of space in the course.

The institution may withhold permission to register or to receive official transcripts of grades or other services offered by the institution from anyone owing fees or another debt to the institution. If a person believes he or she does not owe all or part of an asserted unpaid obligation, that person may contact the business office. The business office, or another office on campus to which the business office may refer the person, will review all pertinent information provided by the person and available to the campus, and advise the person of its conclusions.

### **Credit Cards**

VISA and Master Card 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, tickets for sports events from the Athletics Department, health services from the University Health Center, Bookstore purchases and for Extended University Programs fees. Visa, Master Card, Discover Card, and American Express may be used for payment of registration fees, tuition, housing and certain other University fees using the telephone or web credit card system. The University also accepts electronic check payments, known as eCheck or ACH, using the telephone or web on-line payment systems. Details concerning the use of electronic checks and credit cards for fee payments may be obtained from the University website under MustangInfo.

### **Procedure for the Establishment or Abolishment of a Student Body Fee**

The law governing the California State University provides that fees defined as mandatory, such as a *student body association fee* and a *student body center fee*, may be established. A *student body association fee* must be established upon a favorable vote of two-thirds of the students voting in an election held for this purpose (Education Code Section 89300). A *student body center fee* may be established only after a fee referendum is held which approves by a two-thirds favorable vote the establishment of the fee (Education Code, Section 89304). The current *student body association fee* level was set at California Polytechnic State University, San Luis Obispo by student referendum in 1992. The campus President may adjust the *student body association fee* only after the fee adjustment has been approved by a majority of students voting in a referendum established for that purpose (Education Code Section 89300). The required fee shall be subject to referendum at any time upon the presentation of a petition to the campus President containing the signatures of 10 percent of the regularly enrolled students at the University. Once bonds are issued, authority to set and adjust *student body center fees* is governed by provisions of the State University Revenue Bond Act of 1947, including, but not limited to, Education Code Sections 90012, 90027, and 90068. *Student body association fees* support a variety of cultural and recreational programs, child care centers, and special student support programs.

The process to establish and adjust other campus-based mandatory fees requires consideration by the campus fee advisory committee and sometimes a student referendum. The campus President may use alternate consultation mechanisms if he/she determines that a referendum is not the best mechanism to achieve appropriate and meaningful consultation. Results of the referendum and the fee committee review are advisory to the campus President. The President may also request the Chancellor to establish the mandatory fee. Authority to adjust fees after consideration by the campus fee advisory committee and the completion of a student referendum is delegated to the President.

# Financial Aid

Financial Aid Office  
Administration Bldg. (01), Room 212  
(805) 756-2927  
<http://www.calpoly.edu/~finaid>

The University has a variety of grants, loans, scholarships, and part-time employment opportunities designed to assist students financially. Students who need assistance 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 Handbook, or accessing their webpage.

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 most high schools. It is also available on the Web at [www.fafsa.ed.gov](http://www.fafsa.ed.gov). Scholarship applications are filed online. The priority deadline for filing the FAFSA with the processor is March 2. Scholarship applications are also due on March 2.

## Typical Student Expenses

Following are the average expenses per quarter for the 2000-2001 academic year for the California resident student attending Cal Poly. Charges for room and board are payable in advance or in quarterly installments. Nonresident students should be prepared to pay additional tuition and fees. For the 2002-03 school year nonresident tuition was an extra \$188 per unit. 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.

## University Estimated Expenses per Quarter

Registration fees .....	995
Room and board with 14-meal ticket .....	2,493
Books and supplies (estimated) .....	408
Personal expenses and transportation .....	906
Estimated total per quarter .....	\$4,802

## Cancellation of Registration or Withdrawal from the Institution and Financial Aid

Students who find it necessary to cancel their registration or to withdraw from all classes after enrolling for any academic term are required to follow the University's official withdrawal procedures. Failure to follow formal University procedures may result in an obligation to pay fees as well as the assignment of failing grades in all courses and the need to apply for readmission before being permitted to enroll in another academic term. Information on canceling registration and withdrawal procedures is available from the Office of Academic Records, Admin 222, 805-756-2531.

Students who receive financial aid funds must consult with the Financial Aid and Student Accounts Offices prior to withdrawing from the University regarding any refunds or

repayments of grant or loan assistance received for that academic term or payment period. If a recipient of student financial aid funds withdraws from the institution during an academic term or a payment period, the amount of grant or loan assistance received may be subject to return and/or repayment provisions.

## UNIVERSITY SCHOLARSHIPS

**General Information.** Over 1100 scholarships are awarded each year by the Cal Poly Scholarship Committee and the various academic units within each college. Applications are submitted online to the Financial Aid Office. Scholarship Committee members review financial need, scholastic achievement, participation in school activities, community service, honors and organizational affiliations, and educational objectives. Some scholarships have additional requirements which relate to a concentration or field of study, geographic origin, class level, and project or design portfolios.

Generally, a student must have at least a 3.0 grade point average. There are some scholarships, however, that are awarded to students with lower grade point averages if they meet donor specified criteria. Both undergraduate and graduate students are considered for scholarships.

*Annual Deadline Date:  
March 2 for the following academic year*

## How to Apply

Visit the Financial Aid Office website for the latest information ([www.calpoly.edu/~finaid](http://www.calpoly.edu/~finaid)). For need-based scholarships, the FAFSA must be filed. For priority consideration for financial aid programs and Cal Poly scholarships, the FAFSA should be received at the processor by **March 2**.

## Scholarship Notifications

Scholarships are normally awarded during the spring and summer for the following academic year. During that time award notices are sent which include scholarship amount, disbursement and donor information. Recipients must be in good academic standing and maintain full-time enrollment while receiving a scholarship (extended education, concurrent enrollment and other college units are excluded). Some scholarships require recipients to have earned at least one-half the value of the scholarship during the previous year.

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

## General Scholarships

Alumni Honor Scholarships  
 R. W. Andrews Scholarships  
 Paul and Barbara Boberg Scholarship  
 Lulu Grumbles Bumphrey Scholarships  
 California Rural Rehabilitation Scholarships  
 Cal Poly Alumni Association—Central California Chapter Scholarship  
 Cal Poly Alumni—Greater Monterey Bay Chapter Scholarship  
 Cal Poly Parent Program Scholarships  
 Cal Poly Scholars Program  
 Cal Poly Staff Scholarship  
 Cal Poly State University Memorial Scholarships  
 Cal Poly Wheelmen Scholarship  
 Cal Poly Women's Club Scholarship  
 Felix Camacho-Betteravia Farms Scholarships  
 Centennial Scholarship  
 Ernie and Lorie (Sousa) Chapa Scholarship  
 Josephine M. Chavez Memorial Scholarship  
 Collegians' Jazz Scholarship  
 Herbert E. Collins Scholarships  
 Maurice E. Coulter Scholarship  
 CSU Graduate Equity Fellowships  
 Bill Donahue Memorial Scholarship  
 Educational Equity Scholarships  
 Pat and Molly Elliot Memorial Scholarship  
 Alonzo R. Farrow Scholarship  
 Ford/EEOC Scholarships  
 Ralph V. Fullwiler Scholarships  
 Erica Gafner Memorial Scholarship  
 Green and Gold Barbecue Scholarship  
 Regnar Hesselund Scholarships  
 Floyd O. Hicks Scholarship  
 Robert W. Hill Scholarship  
 Michelle Ann Jacobson Memorial Scholarship  
 Michael Koehn London Study Memorial Scholarship  
 Land Outstanding Service Award  
 Robert and Megan Marshall Scholarship  
 Ian McMillan Memorial in Environmental Activism Scholarship  
 Julian A. McPhee Award  
 Military Veterans of Cal Poly Memorial Award  
 Modesto Alumni Boosters Scholarships  
 Jesse E. and June A. Norris Scholarship  
 Partner Scholar Scholarships  
 Phi Kappa Phi Scholarship  
 Terry Ramirez-Fichthorn Memorial Scholarship  
 Harley and Augusta Roberts Scholarship  
 Glenn H. Robinson Memorial Scholarship  
 Mary Stuart Rogers Foundation Scholarships  
 Walt Rolsma Memorial Scholarship  
 Stan and Elaine Rosenfield Scholarship  
 Rose Parade Float Award  
 Army—ROTC  
 L. Diane Ryan Scholarship  
 Manfred and Jean Sander Quasi Scholarship  
 Helen V. Sandercock Scholarships  
 William and Adelaide Sandercock Scholarships  
 Sonia Sandoval Memorial Dance Award  
 Moon Ja Minn and Paul T. Suhr Dance/Music Award  
 Sheila and Yosef Tiber Scholarships  
 Tomczak—Carter Dance Award  
 William B. Turner Scholarships  
 J. W. Van Dyke Memorial Scholarships  
 George Watte Memorial Scholarship  
 Ralph R. Wilmar Rodeo Queen Scholarship  
 Mildred and Charles Wolverton Scholarships  
 Marilyn R. York Scholarship for International Programs  
 Ed J. Zuchelli Memorial Scholarship

## Agriculture

Catherine C. Adams Scholarships  
 Agribusiness Department Merit Scholarships  
 Matt Ahlem Memorial Scholarship  
 American Spice Trade Association Scholarship  
 American Vineyard Viticulture Scholarship  
 Michael T. Andrews Best Senior and Capstone Project Prize Award  
 Barling Memorial Scholarship  
 Georgia M. and Claude S. Barnett Memorial Scholarship  
 Bartlett Tree Foundation Scholarship  
 Douglas Baylis, FASLA Environmental Horticulture Science Scholarship  
 Paul L. Belveal Memorial Scholarships  
 Danny Bettencourt Memorial Scholarship  
 Boyle-McOmie Scholarship  
 Harold G. Bradshaw Scholarship  
 Marty Brock Scholarship  
 Burlingham Memorial Scholarship  
 Cal-Almond Scholarship  
 California Agri-Fair Scholarships  
 California Association of Nurserymen-Peninsula Chapter Scholarship  
 California Creamery Operators Association Scholarships  
 California Dairy Industries Association Scholarships  
 California League of Food Processors Scholarships  
 California State Grange Scholarships  
 William, Joseph and Charles Cattaneo Memorial Scholarship  
 Central Coast CAPCA Pest Management Scholarship  
 Chalone Wine Foundation/Richard H. Graff Scholarship  
 Carl A. Cilker Scholarship  
 William H. Cilker Scholarship  
 Concord Farm Bureau Scholarship  
 Sandra Crabtree Memorial Scholarship  
 Rosario Curletti Scholarships  
 Gordon T. Davis Memorial Scholarship  
 Dr. Arnold Dean Scholarships  
 General Dillingham Produce Industry Scholarships  
 Eberle Winery Scholarships  
 Environmental Industries, Inc. Academic Award  
 Environmental Industries, Inc. Scholarship  
 Paul Etchechury Memorial Scholarship  
 Gerald H. Fairbairn Scholarship  
 Max and Verda Foster Memorial Scholarship  
 Forestry and Natural Resources Management Award  
 Woody Frey Scholarship  
 J. Cordner Gibson Memorial Award  
 Lisle R. Green Memorial Scholarship  
 Jan Guidetti Memorial Agriculture Scholarship  
 Tyler Hammond III Memorial Award  
 Ray Hansen Memorial Scholarship  
 William Randolph Hearst Foundation Agriculture Scholarship  
 H. J. Heinz Endowed Scholarship  
 William (Ben) and Helen Holman Alumni Scholarship  
 Daisy J. Hudson Agricultural Irrigation Careers Scholarship  
 Harold G. Hull Graduate Assistantships  
 Corwin Johnson Scholarship  
 Richard F. Johnson Scholarship  
 W. Douglas Johnstone-California Cheese and Butter Association Scholarship  
 Richard D. Kaprielian Memorial Scholarship  
 Ted and Dottie Kasinak Scholarship  
 KCBX Central Coast Wine Classic Scholarships  
 Omer L. and Claudia L. King Scholarship  
 Kings River Prune and Apricot Scholarships  
 Knight Brothers Scholarships  
 Doris Krull Dairy Science Scholarships  
 Lambert Scholarship  
 Leprino Foods Scholarship  
 Los Angeles County Fair Association Scholarship  
 Clarence B. Mann FFA Scholarship

Chester O. and Avis J. McCorkle, Sr. Memorial Scholarship  
 Neil and Dorothy McPherson Memorial Scholarship  
 Lou Merrill Scholarship  
 James F. Merson Memorial Scholarship  
 Lionel Middlecamp Memorial Scholarship  
 Military Veterans of Cal Poly Memorial Award  
 Al Montna Agricultural Achievement Scholarship  
 NAMA/West Scholarship  
 Robert J. Newell Memorial Scholarship  
 Don Nikkel Memorial Scholarship  
 Orange County Wine Society Scholarships  
 M.E. "Pappy" Painter Memorial Scholarship  
 Harry Parker Award  
 Thomas M. Parks Scholarship  
 Charles Roland Peebles, III Fund  
 Charles and Helen Penwell Scholarships  
 Roger B. Peters Award  
 Pi Alpha Xi-Howard C. Brown Scholarship  
 Norman Pillsbury and Timothy Plumb Oak Woodland Scholarship  
 Frank W. Pinkert Memorial Scholarship  
 Ranchers Cotton Oil/Earl J. Cecil Scholarship  
 Howard Rhoads Memorial Scholarship  
 Dante Righetti Scholarship  
 Rodeo Club Scholarships  
 Mimi Russell Memorial Scholarship  
 Burton Douglas Salisbury Memorial Scholarship  
 Jean Eddy Sander Rodeo King and Queen Scholarship  
 Fred and Marian Sandercock Scholarships  
 San Marcos Grange Student Teacher Grant  
 San Marcos Grange Women's Activities Committee Scholarship  
 Vard M. and Mildred P. Shepard Memorial Scholarship  
 Joe and Florence Silva Memorial Scholarship  
 Louis H. and Stella S. Soares Achievement Award  
 Sharon Spaulding Memorial Scholarships  
 Herman M. Sperber Memorial Scholarship  
 SunWest Foods Scholarships  
 Richard L. Tate Memorial Scholarship in Dairy Science  
 Joe Terra Scholarship  
 Harmon M. Toone Scholarship  
 Fred Turner Scholarship  
 Eric C. Twist Memorial Scholarship  
 Stanley L. Van Vleck Memorial Scholarship  
 War Veterans Scholarship  
 Barbara Parker Weber Agricultural Education Endowment  
 Walter T. Wells Horticulture Scholarship  
 Harold O. Wilson Memorial Scholarship  
 Richard A. (Alex) Wilson, Jr. Memorial Scholarship  
 Leopold Edward Wrasse Scholarships  
 Yosemite Meat Company, Inc. Scholarships

### **Architecture and Environmental Design**

Stephen O. Anderson Memorial Scholarship  
 bfgc Architects Planners, Inc. Scholarship  
 Douglas Baylis, FASLA College of Architecture and  
 Environmental Design Memorial Scholarship  
 Beavers Heavy Construction Scholarship  
 Alfred B. and Joy G. Berghell Scholarship  
 Brett Berrier Memorial Scholarship  
 Douglas W. Butzbach Memorial Scholarship  
 Don Chapin Company Scholarship  
 City and Regional Planning Scholarships  
 Errett Family Scholarship  
 Richard Lee Fisher Memorial Scholarship  
 Thor Gulbrand, AIA Memorial Scholarship  
 Matthew D. Hubal Award  
 D. Stewart Kerr Scholarship  
 Don and Caryl Koberg Architecture History Scholarship  
 Landscape Architecture Scholarship and Award Fund  
 Alice C. Loh Scholarship Recognizing Women's Contributions in  
 Environmental Design

Warren Ludvigsen Memorial Scholarship  
 Hans Mager Scholarship  
 Douglas James Martin Scholarship  
 MBH Architects Scholarship  
 Michael McDougall Urban Design Award  
 Dr. Glenn G. McRae Internships  
 Robert Hifumi Odo Memorial Scholarship  
 Oltmans Construction Company Scholarship for Design Excellence  
 Professional Architect's Scholarship  
 Sean Rogers Memorial Scholarship  
 Blair Tulloch Memorial Scholarship  
 Robert Cota Vasquez Memorial Scholarship  
 Frederick Peter Young Scholarship

### **Business**

American Public Works Association-Herbert E. Gerfen Scholarship  
 Andersen Consulting Outstanding Junior Management Award  
 Stephen O. Anderson Memorial Scholarship  
 Larry Bennett Memorial Award  
 David Nathan Blanco Scholarship  
 Boeing Scholarships  
 Mickie Burris Award  
 College of Business Household Scholarship  
 Compaq MIS Scholarship  
 Daryl Damon Memorial Scholarship  
 Milton Drandell Memorial Award  
 Ehlers Family Scholarship  
 Ernst and Young Scholarship  
 Frank and Norma Exter Scholarship  
 Robert W. Hill Scholarship  
 Industrial Technology Society Scholarships  
 Michael Koehn Non-Traditional Business Major Scholarship  
 KPGM Peat Marwick Scholarship  
 James R. Landreth, Cal Poly Vice President Emeritus, and Esther A.  
 Landreth Scholarship  
 Kendall Kay Losee Scholarship  
 John S. Maher Scholarships  
 Bert W. Martin Scholarship  
 Merrill Lynch FMA Student Award  
 Price Waterhouse Coopers Scholarship  
 Larry Ratner Scholarship  
 Owen Servatius Scholarships  
 Nelson Smith Industrial Technology Scholarship  
 Roy Wheeler III Memorial Scholarship  
 Leopold E. Wrasse Scholarship

### **Engineering**

Aerospace Systems Scholarship  
 Adele and Aldo Alessio Scholarships  
 American Institute of Aeronautics and Astronautics,  
 Vandenberg Section Scholarship  
 American Public Works Association-Herbert E. Gerfen Scholarship  
 Andersen Consulting Outstanding Junior Awards in  
 Aeronautical Engineering  
 Computer Science  
 Mechanical Engineering  
 Andersen Consulting Outstanding Junior in Industrial Engineering  
 Scholarship  
 Warren R. and Dantza Anderson Electrical Engineering Academic  
 Scholarship  
 Anderson Family Outstanding Freshman Industrial Engineering Scholarship  
 Anritsu Company Engineering Scholarship  
 Bechtel Corporation Scholarships  
 Thomas A. Benton and John P. Benton Memorial Scholarship  
 Charles H. Black Scholarship  
 Grant M. Brown Memorial Foundation Scholarship  
 Richard F. Burris Endowment  
 Don Chapin Company Scholarships  
 ChevronTexaco Scholarships

Civil and Environmental Engineering Advisory Board Professional Advancement Award  
 Computer Science Scholarship  
 Computer Engineering Scholarship  
 Harold and Judy Cota Award  
 Russell Cummings Engineering Music Minor Scholarship  
 Allan R. Davis Memorial Scholarship  
 George S. Demcak Facilities Engineering Excellence Award  
 Electrical Engineering Graduate Fellowship  
 Environmental Research Foundation Award  
 Bill Evans Scholarship  
 Vicki and Darell Farrer Scholarship  
 W. D. Forgeng Award  
 Millard J. Fotter Scholarship  
 William Squires Fowler Scholarship  
 Harold R. Frank Scholarships  
 Cordner Gibson and Ace Smith Scholarship  
 Karl Arne Gulbrand Memorial Scholarship  
 George E. Hoffman Scholarship  
 Glenn A. Hubbard Memorial Scholarship—Experimental Aircraft Association  
 Kimley-Horn Scholarship  
 Charles E. and Pearl P. Knott Memorial Scholarships  
 Dr. and Mrs. Chan F. Lam Achievement Fund  
 Allen J. Larsen Memorial Scholarship  
 John Stephen Larson Memorial Scholarship  
 Litton Industries Scholarships  
 Lockheed Martin Skunk Works Scholarship  
 William H. McKeen Memorial Award  
 Mechanical Engineering Scholarship  
 Konrad Meissner Scholarship  
 Dragoslav M. Mistic Scholarship  
 Montgomery Watson Scholarship  
 J. L. Moore Fellowship  
 Horace C. Morana Scholarship  
 H. Andrew Morse Memorial Scholarship  
 George and Tonny Murray Scholarship  
 Osteeye Family Scholarship  
 Pacesetter Scholarship  
 Frank E. Pilling, Sr. Scholarship  
 Roy N. Poage Memorial Scholarships  
 Raytheon Company Scholarships  
 James J. Regan Scholarship  
 Reinhold Aeronautical Engineering Scholarship  
 Doral Sandlin Aircraft Design Award  
 Shimada Lee Foundation Scholarship  
 Society of Manufacturing Engineers Student Chapter—Leo E. Rogers Memorial Scholarships  
 Solelectron Scholarship  
 Jack and Alice Spaulding Mechanical Engineering Scholarship  
 Warren Stauffer Memorial Aeronautical Engineering Scholarship  
 Warren Stauffer Memorial Computer Engineering Scholarship  
 Gregory Stines Memorial Scholarship  
 Morris P. Taylor Memorial Scholarship  
 Frederick W. Thoburn Memorial Scholarship  
 Toyota Scholars Program Scholarship  
 Unocal Environmental Education Scholarships  
 Andrew Wacht Scholarship  
 Oscar F. and Robert C. Weissgerber Memorial Scholarship  
 Walter T. Wells Engineering Scholarship  
 Charles (Chuck) Peter White Scholarship  
 John H. Wingate, Jr. Scholarship  
 Brad E. Yackle Scholarship in Computer Sciences

### Liberal Arts

George Clarke Beatie Memorial Award  
 Cal Poly Band Scholarship  
 Cellular One Scholarship  
 Collegians' Jazz Scholarship  
 Russell Cummings Engineering Music Minor Scholarship

Harold P. and Rosalie Davidson Award  
 Bennett Derman Scholarship  
 James M. Duenow Scholarship  
 Jon M. Ericson Founders Scholarship  
 FANS/Kathleen Fisher Memorial Scholarship  
 Christopher Frair Scholarship  
 Jay Garner Memorial Scholarship  
 Ann and Gordon Getty Scholarship  
 Graphic Communication Department Leadership Scholarship  
 Graphic Communication Scholarship  
 Gravure Scholarships  
 Elizabeth Hanlon Parks Memorial Scholarship  
 Robert S. Harmon Scholarship  
 Jim Hayes Journalism Scholarship  
 Greg and Jane Hind Scholarship  
 Mary Lou Hughes English Excellence Scholarship  
 Michael Kohn London Study Memorial Scholarship  
 Dan Krieger History Award  
 Janet Lee Memorial Award  
 Janet Lee Memorial Scholarship  
 Herb Kamm Journalism Scholarship  
 Kodak Professional Photography Scholarship  
 London Scholars Quasi Endowment  
 Darren E. Loyd Photography Scholarship  
 John H. Lynn Political Science Award  
 John S. Maher Scholarships  
 John Mendenhall Memorial Scholarship  
 Kristen King Morana Scholarship  
 Martha Michel Music Scholarship  
 Lucian Morrison Memorial Scholarship  
 Music Department Memorial Award  
 Music Faculty Scholarship  
 Alice Parks Nelson Scholarship  
 Dr. Keith and Lonna Nielsen Scholarship  
 Willard "Pete" Pederson Scholarship  
 Virginia Polin Vocal Scholarship  
 George Ramos Scholarship for Journalism Excellence  
 Ronald V. Ratcliffe Award  
 Beatrice A. Rice Scholarship  
 Astrid and Craig Russell Scholarship  
 Loren Russell Scholarship  
 Sonia Sandoval Memorial Modern Languages and Literatures Award  
 Scitex/Adobe Student Scholarship  
 J. Irving Snetsinger Memorial Award  
 Nell E. Spradlin Scholarship for the Recognition of Individuality  
 Doc Stapleton Memorial Scholarship  
 String Music Scholarship  
 Studio Art Concentration Award  
 Clifton Elroy Swanson and Pauline Thompson Swanson Scholarship  
 Vard M. and Mildred P. Shepard Memorial Scholarship  
 Studio Arts Option Award  
 Jeri Ewy Thiel Memorial Scholarship  
 Guy Thomas Memorial Award  
 Hans Veeder K/P Corporation Scholarship  
 Vocal Studies Scholarship  
 Carolyn and Larry Voss Music Scholarship  
 Denise Waters Art Award  
 Ken Watson Scholarship  
 Bert and Wanda Weeden Graphic Communication Scholarship  
 Ralph E. and Florence B. Welles Scholarship  
 Ralph R. Wilmar Classical Piano Scholarship

### Science and Mathematics

Andersen Consulting—Outstanding Junior Math Award  
 Applegarth Biological Scholarships  
 Tri Beta Biological Society Scholarships  
 Biological Sciences Scholarships  
 CAHPERD Scholarship in Honor of Robert A. Mott  
 Chemistry Faculty Scholarship  
 College of Science and Math Household Scholarship

L. Byron Culver, Jr. Cal Poly Scholars Scholarship  
 Joyce Curry-Daly Memorial Scholarship  
 Vicki and Darell Farrer Scholarship  
 Clyde P. Fisher Memorial Scholarship  
 Volmar A. and Viola I. Folsom Scholarships  
 Jerry Lee Frederick Memorial Scholarship  
 Johnny F. Gordon Memorial Award  
 Charles J. Hanks Excellence in Mathematics Award  
 Charles J. Hanks Mathematics Scholarship  
 Hatfield Memorial Award  
 Dwayne Head Scholarship  
 Hanna Herrmann Memorial Scholarship  
 Robert E. Holmquist Memorial Scholarship  
 John David Jackman Memorial Award  
 W. Boyd Judd Scholarship  
 David Keeling Scholarship  
 Katrina J. Killgore Memorial Scholarship  
 KME Founders Award  
 George C. Laumann Scholarship  
 E. H. "Woody" Lehman Memorial-Natural History Scholarship  
 Marie Porter Lehman Math Educator Scholarship  
 Barbara Lee Lincoln Memorial Award  
 George H. McMeen Scholarship  
 Microbiology Scholarship  
 Montgomery/Richards Marine Biology Scholarships  
 Bill Moore Coatings Research Fellowship  
 Don and Jean Morris Physical Education and Kinesiology Department  
 Endowment Stipend  
 Robert Mott Memorial Scholarship  
 Sarah Perryman Memorial Award  
 Robert and Elva Rodin Botanical Scholarship  
 Aryan I. Roest Memorial Scholarship  
 Bryant Russell Memorial Award  
 Sierra Vista Regional Medical Center Volunteers Auxiliary Scholarships  
 Mary E. Smith Memorial Marine Biology Award  
 David H. Thomson Memorial Scholarship  
 Unocal Environmental Education Scholarships  
 Ralph M. Warten Memorial Scholarships  
 Archie and Andrea Waterbury Biological Sciences Scholarships  
 Harold J. Watson Memorial Scholarship  
 David and Frieda Wertman Scholarship  
 Ralph E. Weston Memorial Award  
 Kevin Wright Memorial Scholarship

### University Center for Teacher Education

California Retired Teachers Association-Laura E. Settle Scholarship  
 Michael and Josephine Cappellotti Scholarship  
 Calista Cheek Memorial Scholarship  
 David Joseph Gill Scholarship  
 Don and Jean Morris Teacher Education Scholarship  
 Larry Ratner Scholarship  
 Mary Stuart Rogers Foundation Scholarships  
 David Sanchez Memorial Scholarship

### Athletics

Dick Anderson Aquatic Scholarship  
 Jon Robert Andrews Memorial Scholarship  
 Vic and Sally Buccola Athletic Scholarship  
 Mickie Burris Award  
 Cal Poly Wrestling Alumni Scholarship  
 Charles Daum Memorial Scholarship  
 Berdy Harr Memorial Scholarship  
 Hanna Herrmann Memorial Scholarship  
 Musselman Wrestling Scholarship  
 Mustang Booster Athletic Scholarship  
 Sydney J. Rosenberg Excellence in Golf Award

### Student Affairs

Vicki and Darell Farrer Scholarship  
 Michael Köhn Outstanding Resident Advisor Scholarship  
 Land Family Quest for the Best Award

McGowan-Schultz-Widic Community Service Scholarship  
 President's Community-Based Learning and Service Award  
 Courtney Elizabeth Smythe Memorial Scholarship  
 Dr. Shirley H. Walker Scholarship

### Athletic Program Grants-In-Aid

Cal Poly athletic grants-in-aid are offered to students participating in intercollegiate athletics. Grants are renewable on a quarterly basis, the requisites for renewal being at the discretion of the University.

The grant-in-aid is subject to the financial limitations imposed by the National Collegiate Athletic Association and any conference of which the University is a member. Financial aid, scholarships, specific outside resources and employment shall be considered in determining compliance with these limitations. Additional information can be provided by the Athletic Department.

### Other Scholarships

In addition to the scholarships awarded by the University, 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 over three 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 Educational Loans. Also available are small, short-term emergency loans.

**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 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)** enable parents to obtain annually adjusted variable interest loans (not to exceed nine 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** program makes 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 pays 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.

**Federal Unsubsidized Stafford Loans** are available for students who are ineligible for some or all of a subsidized Federal Stafford Loan. 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. 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.

**Alternative or Private Loans** are offered by the private sector for the purpose of covering educational expenses and do not require students to demonstrate "financial need." Careful review of the interest rates, repayment options and qualification standards will help students determine which is the best loan suited for their needs. This type of loan is meant to be used **after** traditional financial aid eligibility has been exhausted or for students who do not qualify for traditional need based aid programs. Visit the Financial Aid Office website or stop by the office for more information.

**University Long-Term Educational 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 designed to help students cope with unanticipated, educationally-related financial emergencies. Registration fees, rent, or utility bills are expenses that students should plan. They are not considered emergencies as defined under this program. Each application is reviewed on a case-by-case basis by the Financial Aid Office. For further information, visit the Financial Aid Office website, or stop by the office.

#### **University Educational and Emergency Student Loans are Funded by Donations from:**

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  
 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/Resource Conservation Districts Loan Fund  
 California Retired Teachers' Association Loan Fund  
 C.A.R.S.E.S. Loan Fund  
 Loga B. Camp Loan Fund  
 C.A.n 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  
 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  
 Metal Heat Treating Association of California Loan Fund  
 Graham Nissen Agricultural Loan Fund  
 Ornamental Horticulture Loan Fund  
 Janet Penfold Memorial Loan Fund  
 Mary T. Pollock Memorial Loan Fund  
 Rotary Loan Fund  
 San Fernando Valley Club/Printing House Craftsmen Loan Fund  
 George Schlmeyer Memorial Loan Fund  
 Sears Roebuck Loan Fund  
 Laura Settle Loan Fund  
 Norma Sullivan Memorial Loan Fund  
 Telegram-Tribune Loan Fund  
 Todd Farm Loan Fund  
 Marie Van Aspersen Memorial Loan Fund

#### **GRANTS**

**Federal Pell Grants** are designed to help undergraduates and teaching credential candidates pay for their education. 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. To apply, students complete the FAFSA.

**Federal Supplemental Educational Opportunity Grant (SEOG)** is designed 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 (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 GRANTS

The California Student Aid Commission (CSAC) awards entitlement and competitive Cal Grants. To qualify, students must be California residents. If applying for a Cal Grant for the first time, students must complete the FAFSA and a Cal Grant CPA verification form. Request the GPA Verification Form from your high school or college. File the FAFSA with the Processor and mail the GPA Verification Form to CSAC by **March 2**.

For the latest information on the Cal Grant program, visit the CSAC website at [www.csac.ca.gov](http://www.csac.ca.gov)

**Cal Grant A** awards money to middle- and low-income undergraduates. New awards are limited to students who will be freshmen, sophomores or juniors. Cal Grant A covers a portion of student registration fees and eligibility is tied to the cost of attendance at individual schools. Cal Grant A may be renewed until completion of four years in college. Students must continue to meet eligibility standards. Students may be eligible for an additional year of Cal Grant A at Cal Poly if enrolled in a campus designated five-year program, or in the teaching credential program.

**Cal Grant B** helps low income undergraduate students by providing a living allowance, or stipend. First year recipients get stipend only. Cal Grant B renewal recipients receive stipend plus a portion of registration fees. Cal Grant B may be renewed up to four years if eligibility requirements continue to be met. Extensions are allowed for campus designated fifth-year programs, including the teaching credential program. Cal Grant eligibility is tied to cost of attendance at individual schools.

**Cal Grant T** is awarded to students who have a bachelor's degree and plan to enroll in a teacher credential program. The Cal T award is limited to one year. Students who received extended Cal Grant A or B benefits for participation in a teaching credential program, or are currently eligible for extended benefits, are not eligible for a Cal Grant T. Students who already have a teaching credential are not eligible. There is a teaching service requirement upon graduation. Failure to meet this requirement will require repayment of the grant. The Cal Grant T deadline is **June 1**.

**State Educational Opportunity Program Grant (SEOP)** assists 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)** provides 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.

**Cal Poly Grant** provides grants to offset the increased campus Academic Fee. The Cal Poly Grant 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*  
*& Policies*

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# Academic Requirements and Policies

*Academic Records Office and Registration Information (805) 756-2531  
Evaluations (805) 756-2396, Veterans Affairs (805) 756-6018*

## PLACEMENT TEST REQUIREMENTS

The California State University requires each entering undergraduate, except those who qualify for an exemption, to take the CSU Entry Level Mathematics (ELM) examination and the CSU English Placement Test (EPT) after admission and prior to enrollment. These placement tests are not a condition for admission to the CSU, but they are a condition of enrollment. They are designed to identify entering students who may need additional support in acquiring basic English and mathematics skills necessary to succeed in CSU baccalaureate-level courses. Undergraduate students who do not demonstrate college-level skills in English and/or mathematics should enroll in appropriate remedial courses or programs during the first term of their enrollment.

### English Placement Test (EPT)

#### Purpose of the EPT

The EPT is designed to assess the level of reading and writing skills of entering undergraduate students so that they can enroll in appropriate courses. Those undergraduate students who do not demonstrate college-level skills will be advised to enroll in courses or programs designed to help them attain these skills. The test is not a condition for admission to the CSU, but it is a condition of enrollment. Students may take the EPT only once. It may not be repeated.

#### Who Must Take the EPT

The CSU English Placement Test must be completed by all entering undergraduates with the exception of those who present proof of one of the following.

- a score of 550 or above on the Verbal section of the College Board SAT I Reasoning Test taken on or after April 1, 1995.
- a score of 680 or above on the re-centered and adjusted College Board SAT II Writing Test taken May 1998 or after.
- a score of 24 or above on the enhanced ACT English Test taken October 1989 or later.
- a score of 3, 4, or 5 on either the Language and Composition or the Composition and Literature examination of the College Board Scholastic Advanced Placement program.
- for transfer students, completion and transfer of a course that satisfies the General Education or the Intersegmental General Education Transfer Curriculum (IGETC) written communication requirement, provided such a course was completed with a grade of C or better.

## REGISTRATION HOLDS/DISENROLLMENT

CSU Trustee policy requires that all non-exempt students take the EPT examination after admission and before enrollment in the CSU. At Cal Poly, failure to take the EPT examination or show documented exemption before enrollment will result in a hold on registration privileges and may lead to disenrollment from the University.

Registration materials for the EPT will be mailed to all students subject to the requirement. The materials also may be obtained from the Test Office (805-756-1551) or the Writing Skills Program Office (805-756-2067).

### Remediation

In addition, students who do not demonstrate requisite competence are required to enroll in appropriate remedial or developmental courses beginning in their first term in order to complete the requirements during the first year of enrollment (ENGL 102, 103, 104, 111, 112, or 113). All students who score low on the EPT are required to enroll in ENGL 103 Writing Lab concurrently with ENGL 134 Writing: Exposition or ENGL 133 Writing Exposition for ESL. Failure to successfully complete ENGL 103 will result in a grade of F in ENGL 134 or ENGL 133.

Students who do not make adequate progress in developing foundational skills within the first year of enrollment will face disqualification from the University.

## Entry Level Mathematics (ELM) Exam

### Purpose of the ELM

The ELM examination is designed to assess the skill levels of entering CSU students in the areas of mathematics typically covered in three years of rigorous college preparatory mathematics courses in high school (normally Algebra I, Algebra II, and Geometry). Undergraduate students who do not demonstrate college-level skills will be advised to enroll in courses or programs designed to help them attain these skills. The ELM is not a condition for admission to the CSU, but it is a condition of enrollment.

### Who Must Take the ELM

All entering undergraduates must take the ELM examination before enrolling in a course that satisfies the college-level mathematics requirement of the General Education-Breadth program. Exemptions from the test are given only to those students who can present proof of *one of the following*:

- a score of 550 or above on the mathematics section of the College Board SAT I Reasoning Test or on the College Board SAT II Mathematics Tests Level I, IC (Calculator), II, or IIC (Calculator).
- a score of 23 or above on the American College Testing Mathematics Test.
- a score of 3 or above on the College Board Advanced Placement Mathematics examination (AB or BC) or Statistics examination.
- for transfer students, completion and transfer of a course that satisfies the General Education or Intersegmental General Education Transfer Curriculum (IGETC) quantitative reasoning requirement, provided such a course was completed with a grade of C or better.

### REGISTRATION HOLDS/DISENROLLMENT

CSU Trustee policy requires that all non-exempt students take the ELM examination after admission and before enrollment in the CSU. At Cal Poly, failure to take the ELM examination or show documented exemption before enrollment will result in a hold on registration privileges and may lead to disenrollment from the University.

In addition, students who do not demonstrate requisite competence are required to enroll in appropriate remedial or developmental programs during the *first term* of enrollment and each subsequent term until such time as they demonstrate competence. Students who do not demonstrate proficiency within the first year of enrollment will face disqualification from the University.

At Cal Poly, students **may not** enroll in any college level mathematics or statistics course without passing the ELM examination or qualifying for an exemption from it. ELM examination results 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 may be required to retake the ELM examination before enrolling in such a course.

Information and registration materials for the ELM exam will be mailed to all students subject to the requirement. The materials also may be obtained from the Test Office (805-756-1551) or the ELM/MAPE Office (805-756-2268).

### Cal Poly Mathematics Placement Examination (MAPE)

The Cal Poly Mathematics Placement Exams are a series of diagnostic exams given by the Mathematics Department to place students who have satisfied the ELM requirement in the appropriate math course. **The MAPE is not intended for all students, so please read the following information carefully.**

#### Precalculus MAPE

Students who anticipate taking Trigonometry, Calculus, or Mathematics for Elementary Teaching (MATH 119, 141, 221, or 327) must pass the precalculus MAPE unless they have presented proof of *one* of the following exemptions:

- a score of 600 or above on the mathematics section of the SAT I Test or on the SAT II Mathematics Tests Level I, IC (Calculator), II, or IIC (Calculator);
- a score of 30 or above on the ACT math test;
- a score of 3 or above on the Advanced Placement calculus examination (AB or BC);
- completion and transfer of a college course equivalent to MATH 120 (Precalculus Algebra/Trig) with a grade of C or better; *or*
- MATH 120 or equivalent completed at California Polytechnic State University.

#### Intermediate Algebra MAPE

Students who anticipate taking Precalculus Algebra (MATH 118) or Precalculus Algebra/Trig (MATH 120) must pass the intermediate algebra MAPE unless they have presented proof of one of the following exemptions:

##### For MATH 118:

- a score of 550 or above on the mathematics section of the SAT I Test or on the SAT II Mathematics Tests Level I, IC (Calculator), II, or IIC (Calculator);
- a score of 23 or above on the ACT math test; *or*
- a score of 550 or above on the ELM test.

##### For MATH 120:

- a score of 600 or above on the mathematics section of the SAT I Test or on the SAT II Mathematics Tests Level I, IC (Calculator), II, or IIC (Calculator), *or*
- a score of 28 or above on the ACT math test.

**NOTE:** Students who have satisfied the ELM requirement and are planning to take MATH 112 or MATH 116 do *not* need to take the MAPE.

Students who need to take a math placement exam are expected to do so prior to enrollment. The MAPE is free and offered regularly throughout the year. For information, contact the ELM/MAPE Office (805-756-2268) or the Math Department Office (805-756-2206).

## EVALUATION OF TRANSFER CREDIT

The Office of Academic Records evaluates previous college work as it relates to the requirements at Cal Poly. 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 Cal Poly will be converted to quarter units by multiplying the semester units by one and one-half.

Evaluation of Transfer Credit statements are completed automatically after 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:

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

Cal Poly, along with the California Community Colleges (CC's), California State Universities (CSU's) and the Universities of California (UC's), have written articulation agreements relative to the equivalency of courses. These agreements are available at [www.assist.org](http://www.assist.org) as well as General Education (GE) course listings for all CC's and some CSU's and UC's. Cal Poly will accept transfer GE courses for corresponding areas. GE courses do not need to articulate in order to fulfill GE requirements unless the GE course is specified as a *Major* or *Support* course in the curriculum.

GE certifications will be accepted from California institutions from which the students transfer. The certification determines the completion of lower division GE

requirements. Students must still complete twelve units of upper division GE courses and twelve units of GE courses in residence for graduation.

Students planning to transfer to Cal Poly should consult with their school counselors if they have questions about transfer courses.

## OTHER ACADEMIC CREDIT

### Advanced Placement Credit

Cal Poly grants credit toward its undergraduate degrees for examinations successfully completed through the College Board Advanced Placement (AP) program. AP scores may be requested from the College Board and must be sent to Cal Poly to receive credit. Exams passed with a score of 3 or higher result in nine (9) quarter units of credit, except where otherwise noted. *To request scores: AP Exams, PO Box 6671, Princeton, NJ 08541-6671 or (609) 771-7300 (8am-4pm ET).*

Credit may vary from year to year, as Cal Poly requirements and AP Exams change. The AP exams for May 2003 will be available after publication of this catalog. The following table indicates credit likely to be given, based on past experience. It should be viewed as a guideline only and is subject to change:

ADVANCED PLACEMENT EXAM CREDIT - 2002		
Exam Name	#	Credit Granted
<b>Art History</b>	13	ART 112 plus free electives
<b>Art: Drawing</b>	14	9 units in free electives
<b>Art: 2D Design</b>	15	9 units in free electives
<b>Art: 3D Design</b>	16	9 units in free electives
<b>Biology:</b> Score of 3	20	BIO 111 or 115 plus free electives
<b>Biology</b> Score of 4 or 5		BIO 111 or 115 or 151 plus free electives
<b>Calculus AB</b>	66	MATH 141 or 161 or 221 plus additional math units to total 9 in GE Area B1. This will suffice as GE Area B1 credit for majors requiring 112, 118, 120 (or 118 & 119).
<b>Calculus BC</b>	68	MATH 141 and 142 or 161 and 162 or 141 and 182 plus additional math units to total 9 in GE Area B1. This will suffice as GE Area B1 credit for majors requiring 112, 118, 120 (or 118 & 119) or 221.

ADVANCED PLACEMENT EXAM CREDIT - 2002		
Exam Name	#	Credit Granted
<b>Calculus AB Subscore</b>	69	MATH 141 <b>or</b> 161 <b>or</b> 221 plus additional math units to total 9 in GE Area B1. This will suffice as GE Area B1 credit for majors requiring 112, 118, 120 (or 118 & 119).
<b>Note:</b> If <i>both</i> Calc AB & BC are passed, credit is extended only for Calc BC, since BC duplicates AB material.		
<b>Chemistry</b> Score of 3	25	CHEM 110 <b>or</b> 111 <b>or</b> 124 <b>or</b> 127 plus free electives.
Score of 4 or 5		As above and <b>possible</b> credit for CHEM 125 <b>or</b> 128 (see Chemistry Dept.) plus free electives
<b>Comparative Govt &amp; Politics</b>	58	9 units in free electives
<b>Computer Science</b> Test A or AB	31 33	CSC 101 <b>or</b> CPE 101 plus free electives
<b>Note:</b> If <i>both</i> Computer Science A & AB are passed, only 4.5 units of credit are awarded for the second exam; a total of 13.5 units will be awarded		
<b>Economics: Micro</b>	34	ECON 221 plus free electives
<b>Economics: Macro</b>	35	ECON 222 plus free electives
<b>English: Language and Composition or Literature and Composition</b> Score of 3	36 37	ENGL 134 plus free electives
<b>English: Language and Composition</b> Score of 4 or 5	36	ENGL 134 plus free electives
<b>English: Literature and Composition</b> Score of 4 or 5	37	ENGL 134 and GE Area C1 Literature (4 units) plus free elective <b>or</b> English majors: ENGL 134 plus free electives
<b>Note:</b> If <i>both</i> English Lit/Comp & Lang/Comp are passed, only 4.5 units of credit are awarded for the second exam; a total of 13.5 units will be awarded		
<b>Environmental Science</b>	40	FNR 101 plus free electives
<b>European History</b>	43	HIST 111 plus free electives

<b>French: Language or Literature</b> Score of 3	48 51	FR 121 plus free electives
<b>French: Language</b> Score of 4 or 5	48	FR 121 and 122 plus free elective
<b>French: Literature</b> Score of 4	51	FR 121 and 122 plus free elective
Score of 5		FR 121 (1 unit), 122 and 233
<b>Note:</b> If <i>both</i> French Language & Literature are passed, only 4.5 units of credit are awarded for the second exam; a total of 13.5 units will be awarded		
<b>German Language</b> Score of 3	55	GER 121 plus free electives
Score of 4 or 5		GER 121 and 122 plus free electives
<b>Human Geography</b>	53	GEOG 150 plus free electives
<b>Latin: Virgil or Literature</b> Score of 3	60 61	FORL 121 plus free electives
Score of 4 or 5		FORL 121 and 122 plus free elective
<b>Note:</b> If <i>both</i> Latin Virgil & Latin Literature are passed, only 4.5 units of credit are awarded for the second exam; a total of 13.5 units will be awarded		
<b>Music Theory: Aural</b>	76	MU 104 plus 7 free electives
<b>Music Theory and/or Music Theory: Nonaural</b>	75 77	MU 101 plus 5 free electives
<b>Note:</b> If exam 75 and/or exam 77 are passed in conjunction with exam 76, MU 101 & 104 plus 3 free electives are awarded for a total of 9 units		
<b>Physics B</b> Score of 3	78	PHYS 104 plus free electives (take lab book to Physics Dept. for review and <b>possible</b> lab credit)
Score of 4 or 5		PHYS 121 (1 unit) & 122 & 123
<b>Physics C (Mechanics)</b> Score of 3	80	PHYS 121 plus free electives
Score of 4 or 5		PHYS 131 plus free electives
<b>Physics C (Electricity &amp; Magnetism)</b> Score of 3	82	PHYS 123 plus free electives
Score of 4 or 5		PHYS 133 plus free electives

<b>ADVANCED PLACEMENT EXAM CREDIT - 2002</b>		
<b>Exam Name</b>	<b>#</b>	<b>Credit Granted</b>
<b>Psychology</b> Score of 3	85	PSY 201 or 202 plus free electives
Score 4 or 5		PSY 201 or 202 plus the remainder in advisor approved lower-division concentration/ICS electives (CD/PSY Majors only)
<b>Spanish: Language or Literature</b> Score of 3	87 89	SPAN 121 plus free electives
<b>Spanish: Language</b> Score of 4 or 5	87	SPAN 121 and 122 plus free elective
<b>Spanish: Literature</b> Score of 4	89	SPAN 121 and 122 plus free elective
Score of 5		SPAN 121 (1 unit), 122, and 233
<b>Note:</b> If both Spanish Language and Literature are passed, only 4.5 units of credit are awarded for the second exam; a total of 13.5 units will be awarded.		
<b>Statistics</b> Score of 3	90	STAT 130 plus free electives
Score of 4 or 5		STAT 211 or 217 or 218 or 221 or 251 plus free electives
<b>U. S. Government and Politics</b>	57	Upon completion of POLS 111 (Calif. Govt.) 4 units of credit are awarded for Area D1 (without USCP) plus free electives
<b>U. S. History</b>	07	Upon completion of POLS 111 (Calif. Govt.) 4 units of credit are awarded for Area D1 (without USCP) plus free electives
<b>Note:</b> If both US History & US Govt/Politics are passed, 4 units of credit are awarded for Area D1 (without USCP) upon completion of POLS 111 plus 14 free electives		
<b>World History</b>	93	HIST 215 plus free electives

### International Baccalaureate Exam Credit

The International Baccalaureate Diploma shall be considered in lieu of a high school diploma for admission to the University.

Credit will be awarded for classes at the **Higher** level.

All credit is given on a credit/no credit basis; no units are calculated into the GPA.

For each exam score of 5 or higher, a maximum of 8 units of **elective** credit shall be awarded.

Course-specific credit may be granted with the concurrence of the academic department.

The following table indicates credit likely to be given, based on past experience. It should be viewed as a guideline only and is subject to change:

<b>International Baccalaureate Exam Credit</b>	
<b>Exam Name</b>	<b>Credit Given</b>
<b>Biology</b> <b>Grade of 5 or 6</b>	BIO 111 or 115 plus free electives
<b>Grade of 7</b>	BIO 111 or 115 or 151 plus free electives
<b>Chemistry:</b>	CHEM 110 or 111 plus free electives or 127+128 or 124 plus free electives (in lieu of free electives with 124, credit for 125 <i>possible</i> with Chem Dept review)
<b>Economics:</b>	ECON 222 plus free electives
<b>English:</b> <b>Grade of 5</b>	8 units in free electives
<b>Grade of 6 or 7</b>	ENGL 253 plus free electives
<b>History:</b> <b>European</b>	HIST 111 plus free electives
<b>American</b>	Upon completion of POLS 111 (Calif. Govt.) 4 units of credit are awarded for Area D1 (without USCP) plus free electives
<b>Language A1/A2:</b> <b>French</b>	FR 305 plus free electives
<b>German</b>	GER 305 plus free electives
<b>Spanish</b>	SPAN 305 plus free electives
<b>Language B:</b> <b>French</b>	FR 301 plus free electives
<b>German</b>	GER 301 plus free electives
<b>Spanish</b>	SPAN 301 plus free electives
<b>Mathematics:</b>	MATH 141 or 161 or 221 plus free electives
<b>Physics:</b>	PHYS 121 and 122 and 123
<b>Psychology:</b>	PSY 201 or 202 plus PSY prefix electives
<b>Social Anthropology</b>	ANT 201 and GEOG 150

### Credit for Noncollegiate Instruction

Cal Poly grants undergraduate degree credit for successful completion of noncollegiate instruction, either military or civilian, appropriate to the baccalaureate, which 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 submitting evidence of satisfactory completion of basic 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 Examination and some College Level Entrance Program (CLEP) examinations.

There are certain CLEP tests that 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).

### Challenging Cal Poly Courses

A student may challenge a course in which he or she is qualified through previous education by taking an examination developed at the campus. Credit shall be awarded to those who pass them successfully. A student may not petition for credit by examination if the student has *ever* been enrolled in the course. Credit shall not be awarded when credit has been granted at a level more advanced than that represented by the course.

The credit by examination option is only available to regular Cal Poly students during a term in which they are officially enrolled. The graded credit by examination petition must be received by the Office of Academic Records prior to the beginning of the term after which credit is to be granted. A fee is charged for such an exam.

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.

Arrangements to obtain course credit by exam 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.

## General Requirements – Bachelor's Degree

### CHOICE OF CATALOG

Cal Poly issues a new catalog every one or 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 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, or
- (4) as allowed by campus policy.

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.)

### Choice of Catalog Older than 10 years for Returning Students

Students may request to complete their degrees on a catalog older than 10 years if the only remaining degree requirements at the time they left Cal Poly do not exceed 16 units. The remaining degree requirements may include senior project, Graduation Writing Requirement, and/or U. S. Cultural Pluralism requirement. The decision to approve or disapprove a student's request is based on:

- (1) her/his willingness to commit to completing

outstanding degree requirements within a specified timeframe, and (2) her/his ability to demonstrate, with written documentation, reasonable currency of knowledge and skills in her/his degree field to the satisfaction of the faculty in the applicable major, as certified by the department chair. Both the college dean and the Vice Provost for Academic Programs must give approval.

## GENERAL GRADUATION REQUIREMENTS

There are nine general requirements, which all students must meet in order to earn the bachelor's degree from Cal Poly and participate in commencement. *Students must be formally admitted to the major in which they wish to graduate, 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 degree program are shown under the academic department offering the major and include a curriculum display with courses listed by Major, Support, General Education, and Electives. The department may have a flow chart, which shows the recommended sequence of courses leading to the degree.

Students are responsible for meeting all requirements. Advice is available from faculty advisors, college advising centers, and the Office of Academic Records. Students should plan their degree programs carefully and review them frequently with their advisors.

## Minimum Requirements for Graduation

### 1. Minimum Number of Units

Baccalaureate degree programs..... 180 units

For the Bachelor of Arts (BA), 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 (BS), a minimum of 27 major units must be in upper division courses and 60 units overall must be upper division. Individual baccalaureate degree programs may require more than 180 units. (Title 5, Sections 40500, 40501, 40505, 40507)

### 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 on page 81.

### 4. General Education (GE) Courses

Students must complete the GE requirements as indicated in the degree program and shown in the GE section of this catalog (see page 76).

### 5. Graduation Writing Requirement (GWR)

Students must demonstrate competency in writing skills as described below.

### 6. Senior Project

A senior project is a required for all Cal Poly students as described below.

### 7. Academic Residence Requirements

The minimum requirements for units taken in residence at Cal Poly are:

- \* 50 quarter units
- \* 30 units in residence of the last 40 units counted toward the degree
- \* 36 of the 50 units in residence must be upper division
- \* 18 of the 36 upper division units in residence must be in the major.

Extension credit or credit by examination may not be used to fulfill the residence requirements. 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 **four** 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. Graduating students will receive a complimentary diploma. Additional diplomas may be ordered through El Corral Bookstore. The diploma will not be ordered until all degree requirements have been completed. The diploma will be mailed approximately three to four weeks 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.

### 9. Commencement

For a student to participate in graduation ceremonies, the student must satisfy *at least one* of the following:

- \* shall have completed all degree requirements and not have participated in a graduation ceremony previously;
- \* shall currently be enrolled in classes that would complete all of that student's degree requirements;
- \* shall be registered for classes for the following term that would allow the student to complete all of his/her degree requirements.

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

### Graduation Writing Requirement (GWR)

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.

Students must earn proficiency after reaching 90 units. Students should review their program requirements to determine which option is appropriate. The GWR must be fulfilled at Cal Poly, not at another campus.

At Cal Poly students may meet the Graduation Writing Requirement (GWR) through one of the following options:

1. Pass the Writing Proficiency Exam.
2. Pass an approved upper-division course with a grade of C or better AND receive certification of proficiency in writing based on a 500-word in-class essay.

The upper-division courses approved for GWR credit are listed in the *Class Schedule* and on the Academic Programs website, [www.calpoly.edu/~acadprog/gened](http://www.calpoly.edu/~acadprog/gened). Some, but not all, GWR-approved courses also meet GE and USCP requirements.

### Senior Project

**Definition:** the senior project is a capstone experience required for all Cal Poly students receiving a baccalaureate degree. It integrates theory and application from across the student's undergraduate educational experiences. The senior project consists of one or more of the following:

- (1) a design or construction experience,
- (2) an experiment,
- (3) a self-guided study or research project,
- (4) a presentation,
- (5) a report based on internship, co-op, or service learning experience,
- (6) a public portfolio display or performance.

Where the senior project does not consist primarily of a written document, departments, may, where they deem appropriate, require some written documentation (length to be determined by the department) to accompany the senior project. The precise nature or form of a senior project is to be determined by the department or program

of the student's major. The senior project is normally related to the student's field of study, future employment, and/or scholastics goals, and is carried out under direct faculty supervision.

### Expected Outcomes

At the discretion of the major department, students are expected to have the ability to:

- Reduce a topic to specific points of analysis.
- Organize the points of analysis into a logical sequence.
- Apply acquired competencies to the successful completion of a project.
- Obtain, evaluate, synthesize, and apply project-related information.
- Develop and follow a project plan.
- Estimate hours of labor and/or cost of materials necessary to complete a project.
- Organize, illustrate, and write clear and concise project documentation.
- Accept supervision when needed.

### Requirements

1. The total number of senior project units must be 1 to 6 quarter units.
2. The senior project requirement will be the same for all students in a given curriculum, but not for all students in the university, because of the nature of the various curricula.
3. Normally 30 hours of student work will be required for each unit of credit granted.
4. Projects requiring an excessive amount of time are discouraged.
5. The number of students participating in a group senior project should not be so large as to unduly limit individual experience or responsibility and initiative.
6. The student is responsible for identifying costs and potential funding sources for his or her senior project prior to initiation of the project. Costly projects are discouraged.
7. It is the student's responsibility to become informed about the university's intellectual properties policy and human subject policy (where applicable).

### Library Copy

1. The academic department may send one copy of each senior project to the University Library where it will be reproduced on microfiche or in an electronic format. A microfiche or electronic copy of the project will become part of the Library's archival collection where it will be available for public use.

2. After being copied on microfiche or electronically, the original project will be returned to the academic department of its origin, as applicable. Non-print media (slides, audio/video tapes, CD's, floppy disks, etc.), however, comprising all or part of a project will be permanently retained in the Library collection.
3. All projects submitted to the Library will include a completed Senior Project Requirement Form and a title page. The Form must be signed by the student's advisor or academic department head before it can be accepted for processing by the Library. The title page should follow a standardized format.
4. Each student whose senior project is submitted to the library is required to pay a library-processing fee for making her/his senior project available.

## OTHER INFORMATION

### Academic Minors

A minor is an integrated, coherent group of courses (24 to 30 quarter units), which gives the student knowledge in an area that 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. Please see page 19 for the list of minors.

Not more than one-third of the courses in a minor can be graded Credit/No Credit (CR/NC), except for courses that 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. A major and a minor may not be taken in the same degree program.

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.

### Academic 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.

Summa cum laude – 3.85

Magna cum laude – 3.70

Cum laude – 3.50

### Blended BS+MS Programs

Blended programs provide an accelerated route to a graduate professional degree, with simultaneous award of both bachelor's and master's degrees. See individual programs and/or page 96 for additional information.

### Change of Major

An application for change of major will not be considered until/ unless a student has completed *at least one quarter* at Cal Poly. Students who feel they have selected an inappropriate major for their interests and abilities, and who want to change their major, must consult with the department head in the target major (the major to which a student wishes to change). Students are strongly advised also to consult with at least one of the following: department head in the current major, faculty in the target major, advising center staff in current/target major, and Career Services staff.

Applicants for changing major will be evaluated against published performance criteria. The criteria are established by each program and are designed to assess the student's likelihood of achieving success in the major. *Some majors have a limited number of available spaces and not all students who meet the performance criteria will be accepted.* At a minimum, a selection process will take place twice each year. Students should contact the target major department for specific information regarding change of 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 from the Office of Academic Records a re-evaluation of completed requirements for the new major.

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

### Course 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 (GE) courses must be approved by the department offering the GE course and the Director of the GE program. Forms are available at the Office of

Academic Records. See the major department office for substitutions involving major or support courses.

### 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 majors must file a petition for special consideration prior to the date of starting the senior project.

### Graduate Credit Taken by Undergraduates

Undergraduates are not permitted to take courses in the 400 or 500 series for graduate credit until they have achieved senior standing. Students, who subsequently enter a graduate program at Cal Poly, may petition to receive graduate credit for up to 9 units of such coursework, provided the courses were not used toward the baccalaureate degree. Students should verify the applicability of such credit toward their graduate objective.

### 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 requirements in effect at the time of admission to the additional baccalaureate degree program, and all of the courses for the new degree as specified by the department. A minimum of 45 units of coursework for Cal Poly graduates and 50 units for graduates from another accredited institution must be completed in residence after the requirements for the first degree have been fulfilled. A senior project is required for each bachelor's degree.

### Student Classification

Undergraduate students are assigned a 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 Education



[www.calpoly.edu/~acadprog/gened](http://www.calpoly.edu/~acadprog/gened)

*Cal Poly's GE Program has undergone significant changes effective with the 2001-03 Catalog. If you are following a prior catalog, you should consult with your academic advisor, refer to page 77 of this catalog, and refer to the GE web site.*

### Program Goals

Consistent with E.O. 595, Cal Poly's General Education Program is designed to assure graduates have made noteworthy progress toward becoming truly educated persons and to provide means whereby graduates will have

- The ability to think clearly and logically, to find information and examine it critically, to communicate orally and in writing, and to reason quantitatively;
- Appreciable knowledge about their own bodies and minds, about how human society has developed and how it now functions, about the physical world in which they live, about the other forms of life with which they share the world, and about the cultural endeavors and legacies of their civilizations;
- An understanding and appreciation of the principles, methodologies, value systems, and thought processes employed in human inquiries.

### Advising

Students should consult academic advisors and curriculum displays for specific courses that may be required in their degree program.

### Foundational Courses

Students are encouraged to complete foundational courses as early as possible. Lower-division coursework in Areas A-D has been designed to give students the knowledge and skills to move to more complex materials.

### Technology Elective (Area F)

The elective is integrative in nature, requiring the application and generalization of basic scientific and mathematical knowledge along with the study of particular technologies with critical examination from multiple perspectives.

### Double-Counting

Courses from the student's Major department may not be used to fulfill upper-division electives in Areas C4, D5 or F.

### Transfer Credit

Transfer students' General Education-Breadth certifications will be accepted from California institutions. The certification determines the completion of all lower division GE Area A-E Requirements. Many Cal Poly programs require specific GE courses in the Major and/or Support; these courses must be met with equivalencies. Students must complete 12 units of upper division GE courses and 12 units of GE courses in residence.

### Chart 1 GE Requirements for Catalogs Prior to 2001-03

#### Minimum Requirements:

Total of 72 units of GE courses.

3 GE courses shall be earned in residence.

3 GE courses must be at the 300-400 level.

Courses from student's Major dept may not be used to meet C3 or D4b. You may need to select courses from the equivalent GE 2001 Areas, as indicated in parentheses below.

*Consult Advising Charts at*

*www.calpoly.edu/~acadprog/gened*

#### AREA A Communication (minimum 11 units)

Take one course from A1 and one course from A3:

A1 Expository Writing (Area A1)

A3 Speech (Area A2)

Take a minimum of one course from either A2 or A4:

A2 Critical Thinking (Area A3)

A4 Argumentative Writing (Area A3)

#### AREA B Science and Mathematics (minimum 15 units)

Take one course from B1a & one from B1b; one with lab (B4):

B1a Physical Science (Area B3)

B1b Life Science (Area B2)

Take two courses from B2 MATH and/or STAT.

B2 Mathematics and/or Statistics (Area B1)

If less than 15, take one additional course from B1 or B2.

#### AREA C Arts and Humanities (minimum 15 units)

Take one course from each Area C category:

C1a Literature (Area C1)

C1b Philosophy (Area C2)

C2 Fine/Performing Arts (Area C3)

C3 Lit/Phil/Arts (300-400 level) (Area C4)

If less than 15, take one additional course from C1, C2, C3

#### AREA D Social, Political, Economic Inst. (min. 15 units)

Take a minimum of one course from either D1a or D1b (Area D1):

D1a American institutions (History) (Area D1)

D1b American institutions (Government) (Area D1)

Take one course from three of the following four categories: D2, D3, D4a, D4b:

D2 History (Area D5 HIST course)

D3 Economic institutions (Area D2)

D4a Social institutions elective (Area D3)

D4b Social institutions elec (300-400 level) (Area D5)

#### AREA E Life Understanding (minimum 3 units)

Take one course from E1 or E2:

E1 Psychology (Area D4)

E2 Life understanding elective (Area D4)

#### AREA F Technology (minimum 2 units)

**Non-technical programs.** Colleges of Business (except BS Industrial Technology); Liberal Arts; Science & Mathematics.

Take one course from F1 or F2:

F1 Computer literacy (Area F)

F2 Technology elective (Area F)

**Technical programs.** Colleges of Agriculture; Arch & Env Design; Engineering; & BS Industrial Technology program

Take one course from F1:

F1 Computer literacy (Area F)

#### Additional GE Courses

To complete 72-unit requirement, select additional courses from Areas A, B, C, D, E. No more than one additional course per Area.

### Chart 2 Advising Information for Students Changing to the 2001-03 or 2003-05 Catalogs

**Most Majors**=Colleges of Agriculture, Architecture & Environ Design, Business, Science & Mathematics. **CLA**=College of Liberal Arts. **ENGR**=Engineering Programs.

Some programs require specific GE courses in the Major and/or Support.

GE Certification may affect the following Area minimums.

✓ non-unit requirement

Courses from student's Major Dept will not receive credit for C4, D5 or F

*Consult Advising Charts at*

*www.calpoly.edu/~acadprog/gened*

	Most Majors	CLA only	ENGR only
<b>GE Units Taken in Residence</b>	12	12	12
<b>GE Upper Division Units Required</b>	12	12	8
Students must satisfy both the minimum number of units and courses.	<b>Minimum Units</b> (Minimum # Courses)		
<b>AREA A COMMUNICATION</b>	11	11	11
A1 Expository Writing	(1 course)		
A2 Oral Communication	(1 course)		
A3 Reasoning, Argumentation, Writing	(1 course)		
<b>AREA B SCIENCE &amp; MATH</b>	15	18	26
B1 Mathematics/Statistics	(2 courses)		
B2 Life Science	(1 course)		
B3 Physical Science	(1 course)		
B4 One lab taken with B2 or B3 course	✓	✓	✓
B5 elective (for CLA students only)	--	--	--
B6 Upper-division (Engineering)	0	0	(1)
Engineering: Additional Area B	0	0	(2)
CLA students: (1 course from B1-B5)	0	(1)	0
<b>AREA C ARTS AND HUMANITIES</b>	18	15	16
C1 Literature	(1 course)		
C2 Philosophy	(1 course)		
C3 Fine and Performing Arts	(1 course)		
C4 Upper-division elective	(1 course)		
Area C Elective (1 course from C1-C4)	(1)	0	0
<b>AREA D/E SOCIETY/INDIVIDUAL</b>	18	18	16
D1 The American Experience	(1 course)		
D2 Political Economy	(1 course)		
D3 Comparative Social Institutions	(1 course)		
D4 Self Development	(1 course)		
D5 Upper-division elective	(1)	(1)	0
<b>AREA F TECHNOLOGY (upper-div)</b>	3	3	0
<b>ADDITIONAL GE (if needed to complete 72-unit requirement)</b>			
<b>TOTAL GE UNITS</b>	72	72	72

Chart 3

### GE Requirements for 2001-03 or 2003-05 Catalogs

**Most Majors**=Colleges of Agriculture, Architecture & Environmental Design, Business, Science & Mathematics.

**CLA**=College of Liberal Arts. **ENGR**=Engineering Programs.

Some programs indicate specific GE courses to fulfill Major and Support course requirements.

Courses from student's Major department may not be used to fulfill Areas C4, D5 or F.

✓ non-unit requirement

All GE courses are 4 units unless otherwise indicated.

[www.calpoly.edu/~acadprog/gened/](http://www.calpoly.edu/~acadprog/gened/)

	Most Majors	CLA only	ENGR only
<b>GE Units Taken in Residence</b>	12	12	12
<b>GE Upper Division Units Required</b>	12	12	8
<b>AREA A COMMUNICATION</b>	12	12	12
A1 Expository Writing	4	4	4
A2 Oral Communication	4	4	4
A3 Reasoning, Argumentation, and Writing	4	4	4
<b>AREA B SCIENCE &amp; MATH</b>	16	20	28
B1 Mathematics/Statistics	8	8	8
B2 Life Science	4	4	4
B3 Physical Science	4	4	4
B4 One lab taken with B2 or B3 course	✓	✓	✓
B5 elective (for CLA students only)			
B6 Upper-division (Engineering)			4
Engineering: Additional Area B			8
CLA students: (One from B1-B5)		4	
<b>AREA C ARTS AND HUMANITIES</b>	20	16	16
C1 Literature	4	4	4
C2 Philosophy	4	4	4
C3 Fine and Performing Arts	4	4	4
C4 Upper-division elective	4	4	4
Area C Elective (One from C1-C4)	4	0	0
<b>AREA D/E SOCIETY/INDIVIDUAL</b>	20	20	16
D1 The American Experience (40404)	4	4	4
D2 Political Economy	4	4	4
D3 Comparative Social Institutions	4	4	4
D4 Self Development (CSU Area E)	4	4	4
D5 Upper-division elective	4	4	0
<b>AREA F TECHNOLOGY (upper-div)</b>	4	4	0
<b>TOTAL GE UNITS</b>	<b>72</b>	<b>72</b>	<b>72</b>

Chart 3

### General Education Courses

	Most Majors	CLA only	ENGR only
<b>AREA A: COMMUNICATION</b>	<b>12</b>	<b>12</b>	<b>12</b>
<b>A1 Expository Writing</b>	4	4	4
ENGL 133 Writing: Exposition for ESL Students ENGL 134 Writing: Exposition			
<b>A2 Oral Communication</b>	4	4	4
HNRS 101 Public Speaking SCOM 101 Public Speaking SCOM 102 Principles of Speech Communication			
<b>A3 Reasoning, Argumentation, and Writing</b>	4	4	4
ENGL 145 Reasoning, Argumentation, and Writing ENGL 148 Reasoning, Argumentation, and Professional Writing ENGL 149 Technical Writing for Engineers HNRS 145 Reasoning, Argumentation, and Writing HNRS 148 Reasoning, Argumentation, and Professional Writing HNRS 149 Technical Writing for Engineers PHIL 126 Logic and Argumentative Writing SCOM 126 Argument & Advocacy SCOM 145 Reasoning, Argumentation and Writing			
<b>AREA B: SCIENCE &amp; MATH</b>	<b>16</b>	<b>20</b>	<b>28</b>
<b>B1 Mathematics/Statistics</b>	8	8	8
HNRS 141 Calculus I HNRS 142 Calculus II HNRS 143 Calculus III MATH 112 Nature of Modern Math MATH 117 Pre-Calculus Algebra II MATH 118 Pre-Calculus Algebra MATH 119 Pre-Calculus Trigonometry MATH 120 Pre-Calculus Algebra & Trigonometry (5) MATH 141 Calculus I MATH 142 Calculus II MATH 143 Calculus III MATH 161 Calculus for the Life Sciences I MATH 162 Calculus for the Life Sciences II MATH 182 Calculus for Architecture and Construction Mgmt MATH 221 Calculus for Business and Economics STAT 130 Intro Statistical Reasoning STAT 217 Intro to Statistical Concepts and Methods STAT 218 Applied Statistics for the Life Sciences STAT 221 Intro Probability and Statistics STAT 251 Statistical Inference for Management I (5) STAT 252 Statistical Inference for Management II (5) STAT 313 Applied Experimental Design & Regression Models			

	Most Majors	CLA only	ENGR only
<b>B2 Life Science</b> ( <i>B2&amp;4=lab course</i> )	4	4	4
ANT 250 Biological Anthropology BIO 111 General Biology (B2&4) BIO 113 Animal Diversity and Ecology (B2&4) BIO 114 Plant Diversity and Ecology (B2&4) BIO 115 Animal/Human Structure and Function (B2&4) BIO 151 Intro to Biology (5) (B2&4) BIO 227 Wildlife Conservation Bio BOT 121 General Botany (B2&4) MCRO 221 Surv Microbiology (B2&4) MCRO 224 Gen Microbiology I (5) (B2&4) PPSC 110 Peoples, Pests and Plagues (B2&B4) <i>For Engineering students only; concurrent enrollment required:</i> BIO 213 Life Science for Engineers (2) <i>and</i> ENGR/BRAE 213 Bioengineering Fundamentals (2)			
<b>B3 Physical Science</b> ( <i>B3&amp;4=lab course</i> )	4	4	4
ASTR 101 Intro to the Solar System ASTR 102 Intro to Stars & Galaxies CHEM 110 World of Chemistry (B3&4) CHEM 111 Survey of Chemistry (5) (B3&4) CHEM 124 General Chemistry for Engineers (B3&4) CHEM 125 General Chemistry for Engineers (B3&4) CHEM 127 General Chemistry (B3&4) GEOL 102 Introduction to Geology GEOL 205 Earthquakes HNRS 131 General Physics (B3&4) HNRS 132 General Physics (B3&4) PHYS 104 Introductory Physics PHYS 107 Introduction to Meteorology PHYS 111 Modern Physics for Poets PHYS 121 College Physics (B3&4) PHYS 131 General Physics (B3&4) PHYS 132 General Physics (B3&4) PHYS 133 General Physics (B3&4) PSC 101 Physical Environment: Matter & Energy (B3&4) PSC 103 Physical Environment: Earth & Universe			
<b>B4 One lab taken with B2 or B3 course</b>	✓	✓	✓
<b>CLA students:</b> ( <i>Select one from B1-B5</i> )	0	4	0
<b>B5 elective</b> ( <i>GE option for College of Liberal Arts students only</i> )	--	--	--
BIO 112 Conservation Biology & Environmental Science BIO 300 Biology of Cancer BIO 302 Human Genetics FNR 319 Natural Resource Ecology, Theories & Applications FSN 210 Nutrition GEOL 203 Fossils and History of Life PSC 201 Intro to Physical Oceanography PSY 340 Biopsychology SS 121 Intro to Soil Science			

	Most Majors	CLA only	ENGR only
<b>B6 Upper-division Area B</b> ( <i>ENGR only</i> )	0	0	4
CHEM 305 Physical Chemistry for Engineers CSC 341 Numerical Engineering Analysis GEOL 305 Fundamentals Seismology MATH 304 Vector Analysis MATH 317 Topics in Engineering Mathematics MATH 318 Advanced Engineering Mathematics MATH 344 Linear Analysis II MATH 408 Complex Analysis I PHYS 412 & 452 Solid State Physics & Lab PHYS 417 Nonlinear Dynamical Systems STAT 312 Statistical Methods for Engineers STAT 321 Probability & Statistics for Engineers and Scientists STAT 350 Probability & Random Processes for Engineers			
<b>Engineering: Additional Area B</b>	0	0	8

<b>AREA C: ARTS AND HUMANITIES</b>	20	16	16
<b>C1 Literature</b>	4	4	4
ENGL 230 Masterworks British Literature through 18 <sup>th</sup> Century ENGL 231 Masterworks British Lit: Late 18 <sup>th</sup> Century - Present ENGL 240 American Tradition in Literature ENGL 251 Great Books I: Ancient & Classical World ENGL 252 Great Books II: Emergence of Europe ENGL 253 Great Books III: Age of Revolution FR 233 Critical Readings in French Literature GER 233 Critical Readings in German Literature HNRS 251 Great Books I: Ancient & Classical World SPAN 233 Introduction to Hispanic Readings			
<b>C2 Philosophy</b>	4	4	4
PHIL 230 Philosophical Classics: Metaphysics & Epistemology PHIL 231 Philosophical Classics: Social & Political Philosophy			
<b>C3 Fine and Performing Arts</b>	4	4	4
ARCH 217 History of Architecture ARCH 218 History of Architecture ARCH 219 History of Architecture ART 101 Fundamentals of Art ART 111 Introduction to Art ART 112 Survey of Western Art ART 148 Sculpture DANC 221 Dance Appreciation MU 101 Introduction to Music Theory MU 120 Music Appreciation MU 221 Jazz Styles ( <i>USCP</i> ) MU 229 Music of the 60's: War and Peace ( <i>USCP</i> ) SCOM 208 Performance of Literature TH 210 Introduction to Theatre TH 227 Theatre History: Classical TH 228 Theatre History: 18 <sup>th</sup> Century to Contemporary			

<b>C4 Upper-division elective</b>	<b>4</b>	<b>4</b>	<b>4</b>
<i>Courses from student's Major Dept will not receive C4 credit</i>			
ARCH 320 History of Asian Arch & the Built Environment			
ART 314 History of Photography			
ART 318 Asian Art: National, Religion & Intel Movements			
DANC 311 Dance in American Musical Theatre			
DANC 321 Cultural Influences on Dance in America (USCP)			
ENGL 330 Brit Lit: Age of Belief to 1485			
ENGL 331 Brit Lit: Age of Discovery, 1485-1600			
ENGL 332 Brit Lit: Age of Enlightenment, 1660-1798			
ENGL 333 Brit Lit: Age of Romanticism, 1798-1832			
ENGL 334 Brit Lit: Age of Industrialism, 1832-1914			
ENGL 335 Brit Lit: Age of Modernism: 1914-Present			
ENGL 338 Intro Shakespeare: London			
ENGL 339 Intro Shakespeare			
ENGL 340 Literary Sources American Character: 1600-1865			
ENGL 341 Literary Sources American Character: 1865-1914			
ENGL 342 Literary Sources American Character: 1914-1956			
ENGL 343 Multiple Voices Contemp Amer Lit: 1956 - Present			
ENGL 345 Women Writers of 20th Century (USCP)			
ENGL 346 Ethnic American Lit (USCP)			
ENGL 347 African American Literature (USCP)			
ENGL 349 Gender in 20th-Century Literature (USCP)			
ENGL 350 Modern Novel			
ENGL 351 Modern Poetry			
ENGL 352 Modern Drama			
ENGL 353 Drama in London			
ENGL 354 Bible as Literature and in Literature and the Arts			
ENGL 370 World Cinema			
ENGL 371 Film Styles and Genres			
ENGL 372 Film Directors			
ENGL 380 Literary Themes			
ENGL 381 Diversity in 20th-Century American Lit (USCP)			
ENGL 386 Creative Nonfiction			
ENGL 387 Fiction Writing			
ENGL 388 Poetry Writing			
ES 300 Chicano/a Non-Fiction Literature (USCP)			
ES 321 Native American Cultural Images (USCP)			
ES 360 Ethnicity & Land (USCP)			
FNR 360 Ethnicity & Land (USCP)			
FR 305 Significant Writers in French			
FR 350 French Literature in English Translation			
GER 305 Significant Writers in German			
GER 350 German Literature-English Translation			
HNRS 304 Values and Technology			
HNRS 320 Values, Media, Culture			
HUM 303 Values and Technology			
HUM 310 World Cultures			
HUM 312 Chicano/a Culture (USCP)			
HUM 320 Values, Media, Culture			
HUM 340 Content of Our Character			
HUM 361 Modernism			
MU 324 Music and Society			
MU 328 Women in Music			
PHIL 311 Greek Philosophy			
PHIL 312 Medieval Philosophy			

PHIL 313 Continental Philosophy: Descartes to Leibniz			
PHIL 314 British Philosophy: Bacon to Mill			
PHIL 315 German Philosophy: Kant to Nietzsche			
PHIL 316 Contemporary European Philosophy			
PHIL 317 Contemporary British & American Philosophy			
PHIL 320 Asian Philosophy			
PHIL 321 Philosophy of Science			
PHIL 331 Ethics			
PHIL 332 History of Ethics			
PHIL 333 Political Philosophy			
PHIL 334 Philosophy of Law			
PHIL 335 Social Ethics (USCP)			
PHIL 337 Business Ethics			
PHIL 338 Ethics and Education			
PHIL 339 Biomedical Ethics			
PHIL 340 Environmental Ethics			
PHIL 342 Philosophy of Religion			
PHIL 350 Aesthetics			
RELS 304 Judaism			
RELS 305 Christian Origins			
RELS 306 Hinduism			
RELS 307 Buddhism			
RELS 309 Monotheism: The Bible and the Quran			
RELS 336 Religion, Gender and Society (USCP)			
SCOM 308 Group Performance of Literature			
SPAN 305 Significant Writers in Spanish			
SPAN 340 Chicano/a Authors (USCP)			
SPAN 350 Hispanic Literature in English Translation			
SPAN 351 Latino/a Writers in U. S. (USCP)			
TH 310 Women's Theatre			
TH 320 Black Theatre (USCP)			
WS 336 Religion, Gender and Society (USCP)			
<b>Area C Elective (one course from C1-C4)</b>	<b>4</b>	<b>0</b>	<b>0</b>

	<b>Most Majors</b>	<b>CLA only</b>	<b>ENGR only</b>
<b>AREA D/E: SOCIETY &amp; INDIVIDUAL</b>	<b>20</b>	<b>20</b>	<b>16</b>
<b>D1 The American Experience (40404)</b>	<b>4</b>	<b>4</b>	<b>4</b>
ES 112 Race, Culture, Politics in the U.S. (USCP)			
HIST 206 American Cultures (USCP)			
HIST 207 Freedom and Equality in American History (USCP)			
HNRS 112 Race, Culture, Politics in the U.S. (USCP)			
POLS 112 American and California Government			
<b>D2 Political Economy</b>	<b>4</b>	<b>4</b>	<b>4</b>
ECON 201 Survey of Economics			
ECON 222 Macroeconomics			
HIST 213 Modern Political Economy			
HIST 214 Political Economy of Latin America & Middle East			
HNRS 201 Survey of Economics			
SOC 218 International Political Economy			
<b>D3 Comparative Social Institutions</b>	<b>4</b>	<b>4</b>	<b>4</b>
ANT 201 Cultural Anthropology			
ES 212 Global Origins of U.S. Cultures (USCP)			
GEOG 150 Intro to Cultural Geography			
HIST 215 Comparative World History			
HNRS 212 Global Origins of U.S. Cultures (USCP)			
HNRS 215 Comparative World History			
SOC 110 Comparative Societies			

<b>D4 Self Development (CSU Area E)</b>	<b>4</b>	<b>4</b>	<b>4</b>
FSN 250 Food and Nutrition: Customs & Culture (USCP) KINE 250 Healthy Living KINE 255 Personal Health: Multi-cultural Approach (USCP) PSY 201 Introduction to Psychology PSY 202 Introduction to Psychology			
<b>D5 Upper-division elective</b>	<b>4</b>	<b>4</b>	<b>0</b>
<i>Courses from student's Major Dept will not receive D5 credit</i> ANT 325 Precolumbian Mesoamerica ANT 344 Sex, Death & Human Nature ANT 360 Human Cultural Adaptations BUS 311 Managing Technology International Legal Environ CRP 334 Cities in Globalizing World ECON 303 Econ of Poverty Discrimination Immigration (USCP) ECON 304 Comparative Econ Systems ECON 322 Economic History of the Advanced World ES 308 Fire and Society ES 320 African American Cultural Images (USCP) ES 322 Asian American Cultural Images (USCP) ES 323 Mexican American Cultural Images (USCP) ES 330 Chinese American Experience (USCP) FNR 308 Fire and Society FNR 323 Human Dimensions Natural Resource Management GEOG 300 Geography of United States GEOG 301 Geography of Resource Utilization GEOG 308 Global Geography HIST 306 The Witch-Hunt in Europe HIST 307 European Thought, 1800-2000 HIST 308 Trans-Atlantic Slave Trade HIST 309 Cultures of West Africa & African Diaspora HIST 310 East Asian Culture & Civilization HIST 320 Colonial & Revolutionary America HIST 321 Civil War America HIST 322 Modern America HNRS 303 Econ of Poverty Discrimination Immigration (USCP) HUM 316 London: From Roman Colony to World Capitol KINE 323 Sport and Gender (USCP) POLS 325 Global Political Issues POLS 338 Critical Issues American Politics POLS 339 Comparative Political Systems POLS 384 Citizenship, Society and Self PSY 311 Environmental Psychology PSY 318 Psychology of Aging PSY 352 Conflict Resolution: Violent & Nonviolent SOC 315 Global Race Relations SOC 326 Sociology of the Life Cycle SOC 377 Sociology of Religion WS 301 Introduction to Women's Studies (USCP) WS 311 Women in Cross Cultural Perspectives			
<b>AREA F: TECHNOLOGY ELECTIVE (upper division)</b>	<b>4</b>	<b>4</b>	<b>0</b>
<i>Courses from student's Major Dept will not receive Area F credit</i> AERO 310 Air and Space AG 315 Organic Agriculture AG 350 The Global Environment			

AG 360 Holistic Management  
 BIO 307 World Aquaculture: Applies, Methods & Trends  
 BIO 317 Introduction to the World of Spatial Information  
 BRAE 340 Irrigation Water Mgmt  
 BRAE 348 Energy for a Sustainable Society  
 BUS 350 The Global Environment  
 CHEM 349 Chemical and Biological Warfare  
 CSC 302 Computers & Society  
 CSC 310 Computers for Poets  
 EDES 350 The Global Environment  
 ENGR 302 Transportation & Manufacturing in 21<sup>st</sup> Century  
 ENGR 350 The Global Environment  
 ENVE 324 Intro Air Pollution  
 FNR 312 Technology of Wildland Fire Management  
 FNR 317 Introduction to the World of Spatial Information  
 FNR 321 Water Systems Technology, Issues and Impacts  
 FSN 319 Food Technology/Consumer  
 GEOG 317 Introduction to the World of Spatial Information  
 GRC 377 Desktop Publishing for Print and World Wide Web  
 HIST 354 History Network Technology  
 HIST 358 Cloning  
 HIST 359 Living in the Material World  
 HNRS 310 Air and Space  
 HUM 302 Human Values in Agriculture  
 HUM 330 Cal Poly Land: Nature, Technology & Society  
 HUM 350 The Global Environment  
 IME 320 Human Factors & Technology  
 IT 336 Textile Technology  
 IT 341 Plastics Processes & Applications  
 LA 317 Introduction to the World of Spatial Information  
 MATE 359 Living in the Material World  
 ME 321 Solar Energy  
 POLS 333 World Food Systems  
 PSC 307 Nuclear Weapons in Post-Soviet World  
 PSC 320 Energy & Environment for New Millennium  
 SCM 320 Technology in London  
 SCM 325 Genetic Engineering Technology  
 SCM 350 The Global Environment

<b>Total GE Units</b>	<b>72</b>	<b>72</b>	<b>72</b>
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## U.S. Cultural Pluralism Requirement

United States 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, ethnocentricity, 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, or Free Elective category.

The following courses fulfill the United States Cultural Pluralism requirement. Consult the current *Class Schedule* or your academic advisor for an up-to-date list.

\* = Course also satisfies a General Education requirement

AGB 401 Managing Cultural Diversity in Agricultural Labor Relations (4)  
 ANT 415 Native American Cultures (4)  
 CRP 215 Planning for and with Multiple Publics (4)  
 DANC 321 Cultural Influences/Dance in America (4) C4\*  
 ECON 303 Economic Poverty, Discrimination and Immigration (4) D5\*  
 ENGL 345 Women Writers (4) C4\*  
 ENGL 346 Ethnic American Literature (4) C4\*  
 ENGL 347 African American Literature (4) C4\*  
 ENGL 349 Gender in 20<sup>th</sup> Century Literature (4) C4\*  
 ENGL 381 Diversity in 20<sup>th</sup> Century Amer. Lit. (4) (C4)\*  
 ES 112 Race, Culture, and Politics--United States (4) D1\*  
 ES 114 Race in American Culture (4)  
 ES 212 Global Origins of U.S. Cultures (4) D3\*  
 ES 215 Planning for and with Multiple Publics (4)  
 ES 240 Latino Metropolis (4)  
 ES 300 Chicano/a Non-Fiction Literature (4) C4\*  
 ES 320 African American Cultural Images (4) D5\*  
 ES 321 Native American Cultural Images (4) C4\*  
 ES 322 Asian American Cultural Images (4) D5\*  
 ES 323 Mexican American Cultural Images (4) D5\*  
 ES 325 African American Women's Experiences (3)  
 ES 330 Chinese American Experience (4) D5\*  
 ES 350 Asian Amer. & African Amer. Environments (3)  
 ES 360 Ethnicity and the Land (4) C4\*  
 FNR 360 Ethnicity and the Land (4) C4\*  
 FSN 250 Food and Nutrition: Customs/Culture (4) D4\*  
 HIST 206 American Cultures (4) D1\*  
 HIST 207 Freedom & Equality American History (4) D1\*  
 HIST 325 Comparative History of Amer. Minorities (3)  
 HIST 328 American Indian History (3)  
 HIST 329 American Indian Thought (3)  
 HIST 333 African American History from 1865 (4)  
 HIST 435 American Women's History since 1870 (4)  
 HNRS 112 Race, Culture, and Politics—U. S. (4) D1\*  
 HNRS 212 Global Origins of U.S. Cultures (4) D3\*  
 HNRS 303 Economic Poverty, Discrimination and Immigration (4) D5\*

HUM 312 Chicano/a Culture (4) C4\*  
 JOUR 290 Multicultural Journalism (4)  
 KINE 255 Personal Health: Multicultural Approach (4) D4\*  
 KINE 323 Sport and Gender (4) D5\*  
 MU 221 Jazz Styles (4) C3\*  
 MU 229 Music of the 60s: War and Peace (4) C3\*  
 MU 325 America's Music (4)  
 PHIL 335 Social Ethics (4) C4\*  
 POLS 310 Politics of Ethnicity and Gender (4)  
 POLS 343 Civil Rights in America (4)  
 RELS 336 Religion, Gender and Society (4) C4\*  
 SCOM 416 Intercultural Communication (4)  
 SOC 316 American Ethnic Minorities (4)  
 SPAN 111, 112, 113 Elementary Hispanic Language and Culture (4) (4) (4)  
 SPAN 123 Spanish for Heritage Speakers (4)  
 SPAN 340 Chicano/a Authors (4) C4\*  
 SPAN 351 Latino/a Writers in the U. S. (4) C4\*  
 TH 320 Black Theatre (4) C4\*  
 WS 301 Introduction to Women's Studies (4)  
 WS 336 Religion, Gender and Society (4) C4\*  
 WS 435 American Women's History since 1870 (4)  
 WS 450 Feminist Theory (4)

## Registration

Students are required to enroll in courses by using the web registration system (POWER) or the telephone voice response system (CAPTURE). The courses selected should meet the requirements specified for each student's major course of study.

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/POWER system has been confirmed. Students should print copies of their schedule for their records. 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).

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.

## ENROLLMENT POLICY

State funding is allocated to the University based on student enrollment each term. Any attendance/ participation in classes where the student is not officially enrolled during the term of participation (and where appropriate registration fees have not been paid) is against campus policy. This includes enrollment in Internship courses and acceptance of a position through the Cooperative Education program. All registration should be completed by the end of the Add Period, the 11<sup>th</sup> day of the term.

## CLASS ATTENDANCE

Students are expected to attend regularly 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 or graduate advisor. Increase in maximum unit load is not available to students on academic probation. Maximum load requirements may be waived only on presentation of evidence of ability to carry successfully such a group of courses. A petition to carry an excess load is available from the Office of Academic Records.

## ADD/DROP

All changes to individual class registration or enrollments are the responsibility of the student. The add/drop period continues through CAPTURE/POWER initial registration cycles until the end of the first two weeks of instruction of each term. During this period, the student has the opportunity to add or drop classes. Specific dates for completing these transactions are published in the quarterly *Class Schedule*. Students are responsible for knowing and adhering to these published timelines and for their enrollments.

## Adding

*Closed classes:* If a class is full, students may use a permit form to ask the instructor if they can add into the course. See the *Class Schedule* for details.

*Time conflict:* Students may not enroll in two classes that 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/POWER.

## Dropping

Students have until the end of the second week of instruction to drop a class through CAPTURE/POWER 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 information on withdrawing 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 with a written request and approval by campus officials.

### Eligibility for All Leaves

1. A student on Educational or Medical Leave will be considered to be in continuous attendance with the purpose of returning to the same curriculum that was in effect when the leave began.
2. 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.
3. No more than two leaves will be available to each student (totaling a maximum of 8 terms).
4. The student on leave may return and enroll for any term prior to the term when the leave is scheduled to

- end. NO leave will be extended beyond the two-year limitation for any reason.
- 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.

### **Educational Leaves:**

- A Planned Educational Leave must be for a purpose that contributes to the student's educational objective and is approved by the student's major department head or chair.
- 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.
- The application for Educational Leave must be initiated and approved before the leave begins and will not be granted retroactively.
- Application forms and information concerning Leaves of Absence may be obtained from the Office of Academic Records.

### **Medical Leaves:**

- 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 a medical doctor.
- 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.
- A written letter together with medical documentation is required. Information concerning Leaves of Absence may be obtained from the Office of Academic Records.

### **RETURNING STUDENTS**

Matriculated students who have not registered for three consecutive quarters and who have not been on an approved leave of absence must file an application for readmission. The application fee must accompany the application for readmission. See the Admissions section for application deadlines for returning students.

Matriculated students who have not registered for one or two consecutive quarters need not apply for readmission. Summer Quarter is a regular quarter and is counted in determining the length of absence.

### **INTRASYSTEM AND INTERSYSTEM ENROLLMENT PROGRAMS**

Students enrolled at any CSU campus will have access to courses at other CSU campuses on a space available basis unless those campuses or programs are impacted. This access is offered without students being required to be

admitted formally to the host campus and sometimes without paying additional fees. Although courses taken on any CSU campus will transfer to the student's home CSU campus as at least elective credit, students should consult their home campus academic advisors to determine how such courses may apply to their degree programs before enrolling at the host campus.

There are two programs for enrollment within the CSU and one for enrollment between CSU and the University of California or California community colleges. Additional information about these programs is available from the Office of Academic Records, Admin. 222.

**CSU Concurrent Enrollment** – matriculated students in good standing may enroll at both their home CSU campus and a host CSU campus during the same term. Credit earned at the host campus is automatically reported to the home campus to be included on the student's transcript at the home campus. This counts as residential credit towards the degree but will be shown as transfer credit.

**CSU Visitor Enrollment** – matriculated students in good standing enrolled at one CSU campus may enroll at another CSU campus for one term. Credit earned at the host campus is reported automatically to the home campus to be included on the student's transcript at the home campus as transfer credit.

**Intersystem Cross Enrollment** – matriculated CSU, UC, or community college students may enroll for one course per term at another CSU, UC, or community college and request that a transcript of record be sent to the home campus and will be recorded as transfer credit.

### **HEALTH SCREENING**

Entering CSU students are required to present proof of the following immunizations to the CSU campus they will be attending before the beginning of their first term of enrollment. **Measles and Rubella:** All new and readmitted students born after January 1, 1957 must provide proof of full immunization against measles and rubella prior to enrollment. **Hepatitis B:** All new students who will be 18 years of age or younger at the start of their first term at a CSU campus must provide proof of full immunization against Hepatitis B before enrolling. Full immunization against Hepatitis B consists of three timed doses of vaccine over a minimum 4 to 6 months period. Each incoming freshman who will be residing in on-campus housing will be required to return a form indicating that they have received information about meningococcal disease and the availability of the vaccine to prevent one from contracting the disease and whether or not he or she has chosen to receive the vaccination. These are *not* admission requirements, but shall be required of students as conditions 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 these requirements have been satisfied. Contact the Student Health Center for further information concerning clearances or special circumstances.

## 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.

**Earned Hours** are all hours for which credit was earned (excludes grades of F, WU, and NC).

**Quality Hours** carry grade point value (excludes CR and NC).

**Quality Points** are awarded for each course unit and are determined by multiplying course unit by the quality 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. No changes will be made to the academic record after 60 days following the posting of the degree.

## GRADING SYMBOLS

Academic Grading Symbols Earned	Quality Points Earned
A Superior Attainment of Course Objectives	4.0
A – Superior Attainment of Course Objectives	3.7
B + Good Attainment of Course Objectives	3.3
B Good Attainment of Course Objectives	3.0
B – Good Attainment of Course Objectives	2.7

C +	Acceptable Attainment of Course Objectives	2.3
C	Acceptable Attainment of Course Objectives	2.0
*C –	Acceptable Attainment of Course Objectives	1.7
**D +	Poor Attainment of Course Objectives	1.3
D	Poor Attainment of Course Objectives	1.0
D –	Poor Attainment of Course Objectives	0.7
F	Non-Attainment of Course Objectives	0.0
CR	Credit	–
NC	No Credit	–

### Administrative Grading Symbols

AU	Audit	–
I	Incomplete (authorized)	–
RD	Report Delayed	–
RP	Report in Progress	–
W	Withdrawn	–
WU	Withdrawal Unauthorized	0

\* Certain sequenced courses may have a C– prerequisite for advancement.

\*\* If a grade of D+ is received in a course that 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 that are *not* designated by the University as being graded on an exclusive Credit/No Credit basis.

- 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 through the registration system. 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.
- Undergraduate students will be given a grade of CR for accomplishment equivalent to a grade of C– or better. No credit (NC) will be given for D+ or lower grades. Graduate students will receive a grade of CR that 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. **NOTE: Some post-baccalaureate programs penalize students for a grade of CR.**
- 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.

- d. No more than two courses may be selected for Credit/No Credit grading in any term.
- e. Units earned in courses for which the grade was CR will count toward satisfaction of all degree requirements.
- f. Undergraduate students may elect a maximum of 16 units of Credit/No Credit grading. Up to 4 units of Credit/No Credit grading is allowed in major or support courses (subject to the approval of the student's major department) and up to 4 units of Credit/No Credit grading is allowed in General Education courses.
- g. Credit/No Credit grading will be removed for courses not meeting the above guidelines.
- h. Nonmatriculated students, including those 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

An auditor is a student who attends a course and receives no credit for the course. Enrollment as an auditor is subject to permission of the instructor. Enrollment in a course as an auditor shall be permitted only after students otherwise eligible to enroll on a credit basis have had an opportunity to do so.

Auditors are subject to the same fee structure as credit students, and regular class attendance is expected. Once enrolled as an auditor, a student may not change to credit status unless such a change is requested prior to the last day to add classes. Courses enrolled in with audit grades are not considered when determining enrollment status (for financial aid and other purposes).

An instructor is authorized to submit a change-of-grade form to change an AU to NC for students who audit a class but do not attend or do not meet agreed-upon criteria.

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 unforeseen but 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.

The instructor will designate terms of the contract and length of time allowed to complete work, not to exceed one year. Failure to complete the assigned work will result in the I being counted as equivalent to an F (or NC) for grade point average computation. All remaining grades of I will be changed to F (or NC) at the time the student's degree is awarded.

### Withdrawal Unauthorized

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

A student may petition to have one grade of WU changed to a Withdrawal, with appropriate approvals, within one year of enrollment of the course. For details, contact the Office of Academic Records.

### Report In Progress

The "RP" symbol is used in connection with courses that extend beyond one academic term. It indicates that work is in progress but that assignment of a final grade must await completion of additional work. Work is to be completed within one year except for graduate degree theses, which have a three-year time limit.

Cumulative enrollment in units attempted may not exceed the total number applicable to the student's educational objective. 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 RP symbol shall be replaced with the appropriate final grade within one year or the grade will be converted to an F. Grades of RP for graduate degree theses will convert to a grade of No Credit (NC) if a final grade has not been assigned within three years. All remaining RP grade symbols will be changed to F or NC at the time the student's degree is awarded.

### Repeating a Course

Undergraduate students may repeat a maximum of 20 units at Cal Poly for purposes of improving GPA. 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 at Cal Poly with the new grade recorded along with the prior grade. If the second grade is equal to or higher than the first, then the grade earned by repeating the course will replace the quality points, quality hours

and earned hours which were previously earned. The original grade is "forgiven" from GPA computation, but both grades appear on the student's permanent record (transcript). With the exception of the reasons listed below, the repeat adjustment is made automatically at the end of the term in which the course is repeated. If a course is re-taken with credit/no credit grading, the original grade will not be excluded from the GPA.

A repeat petition is required for the following reasons only:

- the course was originally taken at Cal Poly before Fall 1987
- the course was originally taken at another institution
- the course has changed prefix or number
- the course was taken through Cal Poly Extended Education

Repeat petitions for the situations listed above must be turned in to the Office of Academic Records by the end of the seventh week of the quarter in which the course is repeated.

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 period with the approval of the 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 end of the seventh week of instruction a student must request permission to withdraw from a course by processing a petition that 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 department head. The withdrawal petition also requires the signature of the course instructor and the student's academic advisor.

Between the end of the 7th week of instruction and the last day 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 (WU, F, or NC).

### **Cancellation of Registration or Withdrawal from the Term**

Students who find it necessary to cancel their registration or to withdraw from all classes after enrolling for any academic term are required to follow the University's official withdrawal procedures. Failure to follow formal University procedures may result in an obligation to pay fees as well as the assignment of failing grades in all courses and the need to apply for readmission before being permitted to enroll in another academic term.

Students may drop their classes on CAPTURE/POWER all the way through the add/drop period, until the end of the second week of the term. Grades will not be assigned for courses dropped during this period.

With the approval of campus officials, a student is permitted to withdraw from all classes for the quarter for serious and compelling reasons until the end of the 7<sup>th</sup> week of instruction. After the 7<sup>th</sup> week and through the last day of instruction, withdrawals for the term must be based on an emergency situation clearly beyond the control of the student, and approved by campus officials.

The student is required to initiate a request for a term withdrawal with the Registrar and to complete required exit procedures. If the student is unable to appear in person, he/she may write or call the Office of Academic Records, 805-756-2531, to request withdrawal. The request must specify reasons for leaving the institution and include the student's signature. 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. If eligible for a refund, the refund will remain in the student's account on campus, unless the student files a written application for the refund to be sent to the student. Specific limiting dates and application procedures are published in the quarterly *Class Schedule*.

Students who receive financial aid funds must consult with the Financial Aid and Student Account Offices prior to withdrawing from the University regarding any refunds or repayments of grant or loan assistance received for that academic term. If a Title IV financial aid recipient withdraws from the University during a payment period, the grant or loan assistance received is subject to federal refund and repayment provisions.

### **Withdrawal from Previous Terms**

A student may petition to have all grades retroactively changed to the administrative grade of "W" if he/she can

demonstrate and document that there were serious and compelling reasons or circumstances that resulted in the unofficial withdrawal for the quarter in question. A student may not retroactively withdraw from selected courses during a particular quarter, but must petition to withdraw from the entire quarter. **The petition must be submitted within one year following the end of the term.** Refunds of registration fees are not available for withdrawals following the last day of instruction. For more information, contact the Office of Academic Records.

### Academic Renewal

The Trustees of the California State University have established a program of Academic Renewal whereby students who are having difficulty meeting graduation requirements due to a grade point deficiency may petition to have up to two semesters or three quarters of previous college work discounted from all considerations associated with meeting requirements for the baccalaureate degree.

Academic Renewal, as defined by campus policy, will be processed at the point of graduation. Academic Renewal is intended only to facilitate graduation from Cal Poly and is not applicable for individuals who already possess a baccalaureate degree or who meet graduation requirements without the approval of a petition for Academic Renewal.

**Conditions:** In order to qualify for Academic Renewal all of the following conditions established by the Trustees must be met:

1. Five years must have elapsed since the term or terms to be disregarded were completed. Terms taken at any institution may be disregarded.
2. Since completion of the term(s) to be disregarded, the student must have completed coursework at Cal Poly of at least one of the following:
  - 22 units with a GPA of 3.00,
  - 45 units with a GPA of 2.50,
  - 67 units with a GPA of 2.00
3. The student must present evidence that the coursework to be disregarded was substandard and not representative of the student's present scholastic ability and level of performance, due to extenuating circumstances.

For additional information about Academic Renewal contact the Office of Academic Records.

## 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. Each student is responsible for his or her enrollments and timely adds, drops and withdrawals following campus policy.

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.

In classroom settings, instructors have the authority and responsibility to establish rules, maintain order, and to dismiss students from a class session for violation of the rules or misconduct. Violations or misconduct warranting more than a single dismissal from a class session should be referred by the instructor to the Coordinator of Campus Student Relations and Judicial Affairs (756-2794) 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 that 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.

#### **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 MustangInfo ([www.mustanginfo.calpoly.edu](http://www.mustanginfo.calpoly.edu)).

#### **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 for that term. It is the student's responsibility to notify the Office of Academic Records of address changes. 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 an office or represent the University or the Associated Students, Incorporated, in any official capacity.

## Academic Petitions

Academic petitions are handled through the academic affairs division of the University. The process of review may include the academic department, academic advising offices, administrative offices, and/or college dean's office. Typical academic petitions include, but are not limited to, transferring from one program to another, academic requirement or policy deviation requests, and admission/re-admission issues. Contact the appropriate office for specific academic petition procedures.

## Academic Petition Appeals

Following a petition decision, and under limited circumstances, students may appeal to the Vice Provost for Academic Programs and Undergraduate Education or his/her designee. The right to an appeal is not guaranteed and an appeal will only be granted if the student can show that one or more of the following exist:

1. A requirement or policy was incorrectly applied to the petition.
2. A requirement or policy is unclear or ambiguous.
3. There is new information that should be considered in the evaluation of the petition.
4. There are special circumstances warranting the granting of the appeal.

The granting of an academic petition appeal gives students the opportunity to present the merits of their petition to the Vice Provost. The Vice Provost's decisions regarding appeals represent the University's final decision on academic petitions. Contact the Office of Academic Programs at 756-2246 for more information on the procedures for filing an academic petition appeal.

## Student Grievances

The University provides students with a variety of mechanisms to address student grievances or concerns. In all such matters, the University encourages students to attempt to resolve their grievance or concern at the source of the issue (i.e., with the professor, department chair or administrator, or college associate dean). The Office of the Campus Relations (756-6770) is available to any campus community member to assist with identifying and clarifying appropriate campus policies and procedures for addressing student grievances or concerns.

The following list contains the offices or programs designated to address the more common student grievances at the University:

- Grade Grievances** – The Fairness Board: Contact the Academic Senate Office, 756-1258 (See page 24 for more detail on the functions of this Board)
- Student or Student Club Misconduct** – Judicial Affairs, 756-2794 (See page 45 for more detail on the functions of this Office)
- Staff or Faculty Misconduct**  
Office of Campus Relations (756-6770)  
Judicial Affairs (756-2794)  
Student Grievance Board: Contact the Academic Senate (756-1258)

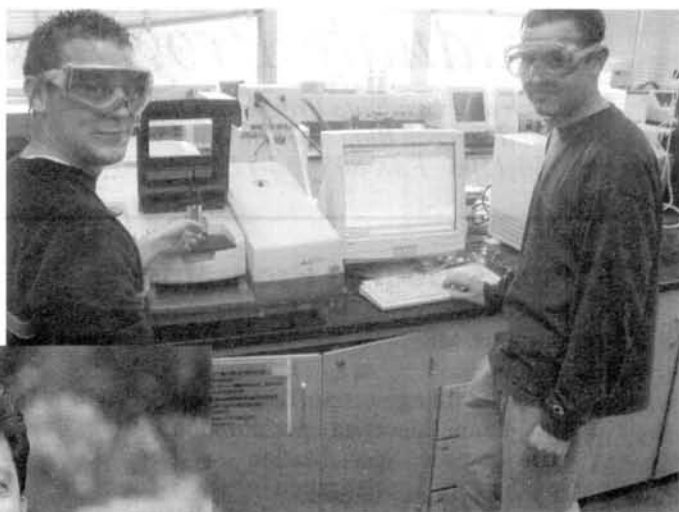
## Student Conduct and Discipline

It is expected that all Cal Poly students are enrolled for serious educational pursuits and that they will conduct themselves so as to preserve an appropriate atmosphere of learning. It is also expected that all students who enroll at Cal Poly are willing to assume the responsibilities of citizenship in the campus community. Association in such a community is voluntary, and students may withdraw from it at any time that they consider the obligations of membership disproportionate to the benefits. While enrolled, students are subject to campus authority that 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 "Code of Student Conduct, Rights and Responsibilities" 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 Conduct, Rights and Responsibilities, and in other official university publications, including the Cal Poly web site.



Students (above) analyze the molecular weight of a polymer using GPC (gel permeation chromatography).



Students (above) prepare a sample for FT-IR (Fourier transfer infra-red spectroscopy) analysis, and determine the viscosity of a polymer solution (below).

### **New Master of Science Degree in Polymers and Coatings Science**

Professor Raymond Fernando has been named to fill the new Arthur C. Edwards Endowed Chair for Coatings Technology and Ecology.



The \$1 million endowed chair, the first to be fully funded at Cal Poly, was made possible by gifts from 21 donors representing a broad spectrum of the polymers and coatings industry.

As Director of the Polymers and Coatings Program, Professor Fernando is developing a new graduate program in polymers and coatings chemistry, plans to expand the content of undergraduate classes, and will also be actively involved in research and recruiting students and industry support.



## *Graduate Programs*

*Photos courtesy of Jeff Greene, Dane Jones, and Academic Programs*

# Graduate Programs

Research and Graduate Programs Office  
Math and Science Bldg. (38), Room 154  
805 756-1508 FAX 805 756-1725

## Master's Degree Programs

Aerospace Engineering, MS \*  
Agribusiness, MS  
Agriculture, MS  
    Agricultural Engineering Technology Specialization  
    Agricultural Education Specialization  
    Animal Science Specialization  
    Crop Science Specialization  
    Dairy Products Technology Specialization  
    Environmental Horticulture Specialization  
    Food Science and Nutrition Specialization  
    Forestry Sciences Specialization  
    General Agriculture Specialization  
    Irrigation Specialization  
    Recreation, Parks, and Tourism Management Specialization  
    Soil Science Specialization  
Architecture, MS  
Biological Sciences, MS  
Business Administration, MBA  
    Agribusiness Specialization  
City and Regional Planning, MCRP  
Civil and Environmental Engineering, MS  
Computer Science, MS  
Education, MA  
    Counseling and Guidance Specialization  
    Curriculum and Instruction Specialization  
    Educational Administration Specialization  
    Literacy and Reading Specialization  
    Special Education Specialization  
Electrical Engineering, MS \*  
Engineering, MS  
    Biochemical Engineering Specialization \*  
    Bioengineering Specialization \*  
    Biomedical Engineering Specialization \*  
    Integrated Technology Management Specialization \*  
    Materials Engineering Specialization  
    Water Engineering Specialization  
Engineering Management, MBA/MS  
English, MA  
Forestry Sciences, MS  
Industrial and Technical Studies, MS  
Industrial Engineering, MS \*  
Kinesiology, MS  
Mathematics, MS  
Mechanical Engineering, MS\*  
Polymers and Coatings Science, MS  
Psychology, MS  
Transportation Planning, MCRP/MS

Cal Poly offers studies leading to advanced degrees through its 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's description. It is important that graduate students, in consultation with their advisors, 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. The application form and official transcripts should be sent directly to the Admissions Office at Cal Poly. An electronic version of the CSU graduate application is available on the World Wide Web at [www.csumentor.edu](http://www.csumentor.edu). The CSU Mentor system allows students to browse through general information about CSU's twenty-two campuses, view multimedia campus presentations, send and receive electronic responses to specific questions, and apply for admission and financial aid.

\* Blended BS+MS programs available, see page 96.

All graduate and postbaccalaureate applicants (e.g., joint PhD and EdD applicants, master's degree applicants, those seeking credentials, and those interested in taking courses for personal or professional growth) must file a complete graduate application. Applicants who completed undergraduate degree requirements on a CSU campus 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 certified 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 applicants must submit the following documents to the Office of Admissions to establish their admission portfolio:

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

Master's and credential applicants 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 without submitting another \$55 application fee.

### FILE COMPLETION DATES

*Graduate program coordinators may select earlier file completion dates. Applicants should check with the department of interest for appropriate filing periods.*

Quarter	Master's	Credential
Summer	April 1 <i>No applications taken for Summer: MA Educ, Counseling &amp; Guidance</i>	April 1
Fall	July 1 May 1: Computer Science, Civil and Environmental Engineering May 15: Biological Sciences <i>Applications taken only for Fall: MS Psychology - Feb. 1</i>	April 1
Winter	Nov. 1 September 15: Computer Science	Oct. 15
Spring	March 1	Dec. 15

All completed portfolios are forwarded to the graduate program coordinators for admission recommendations. The coordinators may request additional documentation to determine eligibility. The documentation may include letters of reference, GRE or GMAT scores, and/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 minimum 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 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 graduate courses for professional or personal growth, a candidate must be admitted as a postbaccalaureate unclassified student. By meeting the minimum requirements, the candidate is eligible for admission as a postbaccalaureate unclassified student. Some departments may restrict enrollment of unclassified students due to 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, and 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.

Under special circumstances graduate coordinators may recommend admission of applicants who do not meet eligibility requirements. The Dean of Research and Graduate Programs will act on these recommendations.

### Residency Status Determination

The campus Admissions Office determines the residency 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. For detailed explanation please refer to *Determination of Residence for Nonresident Tuition Purposes*, page 524.

### International (Foreign) Student Admission Requirements

International master's and credential applicants must file an application for admission with the Office of Admissions. 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 without submitting another \$55 application fee.

### International Student File Completion Dates

Fall Quarter .....	April 1st
Winter Quarter .....	August 1st
Spring Quarter.....	December 1st
Summer Quarter.....	February 1st

All master's and credential applicants must submit the following documents to establish their admission portfolio:

- Application form, Parts A and B
- \$55 application fee
- Certified transcripts from all schools attended, showing coursework. All official documents must be accompanied by a certified English translation from one of the following
  - 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
- Promissory note agreeing to purchase required health insurance
- International Educational Background form
- AACRAO credential analysis fee of \$75 in the form of a U.S. Postal Money Order or an International Money Order, made payable to "AACRAO" (American Association of Collegiate Registrars and Admissions Officers)
- TWE (Test of Written English) with a score of 4.5 or better
- All applicants, regardless of citizenship, whose native language is not English, 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 (see list below), must present a score of 550 or above on a paper-based, or 213 or above on the computer-based Test of English as a Foreign Language (TOEFL). Applicants should take the TOEFL at least six months prior to the term for which they are applying, for

scores to be received in time for full consideration in the selection process.

Both the TWE and TOEFL will be waived for the following countries:

Antigua	Gambia	Lesotho	Sierra Leone
Australia	Ghana	Liberia	Solomon Islands
Bahamas	Grenada	Malawi	South Africa
Barbados	Guyana	Mauritius	Swaziland
Barbuda	India	New Zealand	Trinidad & Tobago
Belize	Ireland	Nigeria	Uganda
Cameroon	Jamaica	Pakistan	United Kingdom
Canada	Kiribati	St. Lucia	Zambia
			Zimbabwe

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 applicant's file.

The Office of Admissions will notify all applicants of the documents needed to complete their portfolios. Graduate coordinators may require additional documentation to assist them in determining an applicant's eligibility.

International applicants 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. All students 18 years of age or younger on the first day of their first quarter of enrollment shall be required to present proof of immunization against hepatitis B. These are *not* admission requirements, but shall be required of students as conditions 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 84 for more information.

## Academic Requirements and Responsibilities

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

- 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

courses in the formal program of study for the degree. 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 courses in the formal program of study for the degree.

A student who has been admitted as postbaccalaureate-classified in order to pursue a 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 taken in the credential program.

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 college 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 that 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 judgment about the student's potential to complete the program.

### **Advisement**

Soon after enrollment, students should contact the department for the assignment of an advisor in their area of study. Students should meet with their advisors 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 advisors and graduate coordinators share the responsibility for advising master's degree students throughout their work toward a degree. College or departmental graduate study committees certify completion of a master's degree program on the recommendation of the advisors. 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 advising.

### **Blended BS+MS Programs**

#### **Academic Objectives**

Blended programs provide an accelerated route to a graduate professional degree, with simultaneous conferring

of both bachelor's and master's degrees. Most blended programs allow for the possibility of students' earning graduate credit for several of their senior electives, effectively decreasing the summed unit requirements for both degrees. Blended programs provide a seamless process whereby students can progress from undergraduate to graduate status without having to apply through the Admissions Office (thereby eliminating the need to pay a \$55 fee). In addition, blended BS+MS programs provide a meaningful capstone experience that in most cases integrates the senior project with the graduate thesis/project.

### **Process for Changing Status**

Students who are interested in pursuing blended programs should submit a request to the department head or graduate coordinator for a change of degree objective. A draft graduate study plan is prepared, but not submitted to the Graduate Programs Office until after 12 graduate units have been completed.

The department head/graduate coordinator, with assistance of the Academic Records Office, determines whether students meet the eligibility criteria (see below). If criteria are met, the coordinator sends a change of degree objective form to Records. Students are notified of their acceptance upon receipt of the signed Change of Objective form.

### **Eligibility for Blended Programs**

The following are minimum eligibility criteria; *individual departments may have more stringent requirements.*

1. Students must successfully complete a minimum of 186 units / maximum 198 units (for engineering programs the maximum number of units is 210). These units must count toward one or other of the two degrees (BS or MS) that will ultimately be awarded in the blended program; they need not be restricted to those counting toward the undergraduate degree alone.
2. Students cannot enter the blended BS+MS program if they have exceeded the maximum number of units as defined in #1.
3. Students must have a minimum 2.5 GPA in the last 90 quarter units attempted. (*Note that students, once admitted to graduate standing, must maintain a 3.0 GPA or better in courses counting toward the graduate degree.*)
4. Students are strongly encouraged to complete the Graduation Writing Requirement (GWR).

### **Process to Graduate with Both Degrees**

1. Students must submit the Formal Study Plan to Graduate Programs Office (only for courses counting toward MS); request Advancement to Candidacy; and maintain a minimum 3.0 GPA for courses counting toward MS.
2. When all requirements are met for both the undergraduate and graduate programs, both degrees are awarded at the same time and graduation ceremony.

3. If a student fails to complete the MS program requirements, then the BS degree may be granted when all requirements for that degree are met.

### **Change of Postbaccalaureate Objective**

If students wish to change their postbaccalaureate objective, they must formally file this intention. A form available from the University Center for Teacher Education, if a credential candidate, or the Graduate Programs Office for all other students, is used to obtain the necessary approvals.

### **Comprehensive Examination**

A comprehensive examination is one of the possible culminating experiences 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 should provide evidence of these abilities and achievement. 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.

### **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 advisor 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 college on the specific coursework to be completed in order to fulfill the requirements for 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 advisor 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 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 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 residency requirement. However, summer session courses, and up to 12 units taken through concurrent enrollment, can be counted as courses in residence. 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 residency 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 approved in the submission of a formal study plan. Concurrent enrollment courses are counted for "in 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 "in-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 conferring of the master's degree requires a GPA of 3.0 or more in the courses taken in the formal study plan. Repeating a failed course does not remove a lower letter grade from the overall GPA calculation.

### Graduate Courses Taken by Undergraduates for Graduate Credit

Cal Poly undergraduates who have achieved senior standing may take courses in the 400 or 500 series for graduate credit while still undergraduates. If they subsequently enter a Cal Poly master's or credential program, they may petition to have such course credit applied toward their master's degree or credential program, if the units were not used 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 whose grade point average is 3.75 or better, may upon the recommendation of their college dean be designated as "Graduating with Distinction."

For information on diploma regulations, see page 73.

### Graduation Requirement in Writing Proficiency

All students must demonstrate competency in writing skills as a requirement for graduation. 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 3 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.

Students may meet the Graduation Writing Requirement (GWR) through one of the following options:

1. Pass the Writing Proficiency Examination.

2. Pass an approved upper-division course with a grade of C or better AND receive certification of proficiency in writing based on a 500-word in-class essay.
3. Document that the GWR was met as part of an undergraduate program of study at Cal Poly within seven years of matriculation as a graduate student.

The upper-division courses approved for GWR credit are listed in the *Class Schedule* and on the Academic Programs website, [www.calpoly.edu/~acadprog/gened/](http://www.calpoly.edu/~acadprog/gened/).

The Graduation Writing Requirement may be waived, at the discretion of campus authorities, in the following circumstances:

1. The requirement was satisfied by the student as an undergraduate on one of the CSU campuses and no more than seven (7) years have elapsed before entering the graduate program at Cal Poly. **Documentation to support this waiver option must include date of satisfaction.**
2. An equivalent upper-division, graduation writing requirement was satisfied at another 4-year college or university. **Official, dated documentation must be provided (i.e., transcripts, catalog description, etc.).** Again, no more than seven (7) years may elapse between meeting the requirement and beginning graduate study.
3. The student has earned an advanced degree at least equivalent to the Master's. **Supporting documentation must be presented.**

Graduate students who wish to waive the GWR should present documentation to the Writing Skills Office (Bldg. 10, Rm. 130, 756-2067) in their first quarter of residence.

### Leaves of Absence

See undergraduate section, page 83.

### Prerequisites

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

### Registration

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

### Repeating a Course

Students may enroll in a course for credit more than once only if the catalog course description states that the course

may be repeated for credit. An exception to this policy allows the repeating of a course in cases where a grade of D or F was received. However, for graduate students both grades will be reflected in the calculation of the grade point average. Graduate students are not eligible to repeat courses and remove the lower grade points from calculation of the GPA.

### **Research Involving Special Conditions**

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

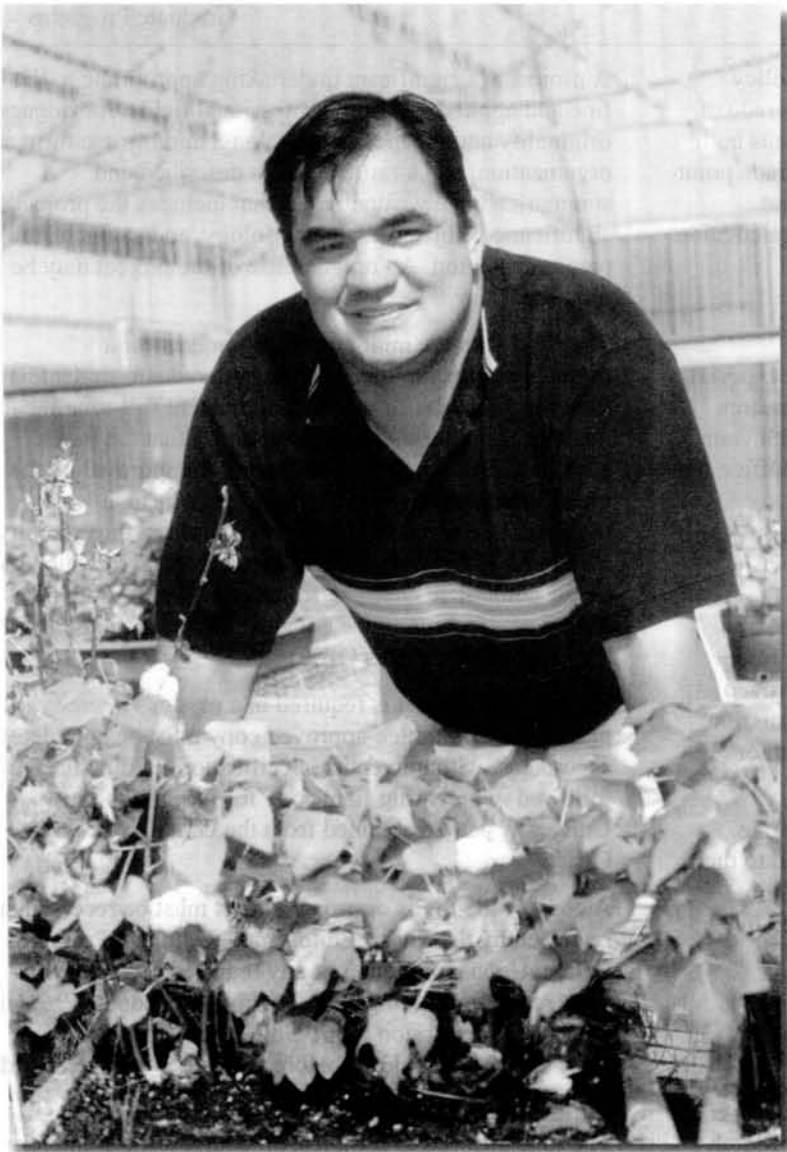
The following are minimum requirements for a thesis/project committee: 1) that the graduate student have a thesis/project advisor who is a permanent full-time faculty member from the student's program; 2) that the thesis advisor and the student recommend, for approval by the graduate coordinator and/or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

If a thesis or project is required in a master's degree program, a committee-approved copy must be completed in accordance with university specifications. 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 all coursework in the formal study plan, including thesis and project courses, 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 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.



### **Jeffrey C. Wong Appointed to J. G. Boswell Professorship**

A new faculty position in the College of Agriculture has been made possible by the James G. Boswell Foundation of Pasadena, the charitable arm of the Corcoran-based J. G. Boswell Co., California's largest and most diverse cotton production and farming operation. Jeffrey C. Wong, formerly of the Department of Crop Sciences at the University of Illinois at Urbana-Champaign, is the new appointee to the position. He has collaborated with researchers at many institutions, including UC Berkeley and the Cold Spring Harbor Laboratory in New York.

At Cal Poly, Professor Wong is teaching an introductory class and laboratory in genetics. "The techniques and experimental approach I use can be applied to many plant species. Crop and vegetable species grown on the Central Coast could be used to provide the link between the basic science concepts and the field application," Wong explains. He also wants to design and teach a laboratory techniques class. The course would use the newest technologies to differentiate plant DNAs to help select genes that would provide the best plant types for cultivation.

*Photo courtesy of Jeff Greene*

College of  
*Agriculture*

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# College of *Agriculture*

**David J. Wehner, Dean**  
**Mark D. Shelton, Associate Dean**  
**Terry Smith, Associate Dean**  
**Agricultural Sciences Bldg. (11), Room 211**  
**(805) 756-2161**

## ACADEMIC PROGRAMS

Agribusiness.....	<i>MS</i>
Agribusiness Specialization .....	<i>MBA</i>
Agricultural Business .....	<i>BS, Minor</i>
Agricultural Communication.....	<i>Minor</i>
Agricultural Science.....	<i>BS</i>
Agricultural Systems Management .....	<i>BS</i>
Agriculture .....	<i>MS, Credential</i>
Animal Science .....	<i>BS</i>
BioResource & Agricultural Engineering .....	<i>BS</i>
Crop Science .....	<i>BS, Minor</i>
Dairy Science .....	<i>BS, Minor</i>
Earth Sciences .....	<i>BS</i>
Environmental Horticultural Science .....	<i>BS</i>
Environmental Management and Protection.....	<i>BS</i>
Equine Science .....	<i>Minor</i>
Food Science .....	<i>BS, Minor</i>
Forestry and Natural Resources .....	<i>BS</i>
Forestry Sciences .....	<i>MS</i>
Fruit Science.....	<i>BS, Minor</i>
Geographic Info Systems for Agriculture .....	<i>Minor</i>
Land Rehabilitation.....	<i>Minor</i>
Meat Science and Processing.....	<i>Minor</i>
Military Science .....	<i>Minor</i>
Nutrition .....	<i>BS, Minor</i>
Ornamental Plant Production .....	<i>Minor</i>
Plant Protection Science.....	<i>BS, Minor</i>
Poultry Management .....	<i>Minor</i>
Rangeland Resources .....	<i>Minor</i>
Recreation, Parks, and Tourism Admin. ..	<i>BS</i>
Soil Science .....	<i>BS, Minor</i>
Water Science .....	<i>Minor</i>
Wine and Viticulture.....	<i>Minor</i>

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.

## FACILITIES

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.

### Campus Farm

A 6,000-acre farm includes 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.

### Labs and Special Facilities

Includes 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.

### Swanton Pacific Ranch

The 3,200 acre Swanton Pacific Ranch in Santa Cruz County was generously donated by Al Smith, alumnus of Cal Poly's Crop Science Department. The ranch provides students with an opportunity to live and work on a commercial farm with forestry, cattle and crop production activities.

## COURSES

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

**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 in agriculture and closely allied fields which support and supplement the block of courses constituting the student's major.

**General Education.** Courses are selected from the physical and life sciences, mathematics, communications, arts and humanities, and social, political, and economic institutions. 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 PROJECTS

Students have many opportunities to participate in agricultural enterprise projects that are sponsored by the Cal Poly Foundation. Enterprise projects offer students practical experience to enhance their study of 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 Environmental Horticultural Science Program 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 Program 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 Earth and Soil Sciences 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.

## AGRICULTURAL COMMUNICATION MINOR

**Brock Center for Agricultural Communication  
Agriculture Bldg. (10), Room 235, (805) 756-6138**

This interdisciplinary minor will enhance the students' ability to seek careers in dynamic professions associated with the agricultural industry, including print journalism, broadcast journalism, and public relations.

A key feature of this minor is an interdisciplinary approach. It is a cooperative effort between the College of Agriculture and the College of Liberal Arts and advised by faculty members assigned to the Brock Center for Agricultural Communication. Students have the opportunity to participate in the Cal Poly chapter of the national Agricultural Communicators of Tomorrow Association.

### Required Courses

JOUR 203 News Writing and Reporting.....	4
JOUR 205 Agricultural Communications .....	4
SCOM 301 Business/Professional Communication ..	4
AGED 404 Agricultural Leadership .....	3

## Elective Area..... 15

### College of Agriculture Majors:

Selected from advisor approved list. Minimum of 10 units must be at 300-400 level; two courses must be selected from JOUR, SCOM, ENGL.

### Journalism, Speech Communications, and other Non-agriculture Majors:

Courses to be selected from advisor approved list.

A minimum of 10 units must be at 300-400 level

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## ENVIRONMENTAL STUDIES MINOR

Please see the College of Science and Mathematics for more information on this interdisciplinary minor.

## GEOGRAPHIC INFORMATION SYSTEMS FOR AGRICULTURE MINOR

An interdisciplinary program sponsored by three departments in the College of Agriculture: BioResource and Agricultural Engineering, Natural Resources Management, and Crop Science. New technologies of geographic information systems (GIS), global positioning systems (GPS), and orthophotography (uniform scale aerial photographs) are revolutionizing the management of resources. There are great employment opportunities for those who understand the technologies and society will benefit from improved management decisions. Students interested in this minor may come from the following majors: forestry and natural resources; crop science; soil science; landscape architecture; agricultural systems management; bioresource and agricultural engineering or animal science.

### Required Courses

BRAE 133 Engineering Design Graphics (3) and	
BRAE 151 CAD for Agric. Engr. (1); or	
CE 114 Intro. CAD Civil & Environ. Engr (4); or	
LA 111 3-D Graphics/Landscape Arch (4) and	
LA 310 Intro Computing/Landscape Arch (2).....	4/6
BRAE 239 Engineering Surveying .....	4
BRAE 345 Aerial Photogrammetry/Remote Sensing ..	3
FNR/GEOG/LA 318 Applications in GIS .....	3
FNR/BRAE/LA/HCS 470 Selected Advanced Topics ..	3

### Emphasis areas (select one) ..... 12

#### Environmental Information Emphasis

- BRAE 447 Advanced Surveying with GIS Applications (4)
- FNR 306 Natural Res Ecology/Habitat Mgt (4) or
- BIO 325 General Ecology (4)
- FNR 416 Environmental Impact Analysis (4)

#### Precision Agriculture Emphasis

- CRSC 244 Precision Farming (4)
- Select two of the following (8):
- BRAE 447; CRSC 405, 410, 421, 431, 445; SS 433;
- VGSC 423

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## LAND REHABILITATION MINOR

Students completing the minor will gain skills in recognizing, assessing, and treating disturbed lands for numerous purposes, including erosion and sediment control, water quality improvement, habitat restoration, and aesthetic enhancement. They will develop proficiency in plant identification and selection, soil properties and processes, and ecological principles, and also learn to set criteria and judge the feasibility, prudence, efficiency, and effectiveness of rehabilitation efforts.

Before being admitted to the minor, students must have successfully completed the following courses:

BOT 121 or BIO 114; SS 121; MATH 118

At least one-half of the units must be at the 300-400 level. Generally, courses required for the student's major degree cannot be counted toward the minor, except that courses selected in the required core may count in both the major and minor programs. This and other course exceptions must be approved by the minor coordinator. As a guideline, students should take at least 20 units from outside their major degree program.

Each student is required to complete a hands-on rehabilitation or restoration field project that provides practical experience in recognizing, assessing, and treating a landscape disturbance. Before beginning the treatment phase, the student must prepare a written plan that includes a problem assessment, treatment design, anticipated outcome, and budget. This plan must be approved by the faculty advisor and the minor coordinator before land treatment begins. Project may be carried out individually or in small groups. Contact the minor coordinator for more details.

### Required core courses (Minimum of 14 units)..... 14

*Plant area (select one course):*

BIO 152; BOT 238, 333; EHS 381

*Soils area:*

SS 321 Soil Morphology (4) or SS 440 Forest and Range Soils (4)

*Ecological Principles (select one course):*

BOT 326; FNR 306; AG 360

*Project (select one course)*

May be selected from Special Problem, Selected Advanced Topic, Senior Project or other course designation approved by the minor coordinator.

### Coordinator approved electives (Minimum of 12 units) 12

Select 4 courses from the following list:

ASCI 329; BIO 418; BOT 313, 324;

BRAE 340, 415; PPSC 321, 327;

EHS 124, 382; FNR/GEOG/LA 318;

FNR 307, 308, 408, 419, 420

MCRO 436; SS 202, 221

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## RANGELAND RESOURCES MINOR

Managing productive and sustainable rangelands, incorporating knowledge of rangeland ecosystems and applying this to grazing animal systems is the main emphasis of this interdisciplinary program. The Animal Science and the Earth and Soil Sciences Departments sponsor this minor. Students learn to develop ranch water quality plans and to develop a holistic approach to management. The courses are intended to provide knowledge and experience regarding the interactions of plants, animals, water, and soil to improve rangeland health. Careers associated with this minor are rangeland specialists, ecologists, wildland managers, ranchers, and environmental specialists.

Before being admitted to the program, students must have successfully completed the following: BOT 121 or BIO 114; MATH GE B1 requirement satisfied; SS 121.

**Required courses.** *At least one-half of the units must be at the 300-400 level. Courses to be selected with advisor approval.*

*Range Resource Area* ..... 8

ASCI 329 and AG 360

*Related Animal Area. Select one course from:* ..... 3-4

ASCI 141; ASCI 143; ASCI 311

*Related Agricultural Business Area.*

*Select one course from:* ..... 4

AGB 212/321/326/457

*Related Plant Area. Select one course from:* ..... 4

BIO 435; BOT 313; BOT 326; BOT 333; CRSC 123; CRSC 330; PPSC 321

*Related Resource Management Area.*

*Select one course from:* ..... 3-4

BIO 325; BIO 419; BIO 427; FNR 306; FNR 408; GEOG/LA/FNR 318

*Related Soil Science Area: Select one course from:* 3-4

.....  
SS 202/321/433/440

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## WATER SCIENCE MINOR

The Water Science minor emphasizes one of three areas of study: irrigation, water policy, 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 the environment and water, the Water Science minor provides marketable skills.

### Required core courses

BRAE 340 Irrigation Water Management .....	4
SS 121 Introductory Soil Science .....	4
FNR 408 Water Resource Law and Policy .....	3

### Select one emphasis area ..... 13-18

#### *Irrigation Emphasis (13)*

BRAE 237 Engineering Surveying (2)

Select 11 units from the following:

BRAE 331, 405, 435, 440, 492

#### *Water Policy Emphasis (17-18)*

AGB 315 Land Economics (4)

FNR 435 Natural Resources Policy Analysis (4)

AGB 409 California Agricultural Law (3) *or*

FNR 404 Environmental Law (3)

FNR 419 Watershed Mgt and Restoration (4)

SS 433 Land Use Planning (3)

#### *Watershed Management Emphasis (16)*

FNR 306 Natural Res Ecology/Habitat Mgt (4)

FNR 419 Watershed Management (4)

FNR 420 Advanced Watershed Hydrology (4)

SS 440 Forest and Range Soils (4)

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## WINE AND VITICULTURE MINOR

The goals of the minor are to educate students in the various aspects of wine and viticulture management, addressing knowl-edge of viticulture, enology, and marketing with skill areas of growing practices, winemaking and wine marketing. The minor is a cooperative effort between the Agribusiness, Food Science and Nutrition, and Crop Science departments, and is designed for students with majors from these departments.

### Required core courses

AGB 443 Branded Wine Marketing .....	4
AGB 444 Wine Compliance and Market Analysis .....	4
FRSC 231 Viticulture .....	4
FRSC 331 Advanced Viticulture .....	4
FSN 341 Wines and Fermented Foods .....	3

### Advisor approved electives..... 8

Select 8 units from the following:

AG 339; AGB 405, 406; BRAE 340/440; FSN 274;

PPSC 321, 414; SS 121, 221.

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# Master of Science in Agriculture

## MS Agriculture with Specializations in:

Agricultural Education  
Agricultural Engineering Technology  
Animal Science  
Crop Science  
Dairy Products Technology  
Environmental Horticultural Science  
Food Science and Nutrition  
General Agriculture  
Irrigation  
Recreation, Parks, and Tourism Management  
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 specializations. Graduates are prepared for:

- \* professional-level positions with business and industry, government, and foreign service in agriculture and related fields;
- \* agricultural teaching in secondary schools or community colleges; or
- \* continued graduate work at other institutions.

## When to Apply

Application filing periods are given on page 93 of this catalog. To ensure adequate processing and full consideration, all application materials should be filed with the Cal Poly Admissions 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 92). 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 MS Agriculture program includes the following specializations: Agribusiness, Agricultural Education, Agricultural Engineering Technology, Animal Science, Crop Science, Dairy Products Technology, Environmental Horticultural Science, Food Science and Nutrition, Forestry Sciences, General Agriculture, Irrigation, and Soil Science. The General Agriculture specialization provides students with the opportunity to focus their graduate study in one of several additional areas, including: Agricultural Communication, Animal Science or Crop Science. 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 Research and Graduate Programs 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 available from the Graduate Studies Coordinator. At least one course in statistical methods and/or experimental design is required of students in a thesis curriculum.

All candidates must meet the current Graduation Writing Requirement; see page 98. All students, whether completing a thesis or project, are required to pass an oral comprehensive examination which is normally given during the final quarter of the program of study. A written comprehensive exam may also be required by the master's degree committee, but this is optional. For students in a thesis program, the final oral comprehensive examination will include, but not necessarily be limited to, a defense of the thesis.

### **MS Agriculture, Specialization in AGRICULTURAL EDUCATION**

Provides students with the opportunity to focus their graduate study in Agricultural Education, and is generally taken concurrently with the credential program.

#### **Required Courses**

AGED 539 Internship .....	6
AGED 520 Program Develop/Agric Education ....	3
AGED 522 Instructional Prog/Agric Mechanics...	3

#### **Restricted electives..... 33**

Any 400- and 500-level courses approved by the student's graduate committee. No fewer than 11 units must be at the 500 level. Students are required to complete one year of successful teaching or graduate level internship prior to the written and oral examinations.

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### **MS Agriculture, Specialization in AGRICULTURAL ENGINEERING TECHNOLOGY**

#### **Required Courses**

AG 599 Thesis .....	6
SS 501 Research Planning .....	4
STAT 512 Statistical Methods .....	4

#### **Restricted electives ..... 31**

Any 400 and 500 level courses approved by the student's graduate committee. At least 9 units must be at the 500 level.

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45

### **MS Agriculture, Specialization in ANIMAL SCIENCE**

An interdisciplinary, science-based program, whereby students gain a scientific foundation and then learn to apply it to improve production in commercial animal species.

#### **Required Courses**

ASCI 570 Selected Topics in Animal Science.....	3
ASCI 581 Graduate Seminar .....	3
AG 599 Thesis .....	6
SS 501 Research Planning .....	4
STAT 512 Statistical Methods.....	4

#### **Select 12 units from the following ..... 12**

ASCI 402 Domestic Animal Endocrinology (4)	
ASCI 410 Ultrasonography (1)	
ASCI 500 Individual Study in Animal Science (6)	
VS 438 Systemic Animal Physiology (4)	
STAT 513 Applied Experimental Design and Regression Models (4)	
CHEM 528 Nutritional Biochemistry (3)	
BIO 431 General and Cellular Physiology (4)	
AGED 426 Presentation Methods in Agricultural Communication (3)	
ZOO 405 Vertebrate Development (5)	

#### **Electives (400-500 level courses) ..... 13**

(Note: A minimum of 23 of the 45 total units must be at the 500 level.)

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### **MS Agriculture, Specialization in CROP SCIENCE**

Research currently is focused primarily in postharvest technology, viticulture, and integrated pest management, with additional work being done in other areas, including agronomy, horticulture, and precision farming.

#### **Required Courses**

CRSC/VGSC 521/FRSC 436/PPSC 405 .....	4
CRSC 581 Graduate Seminar .....	3
CRSC 599 Thesis.....	6
400- or 500-level research methods course.....	3

#### **Restricted electives ..... 29**

Any 400- and 500-level courses, approved by the student's graduate committee. A minimum of 23 units must be at the 500 level.

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## MS Agriculture, Specialization in DAIRY PRODUCTS TECHNOLOGY

### Required Courses

DSCI 401 Physical and Chemical Properties of Dairy Products .....	4
DSCI 522 Bioseparation Processes in Dairy Product Technology .....	4
DSCI 570 Selected Topics in Dairy Science .....	3
DSCI 571 Selected Adv. Lab in Dairy Science.....	3
DSCI 581 Graduate Seminar in Dairy Science .....	3
DSCI 599 Thesis .....	6
STAT 513 Applied Experimental Design and Regression Models .....	4
<b>Restricted electives</b> .....	18
Any 400- and 500-level courses, approved by the student's graduate committee.	
	45

## MS Agriculture, Specialization in ENVIRONMENTAL HORTICULTURAL SCIENCE

For students interested in careers in teaching, applied research positions in industry, or to students planning on continuing on for a Ph.D. It would also appeal to foreign students interested in an American graduate degree, particularly since California is internationally famous for its horticulture industry.

### Required Courses

HCS 500 Individual Study .....	3
HCS 570/571 Selected Topics/Lab .....	3
SS 501 Research Planning .....	4
STAT 512 Statistical Methods .....	4
EHS 599 Thesis.....	6
<b>Restricted electives</b> .....	25
Any 400- and 500-level courses approved by the student's graduate committee. A minimum of 3 units must be at the 500 level.	
	45

## MS Agriculture, Specialization in FOOD SCIENCE AND NUTRITION

### Required Courses

FSN 581 Graduate Seminar .....	3
FSN 599 Thesis .....	6
SS 501 Research Planning <i>or</i> other 400-500 level research methods course .....	2-4
STAT 512 Statistical Methods .....	4
<b>Advisor approved electives</b>	
(400–500 level courses) .....	28-30
	45

## MS Agriculture, Specialization in GENERAL AGRICULTURE

The General Agriculture Specialization provides students with the opportunity to focus their graduate study in one of several areas, including Agricultural Communication.

### Required Courses

AG 539 Internship, AG 500 Individual Study, <i>or</i> AG 599 Thesis.....	6
400- or 500-level research methods course .....	3
Any 581 Graduate Seminar offered in College of Agriculture .....	3
<b>Restricted electives</b> .....	33
Any approved 400- and 500-level courses. No fewer than 11 units must be at the 500 level.	
	45

## MS Agriculture, Specialization in IRRIGATION

Prerequisite: B.S. in a technical field of agriculture, or a B.A. with proficiency in basic chemistry, advanced algebra and trigonometry. All students must have had at least one undergraduate class in general irrigation, soil science, and crop science, plus be familiar with computer spreadsheet usage. Students may complete prerequisite courses at Cal Poly if necessary.

### Required Courses

BRAE 405 Chemigation .....	1
BRAE 435 Drainage <i>or</i> BRAE 437 Conservation Engineering .....	3
BRAE 438 Drip/Micro Irrigation <i>or</i> BRAE 439 Vineyard Irrigation.....	4
BRAE 440 Agricultural Irrigation Systems .....	4
BRAE 532 Water Wells and Pumps .....	4
BRAE 500 Individual Study .....	3
BRAE 533 Irrigation Project Design .....	4
BRAE 599 Thesis .....	6
400-500 level research methods or statistics course .....	3
<b>Electives</b> .....	13
400-500 level courses approved by the student's graduate committee. A minimum of 23 units of 500-level coursework is required.	
	45

### **MS Agriculture, Specialization in RECREATION, PARKS, AND TOURISM MANAGEMENT**

Prerequisite: In order to develop an academic background in this discipline, students who have not completed a BS/BA degree in Recreation Administration will be required to take the following undergraduate courses: REC 101, REC 210, REC 360, and STAT 217/218.

#### **Required Courses**

REC 500 Individual Study .....	3
REC 581 Graduate Seminar .....	3
REC 599 Thesis.....	6
SS 501 Research Planning .....	4
STAT 513 Applied Experimental Design and Regression Models .....	4
<b>Electives</b> .....	25
400-500 level courses approved by the graduate committee. At least 3 units must be at the 500 level.	—
	45

### **MS 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 computer applications course is required. Students may complete prerequisite courses at Cal Poly if necessary.

#### **Required Courses**

SS 501 Research Planning .....	4
SS 508 Landscape Management-Erosion Control ...	3
SS 522 Advanced Soil Fertility .....	3
SS 581 Graduate Seminar in Soil Science .....	3
SS 582 Advanced Land Management .....	3
SS 599 Thesis .....	6
<b>Electives</b> .....	23
400-500 level courses approved by the graduate committee. At least 6 units of electives must be from outside of the College of Agriculture.	—
	45

### **MBA, Specialization in AGRIBUSINESS**

The Orfalea 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 page 183, the Orfalea College of Business). Information and application materials may be obtained by writing to the MBA Coordinator, Orfalea College of Business.

### **MS Engineering, Specialization in WATER ENGINEERING**

The College of Engineering and the BioResource and Agricultural Engineering Department jointly offer the Water Engineering Specialization under the M.S. Engineering. Please see College of Engineering section of this catalog for more information.

# Agribusiness

**Department Office**  
**Agriculture Bldg. (10), Room 210**  
**(805) 756-5000**  
**(805) 756-5040 (FAX)**

## Department Chair, Kenneth C. Scott

James J. Ahern	Jay E. Noel
William H. Amspacher	Nancy C. Ochs
Renny J. Avey	Eivis Qenani-Petrela
Phillip M. Doub	Bradley J. Rickard
Lynn L. Hamilton	David J. Schaffner
Wayne H. Howard	Robert C. Thompson
Sean P. Hurley	Marlin D. Vix
Neal MacDougall	Marianne McGarry Wolf
Robert E. McCorkle	

## ACADEMIC PROGRAMS

### BS Agricultural Business

### MS Agribusiness

### Agribusiness Minor

The BS program in Agricultural Business emphasizes management preparation for careers in agribusiness as 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. 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.

## CONCENTRATIONS

In addition to the required major courses in agricultural business, students select one of the following concentrations or individualized course of study based upon their interests and career goals.

**Agribusiness Finance and Appraisal.** The study of economic, legal and real estate principles in the investment, development and mortgaging of agricultural real estate. Employment opportunities are available with a variety of institutions such as the Farm Credit System, Farm Service Agency, commercial banks, and large insurance companies. Careers may include loan officer, fee appraiser, financial officer, and agricultural real estate management and sales.

**Agribusiness Marketing.** Coursework includes the analysis of marketing methods and planning, sales forecasting, and research design for agribusiness. Career opportunities involve the marketing, advertising, distribution, and sales of farm products.

**Agribusiness Policy.** Coursework includes the analysis of agricultural resource allocation issues with emphasis on policies that impact the production of food and fiber. Typical careers include policy analysts and lobbyists for

agribusiness, farm organizations, commodity associations, agribusiness trade associations, government regulatory agencies, and federal and state legislatures.

**Farm and Ranch Management.** Graduates frequently return to manage the increasingly complex operations of the family farm or find career opportunities with a large-scale farm or ranch operation. The study of farm and ranch management, including factors that influence profits and efficiency, accounting procedures and agricultural tax laws and preparation.

**International Agribusiness Management.** The opportunity for studying global agricultural production, marketing, trade policies and factors influencing U.S. exports of agricultural commodities and products. In addition to the required curriculum, students are encouraged to develop competency in a second language and complete an internship experience outside of the U.S.

**Individualized Course of Study.** Students have the option of choosing one of the above concentrations or developing an individualized course of study with advisor and department head approval. The agribusiness sector is changing rapidly with the evolution of biotechnology and information technology. Students are encouraged to explore these and other topics by developing a program of study that reflects individual talents and interests.

## Graduate Program

Cal Poly offers a Master of Science degree in Agriculture with a specialization in Agribusiness. Please refer to the MS Agriculture section of the College of Agriculture. A specialization in Agribusiness is also offered in the MBA program; please refer to the Graduate Programs section of the Orfalea College of Business. A Master of Science in Agribusiness is pending approval.

## BS AGRICULTURAL BUSINESS

☐ 60 units upper division      ☐ GWR

☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

## MAJOR COURSES

AGB 101 Introduction to Agribusiness .....	4
AGB 202 Sales, Communication, Leadership .....	4
AGB 212 Agricultural Economics .....	4
AGB 301 Food and Fiber Marketing .....	4
AGB 310 Agribusiness Credit and Finance .....	4
AGB 312 Agricultural Policy .....	4
AGB 313 Agricultural Economic Analysis .....	4

AGB 401 Managing Cultural Diversity in Agricultural Labor Relations (USCP) .....	4
AGB 460 Research Methodology in Agribusiness ..	2
AGB 461 Senior Project.....	2
Concentration courses (see below).....	28
	<b>64</b>

**SUPPORT COURSES**

BUS 207 Business Law.....	4
BUS 212 Financial Actg for Nonbusiness Majors ...	4
CHEM 110 World of Chem/Essentials (B3 & B4)*	4
Life science elective with lab (B2*) .....	4
<sup>1</sup> ECON 222 Macroeconomics (D2)* .....	4
<sup>2</sup> MATH 221 Calculus for Business & Econ. (B1)* ...	4
STAT 221 Probability/Statistical Inference (B1)*	5
ASCI 231 or PM 225 or DSCI 230.....	3/4
SS 121 Introductory Soil Science.....	4
FRSC 131/230/231 or CRSC 131/230 or VGSC 230 or EHS 121 .....	4
BRAE 340/BRAE 348/FNR 312/FNR 321/FSN 319 (Area F)* .....	4
Agricultural science electives.....	12/13
12/13 units in Agriculture with course prefixes other than AGB, AGED, REC, MSC. No more than 4 units from courses with AG prefix (AG 210, AG 250, AG 301 and AG 371 do not satisfy units in this area). No more than 4 units from Enterprise Projects and Special Problems. At least 3 of these units should be selected from 300-400 classes	
	<b>57</b>

**GENERAL EDUCATION (GE)**

72 units required; 24 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing.....	4

**Area B Science and Mathematics (no additional units required)**

B1 Mathematics/Statistics * 8 units in Support...	0
B2 Life Science * 4 units in Support .....	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (20 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (16 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy * 4 units in Support.....	0
D3 Comparative Social Institutions .....	4

D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)**

* 4 units in Support.....	0
	<b>48</b>

<b>ELECTIVES</b> .....	<b>17</b>
	<b>186</b>

**CONCENTRATIONS or  
INDIVIDUALIZED COURSE OF STUDY (select one)****Agribusiness Finance and Appraisal**

AGB 322 Principles of Farm Management.....	4
AGB 324 Agric. Property Management and Sales ..	4
AGB 326 Farm Appraisal .....	4
AGB 331 Farm Accounting .....	4
AGB 410 Agricultural Lending .....	4
ECON 337 Money, Banking, and Credit .....	4
Advisor approved electives: AGB/BUS (300-400 level) or foreign language (any level) .....	4
	<b>28</b>

**Agribusiness Marketing Concentration**

AGB 318 Global Agricultural Marketing/Trade.....	4
AGB 323 Agribusiness Managerial Accounting ....	4
AGB 405 Agribus. Marketing Research Methods...	4
AGB 406 Agribusiness Marketing Planning .....	4
AGB 421 Agribusiness Operations Analysis or AGB 433 Agricultural Price Analysis.....	4
AGB 450 Agribusiness Strategy Formulation .....	4
Advisor approved electives: AGB/BUS (300-400 level) or foreign language (any level) .....	4
	<b>28</b>

**Agribusiness Policy Concentration**

AGB 315 Land Economics .....	4
AGB 323 Agribusiness Managerial Accounting or AGB 435 Linear Programming .....	4
AGB 370 World Food Economy .....	4
AGB 412 Advanced Agricultural Policy .....	4
AGB 421 Agribusiness Operations Analysis or AGB 433 Agricultural Price Analysis .....	4
AGB 442 Agricultural Policy Resolution .....	4
Advisor approved electives: AGB/BUS (300-400 level) or foreign language (any level) .....	4
	<b>28</b>

<sup>1</sup> AGB majors: AGB 212 is prerequisite for ECON 222, not ECON 221.<sup>2</sup> Prerequisite: Passing score on appropriate Mathematics Placement Examination, or MATH 118 or equivalent.

**Farm and Ranch Management**

AGB 321 Farm Records.....	4
AGB 322 Principles of Farm Management.....	4
AGB 331 Farm Accounting.....	4
AGB 433 Agricultural Price Analysis.....	4
AGB 435 Linear Programming in Agriculture.....	4
AGB 456/457/458 Crop/Livestock/Dairy Management Problems .....	4
Advisor approved electives: AGB/BUS (300-400 level) or foreign language (any level).....	4
	28

**International Agribusiness Management**

BUS 302 International and Cross Cultural Mgt.....	4
AGB 318 Global Agricultural Mktg and Trade .....	4
AGB 323 Agribusiness Managerial Accounting.....	4
AGB 370 World Food Economy.....	4
AGB 422 Logistics in Global Agribusiness or BUS 433 International Business Finance .....	4
AGB 451 Strategy and Cases in Internatl Agbus.....	4
Area study concentration elective.....	4
To be selected from approved courses in anthropol- ogy, history, humanities, and foreign languages	
	28

**Individualized Course of Study**

Advisor and department head pre-approval of courses is required.....	28
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**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**

AGB 212 Agricultural Economics .....	4
AGB 301 Food and Fiber Marketing .....	4
AGB 310 Agribusiness Credit and Finance .....	4
AGB 401 Managing Cultural Diversity in Agricultural Labor Relations (USCP) .....	4
BUS 212 Financial Accounting for Nonbusiness Majors or AGB 321 Farm Records .....	4

**Additional courses** .....

The student will choose 8 additional units of AGB courses (not including AGB 101, 200, 339, 400) with <i>prior approval</i> by AGB Minor Coordinator.	8
	28

**Interdisciplinary Minors**

The department participates in offering the interdisciplinary minor in Wine and Viticulture. Please see College of Agriculture section for more information.

**MS AGRIBUSINESS**

The Master of Science degree program in Agribusiness has the following objectives:

**Prerequisites:** A bachelor's degree and one course in each of the following areas: Intermediate microeconomics, macroeconomics, statistics, calculus of business calculus.

**Program of Study:** Designed to enhance the agribusiness management, commodity marketing, and technical skills of graduate students with interests in international and domestic agribusiness.

**Core courses**

AGB 433/435/422 .....	4
AGB 450 Agricultural Strategy Formulation (4) .....	4
AGB 460/SS 501 Research Methodology in Agribusiness/Research Planning .....	2/4
AGB 510 International Development and Agribusiness.....	4
AGB 514 Agribusiness Managerial Leadership and Communication .....	4
<sup>1</sup> FNR 532 Forestry Applications in Biometrics and Econometrics.....	4
AGB 543 Agricultural Policy and Program Analysis.....	4
AGB 554 Food Systems Marketing .....	4
AGB 555 Technological and Economic Change in Agriculture .....	4
AGB 563 International Agribusiness Trade: Cases and Theory .....	4
AGB 599 Thesis or Scholarly Project in Agribusiness.....	6
<b>Committee approved elective (400-500 level)...</b>	3/4
	47-50 <sup>2</sup>

<sup>1</sup> This course was included because of its particular statistical applications for economics and business forecasting that are appropriate to this program.

<sup>2</sup> Similar courses or course equivalents already completed at the undergraduate level will require that the student complete additional "committee approved" elective units, but not reduce the degree unit requirement. Those electives are to be selected from the College of Agriculture or the College of Business at the 400 or 500 level.

# Agricultural Education & Communication

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

## Department Head, Robert A. Flores

Glen R. Casey                      Sarah M. Stephens  
 William C. Kellogg              J. Scott Vernon

## ACADEMIC PROGRAMS

### BS Agricultural Science

The Agricultural Education and Communication Department offers a Bachelor of Science degree in Agricultural Science with a choice of one of seven concentrations. The program also offers 26/27 units of advisor approved electives which may be selected from one of two career pathways: preparation of agriculture teachers for the public secondary schools of California, and professional preparation in agricultural communication.

The teaching credential program provides for early field experience and professional education coursework in the undergraduate curriculum. Specialized preprofessional and professional courses are offered for undergraduate and graduate students.

Postbaccalaureate work is required of students seeking the Single Subject in Agriculture or Home Economics, and Agricultural Specialist credentials. 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. A single subject credential in Home Economics is available for Home Economics graduates or graduates from related programs.

Student teaching is a vital part of the graduate program for agriculture and the home economics credential. Candidates must complete a minimum of 45 units of postgraduate coursework necessary for the preliminary teaching credential. For more information see, Teaching Credential Programs.

In association with the Brock Center for Agricultural Communication, selected interdisciplinary courses in Journalism, Graphic Communications, English, Speech Communication and Agriculture make up the Agricultural Communication minor. Career preparation includes a breadth and depth in agriculture along with foundations in

journalism and an industry internship. The Brock Center for Agricultural Communication provides students the opportunity for industry linkages and professional preparation in this rapidly growing career area.

Agricultural Education courses taken at the graduate level may be used to fulfill many of the units required for the MS Agriculture with a specialization in Agricultural Education. Detailed information may be obtained in the office of the Dean of the College of Agriculture or in the Agricultural Education and Communication Department.

## CONCENTRATIONS

**Agricultural Mechanics.** Designed to develop knowledge and ability necessary to perform agricultural mechanical operations and processes.

**Agricultural Products and Processing.** Principles and practices involved in the science of post harvest technology of agricultural products.

**Agricultural Supplies and Services.** Study of the consumable supplies and services needed in the production and post harvest phases of agriculture.

**Animal Science.** Principles and practices related to the economic use of resources in the production of livestock and poultry.

**Crop and Soil Science.** Principles and practices related to the economic use of resources in the culture and production of agricultural plants.

**Forestry and Natural Resources.** Principles and practices involved in the conservation, multiple use or improvement of natural resources.

**Ornamental Horticulture.** Principles and practices involved with the culture of plants used for ornamental or aesthetic purposes.

## Graduate Programs

Cal Poly offers a Master of Science degree in Agriculture with a specialization in Agricultural Education, and a specialization in General Agriculture which provides the opportunity to focus in the area of Agricultural Communication. Please refer to the MS Agriculture section of the College of Agriculture.

## CONTINUING EDUCATION IN AGRICULTURE

Cal Poly and the Agricultural Education and Communication Department play 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 expressed through the California Agricultural Teachers' Association. Cal Poly faculty provide up-to-date training in the technical phases of agriculture and offer instruction in teaching methods.

## BS AGRICULTURAL SCIENCE

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA                      ☐ USCP

\* = Satisfies General Education Requirement

### MAJOR COURSES

AGED 202 Intro. to Agricultural Education .....	2
AGED 404 Agricultural Leadership .....	3
AGC 426 Presentation Methods in Agricultural Communication <i>or</i> EDUC 460 Curriculum and Instruction for Democratic Secondary Schools ....	3
AGED 460 Research Methodology in Agricultural Education and Communication .....	1
AGED/AGC 461 Senior Project .....	1
AGED/AGC 462 Senior Project .....	1
AGB 202 Communication, Leadership and Management Skills for Agribusiness.....	4
AGB 301 Food and Fiber Marketing .....	4
AGB 401 Managing Cultural Diversity in Agricultural Labor Relations (USCP) .....	4
ASCI 231 General Animal Science.....	3
ASCI 232 General Animal Science Laboratory .....	1
BRAE 121 Agricultural Mechanics .....	2
BRAE 141 Agricultural Machinery Safety .....	3
CRSC 230 Agronomic Crop Production.....	4
DSCI 230 General Dairy Husbandry .....	4
DSCI 231 General Dairy Manufacturing <i>or</i> FSN 230 Elements of Food Processing .....	4
AG 360 Holistic Management <i>or</i> ASCI 476 Issues in Animal Agriculture.....	4/3
FRSC 230 California Fruit Growing <i>or</i> VGSC 230 Introduction to Vegetable Science .....	4
EHS 230 Environmental Horticulture .....	4
PM 225 Introduction to Poultry Management.....	4
SS 121 Introductory Soil Science.....	4
Concentration courses (see below).....	22
	<b>85/86</b>

### SUPPORT COURSES

CHEM 110 World of Chem/Essentials (B3 & B4)*	4
BRAE 340 Irrigation Water Management (Area F)* .....	4
FNR 308 Fire and Safety <i>or</i> FNR 323 Human Dimensions in Natural Resources Management (D5)*.....	4
MATH 118 Pre-Calculus Algebra (B1)* .....	4
(MATH 116 & MATH 117 will substitute)	

Advisor approved restricted electives ..... 26/27  
12-20 units must be 300-400 level depending  
on concentration. Career area programs may  
be selected from teaching agriculture, or  
agricultural communication.

**42/43**

## GENERAL EDUCATION (GE)

72 units required; 16 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

### Area A Communication (12 units)

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing.....	4

### Area B Science and Mathematics (12 units)

B1 Mathematics/Statistics * 4 units in Support....	4
B2 Life Science.....	4
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	

### Area C Arts and Humanities (20 units)

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4)	4

### Area D/E Society and the Individual (20 units)

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective *4 units in Support...	0

### Area F Technology Elective (upper division)

(4 units) * 4 units in Support.....	0
	<b>56</b>

**ELECTIVES** ..... **7/9**  
**192**

## CONCENTRATIONS (select one)

### Agricultural Mechanics

BRAE 124 Small Engines.....	2
BRAE 237 Engineering Surveying I.....	2
BRAE 321 Agricultural Safety .....	3
BRAE 335 Internal Combustion Engines .....	4
BRAE electives (7 units at 300-400 level).....	11
	<b>22</b>

**Agricultural Products and Processing**

DSCI 231 General Dairy Manufacturing .....	4
ASCI 211 Meats .....	3
HCS 421 Postharvest Tech. Horticultural Crops.....	3
HCS 425 Postharvest Technology of Horticultural Crops Lab .....	1
DSCI/FSN electives (6 units at 300–400 level) .....	11
	<u>22</u>

**Agricultural Supplies and Services**

AGB 212 Agricultural Economics .....	4
AGB 310 Agribusiness Credit and Finance .....	4
AGB 312 Agricultural Policy.....	4
AGB electives (2 units at 300–400 level).....	10
	<u>22</u>

**Animal Science**

Select two: ASCI 221, 222, 223 .....	4,4
ASCI 220 Intro Animal Nutrition and Feeding.....	4
DSCI 330 Artificial Insemination and Embryo Biotechnology.....	4
ASCI/DSCI/PM electives (300–400 level) .....	6
	<u>22</u>

**Crop and Soil Science**

CRSC/FRSC/VGSC 230 (Select course not taken in major column) .....	4
SS 202 Soil Erosion and Water Conservation.....	4
PPSC 311 Agricultural Entomology .....	4
SS 221 Fertilizers .....	4
CRSC/FRSC/VGSC/SS electives (300–400 level) ..	6
	<u>22</u>

**Forestry and Natural Resources**

BIO 227 Wildlife Conservation Biology .....	4
BIO 228 Wildlife Conservation Laboratory.....	1
FNR 202 Environmental Management.....	3
FNR 208 Dendrology.....	4
FNR 306 Natural Resource Ecology and Habitat Management .....	4
FNR electives (300–400 level).....	6
	<u>22</u>

**Ornamental Horticulture**

EHS 123 Landscape Installation and Maintenance..	4
EHS 124 Plant Propagation.....	4
EHS 125 Florist Practices I.....	3
EHS electives (10 units at 300–400 level).....	11
	<u>22</u>

# Animal Science

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**(805) 756-2419 FAX: (805) 756-5069**  
**www.calpoly.edu/~asci/**

## Department Head, Andrew J. Thulin

Jonathon L. Beckett	William E. Plummer
M. Steven Daugherty	Robert T. Rutherford
Michael H. Hall	Dale A. Smith
Roger M. Hunt	Robert Spiller
Elizabeth Koutsos	Robert D. Vance
Michael W. Lund	Rudy A. Wooten
Jaymie J. Noland	

## Affiliate Faculty:

Brent G. Hallock, Soil Scientist  
 Edwin H. Jaster, Dairy Scientist

## ACADEMIC PROGRAMS

**BS Animal Science**  
**Equine Science Minor**  
**Meat Science and Processing Minor**  
**Poultry Management Minor**

The Bachelor of Science degree in Animal Science prepares students for many career opportunities. The major coursework combines scientific theory and practical applications for animal production. In consultation with their faculty advisors, students select electives according to their interests. Students may select coursework in one of the following areas: livestock production, poultry management, agribusiness, meats/muscle science, teaching agriculture, agricultural communication, resource management, pre-veterinary medicine/graduate school, and zoo and exotic animal care.

In addition, the department offers a wide assortment of extra- and co-curricular activities including five different student clubs and a nationally competitive livestock judging and horse judging teams. Students participate in organizing and conducting special meetings, seminars and field days sponsored by the department.

The department maintains beef cattle, horses, sheep, swine, and poultry. These animal operations are supported by an on-campus veterinary clinic, meat processing facilities, and a feed manufacturing plant. Some of the nation's most noted bloodlines can be found within the registered breeds on campus, where artificial insemination and embryo transfer are commonly used. By actively participating in the management of the herds and flocks, students simulate the larger commercial operations of the industry. The enterprise system is another valuable experience for students, and industry internships are strongly encouraged.

The department has an active role in the management of the Swanton-Pacific Ranch and is developing 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. Cal Poly's Animal Science major provides the knowledge and understanding to apply new technologies for the fast-changing, technology-driven world in which we live. Our focus is to help students build a plan for personal and professional growth. Students develop the ability to apply and manage technology, and they also learn how to be team players, with the ability to solve problems utilizing leadership and professional communication skills. Most importantly, we teach students how to learn so they can adapt to the future.

## Graduate Program

Cal Poly offers a Master of Science degree in Agriculture with a specialization in Animal Science. Please refer to the MS Agriculture section of the College of Agriculture.

## BS ANIMAL SCIENCE

☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

## MAJOR COURSES

ASCI 101 Introduction to the Animal Sciences.....	2
ASCI 102 Principles of Animal Science.....	4
ASCI 211 Meats.....	3
ASCI 220 Intro. Animal Nutrition and Feeding .....	4
ASCI 221 Introduction to Beef Production .....	4
ASCI 222 Systems of Swine Production .....	4
ASCI 223 Systems of Sheep Production.....	4
VS 223 Anatomy and Physiology of Farm Animals	4
ASCI 224 Equine Science.....	4
PM 225 Introduction to Poultry Management .....	4
ASCI 304 Animal Breeding .....	3
ASCI 320/CHEM 313/CHEM 371 .....	3-5
ASCI 351 Reproductive Physiology .....	4
ASCI 461 Senior Project.....	2
ASCI 462 Senior Project.....	2
ASCI 463 Undergraduate Seminar .....	2
ASCI 476 Issues in Animal Agriculture .....	3
<i>Nutrition (select one)</i>	
ASCI 350, 355, 346, 420; DSCI 301 .....	3-4
<i>Physiology (select one)</i>	
ASCI 333, 347, 405, 406; DSCI 330; PM 340; VS 438.....	3-5
<i>Technology (select two)</i>	
AG 360/AG 450; ASCI 311, 329, 384, 403, 415, 450; PM 320, 330; VS 312	6-9
Advisor approved electives.....	20-28
	<b>96</b>

**SUPPORT COURSES**

BIO 151 Introduction to Biology <i>or</i>	
BIO 111 General Biology (B2 & B4)* .....	5/4
BIO 302 Human Genetics <i>or</i> BIO 303 Genetics .....	4/3
CHEM 111/127 Survey of Chemistry (B3&B4)* ....	5/4
CHEM 312 Survey of Organic Chemistry <i>or</i>	
CHEM 316 Organic Chemistry ( <i>transfer</i>	
<i>equivalents</i> CHEM 212, 216) .....	5
MATH 118 Pre-Calculus Algebra (B1)* .....	4

**20-23****GENERAL EDUCATION (GE)**

72 units required; 12 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

**Area B Science and Mathematics (4 units)**

B1 Mathematics/Statistics * 4 units in Support...	4
B2 Life Science * 4 units in Support .....	0
B3 Physical Science * 4 units in Support .....	0
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (20 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division) (4 units).....****4****60****ELECTIVES .....****7-10****186****EQUINE SCIENCE MINOR**

The Equine Science minor is designed for students interested in developing a knowledge of and competency in the areas of equine training and/or reproduction. This science-based program will expose students to various aspects of the horse industry, including basic equine husbandry, training, breeding farm management. By completing this minor, students gain an understanding of the principles and practices used within the equine industry.

**Prerequisites.** BIO 111 or BIO 151; VS 223 is recommended for ASCI 315 but not required.

**Required courses**

ASCI 102 Principles of Animal Science .....	4
ASCI 220 Intro to Nutrition .....	4
ASCI 224 Equine Science .....	4
ASCI 315 Equine Biomechanics .....	4
ASCI 346 Equine Nutrition .....	4
ASCI 333 Equine Reproduction <i>or</i> ASCI 347	
Equine Exercise Physiology .....	5/3

**Selected courses .....**

Select 5-7 units from the following:  
ASCI 324, 329, 333, 339/490, 344, 345, 347;  
AGB 303, 321

**28-32****MEAT SCIENCE AND PROCESSING MINOR**

The Meat Science and Processing minor incorporates knowledge of general food science, basic meat science and the principles and practices of adding value to raw materials through livestock harvesting, carcass fabrication and the manufacture of further processed meat and poultry products. Opportunities for business and management training are available. The minor meets the requirements needed to become eligible for jobs with the government or commercial meat processing firms and other businesses associated with the production of food products containing meat or poultry. In addition to the required courses, selected courses address basic principles of microbiology, food science, food sanitation and safety, food chemistry and process control procedures, and other optional courses are offered in agribusiness.

**Prerequisite.** One quarter of chemistry.

**Required courses**

ASCI 211 Introductory Meat Science .....	3
ASCI 384 Processed Meat Products <i>or</i> PM 320	
Poultry Products .....	4
ASCI 415 HACCP for Meat/Poultry .....	3
MCRO 221 Microbiology .....	4

**Selected courses .....**

6 units must be at upper-division level:

ASCI 102/231, 226, 290/490, 339, 450, 476;  
FSN 125/230, 278, 364; MCRO 421, 444;  
AG 360; any upper-division AGB course

**27-30**

## 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. Career opportunities are many and varied.

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 program is supported by a state-of-the-art poultry production facility. Cal Poly's new Poultry Unit is now considered one of the best in the Western United States; it will accommodate 14,000 layers, 7,000 replacement pullets, 7,000 broilers, and 2,500 chickens/ turkeys for testing and research purposes. These production facilities allow students to gain hands-on learning which complements their formal class work, and provides real-world experience.

### Required courses

PM 225 Introduction to Poultry Management .....	4
PM 320 Egg and Poultry Meat Processing .....	4
PM 330 Poultry Production Management .....	4
PM 340 Poultry Anatomy, Physiology Diseases .....	4
PM 345 Poultry Business Management .....	4
ASCI 350 Applied Nonruminant Nutrition .....	4
<b>Electives</b> .....	4

To be chosen from:

AGB 310; ASCI 339, 415; BUS 212, 346;  
ENGL 310; FSN 275, 278, 323, 334, 335;  
PM 290/490, 360

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### Additional Minors

The department also participates in offering a minor in Rangeland Resources. Please see page 104 for additional information.

# BioResource & Agricultural Engineering

## Department Office

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

## Department Head, Kenneth H. Solomon

Charles M. Burt	Shaun F. Kelly
Richard A. Cavaletto	Robert E. Walker
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Samantha J. Gill	James B. Zetzsche, Jr.
M. Stephen Kaminaka	Mark A. Zohns

## ACADEMIC PROGRAMS

### **BS Agricultural Systems Management** **BS BioResource and Agricultural Engineering**

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

The BioResource and Agricultural Engineering Department is an engineering-based educational organization consisting of professionals whose mission is the study, teaching, and practice of engineering and systems management support for agriculture. The Department is nationally recognized as a leader in this field, and for balancing theory with application and principle with practice.

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 involved in a broad range of activities and services including Open House displays. The student branch of the American Society of Agricultural Engineers offers professional and extracurricular activities.

### **BS Agricultural Systems Management**

The mission of the Agricultural Systems Management program is to provide a "Learn by Doing" undergraduate educational experience that will prepare students for

systems management practice in support of agriculture and related industries throughout the West.

Students receive broad agricultural training with a business and management emphasis in one of the following areas: plant production, livestock production, food and fiber processing, environmental information management, water/irrigation, and processing and manufacturing. Students have the opportunity to develop management expertise through interdisciplinary experiences in agricultural technology and business oriented coursework.

The objectives of the Agricultural Systems Management program are to produce graduates who:

- ◆ are successful in technical, business, or management positions within agriculture or related industries; and
- ◆ are "industry ready" to undertake technological, business, or management projects and make significant contributions from day one on the job; or
- ◆ are enrolled in an advanced degree program and are successful at graduate studies should they choose to pursue them.

Agricultural Systems Management graduates demonstrate a knowledge and understanding of basic agricultural technologies and agribusiness principles necessary for technical operations and business management careers in agriculture and related industries; an understanding of modern science and practice within a specialized agricultural area of interest; and ability to apply quantitative, analytical processes for developing solutions to technological, business or management problems associated with production, processing, or the distribution of products and support services in agriculture and related industries; an understanding of the interconnected "systems" of agriculture; and ability to safely and properly handle the materials, machines, sensors, tools and techniques of modern agricultural or technical operations; and an ability to communicate and perform as effective agricultural systems management professionals in the solution of problems crossing discipline or cultural boundaries.

Career opportunities are available in the manufacturing, sales, and service of agricultural equipment and machinery; management and production of animals and crops; processing of food and fiber; and management of water/irrigation facilities. The program is recognized by the American Society of Agricultural Engineers.

## BS BioResource and Agricultural Engineering

The bioresource/agricultural engineer represents the most general type of engineer, adept at utilizing electrical and mechanical energy sources, water resources, and designing structural units. The curriculum features a unique combination of engineering and applied science coursework, with a focus on preparing graduates for practice in professional engineering.

The mission of the BioResource and Agricultural Engineering program is to provide a "Learn by Doing" undergraduate educational experience that will prepare students for engineering practice in support of agriculture and related industries throughout the West.

The objectives of the BioResource and Agricultural Engineering program are to produce graduates who:

- ♦ are successful in engineering practice within agriculture or related industries; and
- ♦ are "industry ready" to undertake engineering projects and make significant contributions from day one on the job; or
- ♦ are enrolled in an advanced degree program and are successful at graduate studies should they choose to pursue them.

BioResource and Agricultural Engineering graduates demonstrate a knowledge and understanding of the basic mathematics, physical and engineering sciences necessary for modern agricultural engineering practice; the ability to design components, systems or processes to meet specified objectives, including prudent use of resources; an understanding of their professional and ethical responsibilities as agricultural engineers, including the societal impact of engineering solutions and the need to engage in life-long learning; the ability to plan, design, execute and evaluate engineering solutions to problems/projects that are real, practical and of a complexity representative of projects encountered in beginning professional practice; and the ability to communicate and perform as effective engineering professionals in both individual and team-based project environments.

Cal Poly's "learn by doing" philosophy is emphasized by the numerous design-centered laboratories and the senior project. In the senior design project, which is completed in a three-quarter set of capstone courses, students demonstrate their understanding of engineering knowledge and their ability to apply that knowledge creatively to practical problems.

Career opportunities exist in the design, evaluation and management of systems -- irrigation, drainage, hydrology, soil conservation; farm machinery; food processing; and agricultural environments. The program is accredited by the

Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

## Minors

The department participates in offering interdisciplinary minors in Water Science and Geographic Information Systems. Please see College of Agriculture section for more information.

## Graduate Programs

Cal Poly offers the MS in Agriculture with specializations in Agricultural Engineering Technology and in Irrigation, and the MS in Engineering with a specialization in Water Engineering. Please see College of Agriculture and College of Engineering sections for more information.

## BS AGRICULTURAL SYSTEMS MANAGEMENT

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

## MAJOR COURSES

BRAE 128 Careers in Bioresource/Agric. Engr .....	2
BRAE 129 Laboratory Skills and Safety .....	1
BRAE 133 Engineering Design Graphics.....	3
BRAE 141 Agricultural Machinery Safety .....	3
BRAE 142 Agric Power and Machinery Mgt .....	4
BRAE 151 CAD for Agricultural Engineering.....	1
BRAE 203 Agricultural Systems Analysis .....	3
BRAE 301 Hydraulic/Mechanical Power Systems..	4
BRAE 321 Agricultural Safety .....	3
BRAE 324 Principles Agricultural Electrification...	4
BRAE 325 Agricultural Energy Systems.....	3
BRAE 340 Irrigation Water Management .....	4
BRAE 402 Agricultural Materials .....	3
BRAE 418 Agricultural Systems Management I.....	4
BRAE 419 Agricultural Systems Management II....	4
BRAE 425 Computer Controls for Agriculture .....	3
BRAE 432 Agricultural Buildings.....	4
BRAE 460 Senior Project Organization .....	1
BRAE 461 Senior Project.....	2
BRAE 462 Senior Project.....	2
Advisor approved electives .....	15
Selected from: plant production, livestock production, food processing, environment information management, water/irrigation, agricultural waste management, process and manufacturing, or teaching agriculture	

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## SUPPORT COURSES

AG 250/CSC 110/CSC 111/CSC 113 .....	3
CHEM 110 World of Chemistry - Essentials or CHEM 111 Survey of Chemistry (B3 & B4)* ....	4/5
ENGL 148 Reasoning, Argumentation, and Professional Writing (A3)* .....	4

MATH 118 Pre-Calculus Algebra (B1)* .....	4
MATH 119 Pre-Calculus Trigonometry (B1)* .....	4
PHYS 121 College Physics .....	4
SS 121 Introductory Soil Science.....	4
Agribusiness Minor .....	28
Animal or plant production course.....	3
	<b>58/59</b>

**GENERAL EDUCATION (GE)**

72 units required; 16 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

**Area A Communication (8 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing * 4 units in Support .....	0

**Area B Science and Mathematics (4 units)**

B1 Mathematics/Statistics * 8 units in Support ...	0
B2 Life Science.....	4
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (20 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)  
(4 units).....****56**

<b>ELECTIVES .....</b>	<b>0</b>
	<b>187</b>

**BS Agricultural Systems Management - by Year  
Freshman**

BRAE 128 Careers in Bioresource/Agric. Engr. ....	2
BRAE 129 Laboratory Skills and Safety .....	1
BRAE 133 Engineering Design Graphics.....	3
BRAE 141 Agricultural Machinery Safety .....	3
BRAE 142 Agricultural Power/Machinery Mgt. ...	4
BRAE 151 CAD for Agricultural Engineers .....	1
CHEM 110 World of Chemistry - Essentials <i>or</i> CHEM 111 Survey of Chemistry (B3 & B4).....	4
PHYS 121 College Physics .....	4
AG 250/CSC 110/CSC 111/CSC 113 .....	3
ENGL 134 Writing: Exposition (A1) .....	4
MATH 118, 119 Pre-Calc Algebra/Trig (B1).....	4,4
SCOM 101 or SCOM 102 Speech (A2) .....	4
Animal or plant production elective.....	3
	<b>44</b>

**Sophomore**

BRAE 203 Agricultural Systems Analysis .....	3
SS 121 Introductory Soil Science .....	4
ENGL 148 Reasoning, Argumentation, and Professional Writing (A3) .....	4
PSY 201/202 General Psychology (D4) .....	4
Life science elective (B2) .....	4
Philosophy elective (C2).....	4
Fine and performing arts elective (C3) .....	4
Agribusiness electives.....	16
	<b>43</b>

**Junior**

BRAE 301 Hydraulic/Mechanical Power Systems .....	4
BRAE 321 Agricultural Safety .....	3
BRAE 324 Princ. of Agricultural Electrification....	4
BRAE 325 Agricultural Energy Systems.....	3
BRAE 340 Irrigation Water Management .....	4
Advisor approved electives.....	9
Agribusiness electives.....	12
The American experience elective (D1) .....	4
Political economy elective (D2).....	4
Literature elective (C1) .....	4
	<b>51</b>

**Senior**

BRAE 402 Agricultural Materials Science .....	3
BRAE 418, 419 Agricultural Systems Mgt. I, II....	4,4
BRAE 425 Computer Controls for Agriculture .....	3
BRAE 432 Agricultural Buildings.....	4
BRAE 460, 461, 462 Senior Project.....	1,2,2
Arts and humanities elective (Area C).....	4
Literature, philosophy, arts (300-400) (C4) .....	4
Comparative social institutions (D3) .....	4
Society and the individual (300-400) (D5) .....	4
Technology elective (Area F) .....	4
Advisor approved electives.....	6
	<b>49</b>

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## BS BIORESOURCE AND AGRICULTURAL ENGINEERING

☐ 60 units upper division ☐ GWR

☐ 2.0 GPA ☐ USCP

\* = Satisfies General Education requirement

### MAJOR COURSES

BRAE 128 Careers in Bioresource & Ag Engr. ....	2
BRAE 129 Laboratory Skills and Safety .....	1
BRAE 133 Engineering Design Graphics .....	3
BRAE 151 CAD for Agricultural Engineering .....	1
BRAE 216 Fundamentals of Electricity .....	4
BRAE 226 Princ Bioresource Engineering .....	4
BRAE 232 Agricultural Structures Planning .....	4
BRAE 234 Intro Mechanical Systems-Agric .....	4
BRAE 236 Principles of Irrigation .....	4
BRAE 237 Engineering Surveying I or BRAE 239 Engineering Surveying .....	2
BRAE 312 Hydraulics .....	4
BRAE 328 Measurements/Computer Interfacing ..	4
BRAE 331 Irrigation Theory .....	3
BRAE 403 Agricultural Systems Engineering .....	4
BRAE 414 Irrigation Engineering .....	4
BRAE 415 Hydrology .....	4
BRAE 421, 422 Equipment Engineering .....	3,4
BRAE 433 Agricultural Structures Design .....	4
BRAE 460 Senior Project Organization .....	1
BRAE 461, 462 Senior Project .....	2,2
Advisor approved electives .....	8
	<b>76</b>

### SUPPORT COURSES

BIO 213 and ENGR/BRAE 213 (B2)* .....	2,2
CE 201 Strength of Materials or CE 204, 205 Strength of Materials I, II (3) (2) .....	5
CE 206 Strength of Materials Laboratory .....	1
CHEM 124 General Chemistry for the Engineering Disciplines (B3/B4)* .....	4
CHEM 125 General Chemistry for the Engineering Disciplines (Add'l Area B)* .....	4
CSC 111/CSC 231/CSC 234 .....	2/3
ECON 201 (D2)* .....	4
ENGL 149 Technical Writing for Engineers (A3)* ..	4
MATH 141, 142 Calculus I, II (B1)* .....	4,4
MATH 143 Calculus III (Add'l Area B)* .....	4
MATH 241 Calculus IV .....	4
MATH 242 Differential Equations or MATH 244 Linear Analysis I .....	4
ME 211 Engineering Statics .....	3
ME 212 Engineering Dynamics .....	3
ME 302 Thermodynamics .....	3
PHYS 131, 132, 133 General Physics .....	4,4,4
PHYS 206 Instrument/Experimental Physics .....	3
PHYS 256 Electrical Measurements Lab .....	1
SS 121 Introductory Soil Science .....	4
STAT 312 Statistical Methods-Engr. (B6)* .....	4

**81-82**

### GENERAL EDUCATION (GE)

72 units required; 36 units are in Support.

→ See page 76 for complete GE course listing.

→ Minimum of 12 units required at the 300-400 level.

#### Area A Communication (8 units)

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing * 4 in Support .....	0

#### Area B Science and Mathematics (no additional units are required)

B1 Mathematics/Statistics * 8 units in Support ...	0
B2 Life Science * 4 units in Support .....	0
B3 Physical Science * 4 units in Support .....	0
B4 One lab taken with either a B2 or B3 course	
B5 (requirement for Liberal Arts students only)	
B6 Upper-division Area B * 4 units in Support ...	0
Additional Area B units* 8 units in Support .....	0

#### Area C Arts and Humanities (16 units)

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4

#### Area D/E Society and the Individual (12 units)

D1 The American Experience (40404) .....	4
D2 Political Economy * 4 units in Support .....	0
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4

**36**

**ELECTIVES** ..... 0

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## BS BioResource and Agricultural Engineering - by Year

### Freshman

BRAE 128 Careers in Bioresource/Agric. Engr. ....	2
BRAE 129 Laboratory Skills and Safety .....	1
BRAE 133 Engineering Design Graphics .....	3
BRAE 151 CAD for Agricultural Engineering .....	1
BRAE 237 Engineering Surveying I <i>or</i> BRAE 239 Engineering Surveying .....	2
SS 121 Introductory Soil Science.....	4
CSC 111/CSC 231/CSC 234.....	2
MATH 141, 142 Calculus I, II (B1).....	4,4
MATH 143 Calculus III (Add'l Area B).....	4
PHYS 131, 132 General Physics .....	4,4
ENGL 134 Writing: Exposition (A1).....	4
SCOM 101 <i>or</i> SCOM 102 Speech (A2).....	4
ENGL 149 Technical Writing for Engineers (A3)*. ....	4
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### Sophomore

BRAE 216 Fundamentals of Electricity.....	4
BRAE 226 Intro Principles Bioresource Engr .....	4
BRAE 232 Agricultural Structures Planning .....	4
BRAE 234 Intro to Mechanical Systems in Agriculture.....	4
BRAE 236 Principles of Irrigation.....	4
ME 211 Engineering Statics.....	3
ME 212 Engineering Dynamics .....	3
CHEM 124 Gen Chem/Engineering (B3/B4) .....	4
CHEM 125 Gen Chem/Engineering (Add'l Area B).....	4
MATH 241 Calculus IV.....	4
MATH 242 Differential Equations <i>or</i> MATH 244 Linear Analysis I .....	4
PHYS 133 General Physics.....	4
BIO 213 <i>and</i> ENGR/BRAE 213 (B2).....	2,2
	<u>50</u>

### Junior

BRAE 312 Hydraulics.....	4
BRAE 328 Measurements/Computer Interfacing ....	4
BRAE 331 Irrigation Theory.....	3
BRAE 403 Agricultural Systems Engineering .....	4
CE 201 Strength of Materials <i>or</i> CE 204, 205 Strength of Materials I, II (3,2) .....	5
CE 206 Strength of Materials Lab .....	1
ME 302 Thermodynamics .....	3
PHYS 206 Instrumentation-Experimental Physics ..	3
PHYS 256 Electrical Measurements Lab.....	1
ECON 201 Economics (D2).....	4
STAT 312 Statistical Methods for Engineers (B6) ..	4
American experience elective (D1).....	4
Comparative social institutions elective (D3) .....	4
Fine and performing arts elective (C3).....	4
Self-development elective (D4).....	4
	<u>52</u>

### Senior

BRAE 414 Irrigation Engineering .....	4
BRAE 415 Hydrology.....	4
BRAE 421 Equipment Engineering.....	3
BRAE 422 Equipment Engineering.....	4
BRAE 433 Agricultural Structures Design.....	4
BRAE 460 Senior Project Organization .....	1
BRAE 461, 462 Senior Project .....	2,2
Philosophy elective (C2).....	4
Literature elective (C1).....	4
Arts and humanities elective (300-400) (C4).....	4
Advisor approved electives.....	8
	<u>44</u>
	<b>193</b>

# Dairy Science

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## Department Head, Leslie S. Ferreira

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 Nana Y. Farkye  
 William T. Gillis  
 Stanley L. Henderson  
 Rafael Jimenez-Flores  
 Edwin H. Jaster  
 Gary D. Reif  
 Phillip S. Tong

## ACADEMIC PROGRAMS

### Dairy Science - BS, Minor

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 advisor 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 or veterinary 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.

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 Dairy Science faculty. Opportunities also exist to work on joint projects with other institutions.

### Graduate Program

Cal Poly offers a Master of Science degree in Agriculture with a specialization in Dairy Products Technology. Please refer to the MS Agriculture section of the College of Agriculture.

## BS DAIRY SCIENCE

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA      ☐ USCP  
 \* = Satisfies General Education requirement

### MAJOR COURSES

DSCI 100 Enterprise Project <i>or</i>	
DSCI 339 Internship in Dairy Science .....	2
DSCI 101 Dairy Feeds and Feeding .....	4
DSCI 121 Elements of Dairying .....	4
DSCI 134 Intro. to Dairy Products Technology .....	4
DSCI 202 Dairy Promotion and Marketing .....	4
DSCI 223 Frozen Dairy Foods <i>or</i>	
DSCI 241 Dairy Cattle Selection, Breeds, Fitting and Showing.....	4
DSCI 233 Milk Processing and Inspection.....	4
DSCI 234 Dairy Foods Evaluation .....	2
DSCI 301 Dairy Cattle Nutrition <i>or</i>	
DSCI 401 Physical and Chemical Properties of Dairy Products.....	4
DSCI 321 Lactation Physiology <i>or</i>	
DSCI 444 Dairy Microbiology.....	4
DSCI 330 Artificial Insemination and Embryo Biotechnology <i>or</i> DSCI 434 Cheese and Fermented Dairy Foods.....	4
DSCI 333 Dairy Cattle Management, Safety and Animal Well-Being <i>or</i> DSCI 402 Quality Assurance and Control of Dairy Products.....	4
DSCI 422 Breeding and Genetics of Dairy Cattle <i>or</i> DSCI 435 Concentration/Fractionation and Butter Technology.....	4
DSCI 432 Advanced Dairy Herd Management <i>or</i> DSCI 433 Dairy Plant Mgt. & Equipment .....	4
DSCI 461 Senior Project.....	2
DSCI 462 Senior Project.....	2
DSCI 463 Undergraduate Seminar .....	2
	<b>58</b>

### SUPPORT COURSES

\* = Courses satisfy General Education requirement

MCRO 221 Microbiology (B2 & B4)* .....	4
CHEM 111 Survey of Chemistry <i>or</i> CHEM 127 General Chemistry (B3&B4)*.....	5/4
CHEM 312 Survey Organic Chemistry <i>or</i> BIO 151 Introduction to Biology ( <i>transfer equivalent CHEM 212</i> ).....	5
MATH 118 Pre-Calculus Algebra (B1)* .....	4

Advisor approved electives .....	41
At least 18 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.	

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**GENERAL EDUCATION (GE)**

72 units required; 12 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing.....	4

**Area B Science and Mathematics (4 units)**

B1 Mathematics/Statistics * 4 units in Support...	4
B2 Life Science * 4 units in Support .....	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (20 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)**

(4 units).....	4
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60

**ELECTIVES .....**

9/10

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food processing and marketing, quality and regulatory control and processing plant management. Specific programs will be designed to reflect the individual students' interest and needs.

The Dairy Science Minor will require two introductory courses. Students must obtain prior program approval from the Dairy Science Minor Coordinator in selecting an additional five courses according to their interests and goals. A minimum of 26 hours is required for the minor, at least half of which must be at the 300 and 400 level.

**Required courses**

DSCI 121 Elements of Dairying	
or DSCI 230 General Dairy Husbandry .....	4
DSCI 134 Intro to Dairy Products Technology	
or DSCI 231 General Dairy Manufacturing.....	4

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

18

Select five courses from the following, with advisor approval:

**Dairy Husbandry**

DSCI 101 Dairy Feeds and Feeding (4)	
DSCI 241 Dairy Cattle Selection, Breeds, Fitting and Showing (4)	
DSCI 301 Dairy Cattle Nutrition (4)	
DSCI 321 Lactation Physiology (4)	
DSCI 330 Artificial Insemination and Embryo Biotechnology (4)	
DSCI 333 Dairy Cattle Mgt, Safety and Animal Well-Being (4)	
DSCI 422 Breeding/Genetics of Dairy Cattle (4)	
DSCI 432 Advanced Dairy Herd Management (4)	

**Dairy Products Technology**

DSCI 202 Dairy Promotion and Marketing (4)	
DSCI 223 Frozen Dairy Foods (4)	
DSCI 233 Milk Processing and Inspection (4)	
DSCI 234 Dairy Foods Evaluation (2)	
DSCI 401 Phys/Chem Properties of Dairy Products (4)	
DSCI 402 Quality Assurance and Control of Dairy Products (4)	
DSCI 433 Dairy Plant Management and Equipment (4)	
DSCI 434 Cheese and Fermented Dairy Foods (4)	
DSCI 435 Concentration/Fractionation and Butter Technology (4)	
DSCI 444 Dairy Microbiology (4)	

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**DAIRY SCIENCE MINOR**

The purpose of this minor is to help students from other disciplines gain a basic understanding of the terminology and practices used within the field of dairy science. Students may choose to emphasize dairy husbandry or dairy products technology, but the curriculum is flexible enough to accommodate students' individual goals. After completion, dairy husbandry students will have a basic understanding of cattle, dairy nutrition, milk production practices and commercial dairy herd management. Dairy products technology students will have an understanding of dairy

# Earth and Soil Sciences

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Brent G. Hallock	Ronald D. Taskey
Lynn E. Moody	
<b>Affiliate Faculty:</b>	
Antonio F. Garcia	Calvin H. Wilvert
William L. Preston	

## Academic Programs

**Earth Sciences - BS**

**Soil Science - BS, Minor**

### BS Soil Science

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. Also, 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. Also, 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; 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 personable 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 and a glasshouse. 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, or who select the soil science minor, can augment their skills and knowledge, making them more adaptable to changing professional opportunities. 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 in Agriculture degree with a specialization in Soil Science. For information regarding this degree program, please refer to the MS Agriculture section.

### Curricular Concentrations

**Environmental Management.** 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.** 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.

**Land Resources.** 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 select (with departmental approval) from nearly any minor offered by the University. Students are encouraged to consider the minors in Land Rehabilitation, Water Science, and Geographic Information Systems, offered through the College of Agriculture. In addition, students may design their programs to prepare for graduate studies.

## BS Earth Sciences

The BS in Earth Sciences provides a strong foundation for understanding and improving the utilization of land, water, and atmospheric resources. The program emphasizes a wide range of disciplines in natural resources and in the cultures that use and modify them. The core of the earth sciences curriculum is composed of soil science, geography, and geology, and is strengthened by a diverse array of related topical and technical specialties.

The Earth Sciences major provides detailed and thorough training in the natural and cultural processes that govern the relationship between humans and their habitats. The program also furnishes students the marketable expertise to assess, repair, and improve this fragile relationship while acquiring a well rounded education in both the natural and social sciences. In addition, majors can meet the educational requirements for professional certification in a number of areas and will find their training ideal for graduate school preparation in a number of related disciplines.

Due to the multidisciplinary nature of the Earth Sciences major, students have access to diverse faculty and laboratories in the various colleges. The degree program, itself, is administered by the Earth and Soil Sciences department, within the College of Agriculture. The department and its students have access to several thousand acres of agricultural, forest, and range land managed by this school. Additionally, California's Central Coast offers a diverse environmental and cultural setting for real-world training and experiences in the earth sciences.

Undergraduate students majoring in Earth Sciences will earn the credentials for useful careers in resource assessment and administration. They will graduate with a substantial and well rounded education in the natural and social sciences. Moreover, Earth Sciences graduates will possess the understanding, flexibility, and tools to appreciate and adapt to a changing world and its employment opportunities.

### Concentrations

In addition to the required major courses, students select one of the following concentrations or individualized course of study based upon their interests and career goals.

**Geography.** Preparation for careers in environmental assessment, impact analysis, and administration. Study and analysis of environmental use and modification and the current legal and regulatory environment. This concentration also provides a strong foundation for graduate school or a career in education.

**Land and Water Resources.** Prepares students for professional opportunities in the mitigation and conservation of land and water resources. Emphasis is on the processes that endanger these ecosystems and the knowledge necessary to protect and maintain them. Additional training in soils and hydrological studies along

with enhanced technological skills. This concentration also prepares students for graduate study in disciplines that specialize in land and water.

**Individualized Course of Study.** Students may pursue an academic minor or create a program, with faculty approval, based upon their interests and career goals. The coursework may be specifically tailored for a career in industry, education, government, or as preparation for graduate school.

### Graduate Program

Cal Poly offers a Master of Science degree in Agriculture with a specialization in Soil Science. Please refer to the MS Agriculture section of the College of Agriculture.

### SOIL SCIENCE MINOR

Students from major fields other than Soil Science may broaden their education, and enhance their career opportunities, by selecting the minor in Soil Science.

#### Required courses

SS 121 Introductory Soil Science (B5).....	4
SS 202 Soil Erosion and Water Conservation .....	4
SS 221 Fertilizers and Plant Nutrition <i>or</i> SS 223 Rocks and Minerals .....	4
SS 321 Soil Morphology.....	4

#### Restricted Electives .....

SS 310 Urban Soils (4)	11/14
SS 322 Soil Fertility (4)	
SS 323 Geomorphology (4)	
SS 345 Soil Interpretations and Management (4)	
SS 422 Soil Microbiology and Biochemistry (4)	
SS 423 Soil and Water Chemistry (5)	
SS 431 Soil Resource Inventory (4)	
SS 432 Soil Physics (5)	
SS 433 Land Use Planning (3)	
SS 440 Forest and Range Soils (4)	
SS 442 Soil Vadose Zone Remediation (4)	
SS 453 Tropical Soils (4)	

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 27/30

### Additional Minors

The department also participates in offering a minor in Rangeland Resources. Please see page 104 for additional information.

**BS SOIL SCIENCE**

□ 60 units upper division

□ GWR

□ 2.0 GPA

□ USCP

\* = Satisfies General Education requirement

**MAJOR COURSES**

SS 110 Orientation in Soil Science .....	1
SS 121 Introductory Soil Science.....	4
SS 202 Soil Erosion and Water Conservation.....	4
SS 221 Fertilizers and Plant Nutrition.....	4
SS 223 Rocks and Minerals .....	4
SS 321 Soil Morphology .....	4
SS 322 Soil Fertility .....	4
SS 345 Soil Interpretations and Management .....	4
SS 422 Soil Microbiology and Biochemistry.....	4
SS 423 Soil and Water Chemistry.....	5
SS 431 Soil Resource Inventory.....	4
SS 432 Soil Physics.....	5
SS 461 Senior Project.....	1
SS 462 Senior Project.....	3
SS 463 Undergraduate Soils Seminar .....	2
Concentration courses (see below).....	28/29
	<b>81/82</b>

**SUPPORT COURSES**

BOT 121 General Botany (B2 & B4)* .....	4
BRAE 340/BRAE 415/BRAE 435/BRAE 440 .....	3/4
MCRO 221 Microbiology .....	4
CHEM 127 General Chemistry (B3&B4)* .....	4
CHEM 128 General Chemistry .....	4
CHEM 129 General Chemistry .....	4
CHEM 313 Survey of Biochemistry .....	5
GEOL 201 Physical Geology.....	3
FNR/GEOL/LA 318 Applications of GIS in Natural Resources.....	3
<sup>1</sup> MATH 118 Pre-Calculus Algebra or MATH 141 Calculus I (B1)* .....	4
<sup>1</sup> MATH 119 Pre-Calculus Trigonometry or MATH 142 Calculus II (B1)* .....	4
<sup>2</sup> PHYS 121/PHYS 131.....	4
STAT 218 Appl Statistics-Life Sciences.....	4
	<b>50/51</b>

**GENERAL EDUCATION (GE)**

72 units required; 16 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing.....	4

**Area B Science and Mathematics (no add'l units req'd)**

B1 Mathematics/Statistics * 8 units in Support ...	0
B2 Life Science * 4 units in Support .....	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (20 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)**

(4 units) .....	4
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	<b>56</b>
<b>ELECTIVES</b> .....	<b>0-2</b>
	<b>189</b>

**CONCENTRATIONS (select one):****Environmental Management Concentration**

CHEM 312 Survey of Organic Chemistry ( <i>transfer equivalent CHEM 212</i> ).....	5
CRSC 411/STAT 313 .....	4
SS 433 Land Use Planning .....	3
Select from: FNR 202, 306, 311, 416, 425; PHIL 340, REC 302 .....	8
Select from: CRP 404, 408, 420; FNR 408, 464; LA 451 .....	8
	<b>28</b>

**Environmental Science and Technology Concentration**

CHEM 316 ( <i>transfer equivalent CHEM 216</i> ), 317 ( <i>transfer equivalent CHEM 217</i> ) Organic Chemistry I, II .....	5,5
Select from: CHEM 218/318, 231/331, 319, 341, 342, 385, 481.....	8
Select from: ENVE 325, 330, 434, 439; SS 442.....	7
STAT 313 Applied Experimental Design and Regression Models .....	4
	<b>29</b>

**Land Resources Concentration**

CHEM 312 Survey of Organic Chemistry ( <i>transfer equivalent CHEM 212</i> ).....	5
CRSC 411 Experimental Techniques and Analysis.	4
Additional courses selected from approved list. These units may be selected to apply toward an approved minor. ....	19
	<b>28</b>

<sup>1</sup> Students in the Environmental Science and Technology concentration take MATH 141 and MATH 142.<sup>2</sup> Students in the Environmental Science and Technology concentration take PHYS 131.

**BS EARTH SCIENCES**

□ 60 units upper division

□ GWR

□ 2.0 GPA

□ USCP

\* = Satisfies General Education requirement

**MAJOR COURSES**

AG 360 Holistic Management (Area F)* .....	4
ANT 309 Elements of Archaeology .....	4
BOT 121 General Botany (B2 & B4)* .....	4
BOT 313 Taxonomy of Vascular Plants ( <i>transfer</i> <i>equivalent BOT 223</i> ) .....	4
BRAE 237 Engineering Surveying I .....	2
BRAE 345 Aerial Photogrammetry/Remote Sensing ....	3
CHEM 127, 128 General Chemistry (B3 & B4)* ....	4,4
ERSC/GEOG 250 Physical Geography .....	4
ERSC/GEOG 333 Human Impact on the Earth .....	4
ERSC/GEOG 414 Climatology .....	4
ERSC/SS 223 Rocks and Minerals .....	4
ERSC/SS 321 Soil Morphology .....	4
ERSC/SS 461, 462 Senior Project .....	1,3
FNR 306 Natural Resource Ecology/Habitat Mgt ...	4
FNR/GEOG/LA 318 Applic GIS in Natl Resources	3
GEOL 201 Physical Geology .....	4
GEOL 204 Geologic History/California .....	3
GEOL 241 Physical Geology Lab .....	1
GEOL/ERSC 401 Field – Geology Methods .....	4
SS 110 Orientation to Soil Science .....	1
SS 121 Introductory Soil Science .....	4
SS 323 Geomorphology .....	4
STAT 218 Applied Statistics/Life Sciences (B1)* ...	4
STAT 313 <i>or</i> CRSC 411 .....	4
Concentration courses (see below; 4 units B1)* ....	39-41

**128-130****GENERAL EDUCATION (GE)**

72 units required; 20 units are in Major.

→ See page 76 for complete GE course listing.

→ Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

**Area B Science and Mathematics (no add'l units req'd)**

B1 Mathematics/Statistics * 8 units in Major & concentration .....	0
B2 Life Science * 4 units in Major .....	0
B3 Physical Science * 4 units in Major .....	0
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (20 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4

D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)**

\* 4 units in Major .....

0

**52****ELECTIVES** .....**7/9****189****CONCENTRATIONS (select one):****Geography Concentration**

ERSC/GEOG 325 Climate and Humanity .....	4
FNR 416 Environmental Impact Analysis/Mgt ....	4
GEOG 150 Intro Cultural Geography (D3)* .....	4
GEOG 301 Geography of Resource Utilization ....	4
GEOG 308 Global Geography (D5)* .....	4
GEOG 340 Geography of California <i>or</i> GEOG 300 Geography of the United States .....	4
MATH 118 Pre-Calculus Algebra (B1)* .....	4
MATH 119 Pre-Calculus Trigonometry .....	4
PHYS 121 College Physics .....	4
SS 433 Land Use Planning <i>or</i> GEOG 317 Introduction to the World of Geographical Information .....	3/4

**39/40****Land and Water Resources Concentration**

BRAE 415 Hydrology .....	4
CHEM 129 General Chemistry .....	4
MATH 141, MATH 142 Calculus I, II (B1)* .....	4,4
PHYS 131, 132 General Physics .....	4,4
Take four of the following .....	16/17
ANT 310 Archaeological Field Methods (4)	
FNR 419 Watershed Management (4)	
GEOL/ERSC 402 Geologic Mapping (4)	
SS/BIO/FNR 421 Wetlands (4)	
SS 431 Soil Resource Inventory (4)	
SS 432 Soil Physics (5)	

**40/41****Individualized Course of Study**

MATH 118 Pre-Calculus Algebra (B1)* .....	4
MATH 119 Pre-Calculus Trigonometry .....	4
PHYS 121 College Physics .....	4
Restricted electives (minimum 18 units at 300- 400 level) .....	28

**40**

# Food Science and Nutrition

**Department Office**  
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**[www.calpoly.edu/~fsn](http://www.calpoly.edu/~fsn)**

## Department Head, Mary E. Pedersen

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Susan N. Hawk	Lisa M. Nicholson
Hany M. Khalil	O. Robert Noyes
Kathleen A. McBurney	Ammar A. Olabi

## ACADEMIC PROGRAMS

### Food Science - BS, Minor Nutrition - BS, Minor

The department offers two degree programs designed to prepare graduates for employment in the general areas of human nutrition and commercial food processing. Graduates in Nutrition find rewarding careers in public health, business, food industry, clinical nutrition, food systems management and education. Food Science graduates take responsible positions in commercial food processing and development, sales, quality assurance and government regulation. Opportunities for private consulting and business are available to graduates in both majors, depending on personal interests and initiative. The department also offers minors in Food Science and Nutrition.

The department is equipped with a food processing pilot plant and a food preparation laboratory. These and additional laboratories are designed for teaching courses in nutrition, food service management, sensory evaluation, functional components of foods, and quality control as well as other food processing systems. Classroom and laboratory instruction is personalized, and faculty adhere to the university's learn-by-doing philosophy. Multimedia and computer applications are emphasized.

Through the student enterprise program, students can manufacture and market various food products. Enterprise projects are designed to simulate industry and business practices. Students are further encouraged to gain industry experience by working during the summer months or by participating in one of the university co-op or internship programs.

There are two departmental clubs—Nutrition Club and Food Science Club. Club activities involve a wide range of social, professional and service projects. Clubs provide opportunity for leadership training and participation in professional societies and organizations.

## Graduate Program

Cal Poly offers an MS in Agriculture with a specialization in Food Science and Nutrition. Please refer to the MS Agriculture section in the College of Agriculture.

## Interdisciplinary Minors

The department participates in offering interdisciplinary minors in Packaging (see Orfalea College of Business section), and Wine and Viticulture (see College of Agriculture section).

## BS Food Science

The program is designed to prepare students for employment in the food industry. Principal areas of instruction are in food processing and engineering, food safety and sanitation, quality assurance, food chemistry and analysis, product development, and sensory evaluation. Instruction prepares graduates for careers in line production management, quality control, food research/development, 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. IFT scholarship eligibility may require completion of selected courses in food engineering, technical calculus, and chemistry.

## BS Nutrition

The program offers a broad preparation in the science of nutrition. Coursework includes foods and nutrition, general chemistry, organic chemistry, biochemistry, microbiology, general biology, and a variety of general education courses. Students select an area of concentration based upon their interests and career goals. The concentrations are described below.

### Concentrations

**Applied Nutrition.** Prepares students for careers in various areas of nutrition, including dietetics, food systems management, nutrition communications, and community nutrition. This concentration is a Didactic Program in Dietetics (DPD), which is currently granted approval status by the Commission on Accreditation for Dietetics Education, of the American Dietetic Association, 216 W. Jackson Blvd., Chicago, IL 60606-6995, (312) 899-4876. Students in this concentration are eligible to apply for admission to an accredited dietetic internship, upon completion of which the graduate must pass a national examination administered by the Commission on Dietetic Registration to qualify as a registered dietitian (RD).

Graduates also are prepared to pursue advanced degrees in foods and nutrition, public health, and food systems management.

### Culinary Science and Management in Nutrition.

Designed for students wanting to apply a strong science background in one of two areas: foodservice management or food product development. This concentration serves the growing need for nutritionists who are positioned to make decisions that require a blend of management training, culinary expertise, and a fundamental science background. Graduates are prepared to pursue advanced degrees in food science or nutrition, or may choose to attend a two-year culinary program.

**Nutrition and Food Industries.** Designed for students who want to apply knowledge of nutrition to careers in the food industry and related organizations (such as commodity and other non-profit organizations, pharmaceutical companies, or government). A Food Science or Agricultural Communications minor can be earned with proper course selection within this concentration. Students will be prepared for positions in food product research and development, quality and regulatory operations, food and health communications, public relations, extension, and technical sales. In addition, students will be prepared for graduate study in food science, nutrition, or related fields.

**Nutrition Science.** Emphasizes a strong background in basic sciences and human nutrition for students planning further study in graduate school or a health-related profession such as medicine, dentistry, nursing, or physical therapy. Students need to check with their advisors for specific requirements for various health-related professions.

### BS FOOD SCIENCE

☐ 60 units upper division      ☐ GWR

☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

#### MAJOR COURSES

FSN 125 Introduction to Food Science.....	5
FSN 154 Basic Calculations in Food Processing .....	4
FSN 204 Food Processing Operations .....	4
FSN 210 Nutrition.....	4
FSN 270 Food and Wine Plant Sanitation .....	4
FSN 275 Principles of Food Safety and Hazard Analysis .....	4
FSN 334 Food Packaging.....	3
FSN 335 Food Quality Assurance.....	4
FSN 364 Food Chemistry.....	4
FSN 368 Food Analysis .....	4
FSN 374 Food Laws and Regulations.....	4
FSN 408 Food Comp Science and Product Dev. ....	4
FSN 411 Sensory Evaluation of Food.....	3
FSN 444 Engineering Concepts in Food Processing or FSN 494 Food Engineering .....	4
FSN 461 Senior Project.....	3
FSN 462 Senior Project.....	3

FSN 463 Undergraduate Seminar .....	1
FSN 474 Advanced Food Processing .....	4
	<b>66</b>

#### SUPPORT COURSES

BIO 111 General Biology (B2 & B4)* .....	4
CHEM 111 Survey of Chemistry <i>or</i> CHEM 127, 128 General Chemistry (B3&B4)* ..	5/8
CHEM 312 Survey of Organic Chemistry ( <i>transfer equivalent CHEM 212</i> ).....	5
CHEM 313 Survey of Biochemistry and Biotechnology .....	5
<sup>1</sup> MATH 118 Pre-Calculus Algebra <i>or</i> MATH 161, 162 Calculus for Life Sciences I, II (B1)* .....	4/8
MCRO 221 Microbiology .....	4
MCRO 421 Food Microbiology.....	4
PHYS 104 Introductory Physics .....	4
STAT 218 Applied Statistics/Life Sciences (B1)* ..	4
Advisor approved electives.....	16
(at least 7 units must be at 300-400 level)	

**55-62**

#### GENERAL EDUCATION (GE)

72 units required; 16 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

#### Area A Communication (12 units)

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing.....	4

#### Area B Science and Mathematics (no additional units are required)

B1 Mathematics/Statistics * 8 units in Support...	0
B2 Life Science * 4 units in Support.....	0
B3 Physical Science * 4 units credited in Support	0
B4 One lab taken with either a B2 or B3 course	

#### Area C Arts and Humanities (20 units)

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4)	4

#### Area D/E Society and the Individual (20 units)

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

#### Area F Technology Elective (upper division)

(4 units) .....	4
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**56**

#### ELECTIVES .....

**2-9**

**186**

<sup>1</sup> MATH 116 and 117 will substitute for MATH 118 and are taught at a slower pace. Upon completion of both MATH 116 and MATH 117, a student will receive 4 units of GE credit for Area B1.

**BS NUTRITION**

☐ 60 units upper division      ☐ GWR

☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

**MAJOR COURSES**

FSN 101 Orientation to Nutrition.....	1
FSN 121 Fundamentals of Food.....	4
FSN 210 Nutrition.....	4
FSN 230 Elements of Food Processing.....	4
FSN 250 Food and Nutrition: Customs and Culture (D4)* (USCP).....	4
FSN 310 Maternal and Child Nutrition.....	4
FSN 315 Nutrition in Aging.....	4
FSN 328, 329 Advanced Nutrition I, II.....	4,4
FSN 415 Nutrition Education and Communications	4
FSN 461, 462 Senior Project.....	2,2
FSN 463 Undergraduate Seminar .....	1
MCRO 221 Microbiology (B2 & B4)* .....	4
<sup>1</sup> CHEM 111 Survey of Chemistry <i>or</i> CHEM 127 General Chemistry (B3&B4)* .....	5/4
<sup>1</sup> CHEM 312 Survey of Organic Chemistry <i>or</i> CHEM 316 Organic Chemistry I ( <i>transfer equivalents CHEM 212, 216</i> ) .....	5
<sup>1</sup> CHEM 313 Surv Biochemistry & Biotechnology <i>or</i> CHEM 371 Biochemical Principles .....	5
ECON 201 Survey of Economics (D2)* .....	4
ENGL 148 Reasoning, Argumentation, and Professional Writing (A3)* .....	4
<sup>1,2</sup> MATH 118 Pre-Calculus Algebra <i>or</i> MATH 120 Pre-Calculus Algebra & Trig (B1)* .....	4/5
SOC 110 Comparative Societies (D3)* .....	4
STAT 218 Applied Statistics Life Sciences (B1)* ...	4
<sup>1</sup> BIO 111 General Biology <i>or</i> BIO 151 Introduction to Biology.....	4/5
Concentration courses (see below).....	54-61
	<b>138-148</b>

**GENERAL EDUCATION (GE)**

72 units required; 32 units are in Major.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

**Area A Communication (8 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing * 4 units in Major .....	0

**Area B Science and Mathematics (no additional units req'd)**

B1 Mathematics/Statistics * 8 units in Major .....	0
B2 Life Science * 4 units in Major .....	0
B3 Physical Science * 4 units in Major.....	0
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (20 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (8 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy * 4 units in Major.....	0
D3 Comp. Social Institutions * 4 units in Major ...	0

D4 Self Dev. (CSU Area E) * 4 units in Major ...	0
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)**

(4 units) .....	4
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**40**

**ELECTIVES .....**

**0-8**

**186**

**CONCENTRATIONS (select one)****Applied Nutrition Concentration**

FSN 263 Professional Practice in Applied Nutrition .....	2
FSN 321 Culinary Mgt: Principles and Practice .....	4
FSN 343, 344 Institutional Foodservice I, II .....	3,3
FSN 416 Community Nutrition.....	4
FSN 417 Nutrition Counseling .....	4
FSN 426 Food Systems Management .....	3
FSN 429, 430 Clinical Nutrition I, II.....	4,4
BIO 302 Human Genetics .....	4
BUS 212 Financial Actg for Nonbusiness Majors...	4
BUS 384 Human Resources Management.....	4
MCRO 421 Food Microbiology.....	4
PSY 201/202 General Psychology .....	4
ZOO 331, 332 Human Anatomy/Physiology I, II....	5,5
	<b>61</b>

**Culinary Science and Management in Nutrition Concentration**

FSN 304 Adv. Culinary Principles and Practice.....	4
FSN 321 Culinary Mgt: Principles and Practice.....	4
FSN 343 Institutional Foodservice I.....	3
FSN 344 Institutional Foodservice II.....	3
FSN 364 Food Chemistry .....	4
FSN 408 Food Comp. Science/Product Dev. ....	4
FSN 411 Sensory Evaluation of Food .....	3
FSN 426 Food Systems Management.....	3
AGB 301 Food and Fiber Marketing.....	4
BUS 212 Accounting.....	4
BUS 384 Human Resources Management.....	4
MCRO 421 Food Microbiology.....	4
Advisor approved electives.....	16
	<b>60</b>

<sup>1</sup> Most Nutrition majors should take the lower numbered courses. Students choosing the Nutrition Science concentration may need to take higher numbered courses, depending on their career goals and advisor-approved electives. Students selecting CHEM 127 also must take CHEM 128. Students selecting CHEM 317 also must take CHEM 318. See advisor.

<sup>2</sup> MATH 116 and 117 will substitute for MATH 118 and are taught at a slower pace. Upon completion of both MATH 116 and MATH 117, a student will receive 4 units of GE credit for Area B1.

**Nutrition and Food Industries Concentration**

FSN 275 Principles of Food Safety and Hazard Analysis .....	4
FSN 364 Food Chemistry.....	4
FSN 368 Food Analysis .....	4
FSN 374 Food Laws and Regulations.....	4
FSN 408 Food Comp. Science and Product Dev. ....	4
FSN 410 Nutr Implications of Food Ind Practices ...	4
FSN 411 Sensory Evaluation of Food.....	3
FSN 420 Critical Evaluation of Nutrition Research	2
AGB 301 Agricultural Marketing <i>or</i> BUS 245 Elements of Marketing .....	4
Select one from: ASCI 209/211; FSN 204, 244, 285, 341; DSCI 231 .....	2-4
Select one from: ASCI 231, CRSC 230, DSCI 230, FRSC 230, VGSC 230.....	3-4
Select 5 additional courses from one of the emphasis areas below: .....	16-20
<sup>1</sup> <i>Food Processing emphasis</i> ASCI 209, 211, 384, 415; DSCI 231; FSN 154, 204, 244, 270, 285, 304, 334, 335, 341, 444, 474; MCRO 421; PHYS 104; PM 320	
<sup>2</sup> <i>Communications emphasis</i> AGC 407; AGED 404; ENGL 310, 318; JOUR 203, 205, 312, 320, 331, 342, 407; SCOM 301	
	54-61

**Nutrition Science Concentration**

FSN 416 Community Nutrition.....	4
FSN 429 Clinical Nutrition I.....	4
FSN 430 Clinical Nutrition II.....	4
BIO 302 Human Genetics <i>or</i> BIO 351 Classical and Molecular Genetics .....	4/5
PHYS 121 College Physics .....	4
ZOO 331, 332 Human Anatomy/Physiology I, II ....	5,5
Advisor approved electives (must be selected with advisor's approval).....	26
	56-57

**FOOD SCIENCE MINOR**

The minor is principally designed for students majoring in related academic disciplines who desire 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, and quality assurance.

**Required core**

FSN 125 Introduction to Food Science <i>or</i> FSN 230 Elements of Food Processing .....	5/4
FSN 204 Food Processing Operations .....	4
FSN 270 Food and Wine Plant Sanitation .....	4
FSN 335 Food Quality Assurance.....	4

**Emphasis area courses:**..... 10-11

Select 10-11 units from the following courses:

ASCI 209/211, 384, 4415;  
FSN 154, 244, 341, 354, 364, 368, 374, 408, 410, 411, 444, 474;  
DSCI 231; MCRO 421

27

**NUTRITION MINOR**

The minor is designed for students majoring in science disciplines (Chemistry, Biological Sciences, Kinesiology), Agribusiness or Agricultural Communications, and other interested majors such as Business or Psychology. Students can enhance career opportunities or qualification for admission into graduate programs or allied health fields.

**Required core**

FSN 210 Nutrition (B5) .....	4
FSN 310 Maternal and Child Nutrition.....	4
FSN 315 Nutrition in Aging .....	4

**Emphasis area courses**..... 16-18

Follow one area:

*Clinical (CHEM 313 or equivalent as prerequisite)*

FSN 328, 329, 429, and 430

*Community (CHEM 313 or equivalent as prerequisite)*

FSN 328, 329, and 416

Plus select one of the following:

FSN 250, 415; ANT 401; POLS 326; REC 450;  
SOC 323; SCOM 418.

*Culinary Science*

FSN 121, 304, 343, and 344

Plus select one of the following:

FSN 250, 408, 410, 411, 426

*Food Service Management*

FSN 121, 321, 343, 344, and 426

*Nutrition Fundamentals*

FSN 121, 250, 415, and 410 or 416

*Sports Nutrition (CHEM 313 or equivalent as prerequisite)*

FSN 328, 329, KINE 303, and 451

28-30

<sup>1</sup> To earn a Food Science minor, choose FSN 204, FSN 270, FSN 335, and two other courses from this list.

<sup>2</sup> To earn an Agricultural Communications minor, choose AGED 404, JOUR 203, JOUR 205, SCOM 301, and one other course from this list.

# Horticulture and Crop Science

## Department Office

Agricultural Sciences Bldg. (11), Room 244

(805) 756-2279/1237 FAX (805) 756-2869/6504

[www.calpoly.edu/~crsc](http://www.calpoly.edu/~crsc), [www.calpoly.edu/~envhort](http://www.calpoly.edu/~envhort)

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## ACADEMIC PROGRAMS

**Crop Science - BS, Minor**

**Environmental Horticultural Science - BS**

**Fruit Science - BS, Minor**

**Ornamental Plant Production Minor**

**Plant Protection Science - BS, Minor**

Four major curricula leading to the Bachelor of Science degree are offered by the Horticulture and Crop Science Department and are designed to prepare students for many attractive career opportunities. In consultation with faculty advisors, students in the different majors have the flexibility to select electives according to their career goals. Those students majoring in crop science or fruit science select electives in one of the following areas: crop production or management; orchard and vineyard management; post-harvest technology-marketing; crop/vegetable science; pomology; enology; crop ecology; and applied biotechnology. Students majoring in environmental horticultural science may select electives in one of the following areas: production and marketing of nursery plants, fresh flowers, flowering plants, and foliage plants; landscape contracting, design, installation and management; turf management; integrated pest management; and marketing; or may create their own area of specialization.

The Crops Unit has 70 acres of productive citrus, avocados, grapes, deciduous orchard, and berries. Additional nonbearing acreage for instructional use exists and new plantings are under way. Part of the land is certified organic. Students are encouraged to gain experience and earn income by participation in the enterprise project program or by working for the campus farm. There is also a new building containing two modern teaching labs with prep rooms.

The Environmental Horticulture Unit includes 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, a 5,000 square-foot retractable roof greenhouse, 7,500 square feet of shadehouses; a 10,000-square foot US Golf Association specification experimental green; an extensive field container growing area; and a 4-acre arboretum.

The department also has modern, well-equipped laboratories in the Agricultural Sciences Building and at the Units, including labs for biotechnology, landscape industries with CAD, pest management, post harvest technology, 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.

The technological phases of instruction are enhanced by equipment for fruit packing, grading, seed processing and pesticide application. Also available are a pesticide rinsate recycling system and specialized laboratory equipment for the study of various crops and postharvest technology. Field trips supplement instruction.

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 environmental horticulture is available to students. Through the staff, affiliation in several national and state horticultural and agronomic organizations is maintained.

Internships are available and highly recommended. Interns have been placed with private industry and public facilities all across the United States and in several foreign countries. Scholarships are also readily available. Thousands of graduates of the department are employed nationally and internationally and are often leaders in their industries. Graduates of the department are in great demand. Typically there are more internship and job opportunities than there are students to fill them.

Cal Poly's Swanton-Pacific Ranch near Davenport, California offers internship experiences in managing not only crops but also livestock, rangeland and forests. 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 department supports extra- and co-curricular activities for its students, including six student clubs. Student teams in the horticulture science, flower judging, and landscape industry areas have won multiple national championships.

### BS Crop Science

Prepares graduates for careers in crop production, management, sales and service. Positions are available with commercial pest control firms, government regulatory agencies, and agriculturally related organizations. Graduates also pursue careers as agronomists and horticulturists with government or industry. Instruction includes agronomic crops, vegetable crops, and tropical crops.

### BS Environmental Horticultural Science

The Bachelor of Science degree in Environmental Horticultural Science offers the student a comprehensive preparation for attractive positions in the nursery, turf, 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; turf management; integrated pest management; and marketing.

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, pest control advisors, and park and golf course superintendents.

The curriculum is well grounded in the sciences and, through the flexibility of 30 units of advisor-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, integrated pest management; and teaching agriculture. Students may also choose to complete a minor in Agribusiness, Agricultural Communication, Crop Science, Fruit Science, Plant Protection or Water 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 advisor and the current Class Schedule.*

1st Year		
Fall	Winter	Spring
HCS 110	EHS 122	EHS 124
EHS 121	EHS 123	EHS 126
BOT 121	AG 250	EHS 231
CHEM 111	CHEM 212/312	SS 121

2nd Year		
Fall	Winter	Spring
BRAE 340	MATH 118	BUS 212
EHS 232	SS 221	STAT 130
SPAN 111	ECON 201	
3rd Year		
Fall	Winter	Spring
PPSC 311	EHS 327	BOT 324
4th Year		
Fall	Winter	Spring
HSC 461	HSC 463	HSC 462
PPSC 427		

### BS Fruit Science

Prepares graduates for management positions with orchards/vineyards, canneries, 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.

### BS Plant Protection Science

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.

### CROP SCIENCE MINOR

Designed for students majoring in related academic disciplines who desire careers in crop production or the associated industry. The minor offers a broad-based knowledge of the science and technology of agronomy and vegetable production, especially as practiced in California.

#### Required courses

HCS 110 Orientation to Horticulture and Crop Science .....	2
CRSC 131 Introduction to Crop Science .....	4
CRSC 132 Cereal Grain Production or CRSC 133 Row Crop Production .....	4
CRSC 202 or VGSC 202 Enterprise Project .....	2
PPSC 321 Weed Ecology or VGSC 232 California Vegetable Production .....	4
<b>Restricted elective courses</b> .....	<b>16</b>

*Select any **four** courses from the following:*

BRAE 340; any CRSC/PPSC/VGSC 300-400 level courses

## FRUIT SCIENCE MINOR

The minor is designed for students majoring in related academic disciplines who desire to seek careers in fruit production or the associated industry. The minor offers a broad-based knowledge of the science and technology of pomology, viticulture, and citrus and avocado production.

### Required courses

HCS 110 Orientation to Horticulture & Crop Science	2
FRSC 131, 132 Pomology .....	4,4
FRSC 133 Pomology or FRSC 231 Viticulture ....	4
FRSC 342 Citrus and Avocado Fruit Production ....	4
FRSC 202 Enterprise Project .....	2
FRSC 402 Enterprise Project Management .....	2
<b>Restricted elective courses</b> .....	8
<i>Select from the following:</i>	
BRAE 340; BOT 323; CRSC 445;	
FRSC 331, 332, 421, 422, 436; PPSC 311	
	30

## ORNAMENTAL PLANT PRODUCTION MINOR

The Ornamental Plant Production minor gives a student an understanding of the important ornamental crops grown in California, how they are propagated and grown, how we manipulate the environment to control the crop, and how they are harvested and handled after harvest. Ornamental plants are a multibillion dollar part of the agriculture industry in California, and students majoring in Agricultural Business, Crop Science, Fruit Science, and Plant Protection Science may well deal with ornamental plants as crops during their careers.

### Required courses

HCS 110 Orientation to Horticulture & Crop Science	2
EHS 121 Fundamentals of Environmental Horticulture I .....	4
EHS 124 Plant Propagation.....	4
EHS 210/310/401 Enterprise Project/Field Studies .	1
<b>Electives</b> .....	19
<i>Chosen from:</i>	
EHS 231/232, 324, 327, 340, 341, 342, 424, 425	
	30

## 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 for Plant Protection 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
PPSC 311 Agricultural Entomology .....	4
PPSC 321 Weed Ecology .....	4
<b>Courses in area of emphasis</b> .....	16
<i>Students elect Emphasis I or Emphasis II based on their major.</i>	
<b>I. Emphasis for Plant Production Majors (16 units)</b>	
<i>Plant production majors: Crop Science, Fruit Science, Forestry and Natural Resources (Forestry Concentration) and Environmental Horticultural Science.</i>	
Select 16 units from: BIO 435; BOT 325, 431; CRSC 410; FNR 303; PPSC 327, 405, 414, 431, 441; ZOO 335	
<b>II. Emphasis for Non-Plant Production Majors (16 units)</b>	
<sup>1</sup> Select 12 units of agriculture production courses	
<sup>1</sup> Select one course from Emphasis I (4 units)	
	28

## Interdisciplinary Minors

The department participates in offering interdisciplinary minors in Geographic Information Systems for Agriculture, and Wine and Viticulture. Please see College of Agriculture section for more information.

## Graduate Program

Cal Poly offers a Master of Science degree in Agriculture with specializations in Crop Science and Environmental Horticultural Science, among others. Please refer to the MS Agriculture section of the College of Agriculture.

## BS CROP SCIENCE

☐ 60 units upper division      ☐ GWR

☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

### MAJOR COURSES

HCS 110 Orientation to Horticulture/Crop Science.	2
CRSC 131 Introduction to Crop Science .....	4
CRSC 132 Cereal Grain Production .....	4
CRSC 133 Row Crop Production .....	4
CRSC 202/VGSC 202 Enterprise Project.....	3
CRSC 244 Precision Farming .....	4
CRSC 304 Plant Improvement.....	4
PPSC 311 Agricultural Entomology .....	4
PPSC 321 Weed Ecology.....	4
CRSC 331 Commercial Seed Production and Conditioning.....	4
CRSC 410 Crop Physiology and Ecology .....	4
CRSC 411 Experimental Techniques and Analysis.	4
HCS 461, 462 Senior Project.....	2,2

<sup>1</sup> Approval of minor advisor required.

HCS 463 Undergraduate Seminar .....	1
VGSC 232 California Vegetable Production .....	4
CRSC/FRSC/VGSC 300-400 level electives .....	4
	<b>58</b>

**SUPPORT COURSES**

BIO 302/BIO 303 Genetics .....	4/3
BOT 121 General Botany (B2 & B4)* .....	4
CHEM 111 Survey of Chemistry (B3&B4)* .....	5
FRSC 230 California Fruit Growing .....	4
MATH 118 Pre-Calculus Algebra (B1)* .....	4
(MATH 116 & 117 will substitute)	
STAT 218 Applied Statistics/Life Sciences (B1)*...	4
SS 121 Introductory Soil Science.....	4
Advisor-approved electives.....	35/36
<i>Minimum 8 units of BIO/BOT/CHEM. 12-15 units must be 300-400 level. Areas may include applied biotechnology, crop ecology, production mgt., post-harvest tech/marketing, crop/veg. science. May not include Enterprise Project/Mgt.</i>	
	<b>63-65</b>

**GENERAL EDUCATION (GE)**

72 units required; 16 units are in Support.  
 →See page 76 for complete GE course listing.  
 →Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

**Area B Science and Mathematics (no additional units are required)**

B1 Mathematics/Statistics * 8 units in Support ...	0
B2 Life Science * 4 units in Support .....	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (20 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)**

(4 units).....	4
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**56**

<b>ELECTIVES</b> .....	<b>7-9</b>
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**186****BS ENVIRONMENTAL HORTICULTURAL SCIENCE**

☐ 60 units upper division      ☐ GWR

☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

**MAJOR COURSES**

HCS 110 Orientation to Horticulture/Crop Science.	2
EHS 121 Fundamentals Environmental Hort. I .....	4
EHS 122 Fundamentals Environmental Hort. II....	4
EHS 123 Landscape Installation and Maintenance .	4
EHS 124 Plant Propagation .....	4
EHS 126 Environmental Horticulture Construction	2
EHS 210/EHS 401/HCS 200/HCS 339.....	1/2
EHS 231, EHS 232 Plant Materials .....	4,4
EHS 327 Abiotic Plant Problems .....	3
BRAE 340 Irrigation Water Management (Area F)*	4
PPSC 427 Diseases & Pest Control Systems for Ornamental Plants .....	4
HCS 461 Senior Project.....	2
HCS 462 Senior Project.....	2
HCS 463 Senior Seminar .....	1
Advisor approved electives. 300-400 level.....	30

**75/76****SUPPORT COURSES**

BIO 302/BOT 313/PHYS 104/PSC 101 .....	4
BIO 435 Plant Physiology .....	4
BOT 121 General Botany (B2 & B4)* .....	4
BOT 323 Plant Pathology or BOT 324 Orn. & Forest Pathology.....	4
BUS 201/207 Business Law Survey .....	3/4
BUS 212 Financial Accounting for Nonbusiness Majors .....	4
CHEM 111 Survey of Chemistry (B3&B4)* .....	5
CHEM 312 Survey of Organic Chemistry <i>transfer equivalent CHEM 212</i> ).....	5
CSC 110 Computers & Computer Applications or AG 250 Computer Appl. to Agriculture .....	3
ECON 201 Survey of Economics (D2)*.....	4
MATH 118 Pre-Calculus Algebra (B1)*.....	4
(MATH 116 & MATH 117 will substitute)	
PPSC 311 Agricultural Entomology.....	4
SPAN 111 Elementary Hispanic Language and Culture (USCP) .....	4
SS 121 Introductory Soil Science .....	4
SS 221 Fertilizers.....	4
STAT 218 Applied Statistics/Life Sciences (B1)*	4

**64/65****GENERAL EDUCATION (GE)**

72 units required; 24 units are in Support.  
 →See page 76 for complete GE course listing.  
 →Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing.....	4

**Area B Science and Mathematics (no additional units are required)**

B1 Mathematics/Statistics * 8 units in Support ...	0
B2 Life Science * 4 units in Support .....	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (20 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (16 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy * 4 units in Support.....	0
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)**

* 4 units in Major .....	0
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48

**ELECTIVES .....**

0-2

189

**BS FRUIT SCIENCE**☐ 60 units upper division      ☐ GWR☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

**MAJOR COURSES**

HCS 110 Orientation to Horticulture/Crop Science.	2
PPSC 311 Agricultural Entomology .....	4
PPSC 321 Weed Ecology.....	4
CRSC 411 Experimental Techniques/Analysis.....	4
FRSC 422 Tropical/Subtropical Crop & Fruit Prod.	4
HCS 461, 462 Senior Project .....	2,2
HCS 463 Undergraduate Seminar .....	1
FRSC 131, 132, 133 Pomology.....	4,4,4
FRSC 202/402 Enterprise Project Management .....	6
FRSC 231 Viticulture.....	4
FRSC 331 Advanced Viticulture .....	4
FRSC 332 Fruit Plant Propagation.....	4
FRSC 342 Citrus and Avocado Fruit Production.....	4
HCS 421 Postharvest Tech. Horticultural Crops.....	3
HCS 425 Postharvest Tech. Hort. Crops Lab.....	1
FRSC/CRSC/VGSC 300-400 level elective.....	4

65

**SUPPORT COURSES**

BIO 302 or BIO 303 Genetics.....	4/3
BOT 121 General Botany (B2 & B4)*.....	4
CHEM 111 Survey of Chemistry (B3&B4)* .....	5
CRSC 230 or VGSC 230 .....	4

MATH 118 Pre-Calculus Algebra (B1)* .....	4
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(MATH 116 &amp; 117 will substitute)

STAT 218 Applied Statistics/Life Sciences (B1)* ..	4
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SS 121 Introductory Soil Science .....	4
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Advisor-approved electives .....	30/31
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8 units of BIO/BOT/CHEM. 8 units 300-400 level. Areas may include applied biotechnology, crop ecology, enology, orchard/ vineyard mgt., pomology, postharvest tech/mktg. May not include Enterprise Project/MGT.

58-60

**GENERAL EDUCATION (GE)**

72 units required; 16 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing.....	4

**Area B Science and Mathematics (no additional units are required)**

B1 Mathematics/Statistics * 8 units in Support ...	0
B2 Life Science * 4 units in Support.....	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (20 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)**

(4 units) .....	4
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<b>ELECTIVES .....</b>	<b>5-7</b>
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186

**BS PLANT PROTECTION SCIENCE**

☐ 60 units upper division      ☐ GWR

☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

**MAJOR COURSES**

HCS 110 Orientation to Horticulture/Crop Science .....	2
CRSC/FRSC/VGSC 202 Enterprise Project .....	3
CRSC 304 Plant Improv or CRSC 410 Crop Phys ..	4
PPSC 311 Agricultural Entomology .....	4
PPSC 321 Weed Ecology .....	4
PPSC 327 Vertebrate Pest Management .....	4
PPSC 405 Advanced Weed Science .....	4
CRSC 411 Experimental Techniques/Analysis .....	4
PPSC 431 Insect Pest Management .....	4
PPSC 441 Biological Control of Insects .....	4
HCS 461, 462 Senior Project .....	2,2
HCS 463 Undergraduate Seminar .....	1
<sup>1</sup> Select advisor approved production courses in CRSC/FRSC/VGSC .....	16
	<b>58</b>

**SUPPORT COURSES**

BIO 115 Animal/Human Structure/Function .....	4
BIO 302 or BIO 303 Genetics .....	4/3
BIO 325 General Ecology .....	4
BOT 121 General Botany (B2 & B4)* .....	4
BOT 323 Plant Pathology .....	4
CHEM 111 Survey of Chemistry (B3&B4)* .....	5
CHEM 312 Survey of Organic Chemistry ( <i>transfer equivalent CHEM 212</i> ) .....	5
CHEM 313 Survey of Biochemistry .....	5
MATH 118 Pre-Calculus Algebra (B1)* .....	4
(MATH 116 & 117 will substitute)	
SS 121 Introductory Soil Science .....	4
STAT 218 Applied Statistics/Life Sciences (B1)* ..	4
ZOO 335 General Entomology .....	4
Advisor approved electives .....	10/11
	<b>60-62</b>

**GENERAL EDUCATION (GE)**

72 units required; 16 units are in Support.

→ See page 76 for complete GE course listing.

→ Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

**Area B Science and Mathematics (no additional units are required)**

B1 Mathematics/Statistics * 8 units in Support ...	0
B2 Life Science * 4 units in Support .....	0
B3 Physical Science * 4 units in Support .....	0
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (20 units)**

C1 Literature .....	4
C2 Philosophy .....	4

C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)**

(4 units) .....	4
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**56**

**ELECTIVES** ..... **10-12**

**186**

<sup>1</sup> Advisor approval required.

# Military Science

**Department Office**  
**Dexter Bldg. (34), Room 115**  
**(805) 756-7682**

**Department Head,**  
**Lieutenant Colonel Norma Tovar**

Major Mark Johnson  
 Major Paul Buechner  
 Major Russell Clark  
 Master Sergeant Chris Fields  
 Master Sergeant Michael Coleman

## PROGRAMS

### **ROTC Four-Year Program** **Military Science Minor**

#### **Four-Year Program**

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 \$250 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 \$250 a month allowance for the duration of the scholarship. Students interested in ROTC scholarship should contact the Military Science Department. 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.

#### **Phases of 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 challenging opportunity 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 exciting opportunities for all students. To become an ROTC cadet during this phase requires the student be registered for a Military Science class, completion of an ROTC enrollment form (obtained at the Military Science Department, Dexter Building, Room 115), and an interview with the ROTC Enrollment Officer. Because this phase is for students to examine the ROTC Program without obligation, participation in ROTC activities is encouraged but not mandatory. Entry to 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 for attending this camp.

## 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, 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 prestigious commission in the United States Army. In return for the student's commitment, the Military Science Department will provide \$200 a month, classroom instruction, real leadership opportunities, and continuous professional development of their leadership skills.

After their first year of the Advanced Phase, cadets usually attend a five-week camp where their leadership skills are further developed and assessed. 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 substantial financial and experience benefits.

## BASIC PHASE

### Freshman

- MSL 111 Orienteering (2)
- MSL 101 Foundations of Officership I (1)
- MSL 102 Foundations of Officership II (1)
- MSL 103 Basic Leadership (1)

### Sophomore

- MSL 201 Individual Leadership Studies (2)
- MSL 202 Leadership and Teamwork (2)
- MSL 203 Leadership Studies and Personal Development (2)
- <sup>1</sup> MSL 212 Basic Camp (1-7)
- MSL 229 Ranger Challenge (2)

## ADVANCED PHASE

### Junior

- MSL 301 Leadership and Problem Solving (3)
- MSL 302 Leadership, Problem Solving and Effective Communication (3)
- MSL 303 Leadership and Ethics (3)
- <sup>2</sup> MSL 314 ROTC Advanced Camp (6)

### Senior

- MSL 401 Leadership and Management I (3)
- MSL 402 Leadership and Management II (3)
- MSL 403 Officership (3)

<sup>1</sup> Basic Camp is an optional 6-week summer training course (1-7 units) at Fort Knox, Kentucky.

<sup>2</sup> Advanced Camp is a required 6-week summer training experience at Fort Lewis, Washington (6 credits).

**Military Science Minor**

The minor emphasizes the following personal and technical skills: time, personnel, and resource management under duress; knowledge of U.S. military heritage, customs, and courtesies; planning and briefing under time constraints; current national defense issues; equal opportunity, sexual harassment, and military ethics; military justice; physical fitness; map reading and orienteering; leadership, management, and counseling skills under duress; oral, visual, and written communication skills in accordance with Army norms; small unit tactics. It provides marketable skills to students interested in government service, personnel management, and law enforcement. A student does not have to join ROTC to earn a Military Science Minor.

**Required core**

MSL 203 Leadership Studies and Personal Development .....	2
MSL 301 Leadership and Problem Solving .....	3
MSL 302 Leadership, Problem Solving, and Effective Communication.....	3
MSL 303 Leadership and Ethics .....	3
MSL 401 Leadership and Management I.....	3
MSL 402 Leadership and Management II.....	3
MSL 403 Officership .....	3
<b>Advisor approved electives .....</b>	<b>6</b>

Select 6 units from the following:  
MSL 101, 102, 103, 201, 202, 212, 229, 314  
(ROTC only)

# Natural Resources Management

## Department Office

**Agricultural Sciences Bldg. (11), Room 217**

**(805) 756-2702**

**[www.nrm.calpoly.edu](http://www.nrm.calpoly.edu)**

## Department Head, Douglas D. Piirto

Christopher A. Dicus

Walter R. Mark

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Samantha J. Gill

Carolyn B. Shank

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Richard P. Thompson

William W. Hendricks

James R. Vilkitis

Teresa Love

## ACADEMIC PROGRAMS

**BS Environmental Management and Protection (pending final approval)**

**BS Forestry and Natural Resources**

**BS Recreation, Parks, and Tourism Administration**

**MS Forestry Sciences**

## BS FORESTRY AND NATURAL RESOURCES

The Bachelor of Science degree program in Forestry and Natural Resources prepares students for careers in the protection and management of our forest and natural resources. Students may specialize in recreation management; urban forestry; environmental management; watershed management and hydrology, fire and fuels management, wildlife biology, or an individualized course of study.

Graduates qualify for such positions as forester, environmental interpreter, urban forester, environmental specialist, park administrator, resource manager, park ranger, resource planner, watershed manager, hydrologist, or fire and fuels manager.

Cal Poly graduates are employed throughout the world: establishing, managing and sustaining forests and urban wildland areas; providing opportunities for a full range of uses; teaching; extension; research; and protecting and managing the environment.

The NRM Department manages Swanton Pacific Ranch, located near Santa Cruz adjacent to the Pacific Ocean. This 3800-acre field laboratory includes redwood forests, salmon-bearing streams, agricultural land and many other ecological environments. Students make extensive use of this facility. Preparations are in progress for the construction of student residential educational facilities that will enhance the hands-on field-oriented learning. Once the educational facilities are completed at Swanton Pacific Ranch, seniors will spend fall quarter at the ranch taking a full course load.

Most students are required to complete an internship equivalent to one quarter of half-time work. Paid internships are available at Swanton Pacific Ranch, or the student may choose to pursue a seasonal job, volunteer work, or a cooperative education program. Work experience for academic credit must be documented by work supervisor and approved by student's academic advisor.

Students are required to purchase 8-inch high field boots, hard-hats (OSHA approved), hand calculator capable of linear regression, 10X hand lens, and an engineers scale ruler prior to taking 200- or 300-level major courses. Students are strongly encouraged to purchase a laptop before beginning 300-level major courses.

The Society of American Foresters accredits the Forestry and Natural Resources program. Also, the U.S. Office of Personnel Management recognizes employment as a forester with the Federal Government upon graduation.

## Curricular Concentrations

Concentrations prepare students for entry into the profession of forestry and natural resources. Extensive field training occurs concurrently with classroom instruction.

**Environmental Management.** 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.

**Forest Resources Management.** Specialized areas of study are available through an emphasis in Forest Management or individualized studies in such areas as environmental studies, fish and wildlife management, parks and outdoor recreation, computer science, journalism, business administration, Spanish, and marketing.

**Natural Resources Recreation.** Prepares students for employment in the planning, interpretation, development, and management of governmental and private resource-based parks and other recreational lands. Two areas of study are offered: recreation resource management and natural resources tourism.

**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.

**Watershed Management and Hydrology.** Provides students a focused and encompassing program including a proficiency in watershed hydrology in forest ecosystems and Mediterranean ecosystems, rangeland hydrology, post-fire watershed evaluation, watershed and stream restoration and urban/wildland hydrologic implications.

**Wildland Fire and Fuels Management.** Focused study on the management of fire and fuels on landscapes ranging from the wildlands to the urban interface. Emphasis on the practices, issues and policies in controlling fire, using fire as an ecosystem management tool and social and economic impacts of fire.

**Individualized Course of Study.** Students have the option of developing an individualized course of study. The intent of this option is to give students the opportunity to pursue a minor in related areas, such as geographic information systems, land rehabilitation, soil science, and others.

**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.

## Minors

**Geographic Information Systems For Agriculture.** An interdisciplinary minor sponsored by the departments of BioResource and Agricultural Engineering, Natural Resources Management, and Horticulture and Crop Science. For more information, see the College of Agriculture section.

**Water Science.** An interdisciplinary minor that emphasizes one of three areas of study: irrigation, water policy, or watershed management. For more information, see the College of Agriculture section.

## 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 advisor and the current Class Schedule.*

1st Year		
Fall	Winter	Spring
FNR 140	BOT 121	CHEM 111
FNR 201	MATH 120	SS 121
2nd Year		
Fall	Winter	Spring
FNR 208	FNR/BRAE 247	FNR 260
FNR 215	AGB 212	STAT 218
science course	SS 121	BIO 227

3rd Year		
Fall	Winter	Spring
FNR 306	FNR 307	FNR 335
FNR 315	FNR 326	FNR 365
FNR 318	STAT 313/Calc.	BRAE 345
		(concentration)
4th Year		
Fall	Winter	Spring
FNR 402	FNR 414	FNR 435
FNR 412/461	FNR 419	FNR 465
FNR 416	(concentration)	(concentration)

## BS Forestry and Natural Resources

☐ 60 units upper division

☐ GWR

☐ 2.0 GPA

☐ USCP

\* = Satisfies General Education requirement

## MAJOR COURSES

FNR 140 Career Development and Planning NRM.	1
FNR 201 Introduction to Forest Ecosystem Mgmt..	3
FNR 208 Dendrology.....	4
FNR 215 Land and Resource Measurements.....	1
FNR 260 Forest Practices and Environ. Protection .	4
FNR 306 Natural Resource Ecology & Habitat Mgt	4
FNR 307 Fire Ecology .....	3
FNR 315 Measurements and Sampling in Forested Environments .....	4
FNR 318 Applications in GIS.....	3
FNR 326 Natural Resources Econ. & Valuation .....	4
FNR 335 Conflict Mgmt. in Natural Resources.....	4
FNR 365 Silviculture and Vegetation Management	4
FNR 402 Forest Health .....	4
FNR 412 Forest and Natural Resources Senior Assessment Project or FNR 461 Sr. Project.....	3/4
FNR 414 Sustainable Forest Management.....	4
FNR 416 Environmental Impact Analysis & Mgmt.	4
FNR 419 Watershed Management.....	4
FNR 435 Natural Resources Policy Analysis .....	4
FNR 465 Ecosystem Management.....	4
Concentration courses.....	25

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## SUPPORT

AGB 212 Agricultural Economics.....	4
BIO 227 Wildlife Biology (B2)* .....	4
BOT 121 General Botany .....	4
FNR 247 Forest Surveying .....	2
BRAE 345 Aerial Photogram. & Remote Sensing ..	3
CHEM 111 Survey of Chemistry (B3&B4)* .....	5
<sup>1</sup> MATH 120 Pre-Calculus Algebra and Trig. (B1)* .	5
SS 121 Introductory Soil Science .....	4
STAT 218 Applied Stats in the Life Sciences (B1)*	4
STAT 313 or MATH 221 .....	4
Advisor approved science course	
BOT 223/313, CHEM 212/312, PHYS 121 .....	4/5

43/44

**GENERAL EDUCATION (GE)**

72 units required; 16 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing.....	4

**Area B Science and Mathematics (no additional units req'd)**

B1 Mathematics/Statistics * 8 units in Support...	0
B2 Life Science * 4 units in Support.....	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (20 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy.....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division) (4 units)**

56

**ELECTIVES .....**

0-2

192

**CONCENTRATIONS (Select one)****Environmental Management Concentration**

CRP 212 Introduction to Urban Planning .....	4
ENVE 330 Environmental Quality Control .....	4
FNR 339 Internship.....	6
FNR/CRP 404 Environmental Law <i>or</i> FNR 408	
Water Resource Law and Policy .....	3
FNR 425 Applied Resource Analysis .....	4
Restricted electives, advisor's prior written approval	4
	25

**Forest Resources Management Concentration**

FNR 204 Resource Fire Control.....	3
FNR 339 Internship.....	6
FNR 434 Wood Properties and Products .....	4
Restricted electives, advisor's prior written approval	12
	25

**Natural Resources Recreation Concentration**

FNR 311 Environmental Interpretation.....	4
FNR 339 Internship .....	6
FNR 410 Resource Recreation Management .....	4
FNR 417 Resource Recreation Planning .....	3
REC 101 Intro Recreation Parks and Tourism <i>or</i>	
FNR 112 Parks and Outdoor Recreation .....	3
Restricted electives, advisor's prior written approval	5
	25

**Urban Forestry Concentration**

FNR 311/EHS 421 .....	4
FNR 339 Internship .....	6
FNR 350 Urban Forestry.....	3
FNR 450 Community Forestry .....	3
Restricted electives, advisor's prior written approval	9
	25

**Watershed Management and Hydrology Concentration**

FNR 420 Advanced Watershed Hydrology .....	4
SS 321 Soil Morphology .....	4
SS 440 Forest and Range Soils.....	4
Restricted electives, advisor's prior written approval	13
	25

**Wildland Fire and Fuels Management Concentration**

FNR 204 Resource Fire Control.....	3
FNR 339 Internship .....	6
FNR 340 Resource Fire Management .....	2
FNR 455 Urban-Wildland Interface Fire Protection ..	3
Restricted electives, advisor's prior written approval	11
	25

**Individualized Course of Study**

4 units of FNR coursework plus 6 units in FNR 339.

Advisor and department head pre-approval required.. 25

<sup>1</sup> 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.

## MS FORESTRY SCIENCES

The Master of Science degree program in Forestry Sciences has the following objectives:

- To provide the forestry profession in California and the West with graduates educated in the forest science subdisciplines of:
  - ecosystem management in the oak woodland, chaparral and Sierran forest types;
  - economics and valuation in the urban interface forest;
  - forest management using an integrated ecosystem approach;
  - watershed hydrology in Mediterranean ecosystems;
  - fire ecology; and
  - urban and community forestry.
- To develop characteristics and qualities that transcend job-specific skills and knowledge including:
  - critical thinking/problem solving;
  - communications and related social skills;
  - quantitative systems/information management;
  - independent thought and research methods; and
  - preparation for study leading to the Ph.D. degree.

**Prerequisites.** For admission as a classified graduate student, an applicant will have completed a bachelor's degree in forestry at an accredited forestry four-year college or completed the equivalent academic preparation as determined by appropriate campus authorities with a minimum grade point average of 2.75 in the last 90-quarter units. 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.

**Program of Study.** Graduate students must file a formal study plan with their major professor, graduate committee, department, college and university graduate studies office 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). The broad curriculum for the Master of Science degree in Forestry Sciences is:

- a) a minimum of 25 units in the required core;
- b) a minimum of 20 units of restricted electives approved by the student's major professor and department head;
- c) completion of a thesis and an oral and written examination. At the discretion of the graduate committee, the written examination may consist of submitting an article for publication to a referred journal.

<b>Required courses</b> .....	<b>26</b>
SS 501 Research Planning (4)	
FNR 530 Social Systems/Forest Resources Mgt (3)	
FNR 532 Forestry Appl Biometrics/Econometrics (4)	
FNR 534 Forest Ecosystem Mgt & Modeling (3)	
FNR 581 Graduate Seminar in Forest Resources (3)	
FNR 599 Thesis (9)	

<b>Restricted electives</b> .....	<b>19</b>
Determined by the student's graduate committee from forestry subdisciplines (400–500 level)	

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For more information, contact Doug Piirto, Department Head.

## BS ENVIRONMENTAL MANAGEMENT AND PROTECTION (pending final approval)

The program is pending final approval. Students should contact the department for current status.

The Environmental Management and Protection program is an undergraduate, interdisciplinary course of study integrating the biophysical and social/economical/political sciences. The curriculum emphasizes management and protection of ecosystem structures and processes that sustain uses of environmental resources. The major will provide students with the science and management background in natural resources that, when properly integrated, can guide consumptive uses of resources in a sustainable manner.

The relationship of humankind with its environment has grown in importance to society in the last quarter of a century as our worldwide and, more importantly, regional populations have expanded to the limits many believe are unsustainable. Such pressures place extraordinary importance on those involved in managing and protecting natural systems as society seeks to provide the goods and services in sustainable quantities and qualities.

The purpose of environmental management and protection is the sustainable management of environmental resources directed toward balancing the value of those resources for consumptive and non-consumptive uses for both current and future generations.

Because environmental problems arise from human demands on natural systems, solutions must focus on the human dimension of the ecosystem. Environmental management is the management of both people and resources to attain human goals while protecting environmental values in order to sustain natural systems.

Environmental protection should not imply non-use/preservation, although there are unique environmental resources that society occasionally chooses for "non-use." Even then, management is needed since all land uses and values fit within and affect ecosystem values. Knowledge

of the legal and regulatory environment is balanced with study of other theories and practices to solving social conflicts over the environment.

### Curricular Concentrations

In addition to the required major courses, students select one of the following concentrations or an individualized course of study.

**Environmental Policy and Management.** Through further study in land use analysis and planning, economics, regulation, administration, and law, students are prepared for careers in environmental planning and policy analysis. Typical careers include analysts or lobbyists for non-profits, trade associations, and government regulatory agencies.

**Bioresource Waste Management.** Provides students with basic scientific knowledge as well as broad implementation expertise to manage waste products that impact water and land resources primarily in rural and urban/rural interface. Prepares students for a wide variety of careers in water resources management in public and private sectors associated with point and non-point source pollution in agriculture, industry, and land management and development.

**Watershed Management and Hydrology.** Provides students a focused and encompassing program including a proficiency in watershed hydrology in forest ecosystems and Mediterranean ecosystems, rangeland hydrology, post-fire watershed evaluation, watershed and stream restoration and urban/wildland hydrologic implications.

**Individualized Course of Study.** This option for the student is planned, designed and developed through guidance from the student's advisor, and allows development of a program to meet the student's interests and career goals. It allows students to pursue existing minors/concentrations in areas such as water science, land rehabilitation, geographic information systems, soil science, rangeland resources, public administration, sustainable environments, or wildlife biology.

### Recommended Sequence:

*The following is a guide for scheduling Major 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 advisor and the current Class Schedule.*

1st Year		
Fall	Winter	Spring
FNR 140	MATH 141/161/221	PHYS 121
BIO 151/BOT 121	CHEM 111	SS 121
MATH 118		PSY 201/202
2nd Year		
Fall	Winter	Spring
GEOL 201	plant course	animal course
STAT 217/218		FNR 339
CHEM 212		

3rd Year		
Fall	Winter	Spring
BRAE 237 or BRAE/FNR 247	ENVE 330	CRP/FNR 404
BIO 325/FNR 306	FNR 335	BRAE 348/ENVE 324
FNR 326	FNR/GEOL/LA 318	elective
	(concentration)	(concentration)
4th Year		
Fall	Winter	Spring
FNR 412/461	FNR 416	FNR 465
(concentration)	(concentration)	ENVE 434
(concentration)	(concentration)	(concentration)
(concentration)	(concentration)	(concentration)

### BS Environmental Management and Protection (pending final approval)

☐ 60 units upper division      ☐ GWR

☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

#### MAJOR COURSES

Animals: ASCI 329/BIO 153/BIO 227 .....	3-5
BIO 151 Intro to Biology or	
BOT 121 General Botany (B2)* .....	4/5
BIO 325 General Ecology or	
FNR 306 Ecology of Resource Areas .....	4
BRAE 237 Engineering Surveying I or	
BRAE/FNR 247 Field Surveying .....	2
BRAE 348 Energy for a Sustainable Society or	
ENVE 324 Introduction to Air Pollution (Area F)* .....	4
CHEM 111 Survey of Chemistry .....	5
CHEM 212 Introduction to Organic Chemistry .....	5
CRP/FNR 404 Environmental Law .....	3
ENVE 330 Environmental Quality Control .....	4
FNR 140 Career Development and Planning NRM	1
FNR/GEOL/LA 318 Applications in GIS .....	3
FNR 326 Natural Resources Economics and	
Valuation .....	4
FNR 335 Conflict Managemt. in Natural Resources	4
FNR 412 Forest and Natural Resources Senior	
Assessment Project or FNR 461 Senior Project...	3/4
FNR 416 Environmental Impact Analysis and	
Management .....	4
FNR 465 Ecosystem Management .....	4
GEOL 201 Physical Geology .....	3
MATH 118 Precalculus Algebra (B1)* .....	4
MATH 141/161/221 (B1)* .....	4
PHYS 121 Physics (B3&B4)* .....	4
Plant: BIO 152/BOT 333/EHS 231/FNR 208 .....	4/5
PSY 201/202 Introduction to Psychology (D4)* .....	4
SS 121 Introductory Soil Science .....	4
STAT 217/218 Applied Statistics .....	4
Concentration courses (see below) .....	38

126-131

**GENERAL EDUCATION (GE)**

72 units required; 24 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing.....	4

**Area B Science and Mathematics (no additional units req'd)**

B1 Mathematics/Statistics * 8 units in Major.....	0
B2 Life Science * 4 units in Major.....	0
B3 Physical Science * 4 units in Major.....	0
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (20 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) * 4 units in Major .....	0
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)**

(no additional units req'd) * 4 units in Major.....	0
	<b>48</b>

<b>ELECTIVES</b> .....	<b>7-12</b>
	<b>186</b>

**CONCENTRATIONS (Select one)****Bioresource Waste Management Concentration**

BIO 418 Limnology .....	4
BRAE 448 Bioconversion.....	3
CHEM 313 Survey of Biochemistry and Biotech....	5
EDES 408 Implementing Sustainable Principles .....	3
ENVE 434 Water Quality Measurements .....	2
FNR/CRP 408 Water Law.....	3
MCRO 221 Microbiology .....	4
MCRO 342 Sanitary Microbiology or SS 442 Soil Vadose Zone Remediation.....	4
Select 10 units for one of the following emphases:..	10
<i>Non-Point Source Pollution Emphasis:</i>	
ASCI 329, CRP 438, FNR 339, FNR 419, FNR 420, PPSC 311, PPSC 321, PPSC 441	
<i>Point Source Pollution Emphasis:</i>	
CRP 438, DSCI 121/230, DSCI 333, ENVE 439, ENVE 465, FNR 339	

**38****Environmental Policy and Management Concentration**

BIO 228 Wildlife Biology Laboratory.....	1
CRP 212 Introduction to Urban Planning.....	4
CRP 336 Regional and Environmental Planning Foundations .....	4
ECON 431 Environmental Economics .....	4
ENVE 465 Environmental Management and Urban Systems .....	2
FNR 425 Applied Resource Analysis .....	4
FNR 435 Natural Resources Policy Analysis .....	4
AGB 409 California Agricultural Law (3) or FNR/CRP 408 Water Law (4) .....	3/4
FNR 419, FNR/REC 417, or SS 433 .....	3/4
POLS 316 Political Parties and Interest Groups or POLS 318 Political Behavior .....	4
LA 451/EDES 408/FNR 460 .....	2-6
Restricted electives .....	0-3
	<b>38</b>

**Watershed Management and Hydrology Concentration**

FNR 420 Advanced Watershed Hydrology .....	4
SS 321 Soil Morphology .....	4
SS 440 Forest and Range Soils.....	4
Restricted electives, advisor's prior written approval .	26
	<b>38</b>

**Individualized Course of Study**

Courses are selected by the student with the approval of the student's academic advisor .....	38
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**BS RECREATION, PARKS, AND TOURISM ADMINISTRATION**

Recreation, parks, and tourism is a mainstay of the American culture and a foundation of the United States economy, with over 400 billion dollars spent annually on leisure pursuits. U. S. households spend seven to eight percent of their income on recreation. The United States has been ranked as the second most popular tourist destination in the world and generates over 85 billion dollars from international tourism. Both U.S. and foreign tourists can visit any of the 200 million acres of federal land, which the government has set aside for recreation. While recreation, parks, and tourism provide activities for people from all walks of life, these industries also provide numerous jobs, both in this country and abroad.

The Bachelor of Science degree program in Recreation, Parks, and Tourism prepares students for professional employment in public, non-profit, private, and commercial recreation, parks, and tourism organizations. Students may pursue a concentration in commercial recreation and tourism management, or natural resources recreation, or select a course of study in special events management, sport management, or community recreation. The major is accredited by the National Recreation and Park Association/ American

Association for Leisure and Recreation Council on Accreditation.

To prepare students, the major includes a 400-hour required internship (one quarter) in a recreation, parks, or tourism organization. Graduates qualify for diverse positions as recreation supervisors, park and recreation administrators, travel and tourism specialists, environmental educators, park rangers, park naturalists, outdoor recreation managers, recreation-related business owners, private recreation club managers, employee services and recreation specialists, camp directors, chamber of commerce specialists, convention and visitor bureau program directors, meeting planners, and special event planners.

Graduates employed in settings located in and out of the United States are planning, organizing, implementing and evaluating recreation, parks, and tourism services. Sound management skills developed in the program, and through practical and research applications, allow for career progress into executive management positions within the recreation, parks, and tourism industries. Students have access to the department's field laboratories and also develop competencies in a myriad of sites, including leadership laboratories, environmental education centers, leisure businesses, and parks and recreation departments. Students plan and implement major special events and programs, as well as conduct applied research in required and elective coursework.

In addition to major requirements, the curriculum provides a full range of general education and support courses. These courses are designed to fully educate and prepare students for cultural diversity, community engagement, and international understanding in a global society.

### Curricular Concentrations

#### Commercial Recreation/Tourism Management.

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 areas: resorts and private camps, travel and tourism, product sales and marketing, public/private entrepreneurship, joint commercial-public ventures, and small business opportunities. Specific emphasis is placed commercial/tourism enterprises and special event management.

**Natural Resources Recreation.** Prepares students for employment in the planning, development, leadership, and management of outdoor recreation opportunities on public and private lands. Areas of study include adventure/natural resources tourism and outdoor recreation management.

#### Graduate Program

Cal Poly offers a Master of Science degree in Agriculture with a specialization in Recreation, Parks, and Tourism Administration. Please refer to the MS Agriculture section of the College of Agriculture.

### 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 advisor and the current Class Schedule.*

1st Year		
Fall	Winter	Spring
REC 101	REC 110	REC 127
	CSC 110/113/AG 250	MATH 118
2nd Year		
Fall	Winter	Spring
REC 210	REC 252	REC Elective
BUS 212	STAT 217	
3rd Year		
Fall	Winter	Spring
REC 305	REC 324	REC 360
ENGL 310	BUS 384	FNR 410/EHS 337/ LA 363
BUS 346	JOUR 312	REC Elective
4th Year		
Fall	Winter	Spring
REC 405	REC 461	REC 465
REC 460	REC 424	
REC 463		

### BS Recreation, Parks, and Tourism Administration

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

#### MAJOR COURSES

REC 101 Intro. to Recreation, Parks and Tourism...	3
REC 110 Career Planning in Recreation, Parks, and Tourism .....	1
REC 127 Leisure Behavior .....	4
REC 210 Introduction to Program Design .....	4
REC 252 Recreation and Special Populations .....	4
REC 305 Recreation Areas and Facilities Mgt .....	4
REC 324 Legal Aspects of Recreation, Parks, and Tourism .....	4
REC 360 Assessment/Eval of Rec Parks & Tourism	4
REC 405 Recreation, Parks, and Tourism Mgt .....	4
REC 424 Financing Recreation, Parks, and Tourism Services.....	4
REC 460 Research in Recreation, Parks & Tourism	4
REC 461 Senior Project .....	3
REC 463 Pre-Internship Seminar.....	1
REC 465 Internship .....	6
BUS 384 Human Resources Management .....	4
Concentration courses (see below) or advisor approved electives .....	28

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**SUPPORT COURSES**

BUS 212 Financial Actg for Nonbusiness Majors ...	4
BUS 346 Principles of Marketing .....	4
CSC 110/113/AG 250 .....	3
ENGL 310 Corporate Communications .....	4
FNR 410/EHS 337/LA 363 .....	3
JOUR 312 Introduction to Public Relations.....	4
MATH 118 Pre-Calculus Algebra (B1)* <i>or</i>	
MATH 116 and 117 (B1)* .....	4
STAT 217 Intro to Statistical Concepts and	
Methods (B1)* .....	4
	<b>30</b>

**GENERAL EDUCATION (GE)**

72 units required; 8 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing.....	4

**Area B Science and Mathematics (8 units)**

B1 Mathematics/Statistics * 8 units in Support ...	0
B2 Life Science.....	4
B3 Physical Science .....	4
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (20 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)**

(4 units).....	4
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**64****ELECTIVES ..... 10****186****CONCENTRATION OR ADVISOR APPROVED ELECTIVES**

Select either a concentration or advisor approved electives.

**Commercial Recreation/Tourism Management Concentration**

REC 313 Sustainable Tourism.....	4
REC 314 Travel and Tourism Planning.....	4
REC 317 Convention and Meeting Management ....	3
REC 414 Commercial Recreation Enterprise.....	4
Restricted electives .....	13
	<b>28</b>

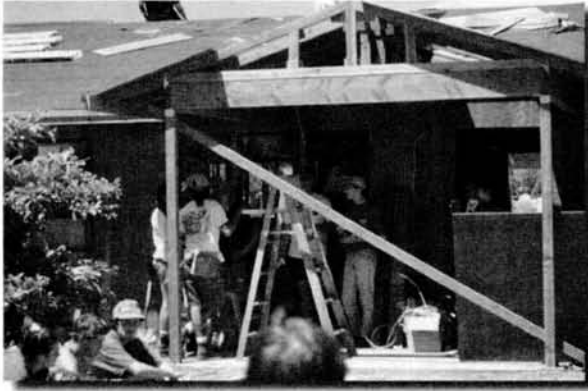
**Natural Resources Recreation Concentration**

REC 302 Environmental and Wilderness Education	
<i>or</i> FNR 311 Environmental Interpretation .....	4
REC 313 Sustainable Tourism.....	4
REC 314 Travel and Tourism Planning <i>or</i>	
FNR/REC 417 Resource Recreation Planning.....	4/3
Restricted electives .....	16/17
	<b>28</b>

**Advisor Approved Electives ..... 28**

## Student Involvement

College of Architecture and Environmental Design (CAED) students receive instruction about concrete strength testing from construction management Professor William Epstein, Ph.D. (shown with hand on test sample, right), and help build a Habitat for Humanity project in the community (below).



*Photos courtesy of College of  
Architecture and Environmental Design*



*Photo courtesy of Jayson Mellom*

A new campus building is in the works for the College of Architecture and Environmental Design, made possible by a partnership of state and private funds. An important part of the new building program is the development of specialized support facilities to enhance the curriculum in the college's five highly ranked programs.

An interdisciplinary team of students from all five departments in the college collaborated on various building designs and presented their results to professors and university planning officials. Realistic projects such as this have earned Cal Poly's CAED programs national recognition by practicing professions.

College of  
*Architecture  
& Environmental Design*

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## College of

# *Architecture and Environmental Design*

**Architecture and Environmental Design Bldg. (05)  
Room 212  
(805) 756-1321**

**K. Richard Zweifel, Interim Dean  
Allan R. Cooper, Interim Associate Dean**

### ACADEMIC PROGRAMS

Architectural Engineering .....	<i>BS</i>
Architecture .....	<i>BArch, MS</i>
City and Regional Planning .....	<i>BS, MCRP, Minor</i>
Construction Management .....	<i>BS, Minor</i>
Environmental Design .....	<i>Minor</i>
Integrated Project Delivery .....	<i>Minor</i>
Landscape Architecture .....	<i>BLA</i>
Real Property Development .....	<i>Minor</i>
Sustainable Environments .....	<i>Minor</i>
Transportation Planning .....	<i>MCRP/MS Engineering</i>

The five undergraduate programs, listed above, have a common objective: the betterment of the human physical environment. These programs endeavor to give the student a set of social values, a technical background, and training which result in creative expressions that are effective both professionally and personally.

The masters programs are designed for students interested in advanced professional studies. The joint MCRP/MS Engineering with a specialization in Transportation Planning is an interdisciplinary program. It is a cooperative effort between the colleges of Engineering and Architecture and Environmental Design.

The well-equipped college facilities include design laboratories, grading galleries, soils laboratory, stress laboratory, construction shop, project yard, instructional resource center, computer laboratories, and photo presentation laboratory. An outlying area of 12 acres known as the "Canyon" is available for experimental construction.

The location of the campus between the great population centers of San Francisco and Los Angeles is ideal for environmental studies ranging from rural to large metropolitan complexes. An active visiting lecturer program joins with faculty in all departments in providing excellent student instruction. Field trips are arranged to various parts of the state as required work. Students have the opportunity to participate in national and international exchange programs. The college offers several opportunities through departmentally sponsored programs for directed foreign study. Students also regularly participate in the California State University's International Programs in Denmark and Italy.

In addition to individual faculty representation in a wide range of professional associations, departments are

members of their respective educators associations: the Association of Collegiate Schools of Architecture (ACSA), the Council of Educators in Landscape Architecture (CELA), the Association of Collegiate Schools of Planning (ACSP), and the Associated Schools of Construction Management (ASCM). Likewise, students maintain active chapters of the professional organizations of the American Institute of Architects (AIA), the American Society of Landscape Architects (ASLA), the Associated General Contractors (AGC), the Structural Engineers Association of California (SEAOC), the American Planning Association (APA), and the National Society of Architectural Engineers (NSAE).

Opportunities for interdisciplinary interaction within the college are made available through coursework, annual forums, participation in district and national student competitions, student council activities and community service projects. Students are exposed to viable economic and ecological alternatives to conventional planning, design and construction through faculty applied research in such areas as passive solar building, post-disaster community rebuilding, sustainable transportation, earthquake-resistant building systems, project delivery methodologies, and daylighting and electrical lighting integration. The college has various enhanced computing capabilities including Geographic Information System Technology, Computer-Aided Design and Immersive Visualization (virtual reality).

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 College Advising Center, Architecture and Environmental Design Bldg. (05), Room 221, and departments. 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.

**CAED Advising Center**  
**Ellen Notermann, Director**  
**Bldg. (05), Room 221**  
**(805) 756-1325**

[www.calpoly.edu/~caed/the\\_CAED/Advising\\_Center/](http://www.calpoly.edu/~caed/the_CAED/Advising_Center/)  
 The College of Architecture and Environmental Design (CAED) Advising Center provides academic advising services to all students within the college in conjunction with each student's faculty advisor. These services include providing curriculum information about academic programs within the college; general education and breadth requirements; transfer credit; university and college policies and procedures; tutoring; special programs; referral of students to other campus resources.

The Advising Center processes most student-related forms including curriculum substitution, course withdrawal, change of major, and others. Curriculum sheets, flowcharts, articulation agreements, and information on jobs, scholarships and competitions are located in the Advising Center.

### ENVIRONMENTAL DESIGN MINOR

The Environmental Design Minor will educate students in the principles and processes of environmental design. It will provide students from all major programs with the knowledge and ability to integrate such broad concerns as design, construction, history, urbanization, sustainable development and historic preservation with their major field of study.

Interested students should contact the Landscape Architecture Department for individual advisement.

Required courses	Units
ARCH 217/218/219 History of Architecture (C3)	4
CRP 212 Introduction to Urban Planning .....	4
EDES 101 Intro to Arch & Environmental Design..	2
LA 201 Survey of Landscape Architecture .....	2
<b>Upper division electives</b> .....	12
Non-CAED majors may select from the following list. CAED majors must take courses from no fewer than 3 prefixes (e.g. EDES) outside their major, and may not include courses required for their major:	
ARCH 316, 401, 447;	
CM 325, 341;	
CRP 314, 336, 402, 447; EDES 406, 420;	
LA 311, 318, 320, 321, 323, 363	
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### ENVIRONMENTAL STUDIES MINOR

Students who complete the Environmental Studies Minor will be able to:

- Analyze, explain, and evaluate environmental issues from both scientific/technical and social/political/economic perspectives.
- Integrate and synthesize knowledge from multiple disciplines.
- Explain and apply the methodologies and approaches that different disciplines bring to bear on complex problems.
- Work productively and effectively with students from other disciplines and with other points of view.
- Confront real issues of contemporary significance; issues that will affect them and their future.
- Gain employment or pursue further study that emphasizes interdisciplinary knowledge and skills.

Interested students should contact the College of Science and Mathematics for individual advisement. Please see the College of Science and Mathematics' catalog section for additional information on this interdisciplinary minor.

### INTEGRATED PROJECT DELIVERY MINOR

This minor is jointly offered by the Construction Management Department and the Architectural Engineering Department, and is specific and intentional in its design. It is intended to provide an "interdisciplinary" understanding of the design and construction process. It is designed to serve students that will be engaged in the A/E/C industry and be involved in integrated services project delivery.

**Prerequisite.** Upper division standing; and thus students are presumed to have completed the majority of their General Education courses, support, and/or major courses.

Interested students should contact the Construction Management Department for individual assessment.

#### Required courses

SCOM 301 Business and Professional Communication .....	4
CM/CRP 315 Fiscal and Project Feasibility .....	4
EDES 430 Collaborative Process.....	3
CM 431 Integrated Project Services .....	3
CM 432 Design-Build Project Management.....	3
IT 454 Facilities Development.....	4
<b>Advisor approved electives</b> .....	9

#### Construction Management students

must complete 9 units of advisor approved DESIGN courses (ARCE, ARCH, CRP or LA prefix)

*Other CAED students must complete:*

- CM 364 Project Administration (3)
- CM 452 Project Controls (3)
- CM 454 Building Estimating (3)

*Non-CAED students*

must complete 9 units of advisor approved design and/or CM courses

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## REAL PROPERTY DEVELOPMENT MINOR

The process of real property development touches all aspects of environmental design and the built environment. This minor imparts the minimum skills, values and knowledge needed to participate in the real property development process. Courses are designed to provide adequate preparation to beginning level employment in private companies and public agencies engaged in development projects. The integration of practitioner experiences in many of the courses provides state-of-the-art knowledge of current methods and techniques. The minor fosters the student's ability to design or structure a project, and thus is beneficial to all partners involved or impacted; this includes lenders, users, the community, agencies and interested parties.

The minor provides understanding of how development serves the space production needs of the private, public and not-for-profit sectors and how projects can be implemented in the context of balanced environmental opportunities and constraints. It capitalizes on environmental design principles to shape and improve the development process and its product: the built environment. The minor is excellent preparation for students whose interests are in the areas of environmental design, built environment or real property development and finance.

Interested students should contact the City and Regional Planning Department for individual advisement.

### Required courses

*Units*

- CM 475 Real Property Development Principles ..... 4
- CRP 315 Fiscal and Project Feasibility ..... 4
- CRP 446 Development Review and Entitlement ..... 4

**Select two or more courses from the following:** ..... 8/9

Required courses in the student's major may not be selected. Courses selected here may count as electives in the major:

- CM 342, 364, 431, 453; CRP 336, 420, 447, 520
- CM 485-495 or CRP 409 (4 units maximum);
- CM 470-471 or CRP 470-471 (4 units maximum);
- BUS 409, 434, 435

## Planning/Design ..... 3/4

Select one course from the following (if a 3-unit course is selected, additional support units may be taken so as to have at least 24 units total):

- ARCH 445 Urban Design in Architecture (3)
- CRP 430 Public Sector Planning Practice (3)

Any real property development-related planning or design course at 400-500 level, with advisor approval (4)

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## SUSTAINABLE ENVIRONMENTS MINOR

This minor will educate students within the college in the principles and various aspects of sustainable environmental design with global, regional and local perspectives and concepts. It will provide students with the knowledge and abilities needed to integrate concerns for ecology, social equity and economics within the context of human and natural resource systems and the built environment.

Interested students should contact the Architecture Department for individual advisement.

### Required courses

*Units*

- EDES 406 Sustainable Environments ..... 4
- EDES 408 Implementing Sustainable Principles .. 3

**Electives** ..... 17

Select 17 units from the following courses:

- AG 450; ANT 201, 360; ARCH 413, 445,
- ARCH/CRP 447; ARCH 472, 531; BIO 112, 301,
- 325; BOT 238; BRAE 348;
- CRP 211, 212, 214, 215, 436, 438, ECON 303;
- EDES 410, 420; ENGL 380; FNR 306,
- FNR/GEOG/LA 318; GEOG 150, 333; HUM 303;
- LA 314; LA 321 451, 482; PHIL 340; PHYS 310;
- POLS 320, 326, 455, 484; PSY 311; SOC 313, 330

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# Architectural Engineering

**Department Office**  
**Engineering West (21), Room 110**  
**(805) 756-1314**

## Department Chair, Abraham C. Lynn

Graham Archer	Vicki May
Craig Baltimore	Ansgar Neuenhofer
Pamalee Brady	Clayton Pharaoh
Kevin Dong	Satwant S. Rihal

## ACADEMIC PROGRAM

### BS Architectural Engineering

The Architectural Engineering Department is an important and integral part of the College of Architecture and Environmental Design and shares and supports the mission of the College. The department has the specific mission of educating men and women to join the structural engineering profession. This commitment to the structural engineering profession includes the interdisciplinary concerns of the design, planning and construction professions. Additionally, graduates are prepared to pursue graduate studies in related academic programs.

The specific goals of the department are to provide an educational opportunity which would develop the ability to apply knowledge of mathematics; science and engineering; design and conduct experiments, as well as to analyze and interpret data; design a system, component, or process to meet desired needs; function on multi-disciplinary teams; identify, formulate, and solve engineering problems; communicate effectively; understand the impact of engineering solutions in a global and societal context; recognize the need for, and an ability to engage in life-long learning; understand contemporary issues; and use the techniques, skills, and modern engineering tools necessary for engineering practice.

The department's learn-by-doing philosophy is part of a pedagogy which emphasizes design-centered laboratories, integrating theory and design, culminating in a senior project capstone design experience.

The Architectural Engineering Program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

### Integrated Project Delivery Minor

The department also participates in offering an interdisciplinary minor in Integrated Project Delivery. Please see the College of Architecture and Environmental Design for more information.

## BS ARCHITECTURAL ENGINEERING

☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

*Note: All ARCE majors must obtain a grade of C- or better in ARCE courses that are prerequisites for other ARCE courses.*

### MAJOR COURSES

ARCE 221 Elementary Structures .....	3
ARCE 222 Mechanics of Structural Members I .....	3
ARCE 223 Mechanics of Structural Members II ....	4
ARCE 225 Dynamics or ME 212 Engineering Dynamics.....	3
ARCE 227 Structural Analysis I.....	2
ARCE 257 Structural CAD for Building Design ....	2
ARCE 302 Structural Analysis II.....	3
ARCE 303 Steel Design.....	3
ARCE 304 Timber Design.....	3
ARCE 305 Masonry Design .....	2
ARCE 306 Matrix Analysis of Structures.....	3
ARCE 351, 352, 353 Structural Computing Analysis I, II, III .....	1,1,1
ARCE 371 Structural Systems Laboratory .....	3
ARCE 372 Steel Structures Design Laboratory.....	3
ARCE 412 Dynamics of Framed Structures .....	3
ARCE 421 Soil Mechanics .....	3
ARCE 422 Foundation Design .....	3
ARCE 444 Reinforced Concrete Lab.....	3
ARCE 451 Timber/Masonry Structures Design Lab .	3
ARCE 452 Concrete Structures Design Laboratory	3
ARCE 453 Senior Project Laboratory.....	3
ARCE 481 Structural Experimental Laboratory .....	1
ARCE 483 Seismic Analysis and Design .....	4
Advanced structural electives .....	6
Approved technical electives .....	4
	<b>76</b>

### SUPPORT COURSES

ARCH 106 Materials of Construction .....	3
ARCH 111 Intro to Drawing and Perspective.....	3
ARCH 221, 222 Architectural Design Fundamentals .....	3,3
ARCH 231 Architectural Practice .....	3
ARCH 217/ARCH 218/ARCH 219 (C3)* .....	4
CHEM 124 General Chem/Engr Discipline (B3/B4)* .....	4

CM 433 Economic Analysis for Engineers or IME 314 Engineering Economics (3).....	2
CSC 231 Fortran for Engineering Students or CSC 234 C and UNIX (3).....	2
CSC 342 Numerical Analysis I or approved equivalent.....	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.....	3
MATH 141, 142 Calculus I, II (B1)* .....	4,4
MATH 143 Calculus III (Add'l Area B)* .....	4
MATH 241 Calculus IV.....	4
MATH 244 Linear Analysis I.....	4
MATH 344/STAT 312/GEOL 305 (B6)*.....	4
ME 302 Thermodynamics.....	3
ME 341 Fluid Mechanics.....	3
PHYS 131 General Physics (Add'l Area B)* .....	4
PHYS 132, 133 General Physics .....	4,4
	<b>83</b>

**GENERAL EDUCATION (GE)**

72 units required; 28 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

**Area B Science and Mathematics (4 units)**

B1 Mathematics/Statistics * 8 units in Support ...	0
B2 Life Science .....	4
B3 Physical Science * 4 units in Support.....	0
B5 (not required of Engineering)	
B4 One lab taken with either a B2 or B3 course	
B6 Upper-division Area B * 4 units in Support...	0
Additional Area B units* 8 units in Support .....	0

**Area C Arts and Humanities (12 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts * 4 units in Support ....	0
C4 Upper-division elective .....	4

**Area D/E Society and the Individual (16 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4

**44****ELECTIVES .....****0****203****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 advisor and the current Class Schedule.

<b>1<sup>st</sup> Year</b>		
<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
ARCH 111	ARCH 106	EDES 113
EDES 101	MATH 142	MATH 143
MATH 141	PHYS 131	PHYS 132
<b>2<sup>nd</sup> Year</b>		
<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
ARCE 221	ARCE 222	ARCE 223
ARCH 221	ARCH 222	ARCE 257
MATH 241	ARCE 227	ARCE 351
PHYS 133	MATH 244	ARCH 231
	CSC 231	
	ARCE 225/ME 212	
<b>3<sup>rd</sup> Year</b>		
<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
ARCE 302	ARCE 303	ARCE 304
ARCE 352	ARCE 306	ARCE 305
ARCE 371	ARCE 353	ARCE 372
ARCE 421	ARCE 422	ARCE 412
ARCH 217/218/219	CSC 342	
MATH 344/STAT 312/GEOL 305		
<b>4<sup>th</sup> Year</b>		
<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
ARCE 444	ARCE 403 or 414, or 447	ARCE 453
ARCE 451	ARCE 452	ARCE 445 or 446
ARCE 483	ARCE 481	
	CM 433	

# Architecture

## Department Office

Arch. & Environmental Design Bldg. (05), Rm 212  
(805) 756-1316 FAX (805) 756-1500

### Interim Director, Margot K. McDonald

Joseph C. Amanzio	Laura E. Joines-Novotny
Sharad D. Atre	Brian B. Kesner
James R. Bagnall	Kenneth M. Kohlen
William R. Benedict	Sandra D. Lakeman
David A. Brodie	John H. Lange
Arthur J. Chapman	Karen F. Lange
Gilbert D. Cooke	David Lord
Allan R. Cooper	Michael A. Lucas
M. Polly Cooper	Sandra D. Miller
M. Bilgi Denel	Brook Muller
Serim Denel	Daniel L. Panetta
Donna P. Duerk	Jens G. Pohl
Thomas Fowler, IV	Jonathan Reich
Merrill C. Gaines	Sandra Stannard
Bruno Giberti	Don E. Swearingen
Terry C. Hargrave	Howard Weisenthal
Patrick D. Hill	Christopher L. Yip
George K. Ikenoyama	

### ACADEMIC PROGRAMS

#### B.Arch. Architecture MS 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.

"In the United States, most state registration boards require a degree from an accredited professional degree program as a prerequisite for licensure. The National Architectural Accrediting Board (NAAB), which is the sole agency authorized to accredit US professional degree programs in architecture, recognizes two types of degrees: the Bachelor of Architecture and the Master of Architecture. A program may be granted a five-year, three-year, or two-year term of accreditation, depending on its degree of conformance with established educational standards.

Masters degree programs may consist of a pre-professional undergraduate degree and a professional graduate degree, which, when earned sequentially,

comprise an accredited professional education. However, the pre-professional degree is not, by itself, recognized as an accredited degree."

### OFF-CAMPUS ARCHITECTURE PROGRAMS

**CSU International Programs.** 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, 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.

**Japan, London and Thailand Study Programs.** The Architecture Department participates in the Japan, London and Thailand Study Programs. Students and faculty live at these sites and use them as the site of design problems and as the base location for field trips. It is possible to get credit for fourth year Design, Professional Electives and GE Areas C and D. Arrangements can be made for special studies for technical elective credit.

**San Francisco Urban Design Internship 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 urbane 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 method is used to observe and analyze practice issues in the participating architectural firms.

### Washington Alexandria Architecture Consortium.

The Consortium is organized to offer a challenging and stimulating one-year option. 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 Architecture Consortium, which is comprised of several universities including Cal Poly.

The Consortium 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.

**Exchange Programs.** The Architecture Department offers a variety of exchange programs with universities throughout the world. At the time of publication, exchange opportunities are offered in Australia, France, Germany, Honduras, India and Sweden. Study opportunities become available in other countries from time-to-time. Contact the Architecture Department for current information.

## BACHELOR OF ARCHITECTURE

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

### MAJOR COURSES

ARCH 101 Survey of Architectural Ed and Practice	2
ARCH 106 Materials of Construction	3
ARCH 121, 122, 123 (3)(3)(3) & ARCH 160 (4) or ARCH 131, 132, 133 (4)(4)(4)	12-13
ARCH 207 Environmental Control Systems I	4
ARCH 217 History of Architecture (C3)*	4
ARCH 218 History of Architecture (Area C)*	4
ARCH 219 History of Architecture	4
ARCH 231 Architectural Practice and Laboratory	3
ARCH 251, 252, 253 Arch. Design Fund. I, II, III	5,5,5
ARCH 307 Environmental Control Systems II	4
ARCH 341, 342 Architectural Practice	4,4
ARCH 351, 352, 353 Architectural Design	5,5,5
ARCH 407 Environmental Control Systems III	4
ARCH 420 Seminar in Architectural History	4
ARCH 441, 442 Professional Practice	3,3
ARCH 451, 452, 453 Architectural Design	5,5,5
ARCH 481 Senior Arch Design Project or <sup>1</sup> ARCH 521 Graduate Arch Design Project	5,5,5
ARCH 492 Senior Design Thesis or <sup>1</sup> ARCH 592 Graduate Design Thesis	3
	<b>125-126</b>

### SUPPORT COURSES

ARCE 221 Elementary Structures	3
ARCE 222 Mechanics of Structural Members I	3
ARCE 226 Structural Systems for Architects	3

ARCE 321/322/323 Timber/Steel/Concrete Structural Systems (choose two classes)	6
EDES 101 Intro to Architecture and Envl Design	2
MATH 141 Calculus I (B1)*	4
MATH 182 Calculus for Architecture and Construction Management (B1)*	4
PHYS 121/131 General Physics (B3 & B4)*	4
PHYS 122/132 General Physics	4
Upper division electives	9
CAED prefix professional electives	9
Environment-behavior advisor approved elective	3
Urban context advisor approved elective	3
	<b>57</b>

## GENERAL EDUCATION (GE)

72 units required; 20 units are in Major and Support.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

### Area A Communication (12 units)

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

### Area B Science and Mathematics (4 units)

B1 Mathematics/Statistics * 8 units in Support	0
B2 Life Science	4
B3 Physical Science * 4 units in Support	0
B4 One lab taken with either a B2 or B3 course	

### Area C Arts and Humanities (12 units)

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts * 4 units in Major	0
C4 Upper-division elective	4
Area C elective * 4 units in Major	0

### Area D/E Society and the Individual (20 units)

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

### Area F Technology Elective (upper division) (4 units)

**52**

<b>ELECTIVES</b>	<b>10-11</b>
	<b>245</b>

<sup>1</sup> Option for students intending to pursue a graduate degree.

**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 advisor and the current Class Schedule.

1st Year		
Fall	Winter	Spring
EDES 101	ARCH 160	ARCH 101
ARCH 121/131*	ARCH 122/132*	ARCH 123/133*
MATH 141	PHYS 121/131**	PHYS 122/132**
ARCH 106	MATH 182	
2nd Year		
Fall	Winter	Spring
ARCH 251	ARCH 231	ARCH 207
ARCE 221	ARCH 252	ARCH 253
	ARCE 222	ARCE 226
3rd Year		
Fall	Winter	Spring
ARCH 341	ARCH 307	ARCH 342
ARCH 351	ARCH 352	ARCH 353
ARCH 217	ARCH 218	ARCH 219
ARCE 321/322/323***	ARCE 321/322/323***	
4th Year		
Fall	Winter	Spring
ARCH 407	ARCH 441	ARCH 442
ARCH 451	ARCH 452	ARCH 453
ARCH 420	Env. Behavior Elective	Prof Electives
		Urban Context Electives
5th Year		
Fall	Winter	Spring
ARCH 481/521	ARCH 481/521	ARCH 481/521
ARCH 492/592	CAED Prof Electives	CAED Prof Electives
Upper Div Free Electives	Upper Div Free Electives	Upper Div Free Electives

\* Select one series: either ARCH 121, 122, 123 or ARCH 131, 132, 133.

\*\* Select one series: either PHYS 121, 122 or PHYS 131, 132.

\*\*\* Select two of the three, ARCE 321/322/323.

**MBA, ARCHITECTURAL MANAGEMENT TRACK**

This program is available only to those students who are enrolled in Cal Poly's Bachelor of Architecture (BArch) program. Students may request permission to enroll in MBA courses during their fourth and fifth years of study. This request should be submitted to the Orfalea College of Business as soon as possible and no later than July 1 of the academic year that the student plans to begin taking MBA courses. Upon completion of the BArch degree, students are eligible to formally apply to the University for graduate student status in the MBA program. Students who fulfill all the requirements will first receive the BArch and then the MBA.

**Core Phase (48)**

GSB 511 Financial Accounting .....	4
GSB 512 Quantitative Analysis .....	4
GSB 513 Organization Behavior .....	4
GSB 514 Business, Government and Society .....	4
GSB 521 Managerial Accounting .....	4
GSB 523 Managerial Economics .....	4
GSB 524 Marketing Management .....	4
GSB 531 Managerial Finance .....	4
GSB 532 Adv. Management Information Systems ..	4
GSB 533 Aggregate Economics .....	4
GSB 534 Production and Operations Management (combined with Management Science) .....	4
Elective selected from:	
GSB 567, 569, 578, 587; BUS 410, 427, 446; ECON 401; or AGB 563 .....	4

**Emphasis Phase (51)**

ARCH 521 Graduate Architectural Design Project or advisor approved elective .....	5,5,5
Approved electives .....	36
Electives must include one approved internationally based course	

99

A comprehensive examination is included in GSB 540, The General Manager IV.

**MCRP, ARCHITECTURE PLANNING TRACK**

This track is available only to students who are enrolled in Cal Poly's Bachelor of Architecture (BArch) program. Students may request permission to enroll in Master of City and Regional Planning (MCRP) graduate level courses during their fourth and fifth years of study. Upon completion of the BArch degree, students are eligible to formally apply to for graduate student status in the MCRP program. Students who fulfill all the requirements will first receive the BArch and then the MCRP. Please contact the Graduate Coordinator, City and Regional Planning Department for additional information.

## MASTER OF SCIENCE IN ARCHITECTURE

The Master of Science in Architecture is a post-professional degree in the broad field of architecture with an emphasis on environmental planning and design in an information society. Common core studies aim to establish a framework for advanced study and research, while specialization and directed electives provide for the development of in-depth study chosen by candidates.

**Professional Practice Specialization.** Designed for applicants holding an accredited architecture degree wishing to pursue advanced studies with a strong professional practice orientation.

**Environmental Design Specialization.** Designed 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.

**Graduate Study Areas.** The graduate study topics are challenging. Each is of critical importance to the architecture, engineering, and construction industry. The knowledge and experience students bring to the program are fully employed. At the same time new practices and new knowledge are acquired. These study areas are:

\* *Computer-Aided Design.* Focusing on the development and utilization of computer systems in the architectural process, with particular emphasis on design information representation and management, the development and utilization of knowledge bases, and expert design assistants. Students are encouraged to participate in the research projects undertaken by the CAD Research Center of the College of Architecture and Environmental Design.

\* *Architectural Science.* Focusing on the increasingly complex performance and technical aspects of architectural design and the knowledge and skills needed when designers deal with the challenges associated with such topics as energy responsive architecture, acoustics, lighting, and wind-effects phenomena.

\* *Facility Management.* Stresses the practice of coordinating the physical workplace with the people and work of an organization. It integrates the principles of business administration, architecture, and behavioral and engineering sciences. Facility management is concerned with the design, construction, maintenance, and management of physical environments. Facility managers usually work as generalists managing teams of specialists such as architects, interior architects, interior designers, engineers, construction personnel, communication technicians, and so on.

## CURRICULUM FOR MS ARCHITECTURE

<b>Core Curriculum</b> .....	36
ARCH 519 Theory of Architecture (3)	
ARCH 551 Architectural Design (15)	
ARCH 561 Advanced Design (9)	
ARCH 598 Master's Design Project (9)	
<b>Directed Electives</b> .....	9
A minimum of 9 units of advisor 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.

# City and Regional Planning

**Department Office**  
**Dexter Bldg. (34), Room 251**  
**(805) 756-1315**

## Department Head, William J. Siembieda

Michael Boswell	D. Gregg Doyle
W. David Conn	David T. Dubbink
Linda C. Dalton	Richard W. Lee
Linda L. Day	Paul Wack
Vicente Del Rio	

## ACADEMIC PROGRAMS

### BS City and Regional Planning

### MCRP Master of City and Regional Planning

### MCRP/MS Transportation Planning

### City and Regional Planning Minor

The profession of city and regional planning is primarily involved in helping people and communities manage growth and change in their physical, social and economic environments. The focus is on understanding how cities and towns (human settlements) function and how to make them better places for people to live and to prosper. Planning has its roots in engineering, architecture, landscape architecture, law, social welfare and government reform. The practice of city and regional planning is both science and art. It involves technical competence, creativity, hard-headed pragmatism and the ability to develop a vision of the future and to build on that vision. Planners today combine design, quantitative and people skills to assist communities and society. Both the undergraduate (BSCR) and the graduate (MCRP) programs are accredited by the national Planning Accreditation Board.

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, architecture, landscape architecture, social sciences or natural sciences, and offers two areas of emphasis: land use planning and environmental planning.

## BS CITY AND REGIONAL PLANNING

☐ 60 units upper division ☐ GWR

☐ 2.0 GPA ☐ USCP

\* = Satisfies General Education requirement

### MAJOR COURSES

CRP 101 Intro to Profession of CRP .....	1
CRP 201 Basic Graphic Skills.....	4
CRP 202 Introduction to Environmental Design .....	4
CRP 203 Intermediate Environmental Design .....	4
CRP 212 Introduction to Urban Planning .....	4
CRP 213 Population, Housing and Econ Apps .....	4
CRP 214 Land Use and Transportation Studies .....	4
CRP 215 Planning for and with Multiple Publics ..	4
CRP 216 Computer Applications for Planning .....	4
CRP 314 Planning Theory.....	3
CRP 315 Fiscal and Project Feasibility .....	4
CRP 336 Regional/Environmental Planning Fdns ..	4
CRP 341 Community Design Laboratory.....	4
CRP 342 Regional and Environmental Planning....	4
CRP 409 Planning Internship .....	2
CRP 410, 411 Community Planning Lab .....	5,5
CRP 412 Implementation .....	4
CRP 420 Land Use Law .....	4
CRP 430 Public Sector Planning Practice .....	3
CRP 436 Collaborative Planning.....	4
CRP 461, CRP 462 Senior Project .....	2,2
Advisor approved electives .....	12
	<b>95</b>

### SUPPORT COURSES

ECON 201 Survey of Economics (D2)* .....	4
EDES 101 Intro to Arch and Env Design.....	2
FNR 306 Natural Resources Ecology/Habitat Mgt or BIO 112 Env. Biology/Conservation .....	4
GEOL 102 Introduction to Geology (B3)* .....	4
LA 213 Site and Terrain Analysis or LA 114 Landscape Analysis & Planning .....	4
MATH 118 Pre-Calculus Algebra (B1)* .....	4
POLS 375/452/471 .....	4
STAT 221 Intro to Probability & Statistics (B1)*...	5
	<b>31</b>

### GENERAL EDUCATION (GE)

72 units required; 16 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

### Area A Communication (12 units)

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

**Area B Science and Mathematics (4 units)**

B1 Mathematics/Statistics * 8 units in Support...	0
B2 Life Science.....	4
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (20 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (16 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy * 4 units in Support.....	0
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)**

(4 units).....	4
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**ELECTIVES** ..... 7

**189**

**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 advisor and the current Class Schedule.*

1st Year		
Fall	Winter	Spring
EDES 101	CRP 212	GEOL 102
CRP 101	MATH 118	STAT 221
ECON 201		
2nd Year		
Fall	Winter	Spring
CRP 201	CRP 202	CRP 203
CRP 216	CRP 213	CRP 214
LA 213/114		CRP 215
BIO 112 or FNR 306		
3rd Year		
Fall	Winter	Spring
CRP 315	CRP 342	CRP 314
CRP 336	CRP electives	CRP 409
CRP 341		CRP 436
		POLS 375 or 471 or 452
4th Year		
Fall	Winter	Spring
CRP 410	CRP 411	CRP 412
CRP 420	CRP 430	CRP 462
CRP electives	CRP 461	CRP electives

**CITY AND REGIONAL PLANNING MINOR**

The minor provides students with an interdisciplinary understanding of the science and the art of city planning and its relationship with other environmental design professionals. The student is provided with an understanding of how growth and change affect the physical, social and economic aspects of the city, including the relationships among land use, transportation, housing and the environment. It includes courses that build skills in the preparation of plan documents, land use studies and environmental studies. Laboratory courses provide opportunities for involvement in community building and plan-making projects.

The minor is excellent preparation for students interested in gaining skills at creating visions of the future, participation in government and community organizations, and enhances skills in disciplines that have linkages with cities and the built and natural environments. It provides the student with the knowledge, skills and values that help people build better communities and cities.

**Required courses**

	Units
CRP 212 Introduction to Urban Planning .....	4
CRP 213 Population, Housing and Economic Applications or CRP 214 Land Use and Transportation Studies .....	4

**Select two courses from the following:** ..... 8

CRP 203 Intermediate Environmental Design (4) or appropriate equivalent
CRP 336 Regional & Environ. Planning Found. (4)
CRP 341 Community Design Laboratory (4)
CRP 342 Regional and Environmental Planning (4)

**Electives** ..... 11/12

Select three courses from the following:

CRP 215, 314, 315, 334, 338, 402, 404, 408, 410, 411, 412, 420, 427, 430, 435, 436, 438, 442, 444, 446, 447, 453, 457, 470, 483;
EDES 406, 408, 410

**27/28**

**Additional Minors**

The department also participates in offering interdisciplinary minors in Environmental Design, Real Property Development, and Sustainable Environments. Please see page 153 for additional information.

**MCRP TRACK FOR BLA & BARCH STUDENTS**

This track is available only to students who are enrolled in Cal Poly's Bachelor of Landscape Architecture (BLA) or Bachelor of Architecture (BArch) programs. Students may request permission to enroll in Master of City and Regional Planning (MCRP) graduate level courses during their fourth and fifth years of study. Contact the Graduate Coordinator, City and Regional Planning Department for additional information.

**BLENDED BACHELOR OF LANDSCAPE ARCHITECTURE/MASTER OF CITY AND REGIONAL PLANNING PROGRAM (BLA/MCRP)**

The blended BLA/MCRP Program is an accelerated route to the graduate professional degree in City and Regional

Planning. Under this program a student can simultaneously graduate with a BLA and MCRP. Students choosing this program shall make a request for admission to the department head. The CRP department head or graduate coordinator makes a determination of eligibility.

## MASTER OF CITY & REGIONAL PLANNING

### General Characteristics

The Master of City and Regional Planning degree program (MCRP) is professionally oriented. It 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 city planning, as well as in an area of special 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 use planning, focused on comprehensive physical planning and urban design; and environmental planning, focused on natural systems and development impacts. In addition, skills building in all aspects of planning communications (visual, verbal, written) is stressed. 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 164).

The MCRP 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 generally expected to begin their studies in the fall quarter. Students with prerequisite coursework deficiencies and those with backgrounds allowing waivers of first-year core courses may be admitted in other quarters. The degree culminates in a thesis (CRP 599), professional project (CRP 596), 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 required to bring with them a background in computers and computer applications equivalent to the Cal Poly course, CSC 110 Computers and Computer Applications: Windows. This includes knowledge of Microsoft Windows, word processing and spreadsheets.

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 quarter units of undergraduate work,
3. In cases of borderline grade point average, 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) demonstrating 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.

*Units*

**Core Courses** ..... 54/56

### 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 Planning Presentation and Communication Techniques (3)
- CRP 516 Quantitative Methods in Planning (4)
- CRP 518 Public Policy Analysis (4)
- CRP 525 Plan Implementation (4)
- CRP 554 Regional Planning and Analysis (4)

### Second Year

- CRP 409 Planning Internship (2)
- CRP 420 Land Use Law (4)
- CRP 530 Planning Agency Management (3)
- CRP 552 Community Planning Laboratory (4)
- CRP 553 Project Planning Laboratory (4)
- CRP 597 Policy, Planning, and Management (4) and comprehensive exam *or*
- CRP 596 Prof Project (4) *or* CRP 599 Thesis/Project (6)

**Emphasis Area (select one)** ..... 11

### Land Use Planning

- CRP 520 Feasibility Studies in Planning (4)
- CRP 548 Principles of City Design (3)
- Urban electives (4)

### Environmental Planning

- CRP 545 Env Planning, Policies and Principles (4)
- Environmental electives (7)

**Advisor 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 City and Regional Planning Department, College of Architecture and Environmental Design. Participation in the program requires enrollment in both Colleges. Students 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 231 Fortran for Engineering Students  
ECON 201 Survey of Economics  
ENGL 148 Reasoning, Argumentation and  
Professional Writing  
MATH 143 Calculus  
PHYS 131 General Physics  
SCOM 101 Public Speaking  
STAT 321 Probability and Statistics for Engineers and  
Scientists

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 (required only if grade point average is below the required 3.0),
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 ..... 65

CE 523 Transportation System Planning (4)  
CE 528 Transportation Analysis *or*  
CE 525 Airport Planning and Design (4)  
CE 591 Graduate Seminar (1)  
CE 599 (2,2,2) *or* CRP 599 Thesis (6)  
CRP 409 Planning Internship (2)  
CRP 420 Land Use 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 Planning Presentation and  
Communication Techniques (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 Community Planning Laboratory (4)  
CRP 553 Project Planning Laboratory (4)  
CSC, MATH, STAT or other approved  
quantitative methods course (3)

### Emphasis Area (select one of the following) ..... 10

#### *Urban Land Planning Emphasis*

CRP 520 Feasibility Studies in Planning (4)  
CRP 548 Principles of City Design (3)  
Urban Land Planning electives (3)

#### *Regional and Environmental Planning Emphasis*

CRP 404 Environmental Law (3) or Env elective  
Regional and Environmental Planning electives (7)

### Approved CE/ENVE electives: ..... 15

Electives may include: CE 421, 422, 424, 522,  
525, 528, 529, 573, 574, ENVE 411, 465

# Construction Management

**Department Office**  
**Engineering West (21), Room 116-A**  
**(805) 756-1323**

## Department Head, Allan Hauck

William C. Epstein	Hal Johnston
Barbara Jackson	James A. Rodger
Barry Jones	Paul Weber

## ACADEMIC PROGRAMS

### **BS Construction Management** **Construction Management Minor**

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.

### **Laptop Requirement**

The department has a requirement that all students have a notebook computer beginning the sophomore year. This is the point the students begin their major coursework and begin preparing themselves for a career in the construction industry. Most Construction Management classes emphasize cooperative projects/assignments, and a notebook computer provides the required mobility to facilitate collaboration. In today's construction environment, computing is an integral component with the computer being the standard tool. A notebook computer is the key to having computing capability available at all times and all locations. Financial aid may be available to cover the cost of the computer laptop (contact the Financial Aid Office for more information).

### **Minors**

The department also participates in offering interdisciplinary minors in Environmental Design, Integrated Project Delivery, and Real Property Development. Please see the College of Architecture and Environmental Design for more information.

## **BS CONSTRUCTION MANAGEMENT**

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA      ☐ USCP  
 \* = Satisfies General Education requirement

### **MAJOR COURSES**

CM 211 Construction Contract Documents .....	4
CM 212 Fundamentals of Construction Mgt .....	3
CM 221 Concrete Technology .....	3
CM 331 Construction Cost Control .....	3
CM 332 Cost Alternatives Evaluation .....	4
CM 333 Construction Contract Administration .....	3
CM 341 Residential & Light Commercial Construction Practices .....	3
CM 342 Commercial, Institutional and Industrial Construction Practices .....	3
CM 343 Earthwork & Civil Works Constr. Practices .....	3
CM 344 Concrete Formwork & Temporary Struct. .....	3
CM 352 Building Electrical Support System Construction Practices .....	3
CM 353 Building Mechanical Support System Construction Practices .....	3
CM 364 Project Administration .....	3
CM 431 Integrated Project Services .....	3
CM 443 Principles of Construction Management ...	3
CM 452 Project Controls .....	3
CM 454 Building Estimating .....	3
CM 463 Professional Practice for Senior Construction Project Managers .....	4
ARCE 221 Elementary Structures .....	3
ARCE 222 Mechanics of Structural Members I .....	3
ARCE 226 Structural Systems for Architects .....	3
ARCH 106 Materials of Construction .....	3
ARCH 111 Intro to Drawing and Perspective .....	3
<b>72</b>	

### **SUPPORT COURSES**

ARCE 421 Soil Mechanics .....	3
Structural design electives .....	3,3
Select two of ARCE 321/322/323	
BRAE 237 Engineering Surveying I .....	2
BUS 207 Business Law .....	4
BUS 214 Financial Accounting .....	5
CRP 212 Introduction to Urban Planning .....	4
ECON 221 Microeconomics .....	4
ECON 222 Macroeconomics (D2)* .....	4
EDES 101 Intro to Architecture and Env Design .....	2
ENGL 310 Corporate Communication or ENGL 318 Advanced Professional Writing .....	4

GEOL 201 Physical Geology.....	4
MATH 141 Calculus I (B1)* .....	4
MATH 142 Calculus II .....	4
PHYS 131 General Physics (B3 & B4)* .....	4
PHYS 132 General Physics.....	4
STAT 251 Statistical Inference for Management I (B1)* .....	4
BUS 200-400 level advisor approved elective .....	4
BUS 300-400 level advisor approved elective .....	4
	<b>70</b>

**GENERAL EDUCATION (GE)**

72 units required; 16 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing.....	4

**Area B Science and Mathematics (4 units)**

B1 Mathematics/Statistics * 8 units in Support...	0
B2 Life Science.....	4
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (20 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (16 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy * 4 units in Support.....	0
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)**

(4 units).....	4
	<b>56</b>

<b>ELECTIVES .....</b>	<b>0</b>
	<b>198</b>

**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 advisor and the current Class Schedule.*

1st Year		
Fall	Winter	Spring
EDES 101	ARCH 106	PHYS 132
MATH 141	MATH 142	CRP 212
ARCH 111	PHYS 131	GEOL 201

2nd Year		
Fall	Winter	Spring
ARCE 221	BUS 214	CM 212
BRAE 237	ECON 221	CM 221
BUS 207	ARCE 222	ECON 222
STAT 251	CM 211	ARCE 226
3rd Year		
Fall	Winter	Spring
ARCE elective	ARCE elective	CM 333
CM 341	CM 342	CM 343
CM 352	CM 353	CM 344
CM 331	CM 332	CM 364
ENGL 310/318		
4th Year		
Fall	Winter	Spring
ARCE 421	CM 431	CM 463
CM 443	CM 454	BUS 300-400 elective
CM 452	BUS 200-400 elective	

**CONSTRUCTION MANAGEMENT MINOR**

The Construction Management Minor provides students an introduction to the body of knowledge expected of persons pursuing careers in the construction industry. This 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 one of the professions involved in the built environment.

The Construction Management Minor is recommended for majors in architecture, architectural engineering, civil engineering, mechanical engineering and electrical engineering. Enrollment in the minor is limited, and selection will be made based upon the applicant's performance in his or her major courses.

CM 331 Construction Cost Control.....	3
CM 332 Cost Alternatives Evaluation.....	4
CM 333 Construction Contract Administration .....	3
Select two of the following three courses: .....	3,3
CM 341 Residential and Light Commercial Construction Practices (3)	
CM 342 Commercial, Institutional and Industrial Construction Practices (3)	
CM 343 Earthwork and Civil Works Construction Practices (3)	
CM 364 Project Administration .....	3
CM 443 Principles of Construction Management or CM 431 Integrated Project Services.....	3
CM 452 Project Controls.....	3
CM 454 Building Estimating.....	3

28

# Landscape Architecture

**Department Office**  
**Dexter Bldg.(34), Room 213**  
**(805) 756-1319**

## Department Head, Dale A. Sutliff

Walter D. Bremer                      Gary C. Dwyer  
 Gary R. Clay                          Omar Faruque  
 Beth Diamond                        Walter M. Tryon

## Affiliated Faculty:

Thomas J. Rice, Earth and Soil Sciences Department

## ACADEMIC PROGRAMS

### Bachelor of Landscape Architecture

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 Landscape Architects Technical Committee of the California Board of Architectural Examiners.

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 advisors 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 or academic positions.

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.

## CONCENTRATIONS

In addition to the required major courses in landscape architecture, students select one of the following concentrations or individualized course of study based upon their interests and career goals. Note: Students may elect to complete coursework for a minor in place of the concentrations listed below.

**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 structured to permit research and application of the concentration focus.

**Recreation and Open Space.** 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.** 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.

**Individualized Course of Study.** Allows for in-depth study in an area specific to individual needs but not addressed in other concentrations. Fifth-year design studios are structured to permit research and application of the concentration focus.

## BACHELOR OF LANDSCAPE ARCHITECTURE

- ☐ 60 units upper division                      ☐ GWR  
☐ 2.0 GPA    ☐ USCP

\* = Satisfies General Education requirement

## MAJOR COURSES

LA 110 Graphic Comm for Landscape Architects ..	3
LA 111 Three Dimensional Graphics for Landscape Architects .....	4
LA 114 Landscape Analysis and Planning .....	4
LA 201 Survey of Landscape Architecture .....	2
LA/BOT 221 Native Plants for Landscape Arch. or EHS 381 Native Plants for Calif. Landscapes .....	3
LA 231 Landscape Architecture Construction .....	3
LA 251 Fundamentals of Design and Planning in Landscape Architecture .....	4
LA 252 Fundamentals of Site Planning and Design	4
LA 253 Applied Design and Planning Fundamentals.	5
LA 300 Internship .....	3
LA 310 Intro to Computing in Landscape Architecture .....	2
LA 311 History of Landscape Architecture .....	4

LA 320 Design Theory for Landscape Architects....	3
LA 321 Concepts in Environmental Decision Making.....	3
LA 323 History of Twentieth Century Landscape Architecture .....	4
LA 351, 352, 353 Design for Landscape Architects.....	5,5,6
LA 401 Research Project .....	1
LA 441, 442 Professional Practice I, II.....	2,2
LA 451 Regional Landscape Assessment .....	6
LA 452 Urban Design for Landscape Architects .....	5
LA 454, 455, 456 Design for Landscape Architects.....	4,4,4
LA 461 Senior Design Project .....	5
LA 464 Senior Seminar .....	1,1,1
Concentration, minor or individualized course of study .....	18
	<b>121</b>

**SUPPORT COURSES**

ARCE 311 Structures for Landscape Architects.....	3
ARCH 217/218/219 History of Architecture (C3)*	4
BIO 114 Plant Diversity and Ecology <i>or</i> BOT 121 General Botany (B2 & B4)* .....	4
BIO 227 Wildlife Conservation Biology .....	4
BRAE 237 Engineering Surveying I.....	2
BRAE 337 Landscape Irrigation .....	3
CM 325 Construction Management Practice .....	3
CRP 212 Introduction to Urban Planning .....	4
EDES 101 Intro Architecture & Env Design .....	2
EHS 231 Plant Materials .....	4
EHS 232 Plant Materials .....	4
MATH 118 Pre-Calculus Algebra (B1)* .....	4
MATH 119 Pre-Calculus Trigonometry .....	4
SS 121 Introductory Soil Science .....	4
STAT 217 Intro to Statistical Concepts and Methods <i>or</i> STAT 218 Appl Statistics/Life Sciences (B1)* .....	4
	<b>53</b>

**GENERAL EDUCATION (GE)**

72 units required; 16 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing.....	4

**Area B Science and Mathematics (4 units)**

B1 Mathematics/Statistics * 8 units in Support...	0
B2 Life Science * 4 units in Support .....	0
B3 Physical Science .....	4
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (16 units)**

C1 Literature .....	4
C2 Philosophy .....	4

C3 Fine/Performing Arts * 4 units in Support....	0
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)**

(4 units) .....	4
	<b>56</b>

**ELECTIVES**

<b>6</b>
<b>236</b>

**CONCENTRATION OR INDIVIDUALIZED COURSE OF STUDY (select one)****Environmental Design**

LIB 302 Library Resources and Literature Searches .....	1
LA 483 Special Studies in Landscape Architecture <i>or</i> Upper division advisor approved electives .....	12
Advisor approved electives .....	5
	<b>18</b>

**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
Advisor approved electives .....	6
	<b>18</b>

**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
Advisor approved electives .....	6
	<b>18</b>

**Individualized Course of Study .....**

18  
Students have the option of choosing one of the above concentrations or they may take 18 advisor approved electives.

**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 advisor and the current Class Schedule.*

1st Year		
Fall	Winter	Spring
LA 110	LA 111	LA 114
EDES 101	MATH 119	BIO 114/BOT 121
MATH 118		SS 121
2nd Year		
Fall	Winter	Spring
LA 251	LA 231	LA 253
LA 201	LA 252	LA 310
ARCH 217/218/219	LA 311	LA 323
BIO 227	BRAE 237	EHS 231
3rd Year		
Fall	Winter	Spring
LA 320	LA 441	LA 353
LA 351	LA 352	LA 321
ARCE 311	BRAE 337	CM 325
EHS 232	CRP 212	
	LA 221/EHS 381	
Summer: LA 300		
4th Year		
Fall	Winter	Spring
LA 451	LA 452	LA 442
		LA 461
		LA 401
		STAT 217/218
5th Year		
Fall	Winter	Spring
LA 464	LA 464	LA 464
LA 454	LA 455	LA 456
Major concentration	Major concentration	Major concentration
Major concentration	Major concentration	Major concentration

**MBA, LANDSCAPE ARCHITECTURE MANAGEMENT TRACK**

This program is available only to students who are enrolled in Cal Poly's Bachelor of Landscape Architecture (BLA) program. Students may request permission to enroll in MBA courses during their fourth and fifth years of study. This request should be submitted to the Orfalea College of Business as soon as possible and no later than July 1 of the academic year that the student plans to begin taking MBA courses. Upon completion of the BLA degree, students are eligible to formally apply to the University for graduate student status in the MBA program. Students who fulfill all the requirements will first receive the BLA and then the MBA.

**Core Phase (48)**

GSB 510 The General Manager I.....	12
GSB 512 Quantitative Analysis (or approved substitute).....	4
GSB 520 The General Manager II.....	12
GSB 530 The General Manager III .....	8
GSB 540 The General Manager IV .....	8
Elective selected from:	
GSB 567, 569, 578, 587; BUS 410, 427, 446; ECON 401; or AGB 563.....	4

**Emphasis Phase (51)**

LA 464 Senior Seminar.....	1,1,1
LA 454, 455, 456 LA Design Studio.....	4,4,4
Approved electives .....	36
Electives must include one approved internationally based course	

99

A comprehensive examination is included in GSB 540, The General Manager IV.

**BLENDED BACHELOR OF LANDSCAPE ARCHITECTURE/MASTER OF CITY AND REGIONAL PLANNING PROGRAM (BLA/MCRP)**

The blended BLA/MCRP Program is an accelerated route to the graduate professional degree in City and Regional Planning. Under this program a student can simultaneously graduate with a BLA and MCRP. Students shall meet the minimum eligibility requirements for a blended degree set down in the university catalog, complete a planning internship and the required MCRP classes. An updated list pertaining to which courses can be counted in the program is available from the City and Regional Planning Department. Students choosing this program shall make a request for admission to the department head. The CRP department head or graduate coordinator makes a determination of eligibility.

MCRP courses for the blended degree include: CRP 420, 510, 516, 518 or 513, 520, 525, 530, 552, and 554.



The Orfalea College of Business encourages socially responsible leadership through personal interaction with faculty advisors and mentors. The college also supports and encourages extracurricular professional organizations and community service.

*Photo courtesy of Orfalea College of Business*

### **Mission Statement**

The Orfalea College of Business challenges highly motivated students to become tomorrow's socially responsible business leaders through a learn-by-doing, technology-oriented education.

Orfalea College of  
*Business*

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# Orfalea College of *Business*

**Teresa (Terri) A. Swartz, (Interim) Dean**  
**Douglas C. Cerf, Associate Dean**  
**Vivian J. Rodriguez, Director of Advancement**  
**Leslie A. McKinley, Director, College and Alumni Relations**  
**Business Bldg. (03), Room 455**  
**805 756-2704**

<b><u>Area/Contact</u></b>	<b><u>Bachelor of Science Degrees:</u></b>
	Business Administration, BS
	<i>Concentrations:</i>
Accounting .....	Accounting Information Systems
	Enterprise Accounting
	Public Accounting
Finance .....	Financial Management
Management .....	Human Resource Management
	International Business Management
	Management Information Systems
Marketing.....	Marketing Management
Associate Dean ....	Independent Course of Study
Economics .....	Economics, BS
	<i>Concentrations:</i>
	Business and Industrial Economics
	International Trade and Development
	Independent Course of Study
Industrial .....	Industrial Technology, BS
Technology	

<b><u>Area/Contact</u></b>	<b><u>Minors:</u></b>
Advising .....	Business
Center	
Economics .....	Economics
Industrial.....	Integrative Technology
Technology	Packaging

<b><u>Area/Contact</u></b>	<b><u>Graduate Programs:</u></b>
Graduate .....	Business Administration, MBA
Management	General MBA
Programs	Agribusiness Specialization
	Architectural Management Track
	Bachelor of Architecture, MBA
	Engineering Management
	MBA & MS Engineering
Industrial .....	Industrial and Technical Studies, MS
Technology	

## **Mission Statement**

The Orfalea College of Business challenges highly motivated students to become tomorrow's socially responsible business leaders through a learn-by-doing, technology-oriented education.

## **Amplification of Strategic Concepts/Phrases**

... challenges highly motivated students:

- Committed to rigorous, relevant courses taught by dedicated, professionally-active faculty
- Committed to students actively involved in their education
- Committed to education occurring both inside and outside the classroom
- Committed to significant faculty-student interaction

... to become tomorrow's socially responsible business leaders:

- Emphasis on having a positive impact on society
- Emphasis on having ethical leaders and role models
- Emphasis on working in a diverse, dynamic business environment
- Emphasis on integration of knowledge
- Development of team skills
- Preparation for careers
- Preparation for lifelong learning

... through a learn-by-doing, technology-oriented education:

- Emphasizes an understanding of the influence and uses of technology in business
- Emphasizes technology-based business decision-making
- Identifies the need to forge partnerships between the College and industry
- Focuses on applied scholarship (AACSB defined)
- Leverages the technological competencies of other colleges at Cal Poly

## Shared Values

- Honesty and Integrity
- Openness and cooperation
- Mutual respect and collegiality
- Students as individuals
- Student-centered teaching and learning
- Quality teaching
- Flexible thinking and innovation
- Learn-by-doing
- Diversity in people and ideas
- Quality scholarship

The BS degree program in Business Administration and the Master of Business Administration are accredited by the AACSB—The International Association to Advance Collegiate Schools of Business. The BS degree program in Industrial Technology is accredited by the National Association of Industrial Technology (NAIT). The objective of accreditation is to foster high quality educational programs.

The college is organized into seven areas: Accounting, Economics, Finance, Industrial Technology, Marketing, Management and Graduate Management Programs. This organizational structure allows for programs of study that blend broad-based knowledge of the functional disciplines of Business and Economics with an in-depth study of particular discipline(s).

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 challenge highly motivated students to become tomorrow's socially responsible business leaders through a learn-by-doing technology oriented education. 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.

## Advising Center

**Elizabeth Ahten-Anderson, Academic Advisor**

**Kris McKinlay, Academic Advisor**

**Jodi Stiegemeier, Academic Advisor**

**Business Bldg. (03), Room 100**

**805 756-2601**

The Orfalea College of Business Advising Center provides academic advising services to all majors within the College in conjunction with each student's faculty

advisor. The Advising Center is open five days a week, eight hours per day during the quarter.

Faculty advisors provide information on course content, career planning, and specific areas of the concentration. Students may also seek information concerning graduate schools, co-ops, internships, and future jobs. Faculty advisors are assigned by the student's area office or by the student's concentration.

The Advising Center provides advice and clarification of university and college policies and procedures. Academic and administrative progress of all Orfalea College of Business students is monitored within the Advising Center. Students who are interested in the Business, Economics, or Packaging minors are also assisted here. Most student-related forms (such as curriculum substitution forms, withdrawal forms, and change of major forms) are processed in the Advising Center. Advisors are available by appointment to assist students with course scheduling. A majority of questions concerning general education and breadth and interpretation of transfer credit may be answered in the Advising Center upon the student's receipt of the initial evaluation provided to the student by the Evaluations Office.

Each Orfalea College of Business student has a file in the Advising Center which is maintained in order to track the student's progress. Student evaluations, file information, and SIS+ (the Cal Poly student information database) are used for general advising purposes including: tracking student degree progress, monitoring student's grade point averages, verifying satisfaction of the Graduation Writing Requirement and United States Cultural Pluralism requirement, and on-course pre-graduation completion checks.

This office houses a wealth of information for students, including curriculum sheets and flowcharts for all College of Business majors, information on minors, articulation agreements, petitions and substitution forms, faculty directory information (including office numbers, office hours, telephone numbers, and e-mail addresses) and updates on course offerings and finals schedules. The Advising Center staff is available to answer most university and college questions or refer the student to the appropriate service on campus.

## Transfer Students

Transfer students to the Orfalea College of Business should refer to the curricula listed for the appropriate major. Please note that all lower division courses may be completed at most California Community Colleges. Full time students who have successfully completed all lower division courses prior to transferring to the College of Business can usually anticipate graduating in six to eight quarters.

# Bachelor of Science Degree Programs

**BS Business Administration**

**BS Economics**

**BS Industrial Technology**

## BS BUSINESS ADMINISTRATION

This program provides students with the knowledge and analytical skills essential for employment in all sectors of business and industry, as well as for managerial careers in governmental and other non-profit organizations.

Opportunities for specialization are provided for students preparing for careers in accounting, financial management, marketing management, management information systems, international business management, general management, and human resources management.

The Business Administration degree program consists of five components: Major, Concentration, Support, General Education, and Electives.

☐ 60 units upper division      ☐ GWR

☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

Note: No major, support or concentration courses may be taken as credit/no credit.

### MAJOR COURSES

BUS 207 Business Law .....	4
BUS 214 Financial Accounting .....	5
BUS 215 Managerial Accounting .....	4
BUS 342 Fundamentals of Corporate Finance .....	4
BUS 346 Principles of Marketing .....	4
BUS 371 Production and Operations Management .....	4
BUS 387 Organizational Behavior .....	4
BUS 391 Management Information Systems .....	4
BUS 401 Business Strategy and Policy Seminar .....	4
BUS 404 Govt/Social Influences on Business .....	4
<i>International business. Select one:</i>	
BUS 303, 402, 407, 410, 427, 433, 446; ECON 401 .....	4
BUS 461 Senior Project .....	2
BUS 462 Senior Project .....	2
Concentration courses (see following pages) .....	28-32
	<b>77-81</b>

### SUPPORT COURSES

ECON 221 Microeconomics .....	4
ECON 222 Macroeconomics (D2)* .....	4
ECON elective (300-400 level) .....	4
MATH 221 Calculus for Business and Econ (B1)* .....	4
STAT 251 Statistical Inference-Mgmt. I (B1)* .....	4
STAT 252 Statistical Inference-Mgmt. II .....	5
	<b>25</b>

## GENERAL EDUCATION (GE)

72 units required; 12 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

### Area A Communication (12 units)

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

### Area B Science and Mathematics (8 units)

B1 Mathematics/Statistics * 8 units in Support .....	0
B2 Life Science .....	4
B3 Physical Science .....	4
B4 One lab taken with either a B2 or B3 course	

### Area C Arts and Humanities (20 units)

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4) ..	4

### Area D/E Society and the Individual (16 units)

D1 The American Experience (40404) .....	4
D2 Political Economy * 4 units in Support .....	0
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

### Area F Technology Elective (upper division) (4 units)

	4
	<b>60</b>

<b>ELECTIVES</b> .....	<b>20-24</b>
	<b>186</b>

# Accounting

**Business Bldg. (03), Room 403**  
**805 756-1384**

## Area Chair, Mary Beth Armstrong

James A. Anderson	M. Zafar Iqbal
Dan Bertozzi, Jr.	Roberta A. Jones
Lee B. Burgunder	Earl C. Keller
Chris Carr	Kathryn A. S. Lancaster
Janice L. Carr	Charles R. (Tad) Miller
Douglas C. Cerf	John C. (Jack) Robison

The primary objectives of the Accounting Area are to:  
 1) provide students within the Orfalea 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.

## ACCOUNTING INFORMATION SYSTEMS CONCENTRATION

This concentration prepares students for careers which require skills in both accounting and information technology. In addition to basic accounting knowledge, it provides students knowledge about information systems.

BUS 320 Taxation of Business Entities.....	4
BUS 321 Intermediate Accounting I.....	4
BUS 322 Intermediate Accounting II.....	4
BUS 429 Accounting Process Analysis.....	4
Twelve units of advisor approved electives from the following courses:.....	12
Any 400 level MIS elective	
BUS 412 Advanced Managerial Accounting (4)	
	28

## ENTERPRISE ACCOUNTING CONCENTRATION

This concentration prepares students for careers in government or private industry. In addition to basic accounting knowledge, it is designed to provide students an integrated view of how the accounting function supports business processes.

BUS 320 Taxation of Business Entities.....	4
BUS 321 Intermediate Accounting I.....	4
BUS 322 Intermediate Accounting II.....	4
BUS 412 Advanced Managerial Accounting.....	4
BUS 429 Accounting Process Analysis.....	4
Eight units of advisor approved electives from the following courses:.....	8
Any 400 level Accounting elective	
Any 400 level Finance elective	
BUS 482 Advanced Operations Management (4)	
BUS 488 Small Business Management (4)	
	28

## PUBLIC ACCOUNTING CONCENTRATION

This program prepares students for careers in public accounting.

BUS 320 Taxation of Business Entities.....	4
BUS 321 Intermediate Accounting I.....	4
BUS 322 Intermediate Accounting II.....	4
BUS 429 Accounting Process Analysis.....	4
BUS 420 Advanced Financial Reporting	
or BUS 425 Auditing.....	4
Eight units of electives from any 400 level Accounting elective.....	8
	28

## Finance

**Business Bldg. (03), Room 402  
805 756-1384**

**Area Chair, Kenneth D. Riener**

John Dobson  
Larry R. Gorman  
Cyrus Ramezani

Luc Soenen  
Alan M. Weatherford

The finance area prepares students for successful careers in financial services as well as the corporate world. Business finance courses examine the role of the financial manager as it applies to a small company as well as a multinational firm. In other finance courses, students are provided with a thorough understanding and working knowledge of the many aspects related to the finance function, as well as skills required for successful careers in the financial services.

The area also offers a financial planning pathway for students who wish to pursue careers in financial services. The financial planning curriculum has been certified by the Certified Financial Planner Board of Standards, Inc., and students who complete this pathway are qualified to take the Board's Certification Examination.

### FINANCIAL MANAGEMENT CONCENTRATION

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, personal financial planning, 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.

Students interested in careers in financial services industry may pursue a financial planning emphasis within this concentration. To pursue this pathway students select their finance electives from course offerings in the area of personal finance, insurance planning, and estate and retirement planning.

BUS 321 Intermediate Accounting I .....	4
BUS 431 Security Analysis and Portfolio Mgmt.....	4
BUS 433 International Business Finance Mgmt.....	4
BUS 443 Case Studies in Finance .....	4
Advisor approved electives .....	12

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## Management

**Business Bldg. (03), Room 405  
805 756-2012**

**Area Chair, James Sena**

Joseph Biggs  
Rebecca Ellis  
Barry Floyd  
Colette Frayne  
J. Michael Geringer  
Kenneth A. Griggs  
Eldon Y. Li

Terri Lituchy  
Patricia A. McQuaid  
David A. Peach  
William Pendergast  
A. B. (Rami) Shani  
Michael W. Stebbins  
Rosemary Wild

The Management Area offers coursework in organization behavior, human resources management, management information systems, operations management, management science, and entrepreneurship. The Area objectives include: 1) to provide students with knowledge, skills, and competencies critical to managerial success in small and complex organizations; 2) to prepare students for initial employment and subsequent management career advancement; 3) to help professionally oriented students use theory, concepts, analytical tools, and problem solving techniques; and 4) to provide experiences that integrate functional business knowledge.

The Management Area includes the following concentrations: Human Resources Management, Management, Management Information Systems.

### HUMAN RESOURCES MANAGEMENT CONCENTRATION

This concentration prepares students for entry and advanced positions in human resource management. It develops knowledge and core competencies in staffing, employee training and development, and compensation, while concentration electives allow students to pursue advanced coursework in human resource information systems, labor relations and contract negotiations, labor law or organization development.

BUS 384 Human Resources Management.....	4
BUS 471 Compensation.....	4
BUS 475 Staffing.....	4
BUS 476 Employee Training and Development.....	4
Advisor approved electives.....	16
	32

**INTERNATIONAL BUSINESS MANAGEMENT  
CONCENTRATION**

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.

BUS 302 International Cross Cultural Mgmt. ....	4
BUS 402 International Business Management .....	4
BUS 403 Adv. Seminar in International Mgmt. ....	4
Eight units from the following courses: .....	8
BUS 303, 311, 407, 410, 433, 446; ECON 401, 405	
Eight units from the following courses:.....	8
BUS 303, 308, 311, 405, 406, 407, 410, 430, 433, 446, 488; ECON 304, 325, 401, 405; AGB 307, 318; ANT 450; GEOG 308	

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 28
**MANAGEMENT CONCENTRATION**

This concentration prepares students for supervisory and staff positions in both small and large enterprises. Students focus on small business management and entrepreneurship subjects or select a course of study tailored to their particular industry and occupational goals.

BUS 382 Organization and Management Theory.....	4
BUS 478 Organization Design .....	4
BUS 494 Small Business Information Systems.....	4
Select one emphasis area: .....	16

*Management Consulting Emphasis*

BUS 477 Organization Development and  
Change (4)

BUS 483 Managerial Consultation (4)

Advisor approved electives (8)

*Program Management Emphasis*

BUS 480 Operations Management and Control (4)

BUS 487 Quality Management (4)

Advisor approved electives (8)

*Entrepreneurship Emphasis*

BUS 320 Taxation of Business Entities (4)

BUS 488 Small Business Management (4)

Advisor approved electives (8)

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 28
**MANAGEMENT INFORMATION SYSTEMS  
CONCENTRATION**

The MIS concentration is a blend of computer science and business information systems knowledge. Students gain competencies in computer programming, analysis, design, and implementation of information systems. At graduation, students pursue diverse management and MIS opportunities within corporations and consulting firms.

CSC 101 Fundamentals of Computer Science I.....	4
CSC 102 Fundamentals of Computer Science II .....	4
BUS 390 Business Data Structures <i>or</i> CSC 103 Fundamentals of Computer Science III ... (for Computer Science minor)	4
BUS 393 Database Systems in Business.....	4
BUS 394 Systems Analysis and Design .....	4
BUS 395 Systems Design and Implementation .....	4
Advisor approved electives.....	8

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## Marketing

**Business Bldg. (03), Room 405  
805 756-1413**

### Area Chair, Norm A. Borin

Jeffrey Danes

R. Krishnan

Lynn E. Metcalf

John Rogers

Teresa (Terri) Swartz

Brian Tietje

The objective of the Marketing Area is twofold: 1) to prepare students for rewarding careers in marketing, and 2) to provide non-marketing students with a basic understanding of marketing and its role in business. At the heart of marketing is a customer-focus; the same is true of the Area and its faculty. The marketing faculty is very student-oriented and is committed to helping students develop the skills necessary to successfully transition from the academic environment to the business world. The Area offers classes in the undergraduate and graduate degree programs offered through the College and works to tailor its courses to meet student needs.

### MARKETING MANAGEMENT CONCENTRATION

This concentration emphasizes coursework in a variety of areas including marketing research, buyer behavior, promotion, sales management, product management and services marketing. Graduates are in demand for positions in marketing intelligence, research, advertising, product management and sales management.

BUS 347 Marketing Information and Analysis .....	4
BUS 348 Buyer Behavior .....	4
BUS 455 Marketing Management .....	4
Electives selected from: BUS 349, 446, 447, 448, 449, 450, 452, 454, 457, 458, 470 .....	16

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## Independent Course of Study

**Business Bldg. (03), Room 100  
805 756-2601**

### Area Coordinator: Associate Dean and Director of Undergraduate Programs

Students have the option of choosing one of the previously mentioned concentrations or 28 units of advisor approved electives selected according to individual talents and interests. This option allows students to blend courses from a variety of areas to achieve specific career objectives.

# Economics

**Business Bldg. (03), Room 407**  
**805 756-2783**

## Area Chair: Alden Shiers

George L. Beardsley, Jr.      Panagiotis Papakyriazis  
 Phillip Fanchon              Daniel J. Villegas  
 Timothy W. Kersten          Daniel P. Williamson  
 Michael L. Marlow

The Economics degree program prepares 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. The program also prepares students to undertake graduate study in economics, law, business administration and related fields in the social sciences. The Economics Area supports the concept of international education and encourages its students to investigate opportunities for overseas study.

## BS ECONOMICS

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA                      ☐ USCP

\* = Satisfies General Education requirement

*Note: No major, support or concentration courses may be taken as credit/no credit.*

## MAJOR COURSES

ECON 221 Microeconomics .....	4
ECON 222 Macroeconomics (D2) * .....	4
ECON 310 Quantitative Methods in Economics....	4
ECON 311, 312 Intermediate Microeconomics .....	4,4
ECON 313, 314 Intermediate Macroeconomics ....	4,4
ECON 337 Money, Banking and Credit .....	4
ECON 339 Econometrics .....	4
ECON 417 Development of Economic Analysis...	4
ECON 461 Senior Project .....	2
ECON 462 Senior Project .....	2
Restricted electives to be selected from:	
ECON 205, 303, 304, 322, 324, 340, 403, 404, 405, 406, 410, 413, 431, 432, 433, 434 .....	8
Concentration courses or advisor approved electives .....	24
	<b>76</b>

## SUPPORT COURSES

BUS 207 Business Law .....	4
BUS 214 Financial Accounting .....	5
BUS 215 Managerial Accounting .....	4
MATH 221 Calculus-Business & Econ. (B1)* .....	4
STAT 251 Statistical Inference-Mgmt I (B1)* .....	4
STAT 252 Statistical Inference-Mgmt II .....	5
	<b>26</b>

## GENERAL EDUCATION (GE)

72 units required; 12 units are in Major/Support.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

## Area A Communication (12 units)

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

## Area B Science and Mathematics (8 units)

B1 Mathematics/Statistics * 8 units in Support .....	0
B2 Life Science .....	4
B3 Physical Science .....	4
B4 One lab taken with either a B2 or B3 course	

## Area C Arts and Humanities (20 units)

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4) ..	4

## Area D/E Society and the Individual (16 units)

D1 The American Experience (40404) .....	4
D2 Political Economy * 4 units in Major .....	0
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

## Area F Technology Elective (upper division)

(4 units) .....	4
	<b>60</b>

<b>ELECTIVES</b> .....	<b>24</b>
	<b>186</b>

## Curricular Concentrations

Economics majors may take any concentration offered by the Orfalea 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 Advisor Approved Electives in place of a concentration.

### BUSINESS AND INDUSTRIAL ECONOMICS CONCENTRATION

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.

ECON 403 Industrial Organization .....	4
ECON 406 Applied Forecasting.....	4
ECON 413 Labor Economics .....	4
BUS 382 Organization and Management Theory .....	4
Advisor approved electives .....	8
	<hr/> 24

### INTERNATIONAL TRADE AND DEVELOPMENT CONCENTRATION

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.

ECON 325 Economics of Development and Growth..	4
ECON 404 International Trade Theory .....	4
ECON 405 International Monetary Economics .....	4
Select one: BUS 402, 410, 433, 446, ECON 304 .....	4
Advisor approved electives .....	8
To be selected from upper division courses with BUS prefix, or any other discipline with approval of advisor.	
	<hr/> 24

## INDEPENDENT COURSE OF STUDY

Students have the option of choosing one of the above mentioned concentrations or 24 units of advisor 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.

Students select courses with advisor approval..... 24

# Industrial Technology

**Business Bldg. (03), Room 409**  
**805 756-2676**

## Area Chair, James Sena

Fred Abitia	Roger Keep
Clifford S. Barber	Lezlie A. Labhard
Cynthia A. Crother	Anthony J. Randazzo
Larry W. Gay	

The BS in Industrial Technology emphasizes preparation for technical leadership responsibilities with a broad variety of industries including manufacturing, communication, transportation and utility services. Students who enjoy working with people in solving technical problems are particularly well-suited for careers in industrial technology. Through the selection of appropriate electives, students may prepare for professions in industrial sales, marketing, training, production, quality, facilities, and packaging.

## BS INDUSTRIAL TECHNOLOGY

- |  |                               |
|--|-------------------------------|
| <input type="checkbox"/> 60 units upper division | <input type="checkbox"/> GWR  |
| <input type="checkbox"/> 2.0 GPA                 | <input type="checkbox"/> USCP |

\* = Satisfies General Education requirement

*Note: No major, support or concentration courses may be taken as credit/no credit.*

### MAJOR COURSES

IT 137 Electronic Systems .....	4
IT 150 Mechanical Systems .....	4
IT 260 Manufacturing Processes .....	4
IT 303 Industrial Quality Assurance .....	4
IT 326 Product Evaluation .....	4
IT 327 Plastics Technology .....	4
IT 329 Industrial Materials .....	4
IT 330 Fundamentals of Packaging .....	4
IT 332 Electrical Power Systems .....	4
IT 333 Introduction to CAD and MIS .....	4
IT 350 Electrical and Mechanical Controls .....	4
IT 402 Technical Presentations .....	4
IT 407 Applied Industrial Operations .....	4
IT 410 Industrial Planning .....	4
IT 411 Industrial Safety and Health Management ...	4
IT 428 Industrial Strategies .....	4
IT 461 Senior Project .....	3
Advisor approved electives .....	16
<hr/>	
	83

### SUPPORT COURSES

BUS 214 Financial Accounting .....	5
BUS 215 Managerial Accounting .....	4
BUS 346 Principles of Marketing .....	4

CHEM 110 World of Chemistry - Essentials or CHEM 111 Survey of Chemistry (B3 & B4)* .....	4/5
ECON 201 Survey of Economics (D2)* .....	4
MATH 141/221 Calculus (B1)* .....	4
PHYS 121, 122 College Physics .....	4,4
STAT 217 Intro to Statistical Concepts and Methods or STAT 218 Appl. Statistics-Life Sciences (B1)* .....	4
<hr/>	
	37/38

## GENERAL EDUCATION (GE)

72 units required; 16 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

### Area A Communication (12 units)

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

### Area B Science and Mathematics (4 units)

B1 Mathematics/Statistics * 8 units in Support .....	0
B2 Life Science .....	4
B3 Physical Science * 4 units in Support .....	0
B4 One lab taken with either a B2 or B3 course	

### Area C Arts and Humanities (20 units)

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4) ..	4

### Area D/E Society and the Individual (16 units)

D1 The American Experience (40404) .....	4
D2 Political Economy * 4 units in Support .....	0
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

### Area F Technology Elective (upper division)

(4 units) .....	4
<hr/>	
	56

ELECTIVES .....	9/10
<hr/>	
	186

# Academic Minors

## Business Economics

## Integrative Technology Packaging

### Business Minor

College Advising Center  
Business Bldg. (03), Room 100  
805 756-2601

This 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 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 while satisfying specified academic performance standards in all minor courses.

**Prerequisites.** The following courses must be taken *before* admission to the minor.

BUS 207 Business Law (4)  
BUS 212 Financial Accounting-Nonbusiness Majors (4)  
or BUS 214 Financial Accounting (5)  
ECON 221 Microeconomics (4)  
ECON 222 Macroeconomics (D2) (4)  
MATH 221 Calculus for Business and Economics (B1) (4)  
or MATH 141 Calculus I (4)  
STAT 251 Statistical Inference for Management I (B1) (4)  
STAT 252 Statistical Inference for Management II (B1) (5)

Required courses	Units
BUS 215 Managerial Accounting .....	4
BUS 342 Fundamentals of Corporate Finance.....	4
BUS 346 Principles of Marketing .....	4
BUS 391 Management Information Systems .....	4
Select three: BUS 371, 382, 384, 387 .....	12
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### Economics Minor

Economics  
Business Bldg. (03), Room 407  
805 756-2783

This minor is designed to give students from other majors a general competency in economics. Students are encouraged to meet with the advisor of the Economics Minor to develop a course of study that complements their major curriculum. For more information, contact the Economics Area office.

	Units
<b>Required courses</b> .....	8
ECON 221 Microeconomics (4)	
ECON 222 Macroeconomics (4) (D2)	
<b>Electives</b> .....	16
Any other courses offered by the Economics Area (except ECON 201) to complete the minimum requirement of 24 units.	
	<hr/> 24

### Environmental Studies Minor

Please see the College of Science and Mathematics for more information on this interdisciplinary minor.

## Integrative Technology Minor

**Industrial Technology**  
**Business Bldg. (03), Room 409**  
**805 756-2676**

This minor is an interdisciplinary program. 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.

	<i>Units</i>
<b>Technology and Issues (Required courses).....</b>	<b>12</b>
IT 301 Technology Issues: Metals Manufacturing and Society (4)	
PSY 494 Psychology of Technological Change (4)	
BUS 311 Managing Technology in the International Legal Environment (4)	
<b>Materials and Processes electives (select three) .....</b>	<b>12</b>
IT 137 Electrical Systems (4)	
IT 150 Mechanical Systems (4)	
IT 260 Manufacturing Processes (4)	
IT 329 Industrial Materials (4)	
IT 330 Fundamentals of Packaging (4)	
IT 333 Introduction to CAD and MIS (4)	
IT 336 Textiles Technology (4) (Area F)	
IT 341 Plastics Processes and Applications (4)	
IT 411 Industrial Safety and Health (4)	
<b>Management elective (select one).....</b>	<b>4</b>
BUS 371 Production Operations Management (4)	
BUS 381 Industrial Management (4)	
BUS 382 Organization and Management Theory (4)	
BUS 383 Industrial Relations (4)	
IT 303 Industrial Quality Assurance (4)	
IT 428 Industrial Strategies (4)	
<b>Humanities and Social Issues (select one) .....</b>	<b>3</b>
HUM 303 Values and Technology (4)	
IME 319 Human Factors (3)	
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## Packaging Minor

**Industrial Technology**  
**Business Bldg. (03), Room 409**  
**805 756-2676**

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.

<b>Required courses .....</b>	<b>15-17</b>
CHEM 110 World of Chemistry - Essentials (4)	
or CHEM 111 Survey of Chemistry (5) (B3 & B4)	
FSN 230 Elements of Food Processing (4)	
or FSN 334 Food Packaging (3)	
IT 330 Fundamentals of Packaging (4)	
or IT 408 Corrugated Protective Packaging (4)	
PHYS 104 Introductory Physics (B3) (4) or	
PHYS 121 College Physics (B3&B4) (4)	
<b>Advisor approved electives.....</b>	<b>10-12</b>
<i>Select three courses from the following list. Two must be 300 level or above to be selected with advisor's approval. Note: Students cannot double-count electives with the above required courses.</i>	
FSN 335 Food Quality Assurance (4)	
FSN 354 Packaging Function in Food Processing (3)	
GRC 211 Substrates and Inks (4)	
GRC 337 Consumer Packaging (3)	
IT 327 Plastics Technology (4)	
IT 330 Fundamentals of Industrial Packaging (4)	
IT 375 Packaging Material and Product Testing (4)	
IT 400 Special Problems (2)	
IT 408 Protective Packaging (4)	
IT 409 Machinery for Packaging (4)	
IT 435 Package Development (4)	

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# Graduate Programs

## Master of Business Administration

**Barry Floyd, Director**  
**Graduate College of Business Programs**  
**Business Bldg. (03), Room 107**  
**805 756-2637**

### General Characteristics

Cal Poly's MBA programs are designed to prepare students to enter successful management positions in industry, government, and not-for-profit organizations. The programs give graduates a broad management background plus a career-oriented emphasis. This dual focus is accomplished by dividing the programs into two phases: A core phase and an emphasis phase. Cal Poly's MBA programs are 96–99-quarter-unit programs. The core phase has 48 quarter units of GSB/BUS/AGB courses. The emphasis phase consists of 48 to 51 quarter units of approved focused courses.

During the core phase, students acquire knowledge of functional business management areas, including accounting, economics, finance, government and society, information systems, international business, management science, marketing, organization behavior, production and operations management, statistics, and strategy. Integration is a major theme during the spring quarters of both the first and second years of the program.

The mission of the core phase is to develop the functional knowledge and integrative system thinking capabilities of program participants.

The objectives of the MBA core phase are to:

- Cover the business functional areas in depth,
- Integrate the functional areas,
- Cover international/global issues and concepts at the general management level and at a specific functional level, and
- Provide a comprehensive integration of business management concepts at an enterprise level.

The emphasis phase consists of approved courses that develop depth in an area of study that is consistent with the student's career objectives. The area of study that the MBA student chooses to emphasize can be completed within the Orfalea College of Business, or by pursuing an approved program of study in other Cal Poly colleges. Graduate level emphasis areas that include other than GSB, BUS, or AGB courses can lead to dual degrees: an MBA and an MS or MA.

### Admission/Acceptance Requirements

Acceptance to the MBA programs is based upon:

- Successful completion of an accredited undergraduate program of study,
- Prior academic performance with particular 90 quarter units (or equivalent),
- Achievement on the Graduate Management Admission Test (GMAT), and
- Prior work experience.

### Programs of Study:

#### The General MBA

The general MBA program consists of a 48-quarter-unit core and an emphasis phase that is developed by selecting a focused group of advanced courses. Most of the emphasis phase courses will be offered by the Orfalea College of Business.

#### Core Phase (48)

GSB 510 The General Manager I.....	12
GSB 512 Quan. Analysis (or approved substitute)	4
GSB 520 The General Manager II.....	12
GSB 530 The General Manager III .....	8
GSB 540 The General Manager IV .....	8
Elective selected from:	
GSB 567, 569, 578, 587; BUS 410, 427, 446; ECON 401; or AGB 563.....	4

#### Emphasis Phase (48)

Approved electives .....	48
	96

**Certain limitations.** As a policy, MBA students:

- Will not be permitted to take more than two classes at the 400 level,
- Will be limited to a total of 8 quarter units of internship and/or co-op credits, and
- Will be limited to a total of 8 quarter units of independent study credits.

### 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 offered by the Agribusiness Department. The MBA with Specialization in Agribusiness 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.

#### Core Phase (48)

GSB 510 The General Manager I.....	12
GSB 512 Quan Analysis (or approved substitute) ...	4
GSB 520 The General Manager II .....	12
GSB 530 The General Manager III.....	8
GSB 540 The General Manager IV.....	8
AGB 563 Internatl Ag Trade: Cases and Theory .....	4

#### Specialization/Emphasis Phase (48)

AG 539 Grad Internship in Agriculture .....	4
AGB 514 Agribusiness Managerial Leadership and Communication .....	4
AGB 543 Agribusiness Policy and Program Anal. ...	4
AGB 554 Food System Marketing.....	4
AGB 555 Technological and Economic Change in Agribusiness .....	4
Approved electives .....	28
	96

#### MBA, Architectural Management Track

This program is available only to those students who are enrolled in Cal Poly's Bachelor of Architecture (BArch) program. Students may request permission to enroll in MBA courses during their fourth and fifth years of study. This request should be submitted to the Orfalea College of Business as soon as possible and no later than July 1 of the academic year that the student plans to begin taking MBA courses. Upon completion of the BArch degree, students are eligible to formally apply to the University for graduate student status in the MBA program. Students who fulfill all the requirements will first receive the BArch and then the MBA.

#### Core Phase (48)

GSB 510 The General Manager I.....	12
GSB 512 Quantitative Analysis (or approved substitute)	4
GSB 520 The General Manager II .....	12
GSB 530 The General Manager III.....	8
GSB 540 The General Manager IV.....	8
Elective selected from:	
GSB 567, 569, 578, 587; BUS 410, 427, 446; ECON 401; or AGB 563 .....	4

#### Emphasis Phase (51)

ARCH 521 Graduate Architectural Design Project or advisor approved elective.....	5,5,5
Approved electives .....	36
Electives must include one approved internationally based course	
	99

#### MBA, Landscape Architecture Management Track

This program is available only to students who are enrolled in Cal Poly's Bachelor of Landscape Architecture (BLA) program. Students may request permission to enroll in MBA courses during their fourth and fifth years of study. This request should be submitted to the Orfalea College of Business as soon as possible and no later than July 1 of the academic year that the student plans to begin taking MBA courses. Upon completion of the BLA degree, students are eligible to formally apply to the University for graduate student status in the MBA program. Students who fulfill all the requirements will first receive the BLA and then the MBA.

#### Core Phase (48)

GSB 510 The General Manager I.....	12
GSB 512 Quan Analysis (or approved substitute)...	4
GSB 520 The General Manager II.....	12
GSB 530 The General Manager III .....	8
GSB 540 The General Manager IV .....	8
Elective selected from:	
GSB 567, 569, 578, 587; BUS 410, 427, 446; ECON 401; or AGB 563.....	4

#### Emphasis Phase (51)

LA 464 Senior Seminar .....	1,1,1
LA 454, 455, 456 LA Design Studio.....	4,4,4
Approved electives .....	36
Electives must include one approved internationally based course	
	99

#### Other MBA/MS or MA/Dual Degree Options

The Orfalea College of Business will permit students to elect up to 48 approved quarter units of non-GSB/BUS/AGB course-work as part of the emphasis phase of the MBA program. This option offers graduate students the opportunity to simultaneously pursue an MBA degree in the Orfalea College of Business and an MA or MS degree in one of Cal Poly's other colleges.

**Two Formal Study Plans.** Two Formal Study Plans must be completed by dual-degree students. The plan for the MBA degree must include 48 GSB/BUS/AGB core units and 48 approved emphasis units. This plan must be approved by the Orfalea College of Business Director of Graduate Programs. The MS or MA plan must be completed for the MS or MA degree and must be approved by the advisor for that program.

#### Dual-Graduate-Degree Application Process.

Acceptance into both the MBA and MS or MA programs is a prerequisite to pursuing a dual-graduate-degree option. Students applying for admission to the EMP apply simultaneously for admission to both the Orfalea College of

Business MBA program and to the College of Engineering MS in Engineering program. Students pursuing a non-EMP dual-graduate-degree option must first apply for formal admission to one specific Cal Poly graduate program such as the MBA. After admittance into a specific graduate program, the student must process a "Postbaccalaureate Change of Objective" form for acceptance into the second graduate program. Students who have been accepted into two graduate programs can earn both graduate degrees (MBA and MS or MA) at the same time.

The Orfalea College of Business will apply the same criteria to all applicants who apply for acceptance to the MBA program, whether the application is through the formal Cal Poly admission process or through the Postbaccalaureate Change of Objective process.

## *Engineering Management, MBA & MS*

**Barry Floyd, Director**  
**Graduate College of Business Programs**  
**Business Bldg. (03), Room 107**  
**805 756-2637**

The dual-degree Engineering Management Program (EMP) is an interdisciplinary specialization linking the MBA and MS in Engineering degree programs. It is a cooperative effort between the Orfalea College of Business and the College of Engineering (Industrial and Manufacturing Engineering Department). Entering 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 Orfalea College of Business, and to be enrolled in both degree programs.

The program can be completed in 21 months. Successful participants will be awarded both MBA and MS in Engineering degrees, each with a specialization in Engineering Management.

The mission of the program is to develop "industry ready" graduates who will be facilitators of change and integrators of engineering, business, and people issues.

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.

### **Business courses (48)**

GSB 510 The General Manager I .....	12
GSB 520 The General Manager II .....	12
GSB 530 The General Manager III .....	8
GSB 540 The General Manager IV .....	8
(includes comprehensive examination)	
Approved GSB or BUS electives selected from:	
GSB 567, 569, 578, 587; BUS 410, 427, 446;	
ECON 401; AGB 563 .....	8

### **Engineering courses (45)**

IME 503 Applied Statistical Analysis for Engineers	4
IME 556 Technological Project Management .....	4
IME 557 Technological Assessment and Planning	4
IME 558 EMP Executive Seminars .....	4
IME 580 Manufacturing Systems .....	4
IME 575 Critical Technologies .....	4
IME 596 EMP Internship/Team Project .....	10/9
Approved Engineering electives .....	11/12
<b>Approved GSB/BUS or Engineering elective .....</b>	<b>4</b>
<b>97</b>	

**Formal Study Plan.** The Formal Study Plan for this dual degree must be approved by both the Orfalea College of Business Director of Graduate Programs and by the College of Engineering Advisor for the Engineering Management Program.

## *MS Industrial & Technical Studies*

**Anthony Randazzo, Coordinator**  
**Business Bldg. (03), Room 317**  
**805 756-1618**

### **General Characteristics**

The Master of Science in Industrial and Technical Studies (MSI&TS) program is designed to prepare students for critical "hands-on" positions in companies as operations-based facilitators. The program concentrates on developing graduates who will function successfully in technically focused industrial environments that are characterized by rapid and continual change.

The core of the program offers preparation in business-based decision tools, and technically-focused industrial processes and methods. Additional courses are taken to develop depth in a focus area that is designed to meet the student's career objectives.

## Admission Requirements

Admission to the MSI&TS program is based upon:

- (a) Successful completion of an accredited undergraduate program of study.
- (b) Prior academic performance, with particular emphasis placed on performance in the last 90 quarter units (or equivalent).
- (c) Achievement on the General Test of the Graduate Record Examination (GRE) or the Graduate Management Admission Test (GMAT).
- (d) Prior work experience.

## Program of Study

The MSI&TS is a 45-quarter-unit degree program with 29 units of core courses and 16 units of focus area courses.

Students can choose to focus in one of the following five areas of study:

Production Management,  
Facilities Management,  
Packaging Management,  
Quality Management, or  
Specially designed focus in Engineering,  
Science, or Business

The courses that make up the 29-unit core of the MSI&TS program provide students with background information and training to:

- Utilize accounting/economics/finance-based decision tools,
- Deal successfully with the impact of science and technology on industrial processes and methods,
- Improve productivity through the use of technology,
- Commercialize changed and new technologies,
- Understand and implement the impact of technology on business strategies, and
- Deal with the human and cultural issues that arise in technically focused industrial settings.

## Required core courses

BUS 501 Managerial Accounting and Managerial Economics I .....	5
BUS 502 Managerial Finance and Managerial Economics II .....	4
IT 510 Impact of Science and Technology .....	4
IT 512 Improving Productivity Through Technology .....	4
IT 514 Commercializing Technological Development .....	4
IT 520 Management of Technology .....	4
IT 527 Trends and Issues in Technology Management .....	4

## Focus area courses ..... 16

Must include IT 599 Industrial & Technical Studies Thesis or Project, or advisor-approved coursework and comprehensive examination.

If IT 599 is not selected, a comprehensive examination must be taken within one year after completion of courses. When this deadline is not met, IT 599 must be taken to fulfill the requirement of the degree. The time limit for completion of a thesis or project is three years.

Students are required to select at least three courses from one of the following focus areas plus a sufficient number of advisor approved electives (if necessary) to yield a total of 16 units.

### *Production Management*

BUS 472, 487; GSB 583; IME 555, 580, 575; IT 410, 428, 445, 522; 599

### *Facilities Management*

BUS 479, 480; IT 411, 451, 453, 454, 522, 599

### *Packaging Management*

GRC 437; IT 408, 435, 409, 599

### *Quality Management*

BUS 487; IME 430, 431, 440; IT 403, 599

### *Specially Designed Focus*

At least three advisor-approved electives must be selected to develop depth in an engineering, science, or business focus area (4,4,4), and IT 599

Students without sufficient prior academic technical training will be required to complete 15 units of approved courses prior to submitting a Formal Study Plan. This requirement is in addition to the 45-unit degree requirement.



### CubeSat and Deployer Designed and Prepared for Space Launch

Dr. Jordi Puig-Suari and students (below) at work in the new multidisciplinary Space Technology Laboratory. At present the main activity in the lab is performing extensive testing and preparation of Cal Poly's first CubeSat satellite, CP1, along with the CubeSat deployer known as the P-POD.



Aerospace engineering students (above, from left) Michelle Creedon, Isaac Nason, Nick Johansen and team leader, electrical engineering student Jake Schaffner, are part of the 20-member PolySat team aiming to launch the picosatellite (also known as a CubeSat), held by Nason, aboard a rocket at Vandenberg Air Force Base.

Cal Poly has been working with more than 20 other universities around the globe on the project, and has become the hub of the CubeSat program, an international small-satellite revolution.

### Cal Poly's SENVE Wins Water Treatment Competition

Cal Poly's Society of Environmental Engineers (SENVE) won the American Society of Civil Engineers (ASCE) Wastewater Treatment Competition with their water treatment systems designed within the theme of supplying drinking water on a desert island.

Two Cal Poly SENVE teams competed and placed 1<sup>st</sup> and 2<sup>nd</sup> at the competition held at the University of the Pacific. The two teams were classmates in a water filtration design course. To make the experience more realistic, students simulated washing ashore at Avila Beach.

As winners, the SENVE students have big plans for hosting the contest at Cal Poly this year.

*Dean Peter Lee (left) and Associate Professor Yarrow Nelson (right) with members of the team.*



College of  
*Engineering*

# College of *Engineering*

**Peter Y. Lee, Dean**  
**Paul E. Rainey, Associate Dean**  
**Daniel W. Walsh, Associate Dean**

**Engineering Bldg. (13), Room 266**  
**(805) 756-2131**

## ACADEMIC PROGRAMS

Aerospace Engineering .....	<i>BS*, MS</i>
BioResource & Agricultural Engineering ...	<i>BS*</i>
(College of Agriculture)	
Civil and Environmental Engineering .....	<i>MS</i>
Civil Engineering .....	<i>BS*</i>
Computer Engineering .....	<i>BS*</i>
Computer Science .....	<i>BS**, MS,</i>
	<i>Minor</i>
Electrical Engineering .....	<i>BS*, MS</i>
Engineering .....	<i>MS</i>
Engineering Management .....	<i>MBA/MS</i>
Environmental Engineering .....	<i>BS*</i>
General Engineering .....	<i>BS</i>
Industrial Engineering .....	<i>BS*, MS</i>
Manufacturing Engineering .....	<i>BS*</i>
Materials Engineering .....	<i>BS*</i>
Mechanical Engineering .....	<i>BS*, MS</i>
Multidisciplinary Design .....	<i>Minor</i>
Software Engineering .....	<i>BS</i>
Transportation Planning .....	<i>MCRP/MS</i>

\* Engineering programs accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 – telephone: (410) 347-7700.

\*\* BS Computer Science program accredited by the Computing Accreditation Commission of the Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 – telephone: (410) 347-7700.

Engineering and computer science programs at Cal Poly are strongly oriented toward preparing graduates for immediate entry into professional practice. Students declare their majors when they enter as freshmen, and they generally take at least one course in that major each quarter. This early introduction better motivates and prepares students to master the foundational mathematics, basic science, and engineering science or computer science central to success in all the engineering disciplines.

The undergraduate engineering disciplines listed above provide the education needed 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 highly desired by industry and find a variety of professional opportunities awaiting them, 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 College of Engineering is an internationally-recognized, premier undergraduate engineering college. Its mission is to educate students for careers of service, leadership and distinction in engineering or other fields by using a participatory, learn by doing, "hands-on" laboratory, project and design centered approach.

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."

Engineering and computer science programs at Cal Poly prepare graduates for practice in professional engineering and computer science. Attributes of engineering graduates include:

- (a) an ability to apply knowledge of mathematics, science, and engineering;
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data;
- (c) an ability to design a system, component, or process to meet desired needs;
- (d) an ability to function on multi-disciplinary teams;
- (e) an ability to identify, formulate, and solve engineering problems;
- (f) an understanding of professional and ethical responsibility;
- (g) an ability to communicate effectively;
- (h) the broad education necessary to understand the impact of engineering solutions in a global and societal context;
- (i) a recognition of the need for, and an ability to engage in life-long learning;
- (j) a knowledge of contemporary issues; and
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Our curricula reflects a "learn by doing" philosophy via incorporation of numerous design-centered laboratories, integration of design, and inclusion of the senior design project capstone design experience.

The excellence of Cal Poly's undergraduate engineering and computer science programs provides the foundation for master's degree programs. Industry 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.

## **ENVIRONMENTAL STUDIES MINOR**

Please see the College of Science and Mathematics for more information on this interdisciplinary minor.

## **STUDENT SERVICES CENTER**

The College of Engineering Student Services Center, located in the Engineering South Building (40), houses the Advising Center, the MESA Engineering Program, and the Women's Engineering Program. These offices provide centralized services to undergraduate engineering students.

### **Advising Center**

**Stacey Breitenbach, Director**  
**Engineering South (40), Room 115**  
**(805) 756-1461**

[www.ee.calpoly.edu/CENGAC/](http://www.ee.calpoly.edu/CENGAC/)

The College of Engineering Advising Center provides academic advising services to all majors within the college in conjunction with each student's faculty advisor. The Advising Center is open five days a week, nine hours per day during the quarter.

The center tracks the academic and administrative progress of all engineering students. Current academic and administrative probation policies are posted on our web site, as well as other information that pertains to new and continuing students. Students should be aware that all full-time engineering students are expected to complete (with passing grades) 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 and change of major) are processed in the Advising Center. The majority of the general education questions and interpretation of transfer credit questions are handled in the Advising Center after the Evaluations Office has provided the initial evaluation.

The Advising Center maintains working folders on each student. These folders are used for general advising purposes. The Advising Center has past and present flowcharts and curriculum sheets for all engineering majors, major specific technical elective forms, FE (EIT)

information packets, articulation agreements, and engineering-related pamphlets for student perusal.

While the Advising Center is responsible for providing procedural advice, faculty advisors are responsible for providing academic content and technical advice. Student course scheduling, course content questions, and career planning are usually done by the faculty advisors. Depending on the form and the student's major, the director of the Advising Center has signature authority to sign for the advisor, department chair, and associate dean with strict adherence to procedures developed with the department heads/chairs and the dean and associate deans.

## **MESA Engineering Program (MEP)**

**David Cantu, Director**  
**Engineering South (40), Room 117**  
**(805) 756-1433**

[www.calpoly.edu/~mep](http://www.calpoly.edu/~mep)

The MESA Engineering Program (MEP) is an academic support program designed to recruit, retain, and graduate educationally disadvantaged students in engineering and computer science disciplines. MEP builds an academic support community among students and provides the necessary bridges for students' academic and professional success.

MEP offers an orientation class in effective learning techniques. A study center is available for students so that they can overcome feelings of isolation, develop supportive academic peer groups, and share information about classes and scholarship opportunities. Tutoring is available for undergraduate technical courses. Group study workshops teach students complex technical concepts through group study and support. MEP fosters professional development by helping coordinate summer jobs, internship, and scholarship opportunities with companies who recognize the MEP as a valuable source for skilled future employees.

## **Women's Engineering Program (WEP)**

**Helene Finger, Director**  
**Engineering South (40), Room 119**  
**(805) 756-2350**

<http://ceng-web.calpoly.edu/wep.php>

The mission of the Women's Engineering Program (WEP) is to recruit and retain women engineering and computer science students by focusing on outreach, on-campus support and professional preparation objectives. To meet these objectives, WEP works closely with the Society of Women Engineers (SWE) Cal Poly student section, one of the top student sections in the nation, in supporting a variety of programs directed at pre-college, undergraduate and graduate students.

Outreach activities are directed at students from kindergarten through community college. These programs are designed to encourage pre-university women and girls

to consider engineering as a career choice. Outreach recruitment activities include: Building an Engineer workshops, Shadow an Engineering Student day, Engineering Road Show, Girl Scout Engineering Badge day, elementary school workshops, and career fairs.

The Women's Engineering Program provides on-campus support to Cal Poly women engineering students through a variety of academic, leadership and social activities. These activities help students connect to their peers while concurrently assisting them in achieving their educational goals. On-campus support activities include: scholarships, academic counseling and referrals, pre-registration counseling, big sibling program, test files, teacher evaluations, SWE meetings, and community service activities.

Professional preparation activities are designed to prepare students for a productive career by facilitating networking with professionals and corporations. Professional preparation activities include: Shadow an Engineer, Evening With Industry banquet, Team Tech, Industry Tours, Resume Book, and MentorNet.

# Master of Science in Engineering

## PROGRAMS

### MS Engineering with Specializations in:

Biochemical Engineering  
 Bioengineering  
 Biomedical Engineering  
 Integrated Technology Management  
 Materials Engineering  
 Water Engineering

### Blended BS+MS Programs

#### Joint Programs:

Engineering Management Specialization,  
 MBA/MS Engineering  
 Transportation Planning Specialization,  
 MCRP/MS Engineering

## MS Engineering

### General Characteristics

The Master of Science degree program in Engineering has the following objectives:

- Provide preparation for further study in engineering, leading to the Doctor of Engineering or Ph.D. degree.
- Provide an empowering terminal professional degree for students who intend to become practicing engineers, a degree that not only retains the strong laboratory emphasis and industrial interaction found in the BS curriculum, but which also provides an attractive, efficient educational option to undergraduate students.
- Provide job-entry education for the more complex and evolving interdisciplinary areas of engineering, such as research and development, innovative design, systems analysis and design, bio-engineering, biomedical engineering, manufacturing, mechatronics, and engineering management.
- Update and upgrade opportunities for practicing engineers.
- 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.

### Program of Study

Graduate students must file formal study plans with their advisor, department, college, and university graduate studies office 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, Bioengineering, Biomedical Engineering, Industrial Engineering, Integrated Technology Management, Materials Engineering, or Water Engineering.

### Requirements

The broad curriculum requirements for the Master of Science degree in Engineering are:

- a minimum of 24 units in the field of specialization, with at least 18 units at the 500 level;
- 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;
- remaining units taken from a list of approved electives;
- at least 23 units of the 45 unit program at the 500 level.

In some specializations, two program options are available: a thesis program which requires coursework, a thesis and oral defense of thesis; *or* a non-thesis option which involves additional coursework and a comprehensive examination. The non-thesis option is normally allowed only for those students who have completed a senior project or have had significant engineering project experience.

### Joint Programs

The College of Engineering offers two joint programs: in conjunction with the Orfalea College of Business, the MBA/MS Engineering, with a specialization in Engineering Management; and with the College of Architecture and Environmental Design (City and Regional Planning Department), the MCRP/MS Engineering, with a specialization in Transportation Planning.

### Other Graduate Engineering Programs

In addition to the MS in Engineering, the college also offers several other graduate programs: MS Aerospace Engineering, MS Civil and Environmental Engineering, MS Computer Science, MS Electrical Engineering, MS Industrial Engineering, and MS Mechanical Engineering. Information regarding these programs is listed with the respective department.

### Blended BS + MS Engineering Program

The blended program provides motivated students with an accelerated route to the MS Engineering, with simultaneous conferring of both bachelor's and master's degrees. Students in the blended program are provided with a seamless process whereby they can progress from undergraduate to graduate status.

#### Eligibility for Blended BS+MS Engineering

Students majoring in BS General Engineering, BS Computer Engineering, BS Manufacturing Engineering, and BS Materials Engineering may be eligible to pursue the blended program toward the MS Engineering with a specialization in Biochemical Engineering, Bioengineering, Biomedical Engineering, or Integrated Technology Management. They may also be able to pursue blended programs incorporating MS degrees from other departments in the College of Engineering.

In addition, students in departments with their own masters degrees may be able to pursue masters degrees in other departments, or the MS Engineering degree via the 4+1 program, based on agreements between their bachelors granting program and their target masters program.

Participation in the program is based on prior academic performance and other measures of professional promise. Students are selected by an interdisciplinary faculty committee, chosen on the basis of the student's area of interest. Please see page 96 for eligibility criteria.

#### Program of Study

The program allows students to complete a more meaningful capstone experience that integrates the senior project with the graduate thesis. This arrangement also increases the possibilities for industrial interaction in the students' professional program. Please refer to your undergraduate degree program for special requirements on the masters thesis where a major design experience requirement is included in order to complete the undergraduate degree.

#### Program of Study

The program allows students to complete a more meaningful capstone experience that integrates the senior project with the graduate thesis. This arrangement also increases the possibilities for industrial interaction in the students' professional program.

The blended program allows students to earn graduate credit for several of their senior electives, effectively decreasing the summed unit requirements for both degrees in the most efficient manner.

#### Other Blended Programs

Blended BS+MS programs are also available in Aerospace Engineering, Civil and Environmental Engineering, Computer Science, Electrical Engineering, Industrial Engineering, and Mechanical Engineering. Additional information may be obtained from the specific department or from the College of Engineering.

### Example Curriculum for General Engineering student in Blended Program

In this example, a student chose to focus on biomaterials aspects of the field.

1st Year		
Fall	Winter	Spring
ENGR 110	ENGR 111	ENGR 112
CHEM 124	CHEM 125	<i>Life science ge</i>
<i>Area A ge</i>	<i>Area A ge</i>	<i>Area A ge</i>
MATH 141	MATH 142	MATH 143
	PHYS 131	PHYS 132
2nd Year		
Fall	Winter	Spring
EE 201	CE 204	MATE 210
ME 211	ME 212	MATE 215
<i>Area D ge</i>	<i>Area D ge</i>	CSC 101
MATH 241	MATH 244	STAT 350*
PHYS 133	CHEM 305*	
3rd Year		
Fall	Winter	Spring
ME 302	ME 313	ME 341
IME 314	ME 328 tech	MATE 424 tech
MATE 230 tech	CHEM 328 elec	CSC 342 tech
CHEM 326 elec	<i>Area C ge</i>	<i>Area C ge</i>
4th Year		
Fall	Winter	Spring
MATE 440 tech	CSC 480 tech	IME 319 tech
MATE 425 tech	ENGR 581 tech*	EE 321 tech
CSC 103 tech	<i>Area C ge</i>	MATE 570 tech*
<i>Area D ge</i>	<i>Area C ge</i>	<i>Area D ge</i>
5th Year		
Fall	Winter	Spring
STAT 512	ENGR 590	ENGR 591
ENGR 582	EE 500-level	MATE 400-level
MATE 530		
Thesis 599 tech*	Thesis 599 tech*	Thesis 599 tech*
Total Units = 231		

<i>ge</i>	General Education
*	Math & Science Elective
<i>elec</i>	Elective
<i>tech</i>	Technical Elective
<i>tech*</i>	Shared BS and MS Technical Elective

## MS Engineering, Specialization in BIOCHEMICAL ENGINEERING

<b>Required Courses</b> .....	37
Analytical methods for engineering (6)	
Advanced mathematics (3)	
ENGR 599 Design Project (Thesis) (2) (2) (5) or 9 units of approved technical electives and written comprehensive examination	
<i>Select 19 units from the following:</i>	
ME 541 Advanced Thermodynamics (4)	
ME 552 Conductive Heat Transfer (3)	
ME 553 Convective Heat Transfer (3)	
ENVE 421 Mass Transfer Operations (3)	
ENGR 581, 582, 583 Biochemical Engr I, II, III (4,4,4)	
<b>Approved Electives</b> .....	8
	45

## MS Engineering, Specialization in BIOENGINEERING

<b>Required Courses</b> .....	33
ENGR 550 Advanced Topics in Bioengineering (4)	
MATE 530 Biomaterials (4)	
ENGR 581 Biochemical Engineering I (4)	
ENGR 599 Design Project (Thesis) (9)	
<i>Select 12 units from the following:</i>	
BIO 431, 432, 442, 542	
CSC 471, 473, 474, 475, 541	
ENGR 450, 582	
ENVE 443, 536	
IME 502	
MATE 425, 570	
ME 401, 502, 551, 552, 553, 554	
STAT 512, 542	
<b>Approved Engineering Electives</b> .....	12
	45

## MS Engineering, Specialization in BIOMEDICAL ENGINEERING

<b>Required Courses</b> .....	32
MATE/CHEM 446 Surface Chemistry/Materials (3)	
ENGR 450 Special Topics in Bioengineering (4)	
ENGR 550 Advanced Topics in Bioengineering (4)	
ENGR 599 Design Project (Thesis) (9)	
<i>Select 12 units from the following:</i>	
CHEM 473; CHEM/BIO 475	
CSC 471, 473, 474, 475	
EE 419	
ENVE 421	
IME 437, 543	
MATE 446, 530, 570	
ME 401, 422, 423, 445, 502, 551	
STAT 542	
<b>Approved Engineering Electives</b> .....	13
	45

## MS Engineering, Specialization in INTEGRATED TECHNOLOGY MANAGEMENT

The program goal is to develop "industry ready" graduates who will be integrators of engineering disciplines, industry concerns, and technology management. Many of the program courses involve actual integrated problems or opportunities from industrial organizations in a collaborative learning environment.

<b>Required Courses</b> .....	33/34
IME 503 Applied Stat. Analysis for Engineers (4)	
IME 556 Technological Project Management (4)	
IME 580 Manufacturing Systems (4)	
IME 596 Team Project/Internship (10) or IME 599 Design Project/Thesis (9)	
Approved electives in specialization (12)	
<b>Approved Engineering Electives</b> .....	8
8 units of approved technical electives	
<b>Approved Electives</b> .....	6
	47/48

## MS Engineering, Specialization in MATERIALS ENGINEERING

<b>Required Courses</b> .....	35
MATE 570 Advanced Materials (4)	
STAT 512 Statistical Methods (4)	
MATE 599 Design Project (Thesis) (2) (2) (5)	
<i>Select 18 units from the following:</i>	
MATE 410 Materials Engineering (4)	
MATE 440 Joining (5)	
MATE 530 Biomaterials (4)	
MATE 562 Mechanical Behavior of Materials (4)	
MATE 580 Fracture Mechanics (3)	
MATE 590 Densification Processing (4)	
<b>Approved Electives</b> .....	10
	45

## MS Engineering, Specialization in WATER ENGINEERING

<b>Required Courses</b> .....	35
Analytical methods for engineering (6)	
Advanced Mathematics (3)	
ECON 410 Public Finance/Cost-Benefit Analysis (4)	
BRAE 435/BRAE 414/BRAE 440 (3)	
BRAE 533 Irrigation Project Design (4)	
CE 533 Adv Water Resources Engineering (3)	
CE 573 Public Works Administration (3)	
BRAE/CE 599 Design Project (Thesis) (2) (2) (5) or 9 units of approved technical electives and written comprehensive examination	
<b>Approved Elective Courses</b> .....	10
<i>Select 10 units from the following:</i>	
BRAE 414, 437, 440, 492, 533	
CE 434, 440	
ENVE 438, 439, 535	
	45

## MBA/MS Engineering, Specialization in ENGINEERING MANAGEMENT

The dual-degree Engineering Management Program (EMP) 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 Orfalea College of Business. Entering 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.

The program can be completed in 21 months. Upon completion, participants will be awarded both MBA and MS in Engineering degrees, each with a specialization in Engineering Management.

The mission of the program is to develop "industry ready" graduates who will be facilitators of change and integrators of engineering, business, and people issues.

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.

### Business courses (48)

GSB 510 The General Manager I .....	12
GSB 520 The General Manager II .....	12
GSB 530 The General Manager III .....	8
GSB 540 The General Manager IV .....	8
(includes comprehensive examination)	
Approved GSB or BUS electives selected from:	
GSB 567, 569, 578, 587; BUS 410, 427, 446;	
ECON 401; AGB 563.....	8

### Engineering courses (45)

IME 503 Applied Statistical Analysis for Engineers	4
IME 556 Technological Project Management.....	4
IME 580 Manufacturing Systems.....	4
IME 596 EMP Internship/Team Project .....	10/9
Approved electives in specialization.....	12
Approved Engineering electives .....	11/12
<b>Approved GSB/BUS or Engineering elective .....</b>	<b>4</b>
	<b>97</b>

**Formal Study Plan.** The Formal Study Plan for this dual degree must be approved by both the College of Business Director of Graduate Programs and by the College of Engineering Advisor for the Engineering Management Program.

## MCRP/MS Engineering, 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 MCRP and the MS 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 understand the technology of transportation planning and the importance of transportation within the urban environment. The required master's project enables students to integrate their work through directed study applied 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 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 231 Fortran for Engineering Students  
 ECON 201 Survey of Economics  
 ENGL 148 Reasoning, Argumentation and Professional Writing  
 MATH 143 Calculus  
 PHYS 131 General Physics  
 SCOM 101 Public Speaking  
 STAT 321 Probability and Statistics for Engineers and Scientists

Applicants for admission are expected to:

- \* Have earned a bachelor's degree from an accredited university or college,
- \* Have attained a grade point average of 3.0 in last 90 units of undergraduate work,
- \* Provide results of the Graduate Record Examination (GRE) Aptitude Test to the Admissions Committee.

- \* 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,
- \* 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** ..... 65

- CE 523 Transportation System Planning (4)
- CE 528 Transportation Analysis *or*
- CE 525 Airport Planning and Design (4)
- CE 591 Graduate Seminar (1)
- CE 599 (2,2,2) *or* CRP 599 Project /Thesis (6)
- CRP 409 Planning Internship (2)
- CRP 420 Land Use 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 Planning Presentation and
- Communication Techniques (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 Community Planning Laboratory (4)
- CRP 553 Project Planning Laboratory (4)
- CSC, MATH, STAT or other approved
- quantitative methods course (3)

**Emphasis Area (select one of the following)** ..... 10

*Urban Land Planning Emphasis*

- CRP 520 Feasibility Studies in Planning (4)
- CRP 548 Principles of City Design (3)
- Urban Land Planning electives (3)

*Regional and Environmental Planning Emphasis*

- CRP 404 Environmental Law (3)
- Regional and Environmental Planning electives (7)

**Approved CE/ENVE electives:** ..... 15

- Electives may include: CE 421, 422, 424, 522,
- 525, 528, 529, 573, 574, ENVE 411, 465

# Aerospace Engineering

**Department Office**  
**Engineering Bldg. (13), Room 260**  
**(805) 756-2562 FAX: (805) 756-2376**

**College of Engineering Advising Center**  
**Engineering South (40), Room 115**  
**(805) 756-1461**

## Department Chair, Daniel J. Biezad

Russell M. Cummings      Jordi Puig-Suari  
 Dianne J. DeTurris      Jin Tso  
 Faysal A. Kolkailah

## ACADEMIC PROGRAMS

### **BS, MS Aerospace Engineering Multidisciplinary Design Minor**

The Bachelor of Science degree in Aerospace Engineering prepares students for engineering work related to aerodynamics, flight testing, structures, propulsion, control systems, vehicle dynamics, stability and control, flight simulation, and design for both fixed and rotary wing aircraft, missiles, and spacecraft. The problems faced by the aerospace industry offer an unusual engineering challenge. Much of the analysis and testing must be accomplished at the very frontiers of knowledge. Nevertheless, products must be designed and manufactured; thus, an exceptionally wide range of engineering abilities is required within the industry and government.

The Aerospace Engineering Department's mission is to educate students using a laboratory-based, hands-on approach. This approach, coupled with a systems view of engineering, is encouraged through coursework and a group-based capstone design experience. This educational philosophy has yielded engineers capable of working in positions of technical responsibility and leadership in a modern multidisciplinary, systems-based environment.

Graduates in Aerospace Engineering will 1) be well rounded engineers for positions of technical responsibility and leadership in a modern multi-disciplinary system-oriented environment that emphasizes problem solving; 2) achieve high-quality professional performance in both aeronautical and astronautical engineering by integrating a systems view of engineering that is built upon group based design experiences; and 3) demonstrate a solid foundation in aerodynamics, controls, structures, propulsion and their integration into systems design.

Aerospace Engineering graduates 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 BS degree program in Aerospace Engineering is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology. It places emphasis on both analysis and design, with supplementary basic work in laboratory projects. 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.

The program maintains laboratory facilities for fabrication, propulsion, structures and composites, aerodynamics, dynamics and control, flight simulation and flight test, aerothermodynamics, and design.

Aerospace students may participate in two student chapters of national professional societies—the American Institute of Aeronautics and Astronautics 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.

### **Blended BS + MS Aerospace Engineering**

The blended program provides motivated students with an accelerated route to the MS Aerospace Engineering, with simultaneous conferring of both bachelor's and master's degrees. Students in the blended program are provided with a seamless process whereby they can progress from undergraduate to graduate status.

### **Eligibility**

Students majoring in BS Aerospace Engineering may be eligible to pursue the blended program toward the MS Aerospace Engineering. Participation in the program is based on prior academic performance and other measures of professional promise, with a minimum GPA of 2.5 required (3.0 GPA recommended). Students are selected by a faculty committee. Please see page 96 for eligibility criteria.

### **Program of Study**

The program allows students to complete a more meaningful capstone experience that integrates the senior project with the graduate thesis. This arrangement also increases opportunities for industrial interaction.

The blended program allows students to double count up to nine units of coursework to fulfill the requirements for the BS and MS degrees. For instance, five of the nine units of AERO 599 Thesis can serve to complete the senior project requirement or a graduate lecture/lab course can be used as a senior elective.

### **Multidisciplinary Design Minor**

The minor will enhance students' ability to work in multidisciplinary engineering teams. The students will develop an understanding of the design process and the role of systems engineering in product design and development including costs analysis. They will also learn the systems integration process and how different subsystems are interfaced to develop a successful product.

Non-AERO students in the minor will be admitted by permission of the minor coordinator, and not held to the prerequisites for AERO 443/444/445 or AERO 447/448/449, nor IME 418.

### Curriculum for Multidisciplinary Design Minor

<b>Introductory courses</b> .....	14
IME 314 Engineering Economics (3)	
IME 418 Product-Process Design (4)	
BUS 271 Principles of Management (3)	
PSY 350 Teamwork (4)	
<b>Core courses</b> .....	16
AERO 360 Creative Prob. Solv/Engrg Design (2)	
AERO 443/444/445 or AERO 447/448/449 (10)	
AERO 450 Aerospace Systems Engineering (4)	
	30

### BS AEROSPACE ENGINEERING

For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic advisor. \* Satisfies GE requirement; see page 76.

#### Freshman

AERO 121 Aerospace Fundamentals.....	2
CHEM 124 Gen Chem for Engineering (B3/B4)*.	4
IME 144 Intro Design and Manufacturing .....	4
ENGL 134 Writing: Exposition (A1)* .....	4
ENGL 149 Technical Writing for Engineers (A3)*.	4
SCOM 101/102 Speech Communication (A2)* .....	4
MATH 141, 142 Calculus I, II (B1)* .....	4,4
MATH 143 Calculus III (Add'l Area B)* .....	4
PHYS 131 General Physics (Add'l Area B)* .....	4
PHYS 132 General Physics .....	4
Literature elective (C1)* .....	4
Self development elective (CSU Area E) (D4)* ...	4
	50

#### Sophomore

AERO 215 Introduction to Aerospace Design .....	2
AERO 300 Aerospace Engineering Analysis .....	5
BIO 213 and ENGR/BRAE 213 (B2)* .....	2,2
CE 204 Strength of Materials .....	3
CE 205, 206 Strength of Materials and Lab .....	2,1
EE 201, 251 Electric Circuit Theory and Lab .....	3,1
ME 211 Engineering Statics .....	3
ME 212 Engineering Dynamics .....	3
MATH 241 Calculus IV .....	4
MATH 244 Linear Analysis I .....	4
PHYS 133 General Physics .....	4
STAT 312 Statistical Methods for Engineers (B6)*	4
Fine and performing arts elective (C3)* .....	4
American experience elective (D1)* .....	4
	51

#### Junior

AERO 301, 302 Aerothermodynamics .....	5,5
AERO 303, 304 Aerothermodynamics .....	5,2
AERO 306 Aerodynamics and Flight Performance.	4
AERO 307 Experimental Aerodynamics .....	2
AERO 320 Fundamentals of Guidance and Control	4
AERO 331 Aerospace Structural Analysis I .....	5

EE 321, 361 Electronics and Lab .....	3,1
MATE 210 Materials Engineering .....	3
Political economy elective (D2)* .....	4
Comparative social institutions elective (D3)* .....	4
	47

#### Senior

AERO 401 Propulsion Systems .....	4
AERO 420 Stability/Control of Aerospace Vehicles	4
AERO 431 Aerospace Structural Analysis II .....	3
AERO 433 Aerospace Experimental Stress Anlys..	1
AERO 461, 462 Senior Project or	
AERO 463, 464 Senior Project Laboratory .....	2,3
Philosophy elective (C2)* .....	4
Literature, philosophy, arts (300-400 level) (C4)*.	4
Courses to complete concentration .....	22
	47

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### BS AEROSPACE ENGINEERING

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

#### MAJOR COURSES

AERO 121 Aerospace Fundamentals .....	2
AERO 215 Introduction to Aerospace Design .....	2
AERO 300 Aerospace Engineering Analysis .....	5
AERO 301, 302 Aerothermodynamics .....	5,5
AERO 303, 304 Aerothermodynamics .....	5,2
AERO 306 Aerodynamics and Flight Performance	4
AERO 307 Experimental Aerodynamics .....	2
AERO 320 Fundamentals of Guidance and Control	4
AERO 331 Aerospace Structural Analysis I .....	5
AERO 401 Propulsion Systems .....	4
AERO 420 Stability/Control of Aerospace Vehicles	4
.....	
AERO 431 Aerospace Structural Analysis II .....	3
AERO 433 Experimental Stress Analysis .....	1
AERO 461; 462 Senior Project or	
AERO 463, 464 Senior Project Laboratory .....	2,3
CE 204 Strength of Materials .....	3
CE 205, 206 Strength of Materials and Lab .....	2,1
EE 201, 251 Electric Circuit Theory and Lab .....	3,1
Concentration courses (see below) .....	22
	90

#### SUPPORT COURSES

BIO 213 and ENGR/BRAE 213 (B2)* .....	2,2
CHEM 124 Gen Chem for Engineering (B3/B4)*.	4
EE 321, 361 Electronics and Lab .....	3,1
ENGL 149 Technical Writing for Engineers (A3)*	4
IME 144 Intro Design and Manufacturing .....	4
MATE 210 Materials Engineering .....	3
MATH 141, 142 Calculus I, II (B1)* .....	4,4
MATH 143 Calculus III (Add'l Area B)* .....	4
MATH 241 Calculus IV .....	4
MATH 244 Linear Analysis I .....	4
ME 211 Engineering Statics .....	3
ME 212 Engineering Dynamics .....	3

PHYS 131 General Physics (Add'l Area B)* .....	4
PHYS 132, 133 General Physics .....	4,4
STAT 312 Statistical Methods for Engineers (B6)* .....	4
	<b>65</b>

**GENERAL EDUCATION (GE)**

72 units required; 32 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 8 units required at the 300-400 level.

**Area A Communication (8 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing * 4 units in Support .....	0

**Area B Science and Mathematics (no add'l units req'd)**

B1 Mathematics/Statistics * 8 units in Support.....	0
B2 Life Science * 4 units in Support.....	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	
B5 (requirement for Liberal Arts students only)	
B6 Upper-division Area B * 4 units in Support.....	0
Additional Area B units* 8 units in Support.....	0

**Area C Arts and Humanities (16 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4

**Area D/E Society and the Individual (16 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4

**40**

<b>ELECTIVES</b> .....	0
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**195****CONCENTRATIONS (select one)****Aeronautics Concentration**

AERO 405 Supersonic/Hypersonic Aerodynamics...	4
AERO 443, 444, 445 Aircraft Design .....	2,4,4
Aeronautics electives .....	8
	<b>22</b>

**Astronautics Concentration**

AERO 451 Orbital Mechanics I .....	4
AERO 447, 448, 449 Spacecraft Design .....	2,4,4
Astronautics electives .....	8
	<b>22</b>

**MS AEROSPACE ENGINEERING**

**General Characteristics.** The Master of Science program in Aerospace Engineering prepares the student for entry into a well-established field of aerospace engineering. The subject matter relative to flight simulation and controls, structures, propulsion, and aerothermal sciences has been integrated into coursework. The program emphasizes engineering science and research activity. Graduates have

an increased capability for complex research, development, and innovative design, and are prepared for further study in engineering, leading to the Doctor of Engineering or Ph.D.

**Prerequisites.** For admission as a classified graduate student, an applicant must hold a bachelor's degree in engineering (preferably aerospace 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 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, Department of Aerospace Engineering.

**Program of Study.** Graduate students must file a formal study plan with their advisor, department, college and 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.

The Department also offers the same MS degree program to Air Force officers and engineers at Vandenberg Air Force Base (VAFB), about 60 miles south of Cal Poly. This off-campus site has the same curriculum and faculty as the main campus. During the fall, winter, and spring quarters, courses will be offered via video teleconferencing and during the summer quarter via on-site teaching. Courses will typically be offered between 4-8 p.m. to accommodate the students' working schedules.

**Required Courses**..... 29*Select four of the following five options:*

- AERO 520 Appl Airplane Aerodynamics (4) *or* AERO 521 Missile/Launch Vehicle Aerodyn (4)
- AERO 535 Adv Aerospace Structural Anly (4) *or* AERO 534 Aero Structural Dynamics Anly (4)
- AERO 540 Elements of Rocket Propulsion (4) *or* AERO 541 Air Breathing Propulsion (4)
- AERO 550 Anly/Design Flight Control Sys (4) *or* AERO 560 Spacecraft Dynamics and Control (4)
- AERO 515 Continuum Mechanics (4) *or* MATH 501 Applied Mathematics I (4)

AERO 599 Thesis (Design Project) (3) (3) (3)

**Math or numerical methods elective**..... 4**Advisor approved electives**..... 12**45**

# Civil and Environmental Engineering

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**College of Engineering Advising Center**  
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## Department Chair, Alypius E. Chatziioanou

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Jay S. DeNatale	H. Mallareddy
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Rakesh K. Goel	Yarrow M. Nelson
Garrett J. Hall	Nirupam Pal
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Damian I. Kachlakev	S. Somayaji
Eric P. Kasper	Edward C. Sullivan
Robert J. Lang	Samuel A. Vigil

## ACADEMIC PROGRAMS

### BS Civil Engineering

### BS Environmental Engineering

### MS Civil and Environmental Engineering

#### BS 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 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.

Students learn to solve practical engineering problems and design civil engineering facilities and systems using traditional and state-of-the-art techniques. Extensive experience is gained through the use of modern, well-equipped laboratories. The program focuses on the preparation of graduates for immediate entry into the profession; however, adequate scientific depth is maintained throughout the curriculum so that graduates are readily accepted into graduate programs in civil engineering.

The main focus of the program is to prepare graduates for practice in professional engineering. Thus, Cal Poly's

"learn by doing" philosophy is emphasized by integrating design throughout the curriculum, especially in the numerous design-centered laboratories. In the required senior project, which is completed in a two-quarter set of capstone courses, students demonstrate their understanding of engineering knowledge and their ability to apply that knowledge creatively to practical problems.

The Civil Engineering program's educational objectives are that its graduates are able to:

- Solve civil engineering problems using techniques of theoretical analysis, results from laboratory and field experiments, and principles of engineering design.
- Use effective communication and teamwork skills, and appreciate the value of liberal arts and social sciences.
- Be ethically responsible and aware of environmental and other contemporary issues in the civil engineering profession.
- Continue life-long learning.
- Pursue advanced studies in civil engineering.

Various program constituencies are consulted periodically for input on the appropriateness as well as the attainment of the educational objectives. Other indicators such as student/alumni placement and success rates in various tests are also used to evaluate attainment.

Graduates of the program accept a wide variety of positions in local, state and federal government service or with private engineering firms. Typically, graduates are immediately involved in the planning, design, and construction of civil engineering projects.

The Civil Engineering curriculum includes broad coverage of the engineering sciences and basic sciences, mathematics, social sciences, and humanities. Essential training is given in each of the principal civil engineering emphasis areas: environmental engineering, geotechnical engineering, structural engineering, transportation engineering, and water resources engineering. Flexibility within the curriculum allows students to take 28 units of upper division civil engineering technical electives. A student may choose to use these technical elective units to study topics related to one or more of the five principal civil engineering emphasis areas listed above. Suggested emphasis area curricula are available from the department. In lieu of choosing a particular emphasis area, students have the opportunity to design a curriculum of their own, allowing for a broad range of civil engineering interests.

The Society of Civil Engineers (SCE) student organization is recognized as one of the nation's premiere student chapters. The organization sponsors a variety of opportunities for professional development, community service, and social activities to supplement the formal academic program. SCE is made up of chartered student chapters of the following professional organizations: the American Public Works Association, the American Society of Civil Engineers, and the Institute of Transportation Engineers.

### BS Environmental Engineering

The Bachelor of Science degree program 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, environmental health and safety, solid waste, hazardous waste management, and pollution prevention. Cal Poly has one of the few undergraduate programs in this field.

The program offers a sound background in the fundamentals of thermodynamics, 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 main focus of the program is to prepare graduates for practice in professional engineering. Thus, Cal Poly's "learn by doing" philosophy is emphasized by integrating design throughout the curriculum, especially in the numerous design-centered laboratories. In the required senior design project, which is completed in a two-quarter set of capstone courses, students demonstrate their understanding of engineering knowledge and their ability to apply that knowledge creatively to practical problems.

The Environmental Engineering program educational objectives are that its graduates will:

- Practice as professional engineers by gaining a thorough foundation in the following areas: (a) water and waste water, (b) air pollution, and (c) solid and hazardous wastes.
- Pursue higher studies, research and life-long learning, and develop an appreciation of liberal arts and social sciences.
- Have a global awareness of environmental issues and use appropriate technologies to solve them.

Various program constituencies are consulted periodically for input on the appropriateness as well as the attainment of the educational objectives. Other indicators such as student/alumni placement and success rates in various tests are also used to evaluate attainment.

The Society of Environmental Engineers offers technical programs and other activities, including field trips each year

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.

### Blended BS + MS Civil and Environmental Engineering

The blended program provides motivated students with an accelerated route to an MS in Civil and Environmental Engineering, with simultaneous conferring of both bachelor's and master's degrees. Students in the blended program are provided with a seamless process whereby they can progress from undergraduate to graduate status.

#### Eligibility

Students majoring in BS Civil Engineering or BS Environmental Engineering may be eligible to pursue the blended program toward an MS in Civil and Environmental Engineering after completing all required support and CE/ENVE 300-level classes. Participation in the program is based on prior academic performance and other measures of professional promise, with a minimum GPA of 3.0. Please see page 96 for additional eligibility criteria.

#### Program of Study

Students originating in the BS Civil Engineering program are allowed to complete a capstone experience that integrates the senior project with the CE 599 graduate thesis. Students originating in the BS Environmental Engineering program are required to take both ENVE 466/7 Senior Project Design Laboratory I, II and complete the nine units of ENVE 599 thesis.

The blended program allows students to earn graduate credit for several of their senior electives, effectively decreasing the summed unit requirements for both degrees. A maximum of nine units can be shared between the B.S. and M.S. program requirements.

### BS CIVIL ENGINEERING

*For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic advisor. \* Satisfies GE requirement; see page 76.*

#### Freshman

CE 111 Introduction to Civil Engineering.....	1
CE 114 Intro CAD in Civil/Environ Engr. ....	4
CHEM 124 Gen Chem for Engineering (B3/B4)* ..	4
CHEM 125 Gen Chem for Engineering .....	4
ENGL 134 Writing: Exposition (A1)* .....	4
SCOM 101/102 Speech Communication (A2)* .....	4
ENGL 149 Technical Writing for Engineers (A3)*	4

MATH 141, 142 Calculus I, II (B1)* .....	4,4
MATH 143 Calculus III (Add'l Area B)* .....	4
PHYS 131 General Physics (Add'l Area B)* .....	4
PHYS 132 General Physics .....	4
CSC 231 Fortran <i>or</i> CSC 234 C/UNIX .....	2/3
<sup>1</sup> Political economy elective (D2)* .....	4
	51

**Sophomore**

CE 201 Strength of Materials (5) <i>or</i> CE 204, CE 205 Strength of Materials I, II (3)(2) .....	5
CE 206 Strength of Materials Laboratory .....	1
CE 221, 222 Fund Transportation Engr and Lab ....	3,2
CE 259 Civil Engineering Materials .....	2
BRAE 239 Engineering Surveying .....	4
GEOL 201 Physical Geology .....	3
MATE 210, 215 Materials Engineering and Lab ....	3,1
MATH 241 Calculus IV .....	4
MATH 244 Linear Analysis I .....	4
ME 211 Engineering Statics .....	3
ME 212 Engineering Dynamics .....	3
ME 302 Thermodynamics .....	3
ME 341 Fluid Mechanics .....	3
PHYS 133 General Physics .....	4
Literature elective (C1)* .....	4
	52

**Junior**

CE 336 Water Resources Engineering .....	4
CE 337 Hydraulics Laboratory .....	1
CE 351 Structural Analysis .....	5
CE 355 Reinforced Concrete Design .....	3
CE 381, 382 Geotechnical Engineering and Lab ....	4,1
CE 407 Structural Dynamics .....	4
CE 453 Structural Steel Design .....	3
ENVE 331 Intro to Environmental Engineering .....	4
CSC 341 Numerical Analys <i>or</i> IME 314 Engr Econ .....	4/3
EE 201 Electric Circuits Theory .....	3
STAT 312 Statistical Methods for Engineers (B6)* .....	4
American experience elective (D1)* .....	4
Philosophy elective (C2)* .....	4
BIO 213 <i>and</i> ENGR/BRAE 213 (B2)* .....	2,2
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**Senior**

CE 461, 462 Senior Project <i>or</i> CE 466, 467 Senior Project Design Lab .....	2,2
Fine and performing arts elective (C3)* .....	4
Literature, philosophy, arts (300-400 level) (C4)* .....	4
Comparative social institutions elective (D3)* .....	4
Self development elective (CSU Area E) (D4)* .....	4
<sup>2</sup> Advisor approved emphasis area to be selected from: general civil, geotechnical, structural, transportation, or water resources engineering .....	14
<sup>2,3,4</sup> Advisor approved technical electives .....	14
	48
	202

**BS CIVIL ENGINEERING**

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA      ☐ USCP  
 \* = Satisfies General Education requirement

**MAJOR COURSES**

CE 111 Introduction to Civil Engineering .....	1
CE 114 Intro CAD in Civil & Environmental Engr .....	4
CE 201 Strength of Materials (5) <i>or</i> CE 204, CE 205 Strength of Materials I, II (3)(2) .....	5
CE 206 Strength of Materials Laboratory .....	1
CE 221, 222 Fund Transportation Engr and Lab ....	3,2
CE 259 Civil Engineering Materials .....	2
CE 336 Water Resources Engineering .....	4
CE 337 Hydraulics Laboratory .....	1
CE 351 Structural Analysis .....	5
CE 355 Reinforced Concrete Design .....	3
CE 381, 382 Geotechnical Engineering and Lab ....	4,1
CE 407 Structural Dynamics .....	4
CE 453 Structural Steel Design .....	3
CE 461, 462 Senior Project <i>or</i> CE 466, 467 Senior Project Design Lab .....	2,2
<sup>2</sup> Advisor approved emphasis area to be selected from: general civil, geotechnical, structural, transportation, or water resources engineering ....	14
<sup>2,3,4</sup> Advisor approved technical electives .....	14
	75

**SUPPORT COURSES**

BIO 213 <i>and</i> ENGR/BRAE 213 (B2)* .....	2,2
BRAE 239 Engineering Surveying .....	4
CHEM 124 Gen Chem for Engineering (B3/B4)* .....	4
CHEM 125 Gen Chem for Engineering .....	4
CSC 231 Fortran for Engineering Students <i>or</i> CSC 234 C and UNIX .....	2/3
CSC 341 Numerical Analys <i>or</i> IME 314 Engr Econ .....	4/3
EE 201 Electric Circuits Theory .....	3
ENGL 149 Technical Writing for Engineers (A3)* .....	4
ENVE 331 Intro to Environmental Engineering .....	4
GEOL 201 Physical Geology .....	3
MATE 210 Materials Engineering .....	3
MATE 215 Materials Engineering Laboratory .....	1
MATH 141, 142 Calculus I, II (B1)* .....	4,4
MATH 143 Calculus III (Add'l Area B)* .....	4
MATH 241 Calculus IV .....	4
MATH 244 Linear Analysis I .....	4
ME 211 Engineering Statics .....	3

<sup>1</sup> ECON 201 or equivalent if planning to take IME 314.

<sup>2</sup> To be selected in accordance with the A.B.E.T. 24-unit and Culminating Engineering Design requirement, after consultation with your academic advisor.

<sup>3</sup> More than 4 units of advisor-approved coursework outside CE/ENVE is only permitted in special/unusual cases, requires written justification by the student, and approval by the Department Chair.

<sup>4</sup> No more than 4 total units of advisor-approved technical elective credit from CE 400, 500 and ENVE 400, 500 combined.

ME 212 Engineering Dynamics .....	3
ME 302 Thermodynamics .....	3
ME 341 Fluid Mechanics .....	3
PHYS 131 General Physics (Add'l Area B)* .....	4
PHYS 132, 133 General Physics.....	4,4
STAT 312 Statistical Methods for Engr (B6)* .....	4
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**GENERAL EDUCATION (GE)**

72 units required; 32 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 8 units required at the 300-400 level.

**Area A Communication (8 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing * 4 units in Support .....	0

**Area B Science and Mathematics (no add'l units req'd)**

B1 Mathematics/Statistics * 8 units in Support.....	0
B2 Life Science * 4 units in Support.....	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course B5 (requirement for Liberal Arts students only)	
B6 Upper-division Area B * 4 units in Support.....	0
Additional Area B units * 8 units in Support.....	0

**Area C Arts and Humanities (16 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4

**Area D/E Society and the Individual (16 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4

	<b>40</b>
<b>ELECTIVES .....</b>	<b>0</b>
	<b>202</b>

**BS ENVIRONMENTAL ENGINEERING**

For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic advisor. \* Satisfies GE requirement; see page 76.

**Freshman**

ENVE 111 Intro to Env. Engineering Profession ..	1
CHEM 124 Gen Chem for Engineering (B3/B4)* ..	4
CHEM 125 Gen Chem for Engineering .....	4
CHEM 129 General Chemistry .....	4
CSC 231 Fortran or CSC 234 C/UNIX .....	2/3
MATH 141, 142 Calculus I, II (B1)* .....	4,4
MATH 143 Calculus III (Add'l Area B)* .....	4
PHYS 131 General Physics (Add'l Area B)* .....	4
PHYS 132 General Physics.....	4

ENGL 134 Writing: Exposition (A1)* .....	4
SCOM 101/102 Speech Communication (A2)* .....	4
American experience elective (D1)* .....	4
Political economy elective (D2)* .....	4
	<b>51</b>

**Sophomore**

CE 201 Strength of Materials (5) or CE 204, 205 Strength of Materials I, II (3)(2) .....	5
ENVE 309 Noise and Vibration Control.....	3
ENVE 325 Environmental Air Quality .....	3
ENVE 331 Intro Environmental Engineering .....	4
CHEM 312 Survey of Organic Chemistry (transfer equivalent CHEM 212) .....	5
EE 201 Electric Circuit Theory .....	3
MATH 241 Calculus IV .....	4
MATH 244 Linear Analysis I.....	4
ME 211 Engineering Statics.....	3
ME 212 Engineering Dynamics .....	3
ME 302 Thermodynamics .....	3
PHYS 133 General Physics .....	4
STAT 312 Statistical Methods for Engineers (B6)* .....	4
	<b>48</b>

**Junior**

CE 336 Water Resources Engineering .....	4
CE 337 Hydraulics Laboratory.....	1
ENVE 304 Thermodynamics of Processes.....	3
ENVE 421 Mass Transfer Operations .....	3
ENVE 436 Intro Hazardous Waste Management....	3
ENVE 438 Water & Wastewater Treatment Design	3
ENVE 439 Solid Waste Management .....	3
ENVE 455 Environmental Health and Safety .....	4
ENGL 149 Technical Writing for Engineers (A3)* ..	4
MCRO 221 Microbiology (B2)* .....	4
ME 341 Fluid Mechanics .....	3
Literature elective (C1)* .....	4
Philosophy elective (C2)* .....	4
	<b>43</b>

**Senior**

CE 381 Geotechnical Engineering .....	4
CE 434 Groundwater Hydraulics and Hydrology ...	3
ENVE 411 Air Pollution Control .....	3
ENVE 416 Environmental Process Modeling .....	4
ENVE 426 Air Quality Measurements.....	3
ENVE 434 Water Quality Measurements.....	2
ENVE 450 Industrial Pollution Prevention .....	4
ENVE 466, 467 Senior Project Design Laboratory.	2,2
Fine and performing arts elective (C3)* .....	4
Literature, philosophy, arts (300-400 level) (C4)* (PHIL 340 or FNR 360 recommended) .....	4
Comparative social institutions elective (D3)* .....	4

Self development elective (CSU Area E) (D4)* .....	4
<sup>1,2</sup> Advisor approved technical electives.....	11
	<u>54</u>
	<b>196</b>

**BS ENVIRONMENTAL ENGINEERING**

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA                              ☐ USCP

\* = Satisfies General Education requirement

**MAJOR COURSES**

CE 201 or CE 204, 205 Strength of Materials .....	5
CE 336 Water Resources Engineering.....	4
CE 337 Hydraulics Laboratory .....	1
CE 381 Geotechnical Engineering .....	4
CE 434 Groundwater Hydraulics and Hydrology ....	3
ENVE 111 Intro to Env. Engineering Profession ....	1
ENVE 304 Thermodynamics of Processes .....	3
ENVE 309 Noise and Vibration Control.....	3
ENVE 325 Environmental Air Quality .....	3
ENVE 331 Intro to Environmental Engineering .....	4
ENVE 411 Air Pollution Control.....	3
ENVE 416 Environmental Process Modeling.....	4
ENVE 421 Mass Transfer Operations.....	3
ENVE 426 Air Quality Measurements.....	3
ENVE 434 Water Quality Measurements .....	2
ENVE 436 Intro Hazardous Waste Management.....	3
ENVE 438 Water & Wastewater Treatment Design	3
ENVE 439 Solid Waste Management.....	3
ENVE 450 Industrial Pollution Prevention.....	4
ENVE 455 Environmental Health and Safety.....	4
ENVE 466, 467 Senior Project Design Laboratory .	2,2
<sup>1,2</sup> Advisor approved technical electives.....	11
	<u>78</u>

**SUPPORT COURSES**

CHEM 124 Gen Chem for Engineering (B3/B4)*. ....	4
CHEM 125 Gen Chem for Engineering.....	4
CHEM 129 General Chemistry .....	4
CHEM 312 Survey of Organic Chemistry ( <i>transfer equivalent CHEM 212</i> ) .....	5
CSC 231 Fortran or CSC 234 C/UNIX.....	2
EE 201 Electric Circuit Theory .....	3
ENGL 149 Technical Writing for Engineers (A3)* .....	4
MATH 141, 142 Calculus I, II (B1)* .....	4,4
MATH 143 Calculus III (Add'l Area B)* .....	4
MATH 241 Calculus IV .....	4
MATH 244 Linear Analysis I .....	4
MCRO 221 Microbiology (B2)*.....	4
ME 211, 212 Engr Statics, Engr Dynamics.....	3,3
ME 302 Thermodynamics.....	3
ME 341 Fluid Mechanics .....	3
PHYS 131 General Physics (Add'l Area B)* .....	4
PHYS 132, 133 General Physics .....	4,4
STAT 312 Statistical Methods/Engrs (B6)* .....	4
	<u>78</u>

**GENERAL EDUCATION (GE)**

72 units required; 32 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 8 units required at the 300-400 level.

**Area A Communication (8 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing * 4 units in Support.....	0

**Area B Science and Mathematics (no additional units required)**

B1 Mathematics/Statistics * 8 in Support.....	0
B2 Life Science * 4 units in Support.....	0
B3 Physical Science * 4 in Support.....	0
B4 One lab taken with either a B2 or B3 course	
B5 (requirement for Liberal Arts students only)	
B6 Upper-division Area B * 4 in Support.....	0
Additional Area B units* 8 in Support .....	0

**Area C Arts and Humanities (16 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective (PHIL 340 or FNR 360 recommended) .....	4

**Area D/E Society and the Individual (16 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
	<u>40</u>

<b>ELECTIVES</b> .....	<u>0</u>
	<b>196</b>

<sup>1</sup> To be selected in accordance with the A.B.E.T. 24-unit and Culminating Engineering Design requirement, in consultation with your academic advisor.

<sup>2</sup> No more than 4 units of ENVE 400 or CE 400 can be counted towards technical electives.

## MS 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 opportunities for practicing engineers;
- Graduate preparation for further study in engineering, leading to the Doctor of Engineering or Ph.D. degree;
- Graduates who are able 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 GPA of 3.0 in the last 90 quarter units (60 semester) attempted. Applicants 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 advisor, 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 advisor's approval, students 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 MS in Civil and Environmental Engineering are:

- \* a core of 10 units as required;
- \* a minimum of 26 units of advisor approved electives within the major;
- \* a minimum of 9 units of advisor-approved electives outside the department;
- \* at least 24 units of the 45 unit program at the 500 level;
- \* a comprehensive written examination (non-thesis option) or an oral defense examination (thesis option).

Two program options are available:

**Thesis option.** 36 units of advisor-approved coursework, 9 units of thesis research/design, and an oral thesis defense examination administered by a panel of three faculty.

**Non-thesis option.** 45 units of advisor-approved coursework and a written comprehensive examination administered by a panel of three faculty (maximum of three opportunities to pass this examination).

	<i>Units</i>
<b>Required Courses</b> .....	10
CE 591 Graduate Seminar (1)	
CE 599/ENVE 599 Design Project (Thesis) (9) <i>or</i> additional 9 units of advisor approved analysis and design electives within the major (non-thesis option) and Comprehensive Examination.	
<b>Advisor approved analysis and design electives</b> (normally to be selected from the following list after consultation with your academic advisor and the CE/ENVE graduate coordinator): .....	26
<b>Advisor approved analysis electives outside the major</b> (to be selected after consultation with your academic advisor and the CE/ENVE Graduate Coordinator). .....	9
	45

### Analysis and design CE and ENVE electives:

CE 400<sup>1</sup>, CE 401, CE 402, CE 407, CE 421, CE 422, CE 424, CE 431, CE 432, CE 434, CE 440, CE 453, CE 454, CE 457, CE 458, CE 459, CE 466, CE 467, CE 481, CE 482, CE 483, CE 500<sup>1</sup>, CE 501, CE 504, CE 505, CE 521, CE 522, CE 523, CE 525, CE 528, CE 529, CE 533, CE 535, CE 537, CE 554, CE 555, CE 558, CE 559, CE 571, CE 573, CE 574, CE 581, CE 582, CE 583, CE 584, CE 585, CE 586, CE 599  
 ENVE 400<sup>1</sup>, ENVE 411, ENVE 416, ENVE 421, ENVE 434, ENVE 436, ENVE 437, ENVE 438, ENVE 439, ENVE 443, ENVE 450, ENVE 455, ENVE 465, ENVE 466, ENVE 467, ENVE 500<sup>1</sup>, ENVE 534, ENVE 535, ENVE 536, ENVE 541, ENVE 551

<sup>1</sup> No more than 4 total units of advisor-approved technical elective credit from CE 400, 500 and ENVE 400, 500 combined.

# Computer Engineering

**Program Office**  
**Engineering East Building (20), Room 215**  
**(805) 756-1229**  
**www.cpe.calpoly.edu**

**College of Engineering Advising Center**  
**Engineering South (40), Room 115**  
**(805) 756-1461**

## Director, C. Arthur MacCarley

James L. Beug	Diana M. Keen
David B. Braun	Albert A. Liddicoat
Fred W. DePiero	Leonard D. Myers
Joseph E. Grimes	Phillip L. Nico
James G. Harris	John A. Saghri
Lewis D. Hitchner	Richard S. Sandige
John Y. Hsu	Hugh M. Smith
Martin E. Kaliski	Daniel J. Stearns

## ACADEMIC PROGRAM

### BS Computer Engineering

The Bachelor of Science in Computer Engineering prepares students interested in the design and application of computers and computer-based systems. The program incorporates a firm foundation in both electrical engineering and computer science, with a focus on the integration of hardware and software systems.

The mission of the Computer Engineering Program (CPE) is to provide students with a well-rounded education encompassing the theory and practice of selected, balanced topics in electrical engineering and computer science, to enable students to contribute and continue their education in a wide range of computer-related engineering careers. The program seeks to emphasize “hands-on” experience, problem solving skills, the creative process and responsible action. Through professional development activities, faculty contribute to the advancement of the state-of-the-art, and strive to directly incorporate this experience in the classroom.

The primary educational objectives of the Computer Engineering Program are to:

1. provide theoretical background in fundamentals underlying computer engineering.
2. provide technical knowledge and experience required for the practice of computer engineering.
3. provide hands-on experience to develop proficiency in experimental, testing, and research skills.
4. develop communications skills, establish ethical standards of practice, and foster life-long learning skills.
5. provide a well-rounded understanding of social, interpersonal, artistic, and world issues, and the relationship between these and the practice of computer engineering.

In addition to the general abilities expected of College of Engineering graduates, computer engineering students are expected to graduate with:

- a knowledge of probability and statistics appropriate to computer engineering applications;
- a knowledge of mathematics through differential and integral calculus, basic sciences, and engineering sciences to analyze and design complex devices and systems containing hardware and software components; and
- a knowledge of discrete mathematics.

The program prepares graduates for professional practice in industry, as well as continued study in graduate school. Cal Poly's “learn by doing” philosophy is emphasized by integrating design throughout the curriculum, especially in the numerous design-centered laboratories. In the required senior design project, which is completed in a two-quarter set of capstone courses, students demonstrate their understanding of engineering knowledge and their ability to apply that knowledge creatively to practical problems.

This integrated approach will allow students to work effectively in such diverse areas as digital systems simulation and digital control systems. Knowledge and laboratory experience in computer architecture and structures will provide the understanding necessary to design and build computer systems, computer networks and digital communications systems. A thorough knowledge of modern microprocessors enables the graduate to apply these machines in applications such as robotics and data acquisition. Twelve units of technical electives allow students the option to specialize in an area of special interest. Current technical elective tracks are:

- computer architecture and system integration
- computer networks
- computer based controls and robotics
- software systems
- graphics and multimedia
- electronics implementation and VLSI

In addition to a sound theoretical background in computer engineering concepts, students experience practical design courses intended to build problem solving skills. Laboratory courses supplement the program to develop

"hands on" skills in all areas of study. Students are exposed to a wide variety of computing equipment: microprocessor development systems, workstations and personal computers, and advanced network hardware and software.

Active student groups of interest to computer engineering majors include the IEEE Computer Society, the IEEE Student Branch, the Association for Computing Machinery, and many other project-oriented student clubs and activities.

Graduates of the Computer Engineering Program are qualified for admission to Cal Poly master's degree programs in electrical engineering, computer science, and general engineering (including biomedical engineering). The opportunity also exists for advanced students to begin graduate study in these areas prior to completion of the BS degree, via a "blended 4+1" program. This opportunity provides a number of advantages to qualified students, and makes it possible for completion of both the BS and MS degrees in as little as 5 years. Computer engineering students participating in a blended 4+1 program are permitted to fulfill the computer engineering senior project requirement with the master's degree thesis. Students must be prepared for engineering practice via the curriculum which culminates in a major design experience based on the knowledge and skills acquired in earlier coursework and incorporating engineering standards and realistic constraints, as listed in the ABET Engineering Criteria. Therefore, all "Blended BS + MS Program" students, even those students completing the Master of Science in Engineering, must have a master's thesis with this major design experience requirement included in to complete the undergraduate degree. The thesis supervisor will assist the student in ensuring that this requirement is met. Further details are provided in the graduate study sections for each of these programs.

## BS COMPUTER ENGINEERING

*For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic advisor. \* Satisfies GE requirement; see page 76.*

### Freshman

CPE 100 Computer Engineering Orientation.....	1
CPE 101 Fund Computer Science I.....	4
CPE 102, 103 Fund Computer Science II, III .....	4,4
CSC 141 Discrete Structures I .....	4
ENGL 134 Writing: Exposition (A1)*.....	4
IME 156 Basic Electronics Manufacturing <i>or</i>	
IME 157 Electronics Manufacturing .....	2
SCOM 101/102 Speech Communication (A2)*.....	4
MATH 141,142 Calculus I, II (B1)* .....	4,4
MATH 143 Calculus III (Add'l Area B)*.....	4
PHYS 131 General Physics (Add'l Area B)* .....	4
Fine and performing arts elective (C3)*.....	4
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### Sophomore

CPE 129, 169 Digital Design & Lab .....	3,1
CPE 229, 269 Computer Design and Assembly	
Language Programming and Lab.....	3,1
CHEM 124 Gen Chem for Engineering (B3/B4)* ..	4
EE 213, 253 Basic Circuit Analysis and Lab .....	4,1
EE 214, 254 Steady-State Circuit Analysis and Lab	4,1
MATH 241 Calculus IV .....	4
MATH 244 Linear Analysis I.....	4
PHYS 132, 133 General Physics.....	4,4
PHYS 211 Modern Physics .....	4
Philosophy elective (C2)* .....	4
American experience elective (D1)* .....	4
	<hr/> 50

### Junior

CPE 250 Systems Programming.....	4
CPE 315 Computer Architecture.....	4
CPE 316 Micro Controllers and Embedded	
Applications .....	4
CPE 329 Programmable Logic and	
Microprocessor-Based Systems Design.....	4
CPE 350 CPE Capstone Preparation .....	1
CPE 453 Operating Systems I .....	4
EE 228 Continuous-Time Signals and Systems .....	4
EE 306, 346 Semiconductor Device Electronics	
and Lab .....	3,1
EE 307, 347 Digital Electronics and Integrated	
Circuits and Lab.....	3,1
ENGL 149 Technical Writing for Engineers (A3)*	4
Literature elective (C1)* .....	4
Literature, philosophy, arts (300-400 level) (C4)*..	4
Comparative social institutions elective (D3)* .....	4
	<hr/> 49

### Senior

CPE 450 CPE Capstone Project .....	4
CPE 464 Introduction to Computer Networks .....	4
CPE 461, 462 Senior Project.....	3,2
BIO 213 and ENGR/BRAE 213 (B2)* .....	2,2
ME 211 Engr Statics <i>or</i> MATE 210, 215 (4)	3
STAT 350 Probability and Random Processes for	
Engineers (B6)* .....	4
Political economy elective (D2)* .....	4
Self development elective (CSU Area E) (D4)*.....	4
Advisor approved technical electives .....	12
	<hr/> 44
	<hr/> 190

**BS COMPUTER ENGINEERING**

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA                              ☐ USCP

\* = Satisfies General Education requirement

**MAJOR COURSES**

CPE 100 Computer Engineering Orientation.....	1
CPE 101 Fundamentals Computer Science I.....	4
CPE 102, 103 Fund Computer Science II, III .....	4,4
CPE 129, 169 Digital Design and Lab .....	3,1
CPE 229, 269 Computer Design and Assembly Language Programming and Lab .....	3,1
CPE 250 Systems Programming .....	4
CPE 315 Computer Architecture.....	4
CPE 316 Micro Controllers and Embedded Apps....	4
CPE 329 Programmable Logic and Microprocessor-Based Systems Design .....	4
CPE 350 CPE Capstone Preparation .....	1
CPE 450 CPE Capstone Project.....	4
CPE 453 Operating Systems I.....	4
CPE 461, 462 Senior Project.....	3,2
CPE 464 Introduction to Computer Networks .....	4
CSC 141 Discrete Structures I .....	4
EE 213, 253 Basic Circuit Analysis and Lab .....	4,1
EE 214, 254 Steady-State Circuit Analysis and Lab .....	4,1
EE 228 Continuous-Time Signals and Systems .....	4
EE 306, 346 Semiconductor Device Electronics and Lab .....	3,1
EE 307, 347 Digital Integrated Electronics and Lab .....	3,1
Advisor approved technical electives.....	12
	<b>93</b>

**SUPPORT COURSES**

BIO 213 and ENGR/BRAE 213 (B2)* .....	2,2
CHEM 124 Gen Chem for Engineering (B3/B4)* ..	4
ENGL 149 Technical Writing for Engineers (A3)* ..	4
IME 156 Basic Electronics Manufacturing or IME 157 Electronics Manufacturing.....	2
MATH 141, 142 Calculus I, II (B1)* .....	4,4
MATH 143 Calculus III (Add'l Area B)* .....	4
MATH 241 Calculus IV .....	4
MATH 244 Linear Analysis I .....	4
ME 211 Engr Statics or MATE 210, 215 (4).....	3
PHYS 131 General Physics (Add'l Area B)* .....	4
PHYS 132, 133 General Physics .....	4,4
PHYS 211 Modern Physics .....	4
STAT 350 Probability and Random Processes for Engineers (B6)* .....	4
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**GENERAL EDUCATION (GE)**

72 units required; 32 units are in Major/Support.

→See page 76 for complete GE course listing.

→Minimum of 8 units required at the 300-400 level.

**Area A Communication (8 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing * 4 units in Support.....	0

**Area B Science and Mathematics (no additional units required)**

B1 Mathematics/Statistics * 8 units in Support.....	0
B2 Life Science * 4 units in Support.....	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	
B5 (requirement for Liberal Arts students only)	
B6 Upper-division Area B * 4 units in Support .....	0
Additional Area B units * 8 units in Support .....	0

**Area C Arts and Humanities (16 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4

**Area D/E Society and the Individual (16 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4

**40**

<b>ELECTIVES.....</b>	<b>0</b>
	<b>190</b>

# Computer Science

**Department Office**  
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**www.csc.calpoly.edu**

**College of Engineering Advising Center**  
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Gene Fisher	Cornel K. Pokorny
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Diana M. Keen	Clark S. Turner
Elmo A. Keller	

## ACADEMIC PROGRAMS

**BS, MS Computer Science**  
**BS Computer Engineering**  
**BS Software Engineering**  
**Computer Science Minor**

The Computer Science Department educates students in the discipline of computer science and teaches them to apply their education to solve practical problems in a socially responsible way. To support the department's educational mission, faculty engage in research and professional development.

In all of the department's programs, laboratory experiences ensure that students have both a theoretical and practical understanding of computer science. Individual and team projects, culminating in the capstone experience of a senior project, reinforce concepts and provide students the opportunity to apply and communicate their knowledge.

The department has active student chapters of the Association for Computing Machinery, IEEE Computer Society and Upsilon Pi Epsilon (the national computer honor society). Student teams compete in national competitions and student organizations sponsor industry/student events.

The department, with industry support, provides a modern computing environment that includes the most current software tools running on a variety of workstations and servers. Projects in advanced courses are supported by specialized laboratories for databases, computer architecture, operating systems, software engineering, computer networks, computer graphics, and human/computer interaction.

## BS Computer Science

The BS Computer Science program provides in-depth study of computer science fundamentals and practice, including programming concepts and languages, software engineering, operating systems and computer architecture.

In addition, the major offers a wide choice of technical electives in a structure that allows students to focus on particular areas and their application. Typical areas of emphasis include databases, distributed computing, software engineering, programming languages, graphical user interfaces, operating systems, computer networks, computer graphics, and artificial intelligence.

The curriculum is project-oriented and develops students' ability to solve problems using modern computing concepts. Students can expect to complete many projects in a variety of languages and on a variety of computer systems. During their last year of study, students complete a senior project spanning two academic quarters. The senior project is done either as an individual or as a member of a team.

Graduates of the computer science program are well prepared to become successful professionals and to pursue graduate study. They are sought by the computer industry for positions as software developers, quality assurance and test engineers, and other technical positions in computer-related industries.

Graduates in computer science:

- Have a broad knowledge of computer science and substantial knowledge of at least one key area of computer science;
- Are prepared to be successful professionals, and, if they desire, are prepared to pursue graduate study;
- Think independently, acquire knowledge, and continue their development as professionals;
- Apply scientific and engineering methodology to the design, implementation, analysis, and evaluation of computer-based systems;
- Communicate effectively, both orally and in writing, and collaborate effectively in teams; and
- Are prepared for the ethical, societal, and global issues associated with the computing field.

The BS Computer Science program is accredited by the Computing Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: (410) 347-7700.

### **BS Software Engineering**

The BS in Software Engineering prepares students to become software engineers: professionals who develop software products on time, within budget, and that meet customer requirements. Building on the fundamentals of computer science, the program focuses on practical aspects of building and deploying real software systems in a socially responsible way. The program's educational mission supports the faculty in research and professional development that keeps them current in their field and in touch with current industry practices and trends.

The hallmark of the program is "hands on" experience where students follow a curriculum that builds on traditional computer science but differs from the BS in Computer Science in the following ways:

1. Classes emphasize the team approach to building software and provide leadership opportunities for every student.
2. Classes place an emphasis on software processes and lifecycles.
3. Classes include significant learning in engineering and management areas such as quality assurance, testing, metrics, maintenance, configuration management and personnel management.
4. The curriculum has a stronger emphasis on mathematics and the use of engineering methods in software design.

The software engineering curriculum culminates in a year-long capstone sequence where the students work in teams to build a large software system. Students are expected to complete a co-operative education experience prior to enrollment in these courses.

Freshmen must choose their major when they apply for admission. The software engineering program is designed to be flexible for those students who might want to refocus their efforts after beginning in another program. To that end, the Software Engineering lower division curriculum is quite similar to the Computer Science and Computer Engineering programs.

The software industry increasingly requires those with a suitable engineering background for their cutting edge projects. Graduates with a BS in Software Engineering can expect to find significant opportunities in software development and management, software engineering and marketing.

### **BS Computer Engineering**

For information regarding this program, please refer to Computer Engineering. This program is jointly

administered by the Computer Science Department and the Electrical Engineering Department.

### **Blended BS + MS Computer Science**

The department offers an accelerated program for motivated, well-qualified students. The blended program allows BS Computer Science, BS Computer Engineering, and BS Software Engineering students to progress toward the Master's degree while still undergraduates. The scheduling flexibility provided by the program enables students to complete the BS and MS degrees efficiently.

#### **Eligibility**

Students majoring in BS Computer Science, BS Software Engineering, and BS Computer Engineering are eligible to apply to the blended program if they meet the following minimum eligibility requirements:

- Junior status and completion of 20 units of CSC courses past CSC/CPE 103;
- Meet the minimum GPA requirement of 3.3; and
- Have not enrolled in senior project.

Participation in the program is based on prior academic performance and other measures of professional promise. Students are selected by a faculty committee.

#### **Program of Study**

Students in the blended program complete all courses required for the MS degree and all courses required for the BS except the senior project. Completion of the MS thesis satisfies the senior project requirement. Please refer to your undergraduate degree program for a restriction on the master's thesis where a major design experience requirement is included in order to complete the undergraduate degree.

Upon completion of the program, students are awarded the BS and the MS degrees at the same graduation ceremony and at the same time. Degrees are earned concurrently, not serially.

### **Computer Science Minor**

Nearly all disciplines need to integrate and utilize the capabilities of computers. The Computer Science minor consists of a core of 16 units and the choice of a track for specialized study. The core provides the common knowledge and skills needed by anyone who wishes to advance further in computer science. The track consists of one or more required courses and several restricted elective courses.

Admission to the minor is limited and selection will be made based upon the applicant's performance in the core courses. Please see the College of Engineering Advising Center for further information *before* planning to enter the minor.

The courses taken in the minor can be counted toward the student's major, support and general education & breadth requirements. Once students have completed CSC/CPE 101, 102, 103, and 141 with a 3.0 gpa (B grade) in each course based on the first time the course is taken, and if they have a

Cal Poly cumulative gpa of a 3.0 or higher, they should make an appointment to see the director of the College of Engineering Advising Center to request acceptance to the minor. The Computer Science minor is not open to CSC, CPE or Software Engineering (SE) major students. Questions concerning the minor should be directed to the College of Engineering Advising Center.

### Curriculum for Computer Science Minor

CSC 101,102,103 Fund Computer Science I,II,III.... 4,4,4

CSC 141 Discrete Structures I..... 4

**Tracks (select one) ..... 8**

*Database and Application Development (8)*

CSC 365 Introduction to Database Systems

CSC 366 Database, Modeling, Design, & Implemnt

*Computer Architecture (8)*

(Note: CPE 229 is prerequisite to CSC 315 )

CSC 315 Computer Architecture

CSC 316 Micro Controllers and Embedded Apps.

*Artificial Intelligence (8)*

CSC 480 Artificial Intelligence

CSC 481 Knowledge Based Systems

*Graphics (8)*

CSC 471 Introduction to Computer Graphics

CSC 473 Advanced Rendering Techniques or CSC

474 Computer Animation or CSC 476 Real-Time 3D Computer Graphics Software

*Human-Computer Interaction (8)*

(Note: CSC 205 is prerequisite to CSC 484)

CSC 484 User-centered Interface Design & Dev.

CSC 486 Human-Computer Interaction

*Professional Software Development (8)*

CSC 305 Individual Software Design & Developmt

CSC 435 Intro to Object-Oriented Design Using GUIs

**Upper-division restricted electives ..... 8**

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### BS COMPUTER SCIENCE

Recommended Course Sequence (prerequisite courses in parentheses, with *'s for "or concurrent") [GE category in brackets]			
Freshman			
Fall	15 units	Winter	16 units
MATH 141 [B1]..... 4		MATH 142 [B1]..... 4 (MATH 141)	
			CSC/CPE 103 ..... 4 (CSC/CPE 102, CSC 141)
CSC/CPE 101 ..... 4		CSC/CPE 102 ..... 4 (CSC/CPE 101, MATH 141)	[D2]..... 4
ENGL 133/134 [A1] ..... 4		CSC 141 ..... 4 (CSC/CPE 102*, MATH 118 & 119 or equiv.)	ENGL 149 [A3]..... 4
Free Elective..... 3		SCOM 101/102 [A2]..... 4	Free Elective..... 2

Sophomore			
Fall	16 units	Winter	16 units
CSC/CPE 205 ..... 4 (CSC/CPE 103)		CSC/CPE 206 ..... 4 (CSC/CPE 205)	CSC/CPE 250 ..... 4 (CSC/CPE 103 and CPE 229/269)
CPE/EE 129/169 ..... 4 (CPE/CSC 101)		CPE/EE 229/269 ..... 4 (CPE/EE 129/169)	BIO 213 ..... 4 and ENGR /BRAE 213 [B2]
[D4] ..... 4		PHIL 230/231 [C2].. 4	[D1]..... 4
Take a sequence of either 3 PHYS or 3 CHEM courses:			
PHYS 131 [B3/4]..... 4 Or CHEM 124 [B3/4]		PHYS 132 ..... 4 Or CHEM 125 [Add'l Area B]	PHYS 133..... 4 Or CHEM 129
Junior			
Fall	16 units	Winter	16 units
CSC 300 ..... 4 (CSC/CPE 206)		CSC 330 ..... 4 (CSC/CPE 103 and CSC/CPE 250)	CSC 349..... 4 (MATH 142, CSC/CPE 103)
CSC/CPE 315 ..... 4 (CSC/CPE 103 and CPE 229/269)		Tech elec <sup>1</sup> ..... 4	Tech elec <sup>1</sup> ..... 4
Math/Stat elec ..... 4		Math/Stat elec ..... 4	STAT 321 [B6]..... 4 (MATH 142)
[D3] ..... 4		[C3] ..... 4	Society & individual elec ..... 4
Senior			
Fall	16 units	Winter	14 units
CSC 445 ..... 4 (CSC/CPE 103)		CSC 453 ..... 4 (CSC/CPE 315 and either CSC/CPE 250 or CSC 353)	Tech elec <sup>1</sup> ..... 4
Tech elec <sup>1</sup> ..... 4		CSC 491 Sr. Project. 2	CSC 492 Sr. Project. 3
Tech elec <sup>1</sup> ..... 4		Tech elec <sup>1</sup> ..... 4	Science elec ..... 4 [Add'l Area B]
[C1] ..... 4		[C4] (300-400)..... 4	Arts & humanities elec ..... 4
		GWR	USCP

Engineering support, technical elective, and GE courses need not be taken where shown.

<sup>1</sup> Subject to Computer Science Department guidelines; contact the College of Engineering Advising Center (<http://www.ee.calpoly.edu/CENGAC>) for additional information and agreement form. Technical electives must be approved in advance.

**BS COMPUTER SCIENCE**

- ☐ 60 units upper division      ☐ GWR  
 ☐ 2.0 GPA                      ☐ USCP

\* = Satisfies General Education requirement

**MAJOR COURSES**

CSC 101 Fundamentals Computer Science I .....	4
CSC 102, 103 Fund. Computer Science II, III .....	4,4
CSC 141 Discrete Structures I .....	4
CPE 129, 169 Digital Design and Lab .....	3,1
CSC 205, 206 Software Engineering I, II .....	4,4
CPE 229, 269 Computer Design and Assembly Language Programming, and Lab .....	3,1
CSC 250 Systems Programming .....	4
CSC 300 Professional Responsibilities .....	4
CSC 315 Computer Architecture .....	4
CSC 330 Programming Languages I .....	4
CSC 349 Design and Analysis of Algorithms .....	4
CSC 445 Theory of Computing .....	4
CSC 453 Introduction to Operating Systems .....	4
CSC 491, 492 Senior Project .....	2,3
Advisor approved technical electives .....	24
Subject to Computer Science Department guide- lines; contact the College of Engineering Advising Center ( <a href="http://www.ee.calpoly.edu/CENGAC">www.ee.calpoly.edu/CENGAC</a> ) for additional information and agreement form. Technical electives must be approved in advance.	
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**SUPPORT COURSES**

BIO 213 and ENGR/BRAE 213 (B2)* .....	2,2
ENGL 149 Technical Writing for Engineers (A3)* .....	4
MATH 141, 142 Calculus I, II (B1)* .....	4,4
STAT 321 Prob/Stats for Engrs/Scientist (B6)* .....	4
<i>Arts and humanities elective.</i>	
Select from GE Area C courses .....	4
<i>Society and the individual elective.</i>	
Select from GE Area D5 courses .....	4
<i>Mathematics/statistics electives.</i> Select from .....	8
CSC 142; MATH 143, 206, 241, 244, 248, 306, 335, 336, 437, 470; STAT 322.	
<i>Science elective (Add'l Area B)*</i> Select from	
BIO 111, 115, 151; BOT 121; CHEM 124; MCRO 221, 224; PHYS 131 (no double counting of units) .....	4
<i>Physical science electives</i> .....	12
CHEM 124 (B3/4)*, 125 (Add'l Area B)*, 129 or	
PHYS 131 (B3/4)*, 132 (Add'l Area B)*, 133	
	<b>52</b>

**GENERAL EDUCATION (GE)**

- 72 units required; 32 units are in Support.  
 → See page 76 for complete GE course listing.  
 → Minimum of 8 units required at the 300-400 level.

**Area A Communication (8 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing * 4 units in Support .....	0

**Area B Science and Mathematics (no add'l units req'd)**

B1 Mathematics/Statistics * 8 units in Support .....	0
B2 Life Science * 4 units in Support .....	0
B3 Physical Science * 4 units in Support .....	0
B4 One lab taken with either a B2 or B3 course	
B5 (requirement for Liberal Arts students only)	
B6 Upper-division Area B * 4 units in Support .....	0
Additional Area B units * 8 units in Support .....	0

**Area C Arts and Humanities (16 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4

**Area D/E Society and the Individual (16 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4

**40****ELECTIVES..... 5****186****BS SOFTWARE ENGINEERING**

For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic advisor. \* Satisfies GE requirement; see page 76.

**Year 1**

CSC 101 Fundamentals Computer Science I .....	4
CSC 102, 103 Fund Computer Science II, III .....	4,4
CSC 141 Discrete Structures I .....	4
ENGL 134 Writing: Exposition (A1)* .....	4
SCOM 101/102 Speech Communication (A2)* .....	4
MATH 141, 142 Calculus I, II (B1)* .....	4,4
MATH 143 Calculus III (Add'l Area B)* .....	4
Fine and performing arts elective (C3)* .....	4
American experience elective (D1)* .....	4
PSY 201/202 General Psychology (D4)* .....	4
	<b>48</b>

**Year 2**

CSC 205, 206 Software Engineering I, II .....	4,4
CSC 305 Individual Software Design and Dev .....	4
ENGL 149 Technical Writing for Engineers (A3)* .....	4
IME 314 Engineering Economics .....	3
MATH 241 Calculus IV .....	4
MATH 244 Linear Analysis I .....	4
Philosophy elective (C2)* .....	4
<i>Physical Science electives (B3/4, 4 units)* (Add'l 4 units Area B)*</i> .....	12
CHEM 124, 125, 129 or PHYS 131, 132, 133	
STAT 312 Statistical Methods for Engineers (B6)* .....	4
Electives .....	4
	<b>51</b>

**Year 3**

CSC 300 Professional Responsibilities .....	4
CSC 330 Programming Languages I .....	4
CSC 349 Design and Analysis of Algorithms .....	4

CSC 353 Systems Programming for Software Engrs	4
CSC 453 Introduction to Operating Systems .....	4
IME 430 Quality Engineering .....	4
PSY 350 Teamwork .....	4
Advisor approved cooperative education experience or technical elective equivalent .....	4
Advisor approved technical electives .....	8
Literature elective (C1)* .....	4
Comparative social institutions elective (D3)* .....	4
	<b>48</b>

**Year 4**

CSC 402 Software Requirements Engineering .....	4
CSC 405 Software Construction .....	4
CSC 406 Software Deployment .....	4
CSC 484 User-Centered Interface Design and Dev. ....	4
CSC 491, 492 Senior Project .....	2,3
BIO 213 and ENGR/BRAE 213 (B2)* .....	2,2
Select one from: MATH 248, 304, 333, 335, 336 .....	4
Literature, philosophy, arts (300-400 level) (C4)* ...	4
Political economy elective (D2)* .....	4
Advisor approved technical electives .....	12
	<b>49</b>
	<b>196</b>

**BS SOFTWARE ENGINEERING**

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA                      ☐ USCP  
 \* = Satisfies General Education requirement

**MAJOR COURSES**

CSC 101 Fundamentals Computer Science I .....	4
CSC 102, 103 Fund Computer Science II, III .....	4,4
CSC 141 Discrete Structures I .....	4
CSC 205 Software Engineering I .....	4
CSC 206 Software Engineering II .....	4
CSC 300 Professional Responsibilities .....	4
CSC 305 Individual Software Design & Dev .....	4
CSC 330 Programming Languages I .....	4
CSC 349 Design and Analysis of Algorithms .....	4
CSC 353 Systems Programming for Software Engrs	4
CSC 402 Software Requirements Engineering .....	4
CSC 405 Software Construction .....	4
CSC 406 Software Deployment .....	4
CSC 453 Intro to Operating Systems .....	4
CSC 484 User-Centered Interface Design & Dev....	4
CSC 491, 492 Senior Project .....	2,3
Advisor approved cooperative education experience or technical elective equivalent .....	4
Advisor approved technical electives .....	20
Subject to Computer Science Department guide- lines; contact the College of Engineering Advising Center ( <a href="http://www.ee.calpoly.edu/CENGAC">www.ee.calpoly.edu/CENGAC</a> ) for additional information and agreement form. Technical electives must be approved in advance.	

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**SUPPORT COURSES**

BIO 213 and ENGR/BRAE 213 (B2)* .....	2,2
ENGL 149 Technical Writing for Engineers (A3)* .....	4
IME 314 Engineering Economics .....	3
IME 430 Quality Engineering .....	4
<i>note: prerequisite waived for SE students</i>	
MATH 141, 142 Calculus I, II (B1)* .....	4,4
MATH 143 Calculus III (Add'l Area B)* .....	4
MATH 241 Calculus IV .....	4
MATH 244 Linear Analysis I .....	4
Select one from: MATH 248, 304, 333, 335, 336 .....	4
PSY 201/202 General Psychology (D4)* .....	4
PSY 350 Teamwork .....	4
Science electives (B3/4)* (Add'l 4 units Area B)* ..	12
<i>Select either</i>	
CHEM 124, 125, 129 or	
PHYS 131, 132, 133	
STAT 312 Statistical Methods for Engineers (B6)* ..	4
	<b>63</b>

**GENERAL EDUCATION (GE)**

72 units required; 36 units are in Major/Support.

→ See page 76 for complete GE course listing.

→ Minimum of 8 units required at the 300-400 level.

**Area A Communication (8 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing * 4 units in Support .....	0

**Area B Science and Mathematics (no add'l units req'd)**

B1 Mathematics/Statistics * 8 units in Support .....	0
B2 Life Science * 4 units in Support .....	0
B3 Physical Science * 4 units in Support .....	0
B4 One lab taken with either a B2 or B3 course	
B5 (requirement for Liberal Arts students only)	
B6 Upper-division Area B * 4 units in Support ..	0
Additional Area B units * 8 units in Support .....	0

**Area C Arts and Humanities (16 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4

**Area D/E Society and the Individual (12 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) * 4 units in Support .....	0
	<b>36</b>

<b>ELECTIVES</b> .....	<b>4</b>
	<b>196</b>

## MS COMPUTER SCIENCE

The MS program in Computer Science offers students the opportunity to prepare for careers in several areas of emphasis including software engineering, computer architecture, programming languages, theory of computing, operating systems, database systems, distributed computing, computer networks, artificial intelligence, computer graphics, and human-computer interaction. The program is designed for maximum flexibility to allow students to concentrate in one or more areas of study.

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. A satisfactory score on the Graduate Record Exam (GRE) is required. Foreign applicants must have a minimum TOEFL score of 550 (paper-based) or 213 (computer-based), plus a minimum TWE score of 4.5. Applicants must provide three letters of recommendation. 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:

- CSC 103 Fundamentals of Computer Science III (4)
- CSC 205 Software Engineering I (4)
- CSC 315 Computer Architecture (4)
- CSC 330 Programming Languages I (4)
- CSC 349 Design and Analysis of Algorithms (4)
- CSC 445 Theory of Computing (4)
- 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

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 MS degree. The formal study plan may be amended with approval of the graduate coordinator.

The MS degree requires at least 45 units beyond the undergraduate degree. Courses must be chosen according to the following requirements:

### Curriculum for MS Computer Science

<b>Select five courses from the following:</b> .....	20
CSC 508 Software Engineering I (4)	
CSC 509 Software Engineering II (4)	
CSC 520 Computer Architecture (4)	
CSC 530 Language and Translators (4)	
CSC 540 Theory of Computing II (4)	
CSC 550 Operating Systems (4)	
CSC 560 Database Systems (4)	
CSC 569 Distributed Computing (4)	
CSC 580 Artificial Intelligence III (4)	
<b>Thesis/Project and Seminar</b> .....	9
CSC 590 Graduate Seminar (3)	
CSC 599 Thesis (6)	
<b>Electives to be selected with Graduate Advisor's approval</b> .....	16
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For further information or advisement students should communicate with the Graduate Coordinator of the Computer Science Department.

# Electrical Engineering

**Department Office**  
**Engineering East Bldg. (20), Room 200**  
**(805) 756-2781**  
**www.ee.calpoly.edu**

**College of Engineering Advising Center**  
**Engineering South (40), Room 115**  
**(805) 756-1461**

## Department Chair, Michael M. Cirovic

Samuel O. Agbo	Bryan J. Mealy
William L. Ahlgren	Shien-Yi Meng
Dean Y. Arakaki	Ahmad Nafisi
David B. Braun	Mahmood Nahvi
Jerome R. Breitenbach	John A. Saghri
Fred W. DePiero	Richard S. Sandige
Saul Goldberg	Ali O. Shaban
Gary Granneman	Cheng Sun
James G. Harris	Shyama C. Tandon
Michael Hawes	Taufik
William F. Horton	Donley J. Winger
Martin E. Kaliski	Michael T. Wollman
Albert A. Liddicoat	Xiao-Hua (Helen) Yu
C. Arthur MacCarley	

## ACADEMIC PROGRAMS

### BS, MS Electrical Engineering BS Computer Engineering

The department offers the BS in Electrical Engineering which is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, and the MS in Electrical Engineering.

The mission of the Electrical Engineering Department is to educate students to achieve excellence in the discipline of electrical engineering and to teach them to apply their education to solve practical problems in a socially responsible way. We seek to prepare students for careers of service, leadership, and distinction in engineering and other related fields using a participatory, learn-by-doing, and "hands-on" laboratory, project, and design-centered approach. We seek to prepare students to participate in lifelong learning in the presence of rapid technological change. The department supports interdisciplinary programs such as Computer Engineering. It welcomes diversity in the student, faculty, and staff populations. The faculty are dedicated to quality teaching and engaging in scholarly activity. Student creativity is encouraged and fostered in this environment.

Thus, the primary educational objectives of the electrical engineering program are to educate graduates who:

1. excel in the profession of electrical engineering;
2. continue to expand their knowledge and skills throughout their careers, in the process of life-long learning; and
3. are readily able to pursue graduate degrees.

In addition to the general abilities expected of college of engineering graduates listed on page 188, electrical engineering students are expected to graduate with:

- a knowledge of probability and statistics, including applications appropriate to the electrical engineering field;
- a knowledge of mathematics through differential and integral calculus, basic sciences, and engineering sciences necessary to analyze and design complex devices and systems containing hardware and software components; and
- a knowledge of advanced mathematics, typically including differential equations, linear algebra, complex variables, and discrete mathematics.

The main focus of the program is to prepare graduates for practice in professional engineering. Thus, Cal Poly's "learn by doing" philosophy is emphasized by integrating design throughout the curriculum in the numerous design-centered laboratories. In the required senior design project, students demonstrate their understanding of engineering knowledge and their ability to apply that knowledge creatively to practical problems.

The intent of the department is to prepare students for pursuing engineering 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.

During their junior and senior years, students choose technical electives. Some courses deal with the development, design and application of circuits, devices and systems for communication, computers, controls, information processing and display, and system instrumentation. Senior 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, photonics, and solid state devices. Other courses deal 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.

Industry recognizes that students who have completed specialized technical courses are early contributors in the workforce. Students wishing to pursue graduate work may select appropriate senior courses in keeping with this goal.

Laboratories are well-equipped to provide students with both hands-on instrumentation and design experiences. 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, photonics, polymer electronics, 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 professional organizations and clubs such as: Institute of Electrical and Electronics Engineers (IEEE), Audio Engineering Society (AES), IEEE Computer Society, Power Engineering Society (PES), Eta Kappa Nu (HKN), Society of Photo-Optical Instrumentation Engineers (SPIE), Student Electrical Engineering Council (SEEC), Amateur Radio Club, and Poly Phase Club. 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.

### BS Computer Engineering

For information regarding this program, please refer to Computer Engineering. This program is jointly offered by the Computer Science Department and the Electrical Engineering Department.

### Blended BS + MS Electrical Engineering

Students must be prepared for engineering practice via the curriculum which culminates in a major design experience based on the knowledge and skills acquired in earlier coursework and incorporating engineering standards and realistic constraints, as listed in the ABET Engineering Criteria. Therefore, all "Blended B.S. + M.S. Program" students, even those students completing the master of Science in Engineering, must have a master's thesis with this major design experience requirement included in order to complete the undergraduate degree.

The blended program is an honors program that provides a means for academically excellent students to complete the MS Electrical Engineering, with simultaneous conferring of both bachelor's and master's degrees. Students in the blended program are provided with a seamless process whereby they can progress from undergraduate to graduate status.

### Eligibility

Students majoring in BS Electrical Engineering or Computer Engineering may be eligible to pursue the blended program after completing all required EE/CPE 300-level courses.

Participation in the program is based on prior academic performance and other measures of professional promise. Students are selected by the Graduate Committee. See page 96 for the minimum university eligibility criteria; contact the EE Department for specific program eligibility criteria.

### Program of Study

A feature of the program is to allow the use of a common project for fulfillment of both the Master's Thesis (EE 599) and Senior Project (EE 461/462). A faculty advisor serves as the thesis committee chairperson and the senior project advisor. *The unit requirements for either degree are unchanged.* A student in this program, at his/her request, may be awarded the BS degree prior to the completion of the program, at a point when all requirements for the BS degree have been met, including an acceptable senior project report.

## BS ELECTRICAL ENGINEERING

Recommended Course Sequence		
<i>(Prerequisite courses in parentheses; *=or concurrent) [GE Engineering support, technical elective, and GE courses need not be taken where shown.]</i>		
Freshman		
Fall ..... 16 units	Winter ..... 16 units	Spring ..... 16 units
MATH 141 [B1]	MATH 142 [B1] (MATH 141)	MATH 143 [B] (MATH 142)
EE 111/151	CSC 101	EE 129/169 (EE 111/151, CSC 101)
CHEM 124 [B3, B4]	PHYS 131 [B] (MATH 141, 142*)	PHYS 133 (PHYS 131, MATH 142)
IME 156		
ENGL 134 [A1]	[A2]	ENGL 149 [A3]
Sophomore		
Fall ..... 17 units	Winter ..... 17 units	Spring ..... 16 units
MATH 244 (MATH 143)	MATH 241 (MATH 143)	PHYS 211 (PHYS 132, 133, MATH 241)
EE 213/253 (PHYS 133, MATH 244*)	EE 214/254 (EE 213/253, MATH 244)	EE 228 (EE 214/254)
PHYS 132 (PHYS 131)	EE 229/269 (EE 129/169)	EE 255/295 (EE 214/254)
BIO&ENGR 213[B2] (MATH 142, CHEM 124)	[C1]	[C2]
Junior		
Fall ..... 16 units	Winter ..... 15 units	Spring ..... 16 units
EE 306/346 (CHEM 124, EE 214/254, IME 156, PHYS 211)	EE 307/347 (EE 229/269, 306/346)	EE 308/348 (EE 307/347, 302/342)
EE 328/368 (EE 228)	EE 302/342 (EE 228, 255/295)	EE 329 (EE 307/347)
STAT 350 [B6] (EE 228)	EE 314 (STAT 350)	EE 335 (MATH 241, EE 214/254)
[C3]	[C4]	[D1]

Senior		
Fall .....17 units	Winter ..... 14 units	Spring ..... 17 units
Engineering Support	Engineering Support	Engineering Support
Technical Elective	Technical Elective	Technical Elective
EE 402/442 (EE 335)	[D2]	[D3]
EE 409/449 (EE 308/348, 328/368, 329)		[D4]
EE 460 (EE 314, 335, 409/449*)	EE 461 or EE 463 (EE 409/449, 460)	EE 462 or EE 464 (EE 461 or EE 463)

## BS ELECTRICAL ENGINEERING

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA                              ☐ USCP

\* = Satisfies General Education requirement

### MAJOR COURSES

EE 111, 151 Intro to Electrical Engineering & Lab.	1,1
EE 129, 169 Digital Design and Lab.....	3,1
EE 213, 253 Basic Circuit Analysis and Lab .....	4,1
EE 214, 254 Steady-State Circuit Analysis and Lab	4,1
EE 228 Continuous-Time Signals and Systems .....	4
EE 229, 269 Computer Design and Assembly Language Programming and Lab	3,1
EE 255, 295 Energy Conversion Electromagnetics and Lab .....	3,1
EE 302, 342 Classical Control Systems and Lab .....	3,1
EE 306, 346 Semiconductor Device Electronics and Lab .....	3,1
EE 307, 347 Digital Electronics and Integrated Circuits and Lab .....	3,1
EE 308, 348 Analog Electronics and Integrated Circuits and Lab .....	3,1
EE 314 Introduction to Communication Systems ....	3
EE 328 Discrete Time Signals and Systems and EE 368 Signals and Systems Laboratory .....	3,1
EE 329 Programmable Logic and Microprocessor- Based Systems Design.....	4
EE 335 Electromagnetic Fields and Transmission...	4
EE 402 Electromagnetic Waves.....	4
EE 442 Electromagnetic Fields and Transmission Laboratory .....	1
EE 409, 449 Electronic Design and Lab .....	3,1
EE 460 Senior Project Preparation.....	1
EE 461 Senior Project or EE 463 Senior Project Design Laboratory .....	3
EE 462 Senior Project or EE 464 Senior Project Design Laboratory .....	2
Advisor approved technical electives.....	12
Select a minimum of 2 EE senior design laboratories and 2 EE senior design lectures.	

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### SUPPORT COURSES

BIO 213 and ENGR/BRAE 213 (B2)* .....	2,2
CHEM 124 Gen Chem for Engineering (B3/B4)*...	4
CSC 101 Fundamentals of Computer Science I.....	4
ENGL 149 Technical Writing for Engineers (A3)*.	4
IME 156 Electronic Manufacturing .....	2

MATH 141, 142 Calculus I, II (B1)* .....	4,4
MATH 143 Calculus III (Add'l Area B)* .....	4
MATH 241 Calculus IV .....	4
MATH 244 Linear Analysis I .....	4
PHYS 131 General Physics (Add'l Area B)* .....	4
PHYS 132, 133 General Physics .....	4,4
PHYS 211 Modern Physics .....	4
STAT 350 Probability and Random Processes for Engineers (B6)* .....	4
Approved engineering support electives .....	9
Select at least 3 courses from list of approved courses (on file in EE Department)	

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### GENERAL EDUCATION (GE)

72 units required; 32 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 8 units required at the 300-400 level.

#### Area A Communication (8 units)

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing * 4 in Support.....	0

#### Area B Science and Mathematics (no additional units required)

B1 Mathematics/Statistics * 8 units in Support.....	0
B2 Life Science * 4 units in Support.....	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	
B5 (requirement for Liberal Arts students only)	
B6 Upper-division Area B * 4 units in Support .....	0
Additional Area B units* 8 units in Support .....	0

#### Area C Arts and Humanities (16 units)

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4

#### Area D/E Society and the Individual (16 units)

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4

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#### ELECTIVES.....

0

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## MS 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, Electrical Engineering Department.

### Program of Study

Graduate students in this program must file a formal study plan with their advisor, department, college and university graduate studies office by no later than the end of the second quarter in the program. The formal program of study must include a minimum of 45 units (at least 28 of which must be at the 500 level and the remainder at the 400 level).

The broad curriculum requirements for the MS in Electrical Engineering are:

- a) core of 16 units;
- b) a minimum of 12 units of additional electrical engineering courses;
- c) at least 17 units of approved electives;
- d) at least 28 units of the 45 unit program at the 500 level.

Two program options are available for MS 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 thesis option is strongly encouraged for all students.

## Curriculum for MS Electrical Engineering

### Core Courses ..... 16

- EE 525 Stochastic Processes for Engineers (4)
- EE 563 Graduate Seminar (1) (1) (1)
- EE 599 Design Project (Thesis) (1-9) units of major field graduate level courses *and* a comprehensive written examination

### Additional Electrical Engineering Graduate Courses ..... 12

*To be selected from the following list: Not all courses listed are offered each academic year. Consult the EE Department for current information on course offerings*

- EE 502 Microwave Engineering (4)
- EE 511 Electric Machines Theory (3)
- EE 513 Control Systems Theory (4)
- EE 514 Advanced Topics in Automatic Control (4)
- EE 515 Discrete Time Filters (4)
- EE 517 Information Theory (4)
- EE 518 Advanced Power System Analysis (3)
- EE 519 Power System Design (4)
- EE 520 Solar-Photovoltaic Systems Design (3)
- EE 521 Computer Systems (4)
- EE 522 Microproc-Based Digital Sys Design (4)
- EE 523 Digital Systems Design (3)
- EE 524 Solid State Electronics (3)
- EE 526 Digital Communications (4)
- EE 527 Advanced Topics in Power Electronics (4)
- EE 528 Digital Image Processing (4)
- EE 529 Microwave Device Electronics (3)
- EE 530 Photonics Systems (4)
- EE 533 Antennas (4)
- EE 541 Advanced Microwave Laboratory (2)
- EE 544 Solid-State Electronics Laboratory (1)

### Approved Technical Electives (400-500 level) ..... 17

May be selected from the course list above and other advisor approved technical electives.

# General Engineering

## 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 South (40), Room 115**  
**(805) 756-1461**

### ACADEMIC PROGRAMS

#### BS General Engineering

The mission of the General Engineering Program is to provide students with the highest quality technical and professional engineering education, with a particular emphasis in new or evolving interdisciplinary areas, while allowing the student to participate in designing their curricula.

The primary goal of the General Engineering Program is to provide students with a theoretically rigorous and a laboratory-centered, practice-oriented, hands-on education that will allow our graduates to immediately participate and to excel in professional environments.

General Engineering graduates are expected to be ready for immediate entry into the professional engineering field. They are also expected to demonstrate an ability to satisfy their personal needs for further education, as expressed in their matriculation to graduate or professional schools in some cases, and an interest in life-long learning in all cases. They are expected to possess a solid engineering foundation which will underpin a successful career. They are expected to be leaders, based on strong communication skills, a capacity to form teams and perform in teams, and an understanding of the economic and social impact of their decisions.

In addition to the abilities expected of all engineering graduates, articulated in the section of this catalog describing the College of Engineering, General Engineering graduates are expected to leave the University with special capabilities pertinent to their own concentrations.

The Bachelor of Science degree in General Engineering is designed to allow students the latitude in course selection required to educate themselves either in the classical study of engineering or in new and evolving interdisciplinary technologies such as bioengineering and mechatronics. The degree is an excellent preparation for an applied terminal masters degree in these interdisciplinary fields such as the Blended BS+MS program described in the MS Engineering section of this catalog. General Engineering can also accommodate 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 advisor and are given the opportunity to focus their education while still at the undergraduate level. The BS degree in General Engineering 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.

General Engineering students are encouraged to participate in the Blended BS+MS program. This program recognizes that the expertise required of entry level engineers in many fields, particularly new and evolving technological fields, implies that a masters degree is a prerequisite for success. The program allows motivated students to reduce the time necessary to earn both degrees.

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 General Engineering curriculum provides the framework for this matrix of understanding, upon which the practitioner may begin to develop a unique area of expertise.

The General Engineering 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, developed with the support of the National Science Foundation, 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.

The application of engineering to medicine and biology underpins a strong and growing segment of the industrial sector and continues to be an area of inherent interest to students. The need for well educated professionals in this area has become more acute as the technology being applied has become more sophisticated. Evolution in computing, electronics, signal analysis and mechatronic systems have been harbingers of improvement to diagnostic efforts, therapeutic approaches and bioindustrial applications. Studies of biological materials, physiological mechanisms, biochemical kinetics and heat and mass transfer in biological systems require engineering expertise. Applied medical and biological research has taken on a distinct engineering aspect.

Mechatronics, another popular student focus, is defined as the application of decision making to physical systems. Today's engineered products are complex, composed of integrated mechanical and electronic components and operate with the aid of control software. Design and fabrication of such products requires knowledge of manufacturing, mechanical engineering, electronics and materials as well as experience with concurrent engineering tools. Embedded computers of all sizes and capabilities are used in the decision making elements of products which daily affect the lives of essentially each resident in the developed world. Microcontrollers and mechatronic systems are found in devices as mundane as lawnmowers and as esoteric as deep space probes – and every system in between.

**Bioengineering Concentration.** Provides students with interdisciplinary exposure in a burgeoning field. The program highlights an immediate introduction to the major, strong personal interaction with faculty, strong partnerships with industrial participants and a signature laboratory emphasis. Rooted in a strong engineering exposure, the curriculum allows students to pursue applied biotechnical research in practical, interdisciplinary settings. Students and faculty are concerned with the design, analysis, integration and operation of engineered materials and engineered systems in biological applications. Typical areas of study include bioinstrumentation, bioelectric signals and communication, remediation and bioindustrial systems.

**Biomedical Engineering Concentration.** Prepares students to enter the increasingly technical world of medicine and medical services. Steeped in a rigorous exposure to engineering, the curriculum allows students to explore biomedical engineering in practical interdisciplinary settings. Students and faculty are concerned with the design, analysis, integration and operation of engineered materials and engineered systems in biomedical applications. Graduates work or go on to graduate study in areas including biomedical instrumentation and medical device development and manufacture, biomaterials production and development, biomechanics or similar areas.

**Individualized Course of Study.** Permits students to pursue a course of study which meets their individual needs and interests. Courses are selected by the student with the advice and approval of the student's academic advisor and department chair.

## BS GENERAL ENGINEERING

*For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic advisor. \* Satisfies GE requirement; see page 76.*

### Freshman

ENGR 110,111,112 Engineering Science I,II,III ...	3,3,3
CHEM 124 Gen Chem for Engineering (B3/B4)*	4
CHEM 125 Gen Chem for Engrg (Add'l Area B)*	4
CSC 234/CSC 101 .....	3/4
ENGL 134 Writing: Exposition (A1)* .....	4
SCOM 101/102 Speech Communication (A2)* .....	4
MATH 141, 142 Calculus I, II (B1)* .....	4,4
MATH 143 Calculus III (Add'l Area B)* .....	4
PHYS 131 General Physics .....	4
PHYS 132 General Physics .....	4
	48-49

### Sophomore

CE 204 Strength of Materials .....	3
EE 201 Electric Circuit Theory .....	3
MATH 241 Calculus IV .....	4
MATH 244 Linear Systems .....	4
ME 211 Engineering Statics .....	3
ME 212 Engineering Dynamics .....	3
PHYS 133 General Physics .....	4
Physical science elective .....	4
ENGL 149 Technical Writing for Engineers (A3)*	4
BIO 213 and ENGR/BRAE 213 (B2)* .....	2,2
Select one of the following: MATH 344; STAT 312, 321, 350 (B6)* .....	4
American experience elective (D1)* .....	4
Comparative social institutions elective (D3)* .....	4
	48

### Junior

IME 314 Engineering Economics .....	3
ME 302 Thermodynamics .....	3
ME 313 Heat Transfer .....	3
MATE 210, 215 Materials Engineering and Lab ....	3,1
Literature elective (C1)* .....	4
Philosophy elective (C2)* .....	4
Political economy elective (D2)* .....	4
Self development elective (CSU Area E) (D4)* .....	4
<sup>1</sup> Concentration or individual course of study .....	22
	51

### Senior

ME 341 Fluid Mechanics .....	3
ENGR 481, 482 Sr. Project Design Lab I, II or Sr. Project-appropriate engineering discipline .....	2,2

<sup>1</sup> A minimum of 34 units at 300-400 level must be completed, in a concentration, individual course of study or free electives, in addition to those required in Major, Support and General Education, for a total of 60 upper division units.

Fine and performing arts elective (C3)*.....	4
Literature, philosophy, arts (300-400 level) (C4)*...	4
Physical science elective .....	4
<sup>1</sup> Concentration or individual course of study.....	18
Electives .....	9-10
	<u>46-47</u>
	<b>194</b>

**BS GENERAL ENGINEERING**

☐ 60 units upper division      ☐ GWR

☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

**MAJOR COURSES**

CE 204 Strength of Materials.....	3
CSC 234/CSC 101.....	3/4
EE 201 Electric Circuit Theory .....	3
ENGR 110,111,112 Engineering Science I,II,III .....	3,3,3
IME 314 Engineering Economics .....	3
MATE 210, 215 Materials Engineering and Lab....	3,1
ME 211 Engineering Statics.....	3
ME 212 Engineering Dynamics .....	3
ME 302 Thermodynamics.....	3
ME 313 Heat Transfer.....	3
ME 341 Fluid Mechanics .....	3
ENGR 481, 482 Sr. Project Design Lab I, II <i>or</i>	
Sr. Project-appropriate engineering discipline .....	2,2
<sup>1</sup> Concentration or individual course of study.....	40
	<b>84-85</b>

**SUPPORT COURSES**

BIO 213 <i>and</i> ENGR/BRAE 213 (B2)*.....	2,2
CHEM 124 Gen Chem for Engineering (B3/B4)*.	4
CHEM 125 Gen Chem for Engineering (Add'l	
Area B)* .....	4
ENGL 149 Technical Writing for Engineers (A3)*	4
MATH 141,142 Calculus I, II (B1)*.....	4,4
MATH 143 Calculus III (Add'l Area B)*.....	4
MATH 241 Calculus IV.....	4
MATH 244 Linear Systems .....	4
Select one of the following: MATH 344; STAT	
312, 321, 350 (B6)*.....	4
PHYS 131, 132, 133 General Physics.....	4,4,4
Physical science electives.....	4,4
	<b>60</b>

**GENERAL EDUCATION (GE)**

72 units required; 32 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 8 units required at the 300-400 level.

**Area A Communication (8 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing * 4	
units in Support .....	0

**Area B Science and Mathematics (no add'l units req'd)**

B1 Mathematics/Statistics * 8 units in Support.....	0
B2 Life Science *4 units in Support.....	0
B3 Physical Science* 4 units in Support.....	0

B4 One lab taken with either a B2 or B3 course	
B5 (requirement for Liberal Arts students only)	
B6 Upper-division Area B * 4 units in Support .....	0
Additional Area B units * 8 units in Support .....	0

**Area C Arts and Humanities (16 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4

**Area D/E Society and the Individual (16 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4

**40**

<b>ELECTIVES</b> .....	<b>9-10</b>
	<b>194</b>

**CONCENTRATIONS OR INDIVIDUALIZED COURSE OF STUDY (select one)****Bioengineering Concentration**

CSC 341 Numerical Engineering Analysis .....	4
ENGR 450 Special Topics in Bioengineering .....	4
IME 144 Introduction to Design and Manufacturing..	4
MATH 344 Linear Analysis II .....	4
ME 326 Intermediate Dynamics .....	4
Select 12 units from the following:.....	12
BIO 431, 432, 442; CHEM 305, 371; CSC 471;	
EE 336, 419; ENVE 304, 331, 421, 443; MATE	
320, 330; ME 328, 329, 401, 428, 445; STAT 312,	
321, 350	

Advisor approved electives.....	8
	<b>40</b>

**Biomedical Engineering Concentration**

CHEM 312 Survey of Organic Chemistry .....	4
CHEM 313 Survey of Biochemistry and Biotechnology	5
ENGR 450 Special Topics in Bioengineering .....	4
IME 144 Introduction to Design and Manufacturing..	4
MATE 425 Corrosion Engineering.....	4
Select 12 units from the following:.....	12
BIO 431, 432; BOT 426; CHEM 305, 306, 371,	
473, 475, CSC 473, 474; ENVE 304, 331; MATE	
446; MATH 344; IME 319, 437; ME 326, 401, 422,	
423, 445; PHYS 315, 323; STAT 312, 321, 350	

Advisor approved electives.....	7
	<b>40</b>

**Individualized Course of Study .....**

Technical electives. A minimum of 34 units must be at 300-400 level.

<sup>1</sup> A minimum of 34 units at 300-400 level must be completed, in a concentration, individual course of study or free electives, in addition to those required in Major, Support and General Education, for a total of 60 upper division units.

# Industrial & Manufacturing Engineering

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**(805) 756-2341**  
**www.ime.calpoly.edu**

**College of Engineering Advising Center**  
**Engineering South (40), Room 115**  
**(805) 756-1461**

## Department Chair (Position Vacant)

Sema E. Alptekin	A. Reza Pouraghabagher
J. Kent Butler	Paul E. Rainey
Kurt Colvin	Ahmad K. Seifoddini
Mark A. Cooper	Richard A. Strahl
Tali Freed	Daniel J. Waldorf
H. Jo Anne Freeman	Donald E. White
Jose Macedo	Tao H. Yang
Unny Menon	

## ACADEMIC PROGRAMS

### **BS, MS Industrial Engineering** **BS Manufacturing Engineering**

The mission of the Industrial Engineering and Manufacturing Engineering Programs at Cal Poly is “to educate students for successful and distinguished careers in industrial engineering, manufacturing engineering, and related fields using a learn-by-doing approach that stresses integrated processes, appropriate technologies, and enterprise competitive advantage.”

The department focuses on programs that integrate engineering with a real concern for people. Our students study topics that lead to satisfying and productive careers, and also provide 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.

Department and university laboratories and computers are integrated into coursework to investigate, test, and apply theoretical principles learned in the classroom. The descriptions below provide details of the various programs.

### **BS Industrial Engineering**

Industrial Engineering is the profession concerned with solving integrated engineering and management problems. The definition by the Institute of Industrial Engineers is as follows: “Industrial Engineering is concerned with the design, installation, and improvement of integrated systems of people, material, information, equipment, and energy by drawing upon specialized knowledge and skills in the mathematical, physical, and social sciences, together with the principles and methods of engineering analysis and design to specify, predict, and evaluate the results to be obtained from such systems.” Key objectives of industrial engineering are to improve the quality and productivity of creating and delivering 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.

The Bachelor of Science program in Industrial Engineering is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology. The following objectives have been set for students completing the Industrial Engineering Program:

1. *Immediate Practice* – Graduates will be ready for immediate entry into and contribution to the practice of industrial engineering or a related field by providing knowledge of contemporary issues and direct, hands-on experience with the modern tools and techniques of the discipline.
2. *Solid Engineering Foundations* – Graduates will have successful careers based on their ability to solve problems and make improvements through engineering design, experimentation, and application of scientific principles as well as their ability to analyze and critically evaluate their decisions.
3. *Broad Education* – Graduates will have careers of distinction and leadership based on their ability to communicate effectively, to contribute meaningfully to a team effort, and to understand the economic, societal, and ethical impacts of their decisions.
4. *Life-Long Learning* – Graduates will demonstrate the ability and desire to follow a life-long pursuit of personal fulfillment through education.

To meet these objectives, several specific outcomes have been identified for students in the Industrial Engineering Program in addition to the general abilities expected of College of Engineering graduates listed on page 188:

1. *Integrated Systems Design* – ability to design, develop, implement and improve integrated systems that include people, materials, information, equipment and energy.
2. *Evaluate Decisions* – ability to evaluate engineering decisions with respect to cost, quality, and productivity.
3. *Manufacturing Processes* – ability to recognize equipment, processes, and techniques used in major manufacturing industries.

Our main focus is to prepare graduates for practice in professional engineering. Thus, our “learn by doing” philosophy is emphasized in the curriculum by the large

number of design-centered laboratories, integrating design throughout the curriculum, and the senior design project capstone design experience.

In the required senior design project, which is completed in a two-quarter set of capstone courses, students demonstrate their understanding of engineering knowledge and their ability to apply that knowledge creatively to practical problems.

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 program is oriented to provide graduates with the capability of producing results with a minimum of additional training. Computer firms, health care industries, banks, retail chains, farms, airlines, mines, as well as government and traditional manufacturing industries, employ graduates of this discipline. Graduates also are well prepared for successful graduate study.

### BS 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 plans, develops, and optimizes the processes of production including methods of manufacture, and designs of tools and equipment for manufacturing. The emphasis is on both development and sustained operation of manufacturing systems, including computer-aided methods, automation, design for manufacture, production tooling, and material handling, as well as the processes and ancillary support systems of modern manufacturing.

The Bachelor of Science program in Manufacturing Engineering is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology. The following objectives have been set for students completing the Manufacturing Engineering Program at Cal Poly:

1. *Immediate Practice* – Graduates will be ready for immediate entry into and contribution to the practice of manufacturing engineering or a related field by their demonstrated knowledge of contemporary issues and direct, hands-on experience with the modern tools and techniques of the discipline.
2. *Solid Engineering Foundations* – Graduates will have successful careers based on their demonstrated ability to solve problems and make improvements through

engineering design, experimentation, and application of scientific principles as well as their ability to analyze and critically evaluate their decisions.

3. *Broad Education* – Graduates will have careers of distinction and leadership based on their ability to communicate effectively, to contribute meaningfully to a team effort, and to understand the economic and ethical impacts of their decisions.
4. *Life-Long Learning* – Graduates will demonstrate the ability and desire to follow a life-long pursuit of personal fulfillment through education.

To meet these objectives, several specific outcomes have been identified for students in the Manufacturing Engineering Program in addition to the general abilities expected of College of Engineering graduates listed on page 188:

1. *Materials and Manufacturing Processes* – understanding of the properties of materials and how the materials behave when they are altered and influenced by processes of manufacture.
2. *Design of Products* – understanding of the design of products, including an understanding of the influence of materials, geometry, and processing on the design and the ability to create design drawings and computer models and interpret dimensions, tolerances, and other engineering specifications.
3. *Business Perspective* – understanding of the relationship of manufacturing costs to profit and loss in an enterprise and of how to judge the economic consequences of design and production strategies, methods of control, and levels of automation.
4. *Control of Processes* – understanding of the control of manufacturing processes, including computer-aided, automated, and statistical methods.
5. *Basic Skills* – ability to use the basic techniques and skills necessary for manufacturing engineering practice, including ability to set up and operate equipment and measure productivity or part quality.
6. *Learn By Doing* – a participatory, “hands-on” education using a laboratory-intensive, project-oriented, design-centered “learn by doing” approach.
7. *Specialized Knowledge* – specialized knowledge in one or more areas of manufacturing and an appreciation for the wealth of information and technology *not* learned during undergraduate study.

In the required senior design project, which is completed in a two-quarter set of capstone courses, students demonstrate their understanding of engineering knowledge and their ability to apply that knowledge creatively to practical problems.

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, mechatronics, tool design, and computer-aided manufacturing are applied directly to the problems of development and sustained operation of manufacturing systems.

Graduates are prepared for job-entry at the professional level in the areas of CAD/CAM, process engineering, mechatronics, quality assurance, and production engineering. They also are well prepared for successful graduate study.

### Blended BS+MS Engineering Program

Students must be prepared for engineering practice via the curriculum which culminates in a major design experience based on the knowledge and skills acquired in earlier coursework and incorporating engineering standards and realistic constraints, as listed in the ABET Engineering Criteria. Therefore, all "Blended BS + MS Program" students, even those students completing the Master of Science in Engineering, must have a master's thesis with this major design experience requirement included in order to complete the undergraduate degree.

Students may be eligible to pursue the blended program toward the MS Engineering with a specialization in Integrated Technology Management. Please refer to the MS Engineering section of this catalog for more information and page 96 for eligibility criteria for blended programs.

### GRADUATE PROGRAMS

The Industrial and Manufacturing Engineering Department participates in offering the following graduate programs:

- MS Industrial Engineering
- MS Engineering with specialization in Integrated Technology Management
- Joint MBA/MS Engineering with specialization in Engineering Management

### BS 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 advisor. \* Satisfies GE requirement; see page 76.*

#### Freshman

IME 101 Intro Industrial/Manufacturing Engr.....	1
IME 141 Manufacturing Processes: Net Shape.....	1
IME 223 Work Design and Measurement.....	4
IME 144 Intro Design and Manufacturing.....	4
CHEM 124 Gen Chem for Engineering (B3/B4)*...	4
CHEM 125 Gen Chem for Engineering.....	4
CSC 234/CSC 111.....	3
ENGL 134 Writing: Exposition (A1)*.....	4
SCOM 101/102 Speech Communication (A2)*.....	4
MATH 141, 142 Calculus I, II (B1)*.....	4,4
MATH 143 Calculus III (Add'l Area B)*.....	4
American experience elective (D1)*.....	4
Self development elective (CSU Area E) (D4)*.....	4
	<hr/> 49

#### Sophomore

IME 239 Industrial Costs and Controls.....	3
IME 251 Manufacturing Engineering Analysis.....	4
IME 314 Engineering Economics.....	3
MATH 241 Calculus IV.....	4
MATH 244 Linear Analysis I.....	4
ME 211 Engineering Statics.....	3
ME 212 Engineering Dynamics.....	3
ENGL 149 Technical Writing for Engineers (A3)*	4
BIO 213 and ENGR/BRAE 213 (B2)*.....	2,2
PHYS 131 General Physics (Add'l Area B)*.....	4
PHYS 132, 133 General Physics.....	4,4
Political economy elective (D2)*.....	4
Philosophy elective (C2)*.....	4
Literature elective (C1)*.....	4
	<hr/> 56

#### Junior

IME 301, 305 Operations Research I, II.....	4,4
IME 312 Data Management and System Design.....	4
IME 319 Human Factors Engineering.....	3
IME 326 Engineering Test Design and Analysis ....	4
IME 335 Computer-Aided Manufacturing I or IME 356 Manufacturing Automation.....	4
IME 421 Manufacturing Organizations.....	3
CE 204 Strength Materials/ME 341 Fluid Mech.....	3
EE 201 Electric Circuits Theory.....	3
EE 321 Electronics.....	3
MATE 210 Materials Engr/ME 302 Thermodyn ....	3
STAT 312 Statistical Methods for Engineers (B6)*	4
<sup>1</sup> Technical electives.....	8
	<hr/> 50

#### Senior

IME 407 Operations Research III.....	4
IME 410 Inventory Control Systems.....	4
IME 420 Simulation and Expert Systems.....	4
IME 429 Ergonomics Lab.....	1
IME 430 Quality Engineering.....	4
IME 441 Engineering Supervision I.....	1
IME 443 Facilities Planning and Design.....	4
IME 481, 482 Sr Project Design Laboratory I, II ...	2,3
Fine and performing arts elective (C3)*.....	4
Literature, philosophy, arts (300-400 level) (C4)*..	4
Comparative social institutions elective (D3)*.....	4
<sup>1</sup> Technical electives.....	6
	<hr/> 45
	<hr/> 200

<sup>1</sup> Advisor approved technical electives.

**BS INDUSTRIAL ENGINEERING**

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA                      ☐ USCP  
 \* = Satisfies General Education requirement

**MAJOR COURSES**

IME 101 Intro Industrial & Manufacturing Engr.....	1
IME 141 Manufacturing Processes: Net Shape.....	1
IME 144 Intro Design and Manufacturing.....	4
IME 223 Work Design and Measurement.....	4
IME 239 Industrial Costs and Controls.....	3
IME 251 Manufacturing Engineering Analysis.....	4
IME 301, 305 Operations Research I, II.....	4,4
IME 312 Data Management and System Design.....	4
IME 314 Engineering Economics.....	3
IME 319 Human Factors Engineering.....	3
IME 326 Engineering Test Design and Analysis.....	4
IME 335 Computer-Aided Manufacturing I or IME 356 Manufacturing Automation.....	4
IME 407 Operations Research III.....	4
IME 410 Inventory Control Systems.....	4
IME 420 Simulation and Expert Systems.....	4
IME 421 Manufacturing Organizations.....	3
IME 429 Ergonomics Lab.....	1
IME 430 Quality Engineering.....	4
IME 441 Engineering Supervision I.....	1
IME 443 Facilities Planning and Design.....	4
IME 481, 482 Sr Project Design Laboratory I, II.....	2,3
<sup>1</sup> Technical electives.....	14
	<b>87</b>

**SUPPORT COURSES**

BIO 213 and ENGR/BRAE 213 (B2)*.....	2,2
CE 204 Strength Materials/ME 341 Fluid Mech.....	3
CHEM 124 Gen Chem for Engineering (B3/B4)*.....	4
CHEM 125 Gen Chem for Engineering.....	4
CSC 234/CSC 111.....	3
EE 201 Electric Circuits Theory.....	3
EE 321 Electronics.....	3
ENGL 149 Technical Writing for Engineers (A3)*.....	4
MATH 141, 142 Calculus I, II (B1)*.....	4,4
MATH 143 Calculus III (Add'l Area B)*.....	4
MATH 241 Calculus IV.....	4
MATH 244 Linear Analysis I.....	4
ME 211 Engineering Statics.....	3
ME 212 Engineering Dynamics.....	3
ME 302 Thermodyn/MATE 210 Materials Engr.....	3
PHYS 131 General Physics (Add'l Area B)*.....	4
PHYS 132, 133 General Physics.....	4,4
STAT 312 Stat. Methods for Engineers (B6)*.....	4
	<b>73</b>

**GENERAL EDUCATION (GE)**

- 72 units required; 32 units are in Support.  
 →See page 76 for complete GE course listing.  
 →Minimum of 8 units required at the 300-400 level.

**Area A Communication (8 units)**

A1 Expository Writing.....	4
A2 Oral Communication.....	4
A3 Reasoning, Argumentation, and Writing * 4 units in Support.....	0

**Area B Science and Mathematics (no add'l units req'd)**

B1 Mathematics/Statistics * 8 units in Support.....	0
B2 Life Science * 4 units in Support.....	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	
B5 (requirement for Liberal Arts students only)	
B6 Upper-division Area B * 4 units in Support.....	0
Additional Area B units * 8 units in Support.....	0

**Area C Arts and Humanities (16 units)**

C1 Literature.....	4
C2 Philosophy.....	4
C3 Fine/Performing Arts.....	4
C4 Upper-division elective.....	4

**Area D/E Society and the Individual (16 units)**

D1 The American Experience (40404).....	4
D2 Political Economy.....	4
D3 Comparative Social Institutions.....	4
D4 Self Development (CSU Area E).....	4

**40****ELECTIVES..... 0****200**

<sup>1</sup> Advisor approved technical electives.

**BS MANUFACTURING ENGINEERING**

For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic advisor. \* Satisfies GE requirement; see page 76.

**Freshman**

IME 101 Intro to Industrial and Mfg Engineering ...	1
IME 141 Manufacturing Processes: Net Shape.....	1
IME 142 Manufacturing Processes: Materials Joining	2
IME 144 Introduction to Design and Manufacturing .....	4
IME 157 Electronics Manufacturing.....	4
IME 223 Work Design and Measurement.....	4
CHEM 124 Gen Chem for Engineering (B3/B4)*	4
CHEM 125 Gen Chem for Engineering .....	4
CSC 234 C and UNIX .....	3
ENGL 134 Writing: Exposition (A1)*.....	4
SCOM 101/102 Speech Communication (A2)*.....	4
MATH 141, 142 Calculus I, II (B1)*.....	4,4
MATH 143 Calculus III (Add'l Area B)*.....	4
PHYS 131 General Physics (Add'l Area B)* .....	4
	<u>51</u>

**Sophomore**

IME 241 Process Design I.....	4
CE 204 Strength of Materials.....	3
MATE 210, 215 Materials Engineering and Lab ....	3,1
MATH 241 Calculus IV .....	4
MATH 244 Linear Analysis I .....	4
ME 211 Engineering Statics.....	3
ME 212 Engineering Dynamics .....	3
ENGL 149 Technical Writing for Engineers (A3)*.	4
BIO 213 and ENGR/BRAE 213 (B2)* .....	2,2
PHYS 132, 133 General Physics.....	4,4
STAT 312 Statistical Methods for Engineers (B6)*	4
Fine and performing arts elective (C3)*.....	4
Political economy elective (D2)* .....	4
	<u>53</u>

**Junior**

IME 314 Engineering Economics .....	3
IME 335 Computer-Aided Manufacturing I .....	4
IME 341 Tool Engineering I.....	4
IME 342 Manufacturing Systems Integration .....	3
IME 352 Manufacturing Process Design II.....	4
IME 356 Manufacturing Automation .....	4
EE 201, 251 Electric Circuits Theory and Lab .....	3,1
EE 321 Electronics.....	3
ME 302 Thermodynamics.....	3
American experience elective (D1)* .....	4
Literature elective (C1)* .....	4
Comparative social institutions elective (D3)* .....	4
<sup>1</sup> Technical electives .....	8
	<u>52</u>

**Senior**

IME 326 Engineering Test Design and Analysis ....	4
IME 418 Product-Process Design .....	4
IME 430 Quality Engineering .....	4
IME 455 Mfg Design and Implementation I .....	3
IME 481, 482 Sr. Project Design Laboratory I, II...	2,3
Philosophy elective (C2)* .....	4
Literature, philosophy, arts (300-400 level) (C4)* ..	4
Self development elective (CSU Area E) (D4)*.....	4
<sup>1</sup> Technical electives .....	8
	<u>40</u>
	<b>196</b>

<sup>1</sup> Advisor approved technical electives.

**BS MANUFACTURING ENGINEERING**

☐ 60 units upper division      ☐ GWR

☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

**MAJOR COURSES**

IME 101 Introduction to Industrial and Manufacturing Engineering.....	1
IME 141 Manufacturing Processes: Net Shape.....	1
IME 142 Manufacturing Processes: Materials Joining .....	2
IME 144 Intro Design and Manufacturing.....	4
IME 157 Electronics Manufacturing.....	4
IME 223 Work Design and Measurement.....	4
IME 241 Process Design I.....	4
IME 314 Engineering Economics .....	3
IME 326 Engineering Test Design and Analysis .....	4
IME 335 Computer-Aided Manufacturing I .....	4
IME 341 Tool Engineering I.....	4
IME 342 Manufacturing Systems Integration.....	3
IME 352 Manufacturing Process Design II.....	4
IME 356 Manufacturing Automation.....	4
IME 418 Product-Process Design .....	4
IME 430 Quality Engineering.....	4
IME 455 Manufacturing Design and Implementation I .....	3
IME 481, 482 Senior Project Design Lab I, II .....	2,3
<sup>1</sup> Technical electives .....	16
	<b>78</b>

**SUPPORT COURSES**

BIO 213 and ENGR/BRAE 213 (B2)* .....	2,2
CE 204 Strength of Materials .....	3
CHEM 124 Gen Chem for Engineering (B3/B4)* .....	4
CHEM 125 Gen Chem for Engineering .....	4
CSC 234 C and UNIX.....	3
EE 201 Electric Circuits Theory .....	3
EE 251 Electric Circuits Lab.....	1
EE 321 Electronics.....	3
ENGL 149 Technical Writing for Engineers (A3)* .....	4
MATE 210 Materials Engineering.....	3
MATE 215 Materials Engineering Lab.....	1
MATH 141, 142 Calculus I, II (B1)* .....	4,4
MATH 143 Calculus III (Add'l Area B)* .....	4
MATH 241 Calculus IV .....	4
MATH 244 Linear Analysis I .....	4
ME 211 Engineering Statics.....	3
ME 212 Engineering Dynamics .....	3
ME 302 Thermodynamics .....	3
PHYS 131 General Physics (Add'l Area B)* .....	4
PHYS 132, 133 General Physics.....	4,4
STAT 312 Stat. Methods for Engineers (B6)* .....	4
	<b>78</b>

**GENERAL EDUCATION (GE)**

72 units required; 32 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 8 units required at the 300-400 level.

**Area A Communication (8 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing * 4 units in Support.....	0

**Area B Science and Mathematics (no additional units required)**

B1 Mathematics/Statistics * 8 units in Support.....	0
B2 Life Science * 4 units in Support.....	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	
B5 (requirement for Liberal Arts students only)	
B6 Upper-division Area B * 4 units in Support .....	0
Additional area units * 8 units in Support .....	0

**Area C Arts and Humanities (16 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4

**Area D/E Society and the Individual (16 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4

**40**

**ELECTIVES .....** **0**

**196**

<sup>1</sup> Advisor approved technical electives. Select courses from the list below. All but 4 units must be upper division engineering courses. IME 301, 303, 312, 313, 319, 336, 351, 357, 410, 411, 413, 416, 417, 421, 427, 428, 429, 431, 443; MATE 230/235, MATE 410/415, MATE 430/435, MATE 440/445; ME 328, ME 341; CE 205, CE 206; BUS 487; IT 327 or current list.

## MS INDUSTRIAL ENGINEERING

### General Characteristics

The Master of Science program in Industrial Engineering has the following objectives:

- To help California industries in meeting their needs with respect to processes of design, optimization, and re-engineering and in competing globally, by educating and training engineers with advanced practical knowledge in the field of Industrial Engineering.
- To attract undergraduate engineers of all majors and provide education in the planning, engineering, optimization, and management of processes using the appropriate tools of Industrial Engineering.
- To further the mission and goals of the College of Engineering at Cal Poly with respect to graduate engineering education by maintaining a balance between undergraduate and graduate educational opportunities in engineering that optimally supports the health of California industry.

Each student is strongly encouraged to work with a particular faculty member in selecting a thesis topic which is of personal interest to the student and the faculty member, and to choose a substantial number of elective courses that will support the issues addressed in the thesis or project.

### Prerequisites

Students with earned undergraduate degrees in any engineering major are eligible for admission. A minimum grade point average of 3.0 in the last 90-quarter units (60 semester units) is required for admission.

All candidates seeking admission to the MSIE program are required to secure a minimum score in the GRE - General Test, as prescribed by the IME Department.

### Program of Study

Graduate students must file a formal study plan with their advisor, department, college and the 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, of which a) at least 23 units must be at the 500 level; b) at least 24 units must be in the degree major with at least 18 units at the 500 level.

The broad curriculum requirements for the program are:

- a core of 12 units
- a comprehensive written examination (non-thesis option) or an oral defense examination (theses option)
- a minimum of 24 units of advisor approved electives

## Curriculum for MS Industrial Engineering

### Core Courses ..... 21

- IME 503 Applied Statistical Methods in Industrial Engineering (4)
- IME 541 Advanced Operations Research (4)
- IME 545 Advanced Topics in Simulation (4)
- IME 599 Design Project (Thesis) (9) *or* additional 9 units of advisor approved electives (non-thesis option) and Comprehensive Examination

### Advisor approved electives..... 24

*Potential electives include:*

- BUS 412 Advanced Managerial Accounting (4)
- IME 409 Economic Decision Systems (3)
- IME 411 Production Systems Analysis (3)
- IME 418 Product-Process Design (4)
- IME 427 Process Optimization through Designed Experiments (4)
- IME 431 Supplier Quality Engineering (4)
- IME 500 Individual Study (1-3)  
(up to a maximum of 6 units)
- IME 516 Mechatronics Systems Analysis (4)
- IME 520 Advanced Information Systems for Operations (4)
- IME 526 Advanced Topics in Manufacturing System Design (4)
- IME 542 Reliability Engineering II (4)
- IME 543 Advanced Human Factors (4)
- IME 544 Advanced Topics in Engineering Economy (4)
- IME 555 Computer-Integrated Manufacturing (4)
- IME 556 Technological Project Management (4)
- IME 559 Engineering Research and Development (4)
- IME 560 Quality Engineering (4)
- IME 570 Selected Advanced Topics (1-3)
- IME 580 Manufacturing Systems (4)

# Materials Engineering

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(805) 756-2568 FAX: (805) 756-2299

[www.mate.calpoly.edu](http://www.mate.calpoly.edu)

email: [matedept@calpoly.edu](mailto:matedept@calpoly.edu)

## College of Engineering Advising Center

Engineering South (40), Room 115

(805) 756-1461

## Department Chair, Linda Vanasupa

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Lanny Griffin

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Anny Morrobel-Sosa

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## ACADEMIC PROGRAMS

### BS Materials Engineering

Materials engineering is a field in which engineers use their knowledge of the relationship between a material's structure and its properties in order to alter the structure to get the properties that are needed. Materials engineers contribute their expertise in virtually all areas of technology: from the nano-sized materials found in biomedical and microelectronic applications to the large-scale composites found in aerospace applications.

Because engineered products are often limited by materials issues (such as performance and manufacturability), materials engineers play a vital role on engineering design teams, working closely with other engineers. As part of these teams, they apply their knowledge of science, engineering, and state-of-the-art analytical instruments.

The majority of our graduates find employment in the biomedical, electronic, aerospace and petroleum industries. Some work as consultants for large or small organizations. Others become executives. A significant number of materials engineers are involved in research and development. Many of our graduates are entrepreneurs who have started their own consulting or manufacturing companies. Others are attorneys or physicians. Because of our broad-based curriculum, our graduates are able to excel in professions of their choosing.

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.

## Program Mission and Goals

The mission of the materials engineering program is to create and sustain an integrated, effectual engineering learning environment that develops students into educated and effective members of society.

Our primary goal is to provide students with a theoretically rigorous and "hands on" practice-oriented education that will enable graduates to be immediately productive in their careers. To attain this goal, the educational objectives of the program are to enable graduates to

1. Apply materials engineering principles to analyze and solve real-world engineering challenges.
2. Communicate and perform as effective engineering professionals in both individual and team-based project environments.
3. Work in an individual or team environment in a socially responsible manner.

## Graduate Study

Graduates of the materials engineering program are qualified for admission to Cal Poly's Master's Degree Programs in Engineering with a Specialization in Materials. The opportunity also exists for advanced students to begin graduate study in these areas prior to completion of the BS degree, via a "blended 4+1" program. This opportunity provides a number of advantages to qualified students, and makes it possible for completion of both the BS and MS degrees in as little as 5 years. Materials engineering students participating in a blended 4+1 program are permitted to fulfill the materials senior project requirement with the master's degree thesis. Because of the design emphasis of the senior project, a master's thesis used to satisfy the senior project requirement must include a major engineering design experience. The thesis supervisor will assist the student in ensuring that this requirement is met. Further details are provided in the graduate study sections for each of these programs.

**BS MATERIALS ENGINEERING**

For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic advisor. \* Satisfies GE requirement; see page 76.

**Freshman**

MATE 110 Introduction to Materials Engineering ..	1
MATE 120 Intro to Materials Engineering Practice	1
CHEM 124 Gen Chem for Engineering (B3/B4)*	4
CHEM 125 Gen Chem for Engineering .....	4
CSC 101/234/231 .....	4/3/2
ENGL 134 Writing: Exposition (A1)* .....	4
SCOM 101/102 Speech Communication (A2)* .....	4
ENGL 149 Technical Writing for Engineers (A3)* ..	4
MATH 141, 142 Calculus I, II (B1)* .....	4,4
MATH 143 Calculus III (Add'l Area B)* .....	4
PHYS 131 General Physics (Add'l Area B)* .....	4
PHYS 132 General Physics .....	4
<sup>1</sup> Engr Drawing/Manufacturing processes electives ...	4
	<b>48</b>

**Sophomore**

MATE 210, 215 Materials Engineering and Lab .....	3,1
MATE 220, 225 Structure of Materials and Lab .....	3,1
MATE 230, 235 Physical Metallurgy and Lab .....	4,1
CE 204 Strength of Materials .....	3
EE 201, 251 Electric Circuits Theory and Lab .....	3,1
MATH 241 Calculus IV .....	4
MATH 244 Linear Analysis I .....	4
ME 211 Engineering Statics .....	3
ME 212 Engineering Dynamics .....	3
PHYS 133 General Physics .....	4
STAT 312 Statistical Methods for Engineers (B6)*	4
American experience elective (D1)* .....	4
Philosophy elective (C2)* .....	4
	<b>50</b>

**Junior**

MATE 310 Polymers .....	4
MATE 320 Ceramics .....	4
MATE 330 Composites .....	4
MATE 340, 345 Electronic Prop Materials/Lab .....	3,1
MATE 350, 355 Mech Behavior Materials/Lab .....	3,2
MATE 360 Thermodynamics of Materials .....	4
MATE 370 Kinetics of Materials .....	4
MATE 375 Thermodynamics and Kinetics of Materials Laboratory .....	1
CE 205, 206 Strength of Materials and Lab .....	2,1
ME 313 Heat Transfer or ME 302 Thermodyn .....	3
CHEM 305 Physical Chemistry .....	4
Political economy elective (D2)* .....	4
Literature elective (C1)* .....	4
Comparative social institutions elective (D3)* .....	4
	<b>52</b>

**Senior**

Select at least one course from each of 3 areas: .....	19
Analysis: MATE 410/415/425/450/510/515/520/ 525/565	

Materials Processing: MATE 430/435/440/445

Special Topics: MATE 446/460/510/515/518/  
520/525/530/540/562/570/580

MATE 467, 468 Senior Project Design Lab .....	1,4
MATE 463 Undergraduate Seminar .....	1
BIO 213 and ENGR/BRAE 213 (B2)* .....	2,2
Math/Science elective (200-400 level) .....	4
IME 314 Engineering Economics (or IME 326) .....	3
Fine and performing arts elective (C3)* .....	4
Literature, philosophy, arts (300-400 level) (C4)* ..	4
Self development elective (CSU Area E) (D4)* .....	4
Electives .....	4
	<b>52</b>
	<b>202</b>

**BS MATERIALS ENGINEERING**

☐ 60 units upper division

☐ GWR

☐ 2.0 GPA

☐ USCP

\* = Satisfies General Education requirement

**MAJOR COURSES**

MATE 110 Intro to Materials Engineering .....	1
MATE 120 Intro. to Materials Engr Practice .....	1
MATE 210, 215 Materials Engineering and Lab .....	3,1
MATE 220, 225 Structure of Materials and Lab .....	3,1
MATE 230, 235 Physical Metallurgy and Lab .....	4,1
MATE 310 Polymers .....	4
MATE 320 Ceramics .....	4
MATE 330 Composites .....	4
MATE 340, 345 Electronic Prop Materials and Lab .....	3,1
MATE 350, 355 Mech Behavior Materials and Lab .....	3,2
MATE 360 Thermodynamics of Materials .....	4
MATE 370 Kinetics of Materials .....	4
MATE 375 Thermodynamics and Kinetics of Materials Laboratory .....	1
MATE 467, 468 Senior Project Design Lab .....	1,4
MATE 463 Undergraduate Seminar .....	1
Select at least one course from each area: .....	19
Analysis: MATE 410/415/425/450/510/515/520/ 525/565	
Materials Processing: MATE 430/435/440/445	
Special Topics: MATE 446/460/510/515/518/520/ 525/530/540/562/570/580	
	<b>70</b>

**SUPPORT COURSES**

BIO 213 and ENGR/BRAE 213 (B2)* .....	2,2
CE 204 Strength of Materials .....	3
CE 205, 206 Strength of Materials and Lab .....	2,1
CHEM 124 Gen Chem for Engineering (B3/B4)*	4
CHEM 125 Gen Chem for Engineering .....	4
CHEM 305 Physical Chemistry .....	3
CSC 101/234/231 .....	4/3/2
EE 201, 251 Electric Circuits Theory and Lab .....	3,1
ENGL 149 Technical Writing for Engineers (A3)*	4

<sup>1</sup> Choose either IME 144 or a combination of ME 151 and one of IME 141, 142, 143, or IT 341, 302.

IME 314 Engineering Economics (or IME 326).....	3
MATH 141, 142 Calculus I, II (B1) * .....	4,4
MATH 143 Calculus III (Add'l Area B)* .....	4
MATH 241 Calculus IV .....	4
MATH 244 Linear Analysis I .....	4
ME 211 Engineering Statics.....	3
ME 212 Engineering Dynamics .....	3
ME 313 Heat Transfer or ME 302 Thermodyn.....	3
PHYS 131 General Physics (Add'l Area B)* .....	4
PHYS 132, 133 General Physics .....	4,4
Math/Science elective (200-400 level).....	4
<sup>1</sup> Engineering Drawing and Manufacturing elective...	4
STAT 312 Statistical Methods for Engineers (B6)* .....	4
<b>87-89</b>	

**GENERAL EDUCATION (GE)**

72 units required; 32 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 8 units required at the 300-400 level.

**Area A Communication (8 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing * 4 units in Support .....	0

**Area B Science and Mathematics (no additional units required)**

B1 Mathematics/Statistics * 8 units in Support.....	0
B2 Life Science * 4 units in Support.....	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	
B5 (requirement for Liberal Arts students only)	
B6 Upper-division Area B * 4 units in Support.....	0
Additional Area B units* 8 units in Support .....	0

**Area C Arts and Humanities (16 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4

**Area D/E Society and the Individual (16 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4

**40**

<b>ELECTIVES .....</b>	<b>3-5</b>
	<b>202</b>

<sup>1</sup> Choose either IME 144 or a combination of ME 151 and one of IME 141, 142, 143, or IT 341, 302.

# Mechanical Engineering

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**www.me.calpoly.edu**

**College of Engineering Advising Center**  
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## Department Chair, William E. Clark

Charles B. Birdsong	Ronald S. Mullisen
Thomas W. Carpenter	William R. Murray
Andrew I. Davol	Saeed B. Niku
Raymond G. Gordon	Franklin C. Owen
Brian S. Higgins	Christopher C. Pascual
Ngozi Kamalu	James Scott Patton
Stephen M. Klisch	John R. Ridgely
James G. LoCascio	Peter J. Schuster
Jesse Maddren	Ramesh T. Shah
Fredrick B. Malmborg	Kim A. Shollenberger
James M. Meagher	Glen E. Thorncroft
A. Masoud Mehdizadeh	Yuen Cjen Yong
Joseph D. Mello	

## ACADEMIC PROGRAMS

### BS, MS Mechanical Engineering

#### Mission Statement

To impart knowledge in the art and science of mechanical engineering through a comprehensive curriculum true to the traditional Cal Poly learn-by-doing philosophy that produces mechanical engineers of high ethics and skill, fully prepared for entry into industry, government, graduate school or private enterprise.

#### Program Educational Objectives

Graduates of the mechanical engineering program at Cal Poly:

- Utilize knowledge and understanding of engineering sciences with a foundation in mathematics, chemistry and physics necessary for mechanical engineering practice.
- Design and develop products, components and systems, including prudent use of resources to meet specified requirements that are of a complexity encountered in professional practice.
- Test, evaluate and execute engineering solutions to problems/projects that are real, practical and of a complexity encountered in professional practice.
- Communicate and perform as effective engineering professionals in both individual and team-based project environments.
- Practice professional and ethical responsibilities as mechanical engineers, including the societal impact of engineering solutions.

- Develop intellectually through continued learning.
- Make positive contributions to society.

#### Program Description

The profession of mechanical engineering is directed toward the design, manufacture, and system integration of a very wide variety of equipment ranging from manufacturing machinery and power generation equipment to consumer goods. Of central concern to mechanical engineers is the sound application of basic principles of solid mechanics, fluid mechanics and thermal sciences in the design, manufacture, and application of this equipment. Mechanical Engineering graduates obtain employment primarily with manufacturers, energy companies, consultants, and government agencies. Types of work performed by graduates include product design, mechanical design, testing, engineering management, engineering sales, design of manufacturing systems, and development of maintenance procedures. Mechanical Engineering graduates also often enhance their careers through graduate study in engineering, and some students also study engineering to build a scientific and technical foundation as a prelude to enrollment in medical, law, and business schools.

The focus of the Cal Poly Mechanical Engineering program is on education based on our "learn by doing" educational philosophy. Thus, the curriculum includes a large number of hands-on laboratories, integration of design throughout, and a senior project requirement for all students. Students are enrolled in engineering laboratories in all years of the curriculum. The program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

The Mechanical Engineering Department is the home of the Donald E. Bently Center for Engineering Innovation. The center provides support for faculty, students, and visiting scholars for the advancement of research, education, and practice in mechanical engineering. In support of the center, Mr. Bently has established a \$6 million endowment to fund three professorships.

Upper division students in the **General Concentration** can choose professional elective courses from such courses as turbomachinery, robotics, mechatronics, composite materials, rotor dynamics, advanced mechanics, solar systems, internal combustion engines, heat and mass transfer, and courses emphasizing the petroleum, air

conditioning, ventilating, and refrigeration industries. Students in the **Mechatronics Concentration** are prepared to enter the microprocessor based product design and factory automation job markets and to do advanced research in the areas of robotics, "intelligent" products and automated manufacturing.

There are six organized student clubs associated with the Mechanical Engineering Department. These are student chapters of the American Society of Mechanical Engineers, Society of Petroleum Engineers, Society of Automotive Engineers, American Society of Heating, Refrigerating and Air Conditioning Engineers, Alternative Energy Club, and the Pi Tau Sigma honorary society. All of these clubs offer students active programs in professional and leadership activities.

### Blended BS + MS Mechanical Engineering

The blended program provides motivated students with an accelerated route to the MS Mechanical Engineering, with simultaneous conferring of both bachelor's and master's degrees. Students in the blended program are provided with a seamless process whereby they can progress from undergraduate to graduate status.

#### Eligibility

Students majoring in BS Mechanical Engineering may be eligible to pursue the blended program toward the MS Mechanical Engineering. Participation in the program is based on prior academic performance and other measures of professional promise, with a minimum GPA of 2.5 required (3.0 GPA recommended). Students are recommended for admission by a faculty committee. Please see page 96 for eligibility criteria.

#### Program of Study

The program allows students to complete a more meaningful capstone experience that integrates the senior project with the graduate thesis. This arrangement also increases opportunities for industrial interaction. Five of the nine units of ME 599 Thesis serve to complete the senior project requirement as long as the five units have associated with them the elements of design, build and test.

#### Thesis Requirement

Students must be prepared for engineering practice via the curriculum which culminates in a major design experience based on the knowledge and skills acquired in earlier coursework and incorporating engineering standards and realistic constraints, as listed in the ABET Engineering Criteria. Therefore, all "Blended BS + MS Program" students, even those students completing the Master of Science in Engineering, must have a master's thesis with this major design experience requirement included in order to complete the undergraduate degree.

## BS MECHANICAL ENGINEERING

*For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic advisor. \* Satisfies GE requirement; see page 76.*

### Freshman

ME 134 Mechanical Systems (Transfer students must take ME 234).....	3
ME 151, 152 Engr Design Communication I, II .....	2,2
IME 142 Mfg Processes: Materials Joining.....	2
IME 143 Mfg Processes: Material Removal .....	2
CHEM 124 Gen Chem for Engineering (B3/B4)* ..	4
CHEM 125 Gen Chem for Engineering .....	4
ENGL 134 Writing: Exposition (A1)* .....	4
SCOM 101/102 Speech Communication (A2)* .....	4
MATH 141, 142 Calculus I, II (B1)* .....	4,4
MATH 143 Calculus III (Add'l Area B)* .....	4
PHYS 131 General Physics (Add'l Area B)* .....	4
PHYS 132 General Physics .....	4
IME 141 or IT 327 or IT 341 Mfg Processes .....	1
	48

### Sophomore

ME 211 Engineering Statics.....	3
ME 212 Engineering Dynamics .....	3
ME 236 Thermal Systems .....	3
CE 204 Strength of Materials .....	3
CE 205, 206 Strength of Materials and Lab .....	2,1
MATE 210, 215 Materials Engineering and Lab ....	3,1
PHYS 133 General Physics .....	4
CSC 231 Fortran for Engineering Students or CSC 234 C and Unix .....	2/3
ENGL 149 Technical Writing for Engineers (A3)* ..	4
MATH 241 Calculus IV .....	4
MATH 244 Linear Analysis I.....	4
MATH 344 Linear Analysis II (B6)* .....	4
American experience elective (D1)* .....	4
Political economy elective (D2)* .....	4
Literature elective (C1)* .....	4
Self development elective (CSU Area E) (D4)* .....	4
	57

### Junior

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, 342, 345 Fluid Mechanics and Lab .....	3,3,1
ME 344, 346 Thermal Engineering and Lab .....	4,1
EE 201, 251 Electric Circuit Theory and Lab .....	3,1
EE 321, 361 Electronics and Lab .....	3,1
Philosophy elective (C2)* .....	4
Fine and performing arts elective (C3)* .....	4
	50

**Senior**

ME 422 Mechanical Control Systems.....	4
ME 440 Thermal System Design .....	4
ME 461, 462 Senior Project	
or ME 481, 482 Senior Project Laboratory .....	2,3
ME 463 Undergraduate Seminar .....	1
Life science elective (excluding ANT 250, BIO 113, BIO 114, and BIO 227) (B2)* .....	2,2
Literature, philosophy, arts (300-400 level) (C4)* ..	4
Comparative social institutions elective (D3)* .....	4
Advisor approved electives/Mechatronics .....	20
	46
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ENGL 149 Technical Writing for Engineers (A3)* ..	4
IME 142 Mfg Processes: Materials Joining .....	2
IME 143 Mfg Processes: Material Removal .....	2
MATE 210, 215 Materials Engineering and Lab .....	3,1
MATH 141, 142 Calculus I, II (B1)* .....	4,4
MATH 143 Calculus III (Add'l Area B)* .....	4
MATH 241 Calculus IV .....	4
MATH 244 Linear Analysis I .....	4
MATH 344 Linear Analysis II (B6)* .....	4
PHYS 131 General Physics (Add'l Area B)* .....	4
PHYS 132, 133 General Physics .....	4,4
Manufacturing Processes elective .....	1
(IME 141 or IT 327 or IT 341)	

**77****BS MECHANICAL ENGINEERING**

☐ 60 units upper division      ☐ GWR

☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

**MAJOR COURSES**

ME 151 Engineering Design Communication I .....	2
ME 152 Engineering Design Communication II .....	2
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 344 Thermal Engineering .....	4
ME 345 Fluid Mechanics Laboratory .....	1
ME 346 Thermal Science Laboratory .....	1
ME 422 Mechanical Control Systems .....	4
ME 440 Thermal System Design .....	4
ME 461, 462 Senior Project	
or ME 481, 482 Senior Project Laboratory .....	2,3
ME 463 Undergraduate Seminar .....	1
Concentration .....	20
	<b>84</b>

**SUPPORT COURSES**

Life Science elective (excluding ANT 250, BIO 113, BIO 114, and BIO 227) (B2)* .....	4
CE 204 Strength of Materials .....	3
CE 205, 206 Strength of Materials and Lab .....	2,1
CHEM 124 Gen Chem for Engineering (B3/B4)* .....	4
CHEM 125 Gen Chem for Engineering .....	4
CSC 231 Fortran for Engineering Students or CSC 234 C and Unix .....	2/3
EE 201, 251 Electric Circuit Theory and Lab .....	3,1
EE 321, 361 Electronics and Lab .....	3,1

**GENERAL EDUCATION (GE)**

72 units required; 32 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 8 units required at the 300-400 level.

**Area A Communication (8 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing * 4 units in Support .....	0

**Area B Science and Mathematics (no additional units required)**

B1 Mathematics/Statistics * 8 units in Support .....	0
B2 Life Science * 4 units in Support .....	0
B3 Physical Science * 4 units in Support .....	0
B4 One lab taken with either a B2 or B3 course	
B5 (requirement for Liberal Arts students only)	
B6 Upper-division Area B * 4 units in Support .....	0
Additional Area B units* 8 units in Support .....	0

**Area C Arts and Humanities (16 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4

**Area D/E Society and the Individual (16 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4

**40****ELECTIVES..... 0****201**

**CONCENTRATIONS (select one)****General Concentration**

ME 428 Design .....	4
EE 255 Energy Conversion Electromagnetics .....	3
EE 295 Energy Conversion Electromag Lab .....	1
Technical electives selected from emphasis area.....	12
	<hr/> 20

**Mechatronics Concentration**

IME 157 Electronics Manufacturing .....	4
ME 405 Mechatronics .....	4
ME 406 Mechatronics Design .....	4
ME 423 Robotics: Fundamentals and Applications	4
<sup>1</sup> CPE 336 or IME 356 .....	4
	<hr/> 20

**MS MECHANICAL ENGINEERING****General Characteristics**

The Master of Science in Mechanical Engineering prepares students to design and develop advanced products and systems; to conduct research and analysis; to work in industry; or to continue study toward a Ph.D. Graduate students enjoy the same flavor of learn-by-doing as other Cal Poly students. Students may choose their technical electives in the area that interest them, including thermo-sciences, controls and robotics, mechanics and stress analysis, composite materials.

**Prerequisites**

For admission as a classified graduate student, in addition to the University requirements, an applicant should hold a BS degree in Mechanical Engineering with a grade point average of 3.0. Other closely related majors may be accepted as conditionally classified graduate students until they take necessary prerequisite mechanical engineering courses as approved by the graduate advisor. For additional information on University requirements, please refer to the Graduate Studies of this catalog.

**MS MECHANICAL ENGINEERING****Core Courses**

ME 599 Design Project (Thesis) (2)(2)(5) <i>or</i> 9 units of approved technical electives <i>and</i> a comprehensive examination.....	9
Approved MATH/STAT/CSC courses.....	8

**Select a minimum of 12 units from the following:** 12

ME 502 Finite Element Analysis (4)	
ME 503 Inelastic Stress Analysis (4)	
ME 517 Advanced Vibrations (4)	
ME 531 Acoustics and Noise Control (3)	
ME 541 Advanced Thermodynamics (4)	
ME 542 Dynamics of Compressible Flow (4)	
ME 552 Conductive Heat Transfer (3)	
ME 553 Convective Heat Transfer (3)	
ME 554 Computational Heat Transfer (3)	
ME 575 Space Vehicle Dynamics (3)	

<b>Approved technical electives</b> .....	16
(400 or 500-level ME or non-ME courses; maximum of 12 units of 400-level courses allowed)	<hr/>

45

<sup>1</sup> Elective based on interests of students.



Cal Poly Wind Orchestra in the Christopher Cohan Center at the Performing Arts Center San Luis Obispo.

### **Wind Orchestra performs in Carnegie Hall**

The 74-member Cal Poly Wind Orchestra performed a concert in New York City's Carnegie Hall on April 3, 2003 titled "A Musical Tribute to Fallen Heroes and Survivors." The Orchestra performed Aaron Copland's "Lincoln Portrait" with FDNY firefighter Kevin Shea narrating excerpts of speeches by the sixteenth President. Other selections included "Without Warning" by Stephen Melillo and David Maslanka's "Symphony No. 4."

Recent appearances by the orchestra have been in the Michael Fowler Performing Arts Center of Wellington, New Zealand, the Sydney Opera House and the Sydney Town Hall of Sydney, Australia. The group is conducted by Professor William Johnson.

*Photo courtesy of Gregg Cobarr*

College of  
*Liberal Arts*

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# College of *Liberal Arts*

Harold Hellenbrand, Dean  
Susan Currier, Associate Dean

Faculty Office Bldg. (47), Room 31  
805 756-2359

## ACADEMIC PROGRAMS

Agricultural Communication.....	Minor
Anthropology & Geography.....	Minor
Art and Design .....	BS
Art .....	Minor
Child Development .....	BS, Minor
Dance .....	Minor
English .....	BA, MA, Minor
Ethnic Studies .....	Minor
French .....	Minor
German.....	Minor
Gerontology .....	Minor
Graphic Communication .....	BS, Minor
History.....	BA, Minor
International Relations .....	Minor
Journalism .....	BS
Liberal Studies .....	BA, BS
Linguistics.....	Minor
Law and Society.....	Minor
Modern Languages & Literatures...	BA
Music.....	BA, Minor
Philosophy.....	BA, Minor
Political Science .....	BA
Psychology.....	BS, MS, Minor
Religious Studies.....	Minor
Social Sciences.....	BS
Sociology .....	Minor
Spanish.....	Minor
Speech Communication .....	BA, Minor
Theatre Arts.....	BA, Minor
Values, Technology and Society....	Minor
Western Intellectual Tradition.....	Minor
Women's Studies .....	Minor

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.

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 offers a London Study Program, which is administered by the International Education and Programs Office. For further information, see the section on Study and Travel – U.S. and Abroad.

The College of Liberal Arts also offers interdisciplinary and international courses through its Humanities Program. Many humanities classes fulfill Cal Poly's general education requirements. For more information, contact the Humanities Program Office (Bldg 47, Room 34E, 805 756-2475).

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 language clubs, creative writing contests, or intercollegiate 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.

## AGRICULTURAL COMMUNICATION MINOR

The Agricultural Communication minor is an interdisciplinary program administered by both the College of Agriculture and the College of Liberal Arts. The 30-unit program consists of coursework in journalism, speech and agriculture. For more information, please see page 103 or contact the Coordinator for the Agricultural Communication Minor.

## ENVIRONMENTAL STUDIES MINOR

Please see the College of Science and Mathematics for more information on this interdisciplinary minor.

# Art & Design

**Department Office**  
**Dexter Bldg. (34), Room 170**  
**805 756-1148**  
<http://cla.calpoly.edu/art>

## Department Chair, Eric B. Johnson

Sky Bergman	George D. Jercich
Robert S. Densham	Mary LaPorte
Keith W. Dills	Enrica Lovaglio
Clarissa Hewitt	Michael B. Miller
Robert Howell	Joanne Beaule Ruggles
Charles W. Jennings	Jean Wetzel

## ACADEMIC PROGRAMS

### BS Art and Design

#### Art Minor

The Bachelor of Science degree program in Art and Design offers a major with concentrations in graphic design, photography and digital imagery, and studio art. The BS in Art and Design is accredited by the National Association of Schools of Art and 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. Courses are available for all students to enrich their creativity, understanding, appreciation, and practical skills in art.

## CONCENTRATIONS

All three concentrations support creative and aesthetic growth and require the development of technical skills as a foundation for personal direction and enrichment. Through team projects, students have the unique opportunity to experience the interaction and relationship of graphic design, photography and digital imagery, and studio art.

**Graphic Design<sup>1</sup>.** Principles of basic design, typography and design history, with specialized courses in such topics as corporate identity, packaging graphics, web site design, advertising, editorial design and illustration. Emphasis is placed on the development of visual problem-solving methodology and acquisition of skills needed in the design profession. Coursework in computer imaging and interactive design allows for an exploration of new technology. The program culminates in the study of professional practices and the preparation of a professional portfolio.

**Photography and Digital Imagery.** A diversified and commercially oriented program stressing preparation for careers in advertising and illustration, portraiture, corporate and editorial photography and digital image

making. Creative problem solving is stressed within the context of a variety of expressive projects, including studio and location lighting, 35 mm black and white and color photography, digital image making, large format photography, video and multimedia production, and advertising illustration. The program culminates in the creation of a professional portfolio and discussion of current professional practices.

**Studio Art.** A selective program designed for students seeking a broad based undergraduate education in the visual arts. The program is distinctive for its depth of required coursework in both two and three dimensional media. The upper division curriculum allows students to specialize in a discipline pertinent to their career choice in the visual arts. Courses in portfolio preparation, professional practices, and senior project prepare students to enter the work place or pursue advanced degrees. Some of the many career possibilities for our graduates include positions in industry, education, entertainment, illustration, and museum/gallery management. Cal Poly, with its learn-by-doing philosophy and its commitment to both the liberal arts and technology, provides a unique setting for studying the visual arts. Within this context, the students in this concentration are presented with an environment where imagination, intellectual rigor, self expression and skill development are expected and valued.

<sup>1</sup> 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.

**BS ART AND DESIGN**

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA                      ☐ USCP  
 \* = Satisfies General Education requirement

**MAJOR COURSES**

ART 101 Fundamentals of Drawing (C3)* .....	4
ART 131 2-Dimensional Design Fundamentals.....	3
ART 132 Beginning Color Theory .....	3
ART 134 3-Dimensional Design I.....	3
ART 148 Beginning Sculpture .....	4
ART 181 Computer Imaging and Design.....	3
ART 201 Intermediate Drawing .....	3
ART 203 Art Theory and Practice.....	3
ART 211 Art History: Ancient-Renaissance .....	4
ART 212 Art History: Renaissance-Baroque .....	4
ART 221 Basic B/W Photography .....	3
ART 222 35mm Intermediate B/W Photography.....	3
ART 224 Intro. Artificial Lighting - Photography ...	3
ART 312 Art History-20th Century Art .....	4
<i>Art History. Select two courses from:</i>	
ART 310, 311, 316, 317, 318 .....	4,4
ART 460 Professional Practices .....	2
ART 461 Senior Project .....	2
ART 462 Senior Portfolio Project .....	2
ART 463 Undergraduate Seminar .....	2
Concentration courses (see below) .....	58

**121****GENERAL EDUCATION (GE)**

- 72 units required; 4 units are in Major.  
 →See page 76 for complete GE course listing.  
 →Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

**Area B Science and Mathematics (20 units)**

B1 Mathematics/Statistics .....	8
B2 Life Science.....	4
B3 Physical Science .....	4
B4 One lab taken with either a B2 or B3 course	
B5 elective	
Area B elective (select one course from B1-B5).....	4

**Area C Arts and Humanities (12 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts *4 units in Major.....	0
C4 Upper-division elective.....	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)  
(4 units)****68****ELECTIVES ..... 9****198****CONCENTRATIONS (select one)****Graphic Design Concentration**

ART 133 Color and Design .....	3
ART 232 Beginning Graphic Design .....	3
ART 313 Design History .....	4
ART 331 Typographic Design .....	3
ART 332 Symbolology .....	3
ART 333 Corporate Identity .....	3
ART 430 Advanced Typographic Design .....	3
ART 431 Package Design .....	3
ART 432/435/486/487 .....	3
ART 433 Editorial Design .....	3

Select 27 units from: any Art courses not already  
required in the major core, GRC 101, 337.....

**27****58****Photography and Digital Imagery Concentration**

ART 314 History of Photography .....	4
ART 322 Color Photography .....	3
ART 323 Introduction to Digital Image Making.....	3
ART 324 Photographic Expression.....	4
ART 325 4x5 Camera Techniques .....	3
ART 326 4x5 Camera/Commercial .....	3
ART 327 Portraiture B/W .....	3
ART 329 Editorial and Corporate Photography.....	3
ART 483 Video and Multimedia Production .....	4
ART 427 Illustration Photography .....	3
ART 428 Portfolio Production Photography .....	1
ART 486 Advanced Digital Image Making .....	3

Select 21 units from: Any ART course not  
already required in the major core, GRC 101,  
202, TH 330.....

**21****58**

**Studio Art Concentration**

ART 133 Color and Design.....	3
ART 209 Beginning Painting .....	3
ART 240 Glassblowing.....	4
ART 245 Ceramics.....	3
ART 248 Intermediate Sculpture.....	3
ART 255 Jewelry Design .....	3
ART 301 Advanced Drawing.....	3
ART 302 Life Drawing .....	3
ART 309 Intermediate Painting .....	3
ART 353 Intermedia/Art .....	4
ART 402/406/448 (may not be double-counted for selected units, below).....	3
300-400 level Art History (in addition to core).....	4
Select 19 units from: Any ART course not already required in the major core (See course descriptions for repeatable units).....	19
	58

**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 advisors from the Art and Design Department: Clarissa Hewitt, George Jercich, Michael B. Miller, Joanne Ruggles or Jean Wetzel.

**Required Core**

	<i>Units</i>
ART 101 Fundamentals of Drawing (C3).....	4
ART 112 Survey of Western Art (C3) .....	4
ART 148 Beginning Sculpture I (C3) .....	4
ART 312 Art History–20th Century Art (C4).....	4

**ART advisor approved electives**

Complete a minimum of 3 units from: .....	3
ART 201 Intermediate Drawing (3)	
ART 203 Art Theory and Practice (3)	
ART 209 Beginning Painting (3)	
ART 240 Introduction to Glassblowing (4)	
ART 245 Ceramics I (3)	
ART 248 Intermediate Sculpture (3)	
ART 255 Jewelry Design (3)	
Complete a minimum of 11 units from: .....	11
(See course descriptions for repeatable units)	
ART 301 Advanced Drawing (3)	
ART 302 Life Drawing I (3)	
ART 304 Intermediate Watercolor (3)	
ART 309 Intermediate Painting (3)	
ART 310 Art History–American Art (4)	
ART 311 Art History–Nineteenth Century (4)	
ART 313 Design History (4)	
ART 314 History of Photography (4) (C4)	
ART 316 Women as Subject and Object in Art History (4)	
ART 317 Asian Art Survey (4)	
ART 318 Asian Art Topics (4) (C4)	
ART 340 Glass Fusing and Forming (4)	
ART 345 Ceramics II (3)	
ART 346 Ceramics III (3)	
ART 353 Intermedia/Art (4)	
ART 355 Metalsmithing (3)	
ART 356 Jewelry Casting (3)	
ART 400 Special Problems (1-2)	
ART 402 Life Drawing II (3)	
ART 409 Advanced Painting (3)	
ART 440 Advanced Selected Topics in Glass (4)	
ART 448 Advanced Topics in Sculpture (3)	

# English

**Department Office**  
**Faculty Office Bldg. (47), Room 32-E**  
**805 756-2596**

## Department Chair, David J. Kann

Mary A. Armstrong	Nancy Lucas
John Battenburg	Carol MacCurdy
Carl R. V. Brown	Steven R. Marx
Kenneth J. Brown	Matthew S. Novak
Kevin Clark	Michael P. Orth
Susann Cokal	Jeannine Richison
Susan Currier	Johanna E. Rubba
William Fitzhenry	Kathryn Rummell
David Gillette	Debora Schwartz
Linda H. Halisky	Habib Sheik
John C. Hampsey	Richard K. Simon
John F. Harrington	Evelyn M. Torres
Robert L. Inchausti	Patricia Troxel
Douglas Keesey	Robert Webber
Alfred Landwehr	Michael J. Wenzl

## ACADEMIC PROGRAMS

### BA, MA English

### English Minor

### Linguistics Minor

### Teaching English/Second Language Certificate

### Technical Communication Certificate

The English Department serves students through courses in writing, in technical communication, in literature, and in linguistics. The aim of the department is to provide students with greater expressive power and understanding and appreciation of literature. The department also endeavors to develop in students abilities valuable in the professional and business world and in private life: the abilities of reading critically, of organizing a large body of information, and of expressing the results in clear, forceful prose.

The department offers general education courses, courses for elective credit, minors in English and Linguistics, and the Bachelor of Arts and the Master of Arts programs. An English major or minor is valuable as preparation for law, for business, for teaching, and for other careers in which handling and expressing ideas are essential. The department also offers upper-division certificate programs in teaching English as a second language and technical communication. 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.

## BA ENGLISH

☐ 60 units upper division ☐ GWR

☐ 2.0 GPA ☐ USCP

\* = Satisfies General Education requirement

## MAJOR COURSES

ENGL/HNRS 251 Great Books of World Literature: Classical and Ancient World (C1)*....	4
ENGL 203 Core I: Old English/Medieval .....	4
ENGL 204 Core II: Renaissance .....	4
ENGL 205 Core III: 1660-1798 .....	4
ENGL 290 Introduction to Linguistics .....	4
ENGL 303 Core IV: 1798-1865.....	4
ENGL 304 Core V: 1865-1914.....	4
ENGL 305 Core VI: 1914-Present.....	4
ENGL 461 Senior Project ( <i>in conjunction with a designated 400-level ENGL course</i> ).....	1
ENGL electives (300 level) .....	8
ENGL electives (400 level; at least 12 units must be in literature courses).....	20

In consultation with Emphasis Area advisor, students may shape 16 units of upper division ENGL electives into one of the following areas:

### *Creative Writing:*

ENGL 387, 388 or 389;  
 Two of: ENGL 487, 488 or 489;  
 ENGL 439, 449, 459 modern/contemporary;  
 Senior Project Adjunct in Creative Writing.

### *Literature:*

ENGL 326 Literary Theory;  
 One 300-level literature course;  
 Two 400-level literature courses;  
 Senior Project Adjunct in Literature.

**SUPPORT COURSES**

Foreign language (121 or 122) <i>or</i> demonstration of a comparable level of proficiency .....	4
	<hr/> 4

**GENERAL EDUCATION (GE)**

72 units required; 4 units are in Major.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

**Area B Science and Mathematics (20 units)**

B1 Mathematics/Statistics .....	8
B2 Life Science.....	4
B3 Physical Science .....	4
B4 One lab taken with either a B2 or B3 course	
B5 elective	

Area B elective (select one course from B1-B5)..... 4

**Area C Arts and Humanities (12 units)**

C1 Literature *4 units in Major .....	0
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective.....	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)**

(4 units).....	4
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**ELECTIVES** ..... 47*(minimum 10 units must be 300-400 level)*

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180**ENGLISH MINOR****Required Courses**

	<i>Units</i>
ENGL 253 Great Books III.....	4
ENGL 302 Writing: Advanced Composition <i>or</i> ENGL 326 Literary Theory .....	4
ENGL 339 Introduction to Shakespeare .....	4
ENGL 390 Linguistic Structure of Modern English <i>or</i> ENGL 395 History of the English Language ..	4
<b>British Literature.</b> <i>Select one of the following</i> .....	4
ENGL 330, 331, 332, 333, 334, 335 (C4)*	
<b>American Literature.</b> <i>Select one of the following</i> ...	4
ENGL 340, 341, 342, 343 (C4)*	
<i>Select one of the following courses</i> .....	4
ENGL 350, 351, 352 The Modern Novel, Poetry <i>or</i> Drama (C4)*	
	<hr/> 28

**LINGUISTICS MINOR****Required Courses.**

	<i>Units</i>
ANT 433 Language and Culture .....	4
ENGL 290 Introduction to Linguistics .....	4
ENGL 391 Topics in Applied Linguistics .....	4
<b>Advisor Approved Electives.</b> May include:.....	16
ENGL 390 Linguistic Structure of Modern English (4)	
ENGL 395 History of the English Language (4)	
ENGL 497 Theories of Language Learning and Teaching (4)	
SCOM 416 Intercultural Communication (4) (USCP)	
	<hr/> 28

**CERTIFICATE PROGRAMS****Teaching English as a Second Language (TESL).**

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 30-unit TESL program provides a solid background in theoretical and applied linguistics, cross-cultural communication, language and culture, second language acquisition, and methods of TESL. The program 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 MA 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.

**Technical Communication.** 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.

The program is designed for men and women who desire careers in technical writing, information development, or business communication. The certificate program is available to Cal Poly students who are enrolled in an undergraduate or graduate degree program, and is also available through Concurrent Enrollment. 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.

**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 knowledge and command of English that will prepare them specifically for:

- teaching English at the elementary, secondary, or community college levels;
- employment in business, industry, and government service where specific communication skills are demanded;
- self-directed development in writing;
- 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 advisor. 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**

- 48 units of graduate work approved by the Director of Graduate Studies and the Graduate Committee;
- a grade point average of 3.0 or better in all courses taken subsequent to admission;
- two years of a foreign language (e.g., French, Spanish, German) or certification of the equivalent;
- 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.

**MA ENGLISH**

Required Courses	Units
ENGL 501 Techniques of Literary Research .....	4
ENGL 502 Seminar in Critical Analysis	
Historical and Contemporary .....	4,4
ENGL 503 Graduate Introduction to 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
<b>English Electives</b> .....	12
Additional ENGL 400-and 500-level courses, to be selected from one of three emphasis areas: literature, writing or linguistics.	
	<hr/> 48

# Ethnic Studies

**Department Office**  
**Math and Science Bldg. (38), Room 136**  
**805 756-1707**

## Interim Chair, Debra Valencia-Laver

Charise Cheney  
 Colleen O'Neill

Victor Valle  
 Maliha Zulfacar

## ACADEMIC PROGRAMS

### 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 department which seeks to integrate aspects of the arts and sciences, 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.

## ETHNIC STUDIES MINOR

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 examines racial, linguistic, 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 world 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.

	<i>Units</i>
<b>Core courses (12)</b>	
ES 112 Race, Culture and Politics in the U.S. (D1) (USCP).....	4
ES 212 Global Origins of U.S. Cultures (D3) (USCP).....	4
ES 320 African American Cultural Images (D5) (USCP) or ES 321 Native American Cultural Images (C4) (USCP) or ES 322 Asian American Cultural Images (D5) (USCP) or ES 323 Mexican American Cultural Images (D5) (USCP) .....	4
<b>Advisor approved electives .....</b>	<b>12</b>
Electives will reinforce and enhance student understanding of issues of culture, race, and gender. A minimum of 8 units must be 300-400 level.	

# Graphic Communication

**Department Office**  
**Graphic Arts Bldg. (26), Room 207**  
**805 756-1108, FAX 805 756-7118**

## Department Head, Harvey Robert Levenson

Herschel L. Apfelberg	Walter D. Horelick
Michael L. Blum	Malcolm G. Keif
Lorraine D. Donegan	Kenneth L. Macro
Gary G. Field	Penny K. Osmond
Henry J. Heesch	Philip K. Ruggles

## ACADEMIC PROGRAMS

### **BS Graphic Communication** **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 printing, publishing, packaging, multimedia, and allied professions.

The program provides courses in general education together with a core of printing technology, Internet, electronic imaging, and management courses. Courses that are specific to the curricular concentrations are also provided. The student is introduced to all stages of the printing process and electronic media, and chooses a specialized concentration at the appropriate time. Students are educated for professional and leadership roles in graphic communication.

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 graphic imaging equipment provide the student with diverse experiences in the practical aspects of the industry.

## CONCENTRATIONS

Majors select one of the following concentrations based upon their interests and career goals.

**Design Reproduction Technology.** Emphasis on modern electronic graphic print and World Wide Web technology with an understanding of design aesthetics. Coursework includes color theory, two-dimensional design, and typography as applied to the publication of books, newspapers, magazines, and electronic documents.

**Electronic Publishing and Imaging.** Study of print media and emerging digital media for publishing such as the Internet, CD ROM and multimedia. In addition to the major requirements for graphic communication, coursework

includes computer science, writing interactive documents and digital media. Students are prepared for careers in management of electronic imaging and publishing systems and with the hardware and software manufacturers that service the graphic communication industry.

**Printing and Imaging Management.** A flexible program for students interested in management careers in printing and digital imaging. In addition to the major requirements in graphic communication, coursework includes business law, accounting, marketing, and related management subjects. Graduates are in high demand in print media, e-commerce, document origination, and digital imaging management positions.

**Individualized Course of Study.** An opportunity to pursue a course of study that meets a student's individual needs and interests. This concentration consists of 29 units; a minimum of 18 units must be upper division and a minimum of 8 units must be Graphic Communication. The student will select the courses in consultation with the concentration coordinator and department head, and provide written justification for the courses and the way they constitute a cohesive, integrated program of study. The list of courses will serve as a contract between the student and the Graphic Communication Department.

**BS GRAPHIC COMMUNICATION**

□ 60 units upper division □ GWR

□ 2.0 GPA □ USCP

\* = Satisfies General Education requirement

**MAJOR COURSES**

GRC 101 Introduction to Graphic Communication..	3
GRC 201 Electronic Publishing Systems .....	3
GRC 202 Image Capture and Manipulation .....	3
GRC 203 Electronic Prepress.....	3
GRC 211 Substrates, Inks and Toners.....	4
GRC 218 Digital Typography and Electronic Copy Preparation .....	4
GRC 302 Digital Printing and Emerging Technologies in Graphic Communication .....	3
GRC 315 Sheetfed Printing Technology .....	5
GRC 316 Web Printing Technology .....	5
GRC 320 Implementing Quality Management in the Graphic Arts .....	4
GRC 324 Binding, Finishing and Distribution Processes.....	3
GRC 338 Digital Content Management for Publishing .....	4
GRC 361 Mktg/Sales for Print/Digital Media.....	4
GRC 403 Estimating for Print/Digital Media.....	4
GRC 411 Pricing, Costing and Web Estimating .....	4
GRC 421 Production Mgt for Print/Digital Media...	4
GRC 422 Supervision and Personnel Issues for Print/Digital Media.....	4
GRC 460 Research Methods in Graphic Communication .....	2
GRC 461 Senior Project.....	3
GRC 472/GRC 473/GRC 485 .....	4
Concentration courses (see below) .....	29

**102****SUPPORT COURSES**

PSC 101 Physical Environment: Matter/Energy (B3/B4)* .....	4
CHEM 111 Survey of Chemistry (B3&B4)* .....	5
<sup>1</sup> MATH 118 Pre-Calculus Algebra <i>or</i> MATH 120 Pre-Calculus Algebra and Trigonometry (B1)* .....	4
STAT 217 Intro to Statistical Concepts and Methods (B1)* .....	4

**17****GENERAL EDUCATION (GE)**

72 units required; 16 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

**Area B Science and Mathematics (4 units)**

B1 Mathematics/Statistics * 8 units in Support.....	0
B2 Life Science.....	4
B3 Physical Science * 4 units in Support .....	0
B4 One lab taken with B3 course	
B5 elective	
Area B elective (select one course from B1-B5) *	
4 units in Support .....	0

**Area C Arts and Humanities (16 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)  
(4 units) (Not GRC courses)****56****ELECTIVES..... 11****186****CONCENTRATIONS (select one)****Design Reproduction Technology Concentration**

ART 131 2-D Design Fundamentals.....	3
ART 132 Beginning Color Theory .....	3
ART 133 Color and Design .....	3
GRC 337 Consumer Packaging.....	3
GRC 339 Digital Design and Production for Multiple Media .....	3
GRC 439 Book Design Technology .....	4
GRC 440 Magazine and Newspaper Design Technology .....	4

<sup>2</sup> Select 6 units from the following.....	6
GRC 322 Advanced Digital Typography (3)	
GRC 429 Digital Media (3)	
ENGL 411 Writing Interactive Documents (4)	
ENGL 519 Web Authoring (4)	

**29**<sup>1</sup> 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 GE Area B2.<sup>2</sup> Other courses as approved by academic advisor.

**Electronic Publishing and Imaging Concentration**

CSC 234 C and UNIX.....	3
CSC electives (in addition to GE Area F) .....	8
ENGL 411 Writing Interactive Documents.....	4
GRC 331 Color Quality Control.....	4
GRC 339 Digital Design and Production for Multiple Media .....	3
GRC 429 Digital Media .....	3
Advisor approved electives .....	4
	<hr/> 29

**Printing and Imaging Management Concentration**

BUS 207 Business Law.....	4
BUS 212 Financial Accounting for Non-business Majors.....	4
BUS 245 Elements of Marketing .....	4
BUS 271 Principles of Management .....	3
GRC 337 Consumer Packaging.....	3
GRC 470 Selected Advanced Topics .....	3
<sup>1</sup> Select 8 units from the following: .....	8
GRC 331 Color Quality Control (4)	
BUS 381 Industrial Management (4)	
BUS 382 Organization and Management Theory (4)	
	<hr/> 29

**Individualized Course of Study**

A minimum of 18 units must be upper division and a minimum of 8 units must be Graphic Communication. The student will select the courses in consultation with concentration coordinator and department head, and provide written justification for the courses and the way they constitute a cohesive, integrated program of study. ....	29
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**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, document preparation, typography, and specifying the processes and materials for a broad range of printing, digital media, and publishing applications. Information and application forms for this minor are available in the Graphic Communication Department office.

	<i>Units</i>
<b>Core Courses</b>	
GRC 101 Intro. to Graphic Communication .....	3
GRC 202 Image Capture and Manipulation .....	3
GRC 212 Substrates, Inks and Toners: Theory .....	3
GRC 218 Digital Typography and Electronic Copy Preparation .....	4
GRC 315 Sheetfed Printing Technology .....	5
GRC 325 Binding and Finishing Processes: Theory	2
GRC 377 Web and Print Publishing (Area F) .....	4
<b>Approved Electives</b> .....	3
<i>(Approved by minor coordinator)</i>	
<i>Select 3 units from the following:</i>	
GRC 337 Consumer Packaging (3)	
GRC 357 Screen Printing Technology (2)	
GRC 361 Marketing and Sales for Print and Digital Media (4)	
GRC 470 Selected Advanced Topics (3)	
GRC 472 Applied Graphic Communication Practices (2)	
	<hr/> 27

<sup>1</sup> Other courses as approved by academic advisor.

# History

**Department Office**  
**Faculty Office Bldg. (47), Room 27C**  
**805 756-2543**

## Department Chair, Carolyn J. Stefanco

Timothy M. Barnes	Lynn M. Hudson
Nancy L. Clark	Daniel E. Krieger
George Cotkin	Andrew D. Morris
Manzar Foroohar	Max E. Riedlsperger
Craig Harlan	John Snetsinger
Paul Hiltbold	Tom R. Trice

## ACADEMIC PROGRAMS

### BA 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.

## 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 weigh evidence and think critically. Details and application forms are available from the History Department.

Required courses	Units
HIST 110 Western Civilization: Ancient to Renaissance.....	4
HIST 111 Western Civilization: Reformation to Twentieth Century .....	5
HIST 303 Research and Writing Seminar .....	5
<b>History electives</b> .....	16
Select 16 units from 300 and 400 upper-division History courses	
	<hr/> 30

## BA HISTORY

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA      ☐ USCP  
 \* = Satisfies General Education requirement

## MAJOR COURSES

HIST 110 Western Civilization: Ancient to Renaissance.....	4
HIST 111 Western Civilization: Reformation to Twentieth Century .....	5
HIST 206 American Cultures or HIST 207 Freedom and Equality in American History (D1)* (USCP) .....	4
HIST 303 Research and Writing Seminar in History .....	5
HIST 304 Historiography .....	4
HIST 460 Senior Project.....	2
HIST 461 Senior Project.....	2
History electives (300–400 level).....	24
Select 12 of the 24 units from the following list: HIST 314, 339, 340, 341, 381, 382, 414, 416, 417, 418, 431, 432, 442, 443, 444, 445	
Foreign language requirement, select one: FR 121, GER 121, SPAN 121 .....	4

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**SUPPORT COURSES**

Electives (300–400, including History)..... 20

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20**GENERAL EDUCATION (GE)**

72 units required.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing ..... 4

A2 Oral Communication ..... 4

A3 Reasoning, Argumentation, and Writing..... 4

**Area B Science and Mathematics (20 units)**

B1 Mathematics/Statistics ..... 8

B2 Life Science..... 4

B3 Physical Science ..... 4

B4 One lab taken with either a B2 or B3 course

B5 elective

Area B elective (select one course from B1-B5)..... 4

**Area C Arts and Humanities (16 units)**

C1 Literature ..... 4

C2 Philosophy ..... 4

C3 Fine/Performing Arts ..... 4

C4 Upper-division elective ..... 4

**Area D/E Society and the Individual (16 units)**D1 The American Experience (40404) \* 4 units in  
Major ..... 0

D2 Political Economy ..... 4

D3 Comparative Social Institutions ..... 4

D4 Self Development (CSU Area E) ..... 4

D5 Upper-division elective ..... 4

**Area F Technology Elective (upper division) (4 units)**

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68**ELECTIVES** ..... 44

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# Humanities

**Program Office**  
**Faculty Office Building (Bldg. 47), Room 28**  
**805 756-1206**

**Director, Richard K. Simon**

## ACADEMIC PROGRAMS

### Values, Technology and Society Minor

The Humanities Program offers interdisciplinary and international classes in a wide variety of subject areas, from the ethical issues involved in technology, to the cultures of China, Japan, and Spain. Many humanities classes satisfy University general education and breadth requirements.

### VALUES, TECHNOLOGY AND SOCIETY MINOR

The purpose of the minor is to increase understanding of how technology shapes and influences modern life. Students will develop an increased understanding of the social, environmental, economic and political implications of technology in the twenty-first 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.

### Required Courses

	<i>Units</i>
ENGR 302 Transportation and Manufacturing in the Twenty-First Century (F).....	4
HUM 303 Values and Technology (C4).....	4
PHIL 321 Philosophy of Science (C4) .....	4
IME 320 Human Factors and Technology (F).....	4

### Elective Courses: ..... 12

Select 12 units, at least one from each category

#### *Technology:*

AERO 310 Air and Space (4) (F)
BRAE 348 Energy for a Sustainable Society (4) (F)
CHEM 348 Bioinformatics (4) (F)
CSC 302 Computers and Society (4) (F)
HIST 354 History of Network Technology (4) (F)
IT 301 Technological Issues: Metals Manufacturing and Society (4) (F)
ME 321 Solar Energy (4) (F)
PSC 307 Nuclear Weapons in the Post-Soviet World (4) (F)
PSC 320 Energy and the Environment for the New Millennium (4) (F)

#### *Society:*

ANT 360 Human Cultural Adaptations (4)
CRP 211 Cities: Form, Culture and Evolution (4)
FNR 201 Introduction to Forest Ecosystem Management (3)
POLS 320 Politics of Global Survival (4)
POLS 451 Science, Technology and Public Policy (4)
PSY 311 Environmental Psychology (4) (D5)
PSY 494 Psychology of Technological Change (4)

#### *Philosophy and Values:*

ENVE 330 Environmental Quality Control (4)
GEOG 333 Human Impact on the Earth (4)
HIST 358 Cloning (4) (F)
HIST 359 Living in a Material World (4) (F)
HUM 302 Human Values in Agriculture (4) (F)
PHIL 339 Biomedical Ethics (4) (C4)
PHIL 340 Environmental Ethics (4) (C4)

# Journalism

Department Office  
Graphic Arts Bldg. (26), Room 228  
805 756-2508

## Department Chair, Nishan R. Havandjian

Teresa Allen  
Mark Arnold

Patrick Munroe  
Randall L. Murray

## ACADEMIC PROGRAMS

### BS 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 advisors, 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.

Of the 189 units required for a bachelor's degree, 131 quarter units must be taken in courses outside the major area of journalism/mass communication/communication, 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 advisors.

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 TV station. They are also expected to participate in professional and scholarly organizations in their interests. The department sponsors campus chapters of the Society of Professional Journalists. The department is headquarters for the California Intercollegiate Press Association (CIPA), an organization whose members consist of the student media in California universities.

## BS JOURNALISM

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA      ☐ USCP  
\* = Satisfies General Education requirement

### MAJOR COURSES

JOUR 203 News Writing and Reporting .....	4
JOUR 218 Mass Media in Society .....	4
JOUR 233 Copy Editing .....	4
JOUR 290 Multicultural Journalism (USCP) .....	4
JOUR 302 Mass Media Law .....	4
JOUR 304 Reporting Contemporary Issues .....	4
JOUR 390 Visual Communication for Mass Media .....	4
JOUR 401 International Communication .....	4
JOUR 444 Media Internship .....	3
JOUR 460 Senior Project .....	3
Choose four units from the following: .....	2,2
JOUR 351 Adv. Radio Reporting: KCPR (2)	
JOUR 352 Adv. Newspaper Reporting: <i>Mustang Daily</i> (2)	
JOUR 353 Adv. Television Reporting: CPTV (2)	
Restricted electives to be selected from: .....	16
JOUR 201, 205, 312, 320, 331, 333, 335, 342, 346, 385, 402, 407, 410, 412, 413, 470.	
	<b>58</b>

### SUPPORT COURSES

Foreign language (all 12 units must be in same language) .....	4,4,4
Department approved upper division electives .....	24
At least 12 units must be in the College of Liberal Arts and/or College of Science and Mathematics. All courses must have a lecture component. Courses must be approved by your academic advisor and department head. <i>Courses in journalism, mass communication and/or communication may not be used to satisfy upper division electives.</i>	
Department approved elective courses .....	23
<i>Courses in journalism, mass communication and/or communication may not be used. Courses must be approved by academic advisor &amp; dept. head.</i>	

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**GENERAL EDUCATION (GE)**

72 units required.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

**Area B Science and Mathematics (20 units)**

B1 Mathematics/Statistics .....	8
B2 Life Science.....	4
B3 Physical Science .....	4
B4 One lab taken with either a B2 or B3 course	
B5 elective	
Area B elective (select one course from B1-B5).....	4

**Area C Arts and Humanities (16 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)**

(4 units).....	4
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**72**

<b>ELECTIVES .....</b>	<b>0</b>
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# *Liberal Studies,* *an Interdisciplinary Program*

**Department Office**  
**Science North (Bldg. 53), Room 211**  
**805 756-2935**

**Department Chair, Susan Duffy**

## **ACADEMIC PROGRAMS** **BA, BS Liberal Studies**

The Liberal Studies Department offers three options of study to students. They may pursue a broadly based and interdisciplinary Bachelor of Arts program with their choice of an Individualized Course of Study or an Elementary Education Concentration. Students may also want to pursue the Bachelor of Science program in Liberal Studies which offers them the opportunity to receive a Multiple Subject Credential or a Special Education Credential in four and a quarter years (thirteen academic quarters).

### **BA Liberal Studies with Individualized Course of Study (General Concentration)**

This course of study offers students a broadly based, interdisciplinary foundation with the opportunity to select a minor of their choice, and a variety of electives that meet their individual needs and interests. Employment opportunities are extensive and include management and sales, publishing, software development, or human resource management. Program graduates are also well-prepared to pursue graduate work in such fields as business, English literature, law, public service, ministry, and counseling.

### **BA Liberal Studies with Elementary Education Concentration**

This course of study is intended primarily for students wishing to become elementary school teachers. Many will apply in their junior year to the Blended BS Liberal Studies/Multiple Subject Credential Program. Those who do not meet the application criteria for the blended program, including those who are "late deciders," may continue to pursue the BA degree; subsequently, they may enter post-baccalaureate Multiple Subject credential programs.

The concentration contains an Area of Emphasis that gives depth to the students' education in the subject matter of their choice, and may enable the credential candidate to achieve a supplemental authorization to teach a specific content area (e.g., English, mathematics) at the Middle School level.

## **Blended BS Liberal Studies/Multiple Subject Credential or Special Education Credential Program**

This program directly addresses California's need to produce more and better-trained elementary school and special education teachers in less time. Graduates will be especially well-prepared in the "high need" teaching areas of science, mathematics, and reading. The curriculum offers innovative coordination of subject matter with professional coursework, as well as a significant number of field experiences in elementary schools or special education settings.

Students have the opportunity to become credentialed in four and a quarter years (thirteen academic quarters) rather than the five or more years the process usually takes. The last academic quarter, which includes the last term of Student Teaching, is completed after attaining the BS degree.

In order to pursue the Blended BS Liberal Studies/Multiple Subject Credential or Special Education Credential Program, students need to do the following:

- \* make an early career decision to become an elementary school or special education teacher,
- \* enter the program leading to the BA Liberal Studies with Elementary Education Concentration,
- \* meet the necessary requirements for application, in their junior year, to Cal Poly's University Center for Teacher Education (UCTE) Multiple Subject Credential or Special Education Credential Program,
- \* be admitted to the UCTE Multiple Subject Credential or Special Education Credential Program, and then
- \* change their "degree objective" from *BA in Liberal Studies* to *BS in Liberal Studies*.

Those students not admitted to the BS Liberal Studies program may continue to pursue the BA Liberal Studies.

**BA LIBERAL STUDIES**

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA                              ☐ USCP  
 \* = Satisfies General Education requirement

**MAJOR COURSES**

(Courses in parentheses are recommended for Multiple Subjects Credential)

LS 101 Orientation to Liberal Studies.....	1
LS 211 The American Enterprise: The Birth of a Nation to 1876 Centennial.....	4
LS 212 The American Enterprise: The 1876 Centennial to the 21 <sup>st</sup> Century .....	4
LS 230 Community-Based Field Experience or EDUC 300 Intro. to the Teaching Profession .....	3
LS 461 or LS 462 Senior Project .....	3
BIO 113 Animal Diversity & Ecology (B2/ B4)* ....	4
BIO 114 Plant Diversity & Ecology (B2&B4)*.....	4
BIO 115 Human Biology .....	4
<i>Literature.</i> Select one course from the following:	
ENGL 330–354, 380, 381; ES 300; SPAN 340, 350, 351 (C4)* (ENGL 345, 346, 347, 349; ES 300; SPAN 340, 351 USCP).....	4
<i>Linguistics.</i> Select one course from the following:	
ENGL 290, 390, 391.....	4
MATH 118 Pre-Calculus Algebra (B1)*.....	4
MATH 119 Trigonometry or STAT 130/217 Statistics (B1)* .....	4
<i>Ethics.</i> Select one course from the following:	
PHIL 331/335/337/338 (PHIL 338).....	4
PSC 101 The Physical Environment: Matter and Energy (B3&B4)* .....	4
PSC 102 Physical Environ: Atoms & Molecules ....	4
PSC 103 Physical Environ: Earth & Universe .....	4
Foreign language 103-level or equivalent .....	4
Courses to complete concentration.....	56
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**GENERAL EDUCATION (GE)**

72 units required; 24 units are in Major.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300–400 level.

(Courses in parentheses are recommended for Multiple Subjects Credential)

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

**Area B Science and Mathematics (no additional units reqd)**

B1 Mathematics/Statistics * 8 units in Major.....	0
B2 Life Science * 4 units in Major .....	0
B3 Physical Science * 4 units in Major .....	0
B4 One lab taken with either a B2 or B3 course *	
Select one course from B1–B5* 4 units in Major.....	0

**Area C Arts and Humanities (12 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective * 4 units in Major.....	0

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions (HIST 215) .....	4
D4 Self Development (CSU Area E) (PSY 201/202).....	4
D5 Upper-division elective (GEOG 308) .....	4

**Area F Technology Elective (upper division) .....****4****ELECTIVES .....****19****186****CONCENTRATIONS**

To complete Major course requirements, select a Concentration or Individualized Course of Study

**Elementary Education Concentration**

CD/EDUC 207 Intro. to Learner's Development, Culture, Language and Identity.....	5
EDUC 310 Effective Teaching and Classroom Mgt with Multicultural Perspective in K-3/4-8 Setting .....	4
EDUC 440 Educating the Exceptional Individual...	4
BIO 306/PSC 304/PSC 305 .....	4
MATH 327 Math for Elementary Teaching I.....	4
MATH 328 Math for Elementary Teaching II.....	4
MATH 329 Math for Elementary Teaching III .....	4
Arts elective: MU 315/LS 310/LS 311/TH 380.....	4
KINE 250 Health Education (D4) .....	4
KINE 310 Concepts in Elementary Physical Ed.....	3
Area of emphasis .....	16

At least 8 units must be 300–400 level. LS 461 Senior Project will complement emphasis.

**56****Individualized Course of Study****(General Concentration)**

At least 42 units must be 300–400 level.

Courses to complete a minor .....	24–30
Psychology advisor approved elective.....	4
Music advisor approved elective .....	4
Fine/performing arts advisor approved elective .....	4
Additional electives .....	20–15

**56**

**BS LIBERAL STUDIES**

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA                      ☐ USCP

Student must be admitted to the University Center for Teacher Education's Multiple Subject Credential Program or Special Education Credential Program in order to pursue the BS Liberal Studies program. Those students not admitted to this program will complete the BA Liberal Studies. To complete a Preliminary Multiple Subject Credential, EDUC 456 and EDUC 457 must be taken as a post-baccalaureate graduate student. To complete a Preliminary Special Education Credential, EDUC 304, 449, 451, 545, and 550 must be taken as a post-baccalaureate graduate student.

**MAJOR COURSES**

<i>See BA Liberal Studies</i> .....	63
Courses to complete Elementary Education Concentration .....	56
	<b>119</b>

**SUPPORT COURSES for the Multiple Subject  
Credential**

EDUC 428 Teaching Reading in Grades K-3 .....	4
EDUC 429 Teaching Reading in Grades 4-8 .....	4
EDUC 431 Teaching Soc. Studies and the Arts .....	4
EDUC 432 Teaching Science and Math.....	4
EDUC 454 Student Teaching I.....	7
EDUC 455 Student Teaching Seminar I.....	2
	<b>25</b>

**OR****SUPPORT COURSES for the Special Education  
Credential**

EDUC 442 Field Experience in General and Special Education .....	2
EDUC 445 Reading/Language Arts Instruction for Special Educators .....	5
EDUC 446 Special Education and Instruction in the K-12 Curriculum.....	4
EDUC 447 Special Education Field Experience .....	4
EDUC 450 Behavior Disorders and Positive Behavior Support Strategies .....	4
EDUC 451 Special Education Fieldwork Seminar...	2
EDUC 452 Support and Transition Strategies in Special Education .....	4
	<b>25</b>

**GENERAL EDUCATION (GE)**

72 units required; 24 units are in Major. →See page 76 for complete GE course listing. →Minimum of 12 units required at the 300-400 level. <i>See BA Liberal Studies</i> .....	48
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<b>ELECTIVES</b> .....	<b>4</b>
	<b>196</b>

# Modern Languages & Literatures

Department Office  
Faculty Office Bldg. (47), Room 28  
805 756-1205

## Department Chair, William Martínez, Jr.

Odile Ayral-Clause	Bianca Rosenthal
Hernán Castellano-Girón	John J. Thompson
William T. Little	Gloria Velásquez

## ACADEMIC PROGRAMS

### BA Modern Languages and Literatures

#### French Minor

#### German Minor

#### Spanish Minor

The Modern Languages and Literatures Department offers coursework in French, German, and Spanish, as well as elementary Italian and Japanese. Instruction at all levels emphasizes communicative competence to prepare students for cultural, educational, literary and professional needs in California, throughout the United States and abroad. Audiovisual components are used in the classroom as well as in the language laboratory.

Students who wish to enroll in Spanish courses for the first time at Cal Poly, numbered 101 through 124, must take the Spanish Placement Examination prior to enrolling. Students who have never studied Spanish are exempt. Students should contact the Modern Languages and Literatures Department for test dates. The department strongly encourages students to follow its placement formula: One year of high school French, German, Italian or Japanese is equivalent to one quarter at Cal Poly.

The department supports the concept of international education and encourages students to investigate all opportunities for overseas study. The department works closely with the CSU's International Programs to insure that all courses taken in an overseas experience count toward either major, support, minor, general education and/or free electives. The department also sponsors summer and single term (fall quarter) abroad experiences. Students interested in studying abroad should consult with the International Education and Programs Office and their assigned academic advisor for more information.

The department is active in training students who wish to obtain a bilingual teaching credential. It administers the Bilingual Proficiency Examination in Spanish.

The department also supports such student clubs as the Polyglots, the French Club, the German Club, the Circolo Italiano, the Latin American Studies Association, MEXA

(Movimiento Estudiantil Xicano de Aztlán), and Tomo Dachi Kai.

The PolyLingual International Resource Center (PIRC) is the department's state-of-the-art digital language laboratory and multimedia production facility. Students and faculty members use the Center for class activities and presentations, and for drop-in language practice and curriculum development. The PIRC also houses the College of Liberal Arts MultiMedia Center (CLAMM), where students and faculty may create a cadre of projects for professional and academic development.

The curriculum for the Bachelor of Arts degree provides strong preparation for a career in single-subject teaching, multiple-subject teaching, business, government, and international affairs; it also provides preparation for graduate study in business administration, Chicano/Latino studies, comparative literature, ethnic studies, foreign languages, Latin American studies, and other fields in the humanities social sciences, and various service areas.

## FRENCH MINOR

Required courses	Units
FR 122 Intermediate French .....	4
FR 233 Critical Reading in French Literature (C1) ..	4
<sup>1</sup> FR 301 Adv. French Composition and Grammar <i>or</i>	
<sup>1</sup> FR 302 Adv. French Conversation/Grammar .....	4
<b>Electives to be chosen from the following:</b> .....	12
FR 301 Adv. French Composition and Grammar (4)	
FR 302 Adv. French Conversation/Grammar (4)	
FR 305 Significant Writers in French (4) (C4) (repeatable to 8 units)	
FR 322 French Food in French (4)	
FR 350 French Literature in English Translation (4) (C4)	
FR 470 Selected Advanced Topics (4) (repeatable to 8 units)	
HUM 310 Humanities in World Cultures (French) (4) (C4)*	

24

<sup>1</sup> Not repeatable as elective units.

**GERMAN MINOR**

<b>Required courses</b>	<i>Units</i>
GER 122 Intermediate German .....	4
GER 233 Critical Reading-German Literature (C1)	4
<sup>1</sup> GER 301 Adv. German Composition/Grammar <i>or</i>	
<sup>1</sup> GER 302 Adv German Conversation/Grammar..	4
<b>Electives to be chosen from the following:</b> .....	12
GER 301 Adv. German Composition/Grammar (4)	
GER 302 Adv German Conversation/Grammar (4)	
GER 305 Significant Writers in German (4) (C4)	
(repeatable to 8 units)	
GER 350 German Literature in English Translation	
(4) (C4)	
GER 470 Selected Advanced Topics (4)	
(repeatable to 8 units)	
HUM 310 Humanities in World Cultures	
(German) (4) (C4)	
	<hr/> 24

**SPANISH MINOR**

<b>Required courses</b>	<i>Units</i>
SPAN 122 Fundamentals of Spanish <i>or</i> SPAN 123	
Spanish for Heritage Speakers .....	4
SPAN 124 Composition in Spanish .....	4
SPAN 233 Introduction to Hispanic	
Readings (C1).....	4
<b>Electives to be chosen from the following:</b> .....	12
SPAN 301 Advanced Composition in Spanish (4)	
SPAN 305 Significant Writers in Spanish (4) (C4)	
(repeatable to 8 units)	
SPAN 340 Chicano/a Authors (4) (C4) (USCP)	
SPAN 350 Hispanic Literature in English	
Translation (4) (C4)	
SPAN 351 Latino(a) Literature in the U.S. (4) (C4)	
(USCP)	
SPAN 402 Advanced Linguistics in Spanish (4)	
SPAN 410 Advanced Literature in Spanish (4)	
SPAN 416 Don Quixote (4)	
SPAN 470 Selected Advanced Topics (4)	
HUM 310 Humanities in World Cultures (Hispanic	
or Latin American) (4) (C4)	
HUM 312 Chicano/a Culture (4)	
	<hr/> 24

**BA MODERN LANGUAGES & LITERATURES**

☐ 60 units upper division      ☐ GWR

☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

**MAJOR COURSES****Primary Language**

SPAN 121 Fundamentals of Spanish .....	4
SPAN 122 Fundamentals of Spanish <i>or</i>	
SPAN 123 Spanish for Heritage Speakers.....	4
SPAN 124 Composition in Spanish .....	4

SPAN 205 Introduction to Spanish Linguistics .....	4
SPAN 210 Intro. to Research Methods in Spanish ..	4
SPAN 233 Intro. to Hispanic Readings (C1)*.....	4
SPAN 301 Advanced Composition in Spanish .....	4
SPAN 305 Significant Writers in Spanish .....	4
SPAN 402 Advanced Linguistics in Spanish .....	4
SPAN 410 Advanced Literature in Spanish .....	4
SPAN 416 Don Quixote.....	4
FORL 460 Senior Project.....	4
Primary language/culture electives (300-400 level).	12

**Secondary Language Concentration**

*Select secondary language in either French, German or other language as approved by Department Chair.*

Introductory courses (101, 102, 103) .....	12
Intermediate courses (121, 122, 233) .....	12
Advanced course (300-400 level).....	4
	<hr/> 88

**GENERAL EDUCATION (GE)**

72 units required; 4 units are in Major.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing.....	4

**Area B Science and Mathematics (20 units)**

B1 Mathematics/Statistics .....	8
B2 Life Science.....	4
B3 Physical Science .....	4
B4 One lab taken with either a B2 or B3 course	
B5 elective	
Area B elective (select one course from B1-B5).....	4

**Area C Arts and Humanities (12 units)**

C1 Literature *4 units in Major.....	0
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective.....	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

<b>Area F Technology Elective (upper division)</b> .....	4
	<hr/> 68

<b>ELECTIVES</b> .....	24
	<hr/> 180

<sup>1</sup> Not repeatable as elective units.

# Music

**Department Office**  
**Davidson Music Center (45), Room 129**  
**805 756-2406 FAX 805 756-7464**  
<http://www.calpoly.edu/~mu>

## Department Chair, Clifton Swanson

Antonio G. Barata	Paul Rinzler
Meredith Brammeier	Craig H. Russell
Thomas H. Davies	John G. Russell
William V. Johnson	William T. Spiller
Alyson McLamore	

## ACADEMIC PROGRAMS

### BA Music Music Minor

The Bachelor of Arts in Music 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 program develops musical skills, encourages creativity, and cultivates vision for the future. The University's polytechnic emphasis also provides an excellent opportunity to explore music in conjunction with a wide range of other fields. Graduates are prepared to begin specialized study at the graduate level and to enter a wide variety of professional careers.

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 may explore the subject in depth have the opportunity to minor in music.

The 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 before their first term of enrollment 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 Department for details regarding appropriate ensembles and applied study policies.) Each student enrolled in private instruction must take an applied music jury at the end of Spring Quarter.

3. Each student is required to attend a minimum of 6 concerts per quarter.
4. At the end of the sixth quarter of enrollment (third quarter of enrollment for transfer students) a student must take a mid-point evaluation to verify progress and potential in music. This test will include the following:
  - private performance skills (should be at the MU 250 level; tested through a jury)
  - musicianship skills up through the level of Musicianship III
  - knowledge of music theory up through the level of Theory II
  - piano proficiency (see No. 5 below)
5. 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.
6. Use of Music Department instruments, scheduled practice rooms, electronic studio, or lockers requires a Music Use Fee. See the Music Department Office for details.
7. It is important that each student stay closely in touch with his/her advisor in order to progress through the music major program in the most efficient manner.
8. The Music Department is not able to offer the full complement of performing ensembles and private instruction during the Summer Quarter; 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.

**BA MUSIC**

☐ 60 units upper division      ☐ GWR

☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

**MAJOR COURSES**

MU 103 Music Theory I .....	4
MU 104 Musicianship I .....	2
MU 106 Musicianship II .....	2
MU 121 Introduction to Non-Western Music .....	4
MU 207 Music Theory II .....	4
MU 208 Musicianship III .....	2
MU 308 Sound Design: Technologies .....	4
MU 309 Music Theory III .....	4
MU 320 Music Research and Writing .....	4
MU 325 (USCP) or MU 326 or MU 336 .....	4
MU 331 Music of the Middle Ages and Renaissance .....	4
MU 332 Music of the Baroque and Early Classic Eras .....	4
MU 333 Music of the Classic and Romantic Eras ...	4
MU 334 Music of the Modern Era .....	4
MU 401 Contemporary Music Theory .....	4
MU 461 Senior Project .....	3
Approved music lecture courses (300–400 level)....	12
Major Ensemble at 100 level with advisor approval	6
Major Ensemble at 300 level with advisor approval	3
Applied Study .....	9
	<b>87</b>

**GENERAL EDUCATION (GE)**

72 units required.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300–400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

**Area B Science and Mathematics (20 units)**

B1 Mathematics/Statistics .....	8
B2 Life Science .....	4
B3 Physical Science .....	4
B4 One lab taken with either a B2 or B3 course	
B5 elective	
Area B elective (select one course from B1-B5) .....	4

**Area C Arts and Humanities (16 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4

D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)**

(4 units) .....	4
	<b>72</b>

**ELECTIVES** ..... **27****186****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. Students must complete one academic music lecture course at Cal Poly, such as MU 101 or MU 120, before applying for the minor. Information and application forms for the declaration of a Music minor are available in the Music Department Office.

**Required Courses**

MU 103 Music Theory I .....	4
MU 104 Musicianship I (2) and one quarter of Vocal or Instrumental Study (1) or 3 quarters/Vocal or Instrumental Study (1)(1)(1) .	3
Select one of the following courses: .....	4
MU 114 Introduction to Composing	
MU 121 Introduction to Non-Western Musics	
MU 207 Music Theory II	
MU 221 Jazz Styles (C3) (USCP)	
MU 229 Music of the 60s: War and Peace (C3), (USCP)	
MU 120 Music Appreciation .....	4

**Adviser approved upper division electives** ..... **15**

Chosen from 300–400 level Music courses (or in some cases, specific courses offered by other departments) selected with advisor approval.

**30**

# Philosophy

**Department Office**  
**Faculty Office Bldg. (47), Room 37-B**  
**805 756-2041**

## Department Chair, Linda Bomstad

Stephen W. Ball	Joseph Lynch
A. C. W. Bethel	Paul S. Miklowitz
Simon J. Evnine	Frederick J. O'Toole
Francisco Flores	Judy D. Saltzman
Charles T. Hagen	Talmage E. Scriven
Laurence D. Houlgate	Kendrick W. Walker
Russell A. Lascola	

## ACADEMIC PROGRAMS

**BA Philosophy**  
**Philosophy Minor**  
**Religious Studies 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.

## CONCENTRATIONS

Students may choose to complete 20 units of 300-400 level philosophy courses *or* the concentration.

**Ethics and Society.** 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 Electives.** 20 units of 300-400 level philosophy courses.

## 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.

*Units*

### Required courses

PHIL 311 Greek Philosophy (C4) .....	4
<i>Select one of the following:</i> .....	4
PHIL 230 Philosophical Classics: Metaphysics and Epistemology (4) (C2)	
PHIL 231 Philosophical Classics: Social and Political Philosophy (4) (C2)	

**Electives to be chosen from the following:** ..... 16

*Two of the following:*

PHIL 312 Medieval Philosophy (4) (C4)	
PHIL 313 Continental Philosophy: Descartes to Leibniz (4) (C4)	
PHIL 314 British Philosophy: Bacon to Mill (4) (C4)	
PHIL 315 German Philosophy: Kant to Nietzsche (4) (C4)	

*Additional courses may be chosen from PHIL 225 or any upper division Philosophy course, for a total of 8 units*

24

## RELIGIOUS STUDIES MINOR

The Religious Studies minor program is designed for students who want to enhance their understanding of the five great religious traditions of the contemporary world: Judaism, Christianity, Islam, Hinduism, and Buddhism. The minor consists of 24 units. Interested students are invited to contact the Philosophy Department Office for more information and application forms.

*Units*

### Required courses

RELS 304 Judaism .....	4
RELS 306 Hinduism.....	4
RELS 307 Buddhism.....	4
RELS 309 Monotheism: The Bible and the Quran (C4).....	4
PHIL 342 Philosophy of Religion <i>or</i> PHIL 320 Asian Philosophy .....	4
PSY 339 Psychology of Religion <i>or</i> SOC 377 Sociology of Religion .....	4

24

**BA PHILOSOPHY**

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA                              ☐ USCP  
 \* = Satisfies General Education requirement

**MAJOR COURSES**

PHIL 225 Symbolic Logic .....	4
PHIL 230 Philosophical Classics: Metaphysics and Epistemology (C2)* .....	4
PHIL 231 Philosophical Classics: Social and Political Philosophy .....	4
PHIL 311 Greek Philosophy .....	4
PHIL 313 Continental Philosophy: Descartes to Leibniz .....	4
PHIL 314 British Philosophy: Bacon to Mill .....	4
PHIL 315 German Philosophy: Kant to Nietzsche .....	4
PHIL 321 Philosophy of Science .....	4
PHIL 331 Ethics .....	4
PHIL 411 Metaphysics .....	4
PHIL 412 Epistemology .....	4
PHIL 460 Senior Project .....	2
PHIL 461 Senior Project .....	2
Concentration (see below) or 300–400 level PHIL electives .....	20
	<b>68</b>

**GENERAL EDUCATION (GE)**

- 72 units required; 4 units are in Major.  
 →See page 76 for complete GE course listing.  
 →Minimum of 12 units required at the 300–400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

**Area B Science and Mathematics (20 units)**

B1 Mathematics/Statistics .....	8
B2 Life Science .....	4
B3 Physical Science .....	4
B4 One lab taken with either a B2 or B3 course	
B5 elective .....	
Area B elective (select one course from B1-B5) .....	4

**Area C Arts and Humanities (12 units)**

C1 Literature .....	4
C2 Philosophy * 4 units in Major .....	0
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)**

(4 units) .....	4
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**68****ELECTIVES..... 44****180****CONCENTRATION OR ELECTIVES**

Select either the following concentration or 20 units of 300–400 level PHIL electives.

**Ethics and Society Concentration..... 20**

Select five of the following courses:

- PHIL 332 History of Ethics (4)  
 PHIL 333 Political Philosophy (4)  
 PHIL 334 Philosophy of Law (4)  
 PHIL 335 Social Ethics (4) (USCP)  
 PHIL 337 Business Ethics (4)  
 PHIL 338 Ethics and Education (4)  
 PHIL 339 Biomedical Ethics (4)  
 PHIL 340 Environmental Ethics (4)

**Philosophy Electives**

300–400 level PHIL electives..... 20

# Political Science

**Department Office**  
**Faculty Office Bldg. (47), Room 14-A**  
**805 756-2984**

## Department Chair, Philip L. Fetzer

Craig Arceneaux	Dianne N. Long
Randal L. Cruikshanks	Carl E. Lutrin
John H. Culver	Carroll R. McKibbin
Alesha E. Doan	Allen K. Settle
David L. George	Linda O. Valenty
Reginald H. Gooden, Jr.	Jean M. Williams
Richard B. Kranzdorf	

## ACADEMIC PROGRAMS

### BA Political Science

### International Relations Minor

### Law and Society Minor

The Political Science Department offers instruction leading to the Bachelor of Arts degree in Political Science. Through the required and elective courses, the department seeks to expand each student's comprehension of the political process, and to develop those understandings and skills which are essential for effective citizenship and for leadership positions in the public and private sectors.

In addition to the undergraduate major, the department offers minors in International Relations and Law and Society. Beyond that, the 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.

## CONCENTRATIONS

**American Politics.** Study of American governmental institutions, politics, and policies. Provides students with a broad knowledge of the American political system that can prepare them for careers in public service, such as campaign advisors or policy analysts.

**International Affairs.** Study of international and comparative politics, politics of developing areas, and U.S. foreign policy. Prepares students for careers in government, business, and related agencies which deal with international relations and also prepares students for graduate studies.

**Pre-Law.** Study of American constitutional law, civil liberties, jurisprudence and judicial process. 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.

**Individualized Course of Study.** As an option to one of the concentrations, students with varying backgrounds and interests may pursue a course of study which meets their individual needs and interests. A minimum of 28 units of coursework are selected by the student and approved by the student's academic advisor. 17 of these must be at the 300–400 level and 16 units must carry a POLS prefix.

## INTERNATIONAL RELATIONS MINOR

The minor consists of required coursework and advisor approved electives. Details are available from the Political Science Department. At least 15 units must be 300–400 level.

### Required courses

POLS 225 Introduction to International Relations .	4
POLS 229 Introduction to Comparative Politics .....	4
POLS 324 International Relations Theory.....	4
POLS 328 Politics of Developing Areas .....	4
POLS 420 Contemporary U.S. Foreign Policy .....	4
POLS 427 Politics of the Global Economy <i>or</i>	
POLS 426 International Organizations and Law .	4
<b>Advisor approved electives.....</b>	<b>4</b>
	<b>28</b>

## LAW AND SOCIETY MINOR

The minor consists of required coursework and advisor approved electives. Details are available from the Political Science Department. At least 15 units must be 300–400 level.

### Required courses

POLS 341 American Constitution .....	4
POLS 344 Civil Liberties .....	4
POLS 345 Judicial Process.....	4
Select two from the following: .....	8
Any English GE C4 course or comparable	
advisor-approved writing class (4)	
POLS 334 Jurisprudence (4)	
POLS 343 Civil Rights in America (4)	
<b>Advisor approved electives.....</b>	<b>8</b>
	<b>28</b>

**BA POLITICAL SCIENCE**

☐ 60 units upper division      ☐ GWR

☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

**MAJOR COURSES**

POLS 112 American and California Government (D1)* .....	4
POLS 180 Political Inquiry .....	4
POLS 225 Introduction to International Relations ...	4
POLS 229 Introduction to Comparative Politics .....	4
POLS 230 Basic Concepts of Political Thought .....	4
POLS 360 Political Analysis .....	5
POLS 481 Senior Project Seminar <i>or</i> POLS 461, 462 Senior Project .....	4
Political science electives (300–400 level) .....	8
Concentration courses <i>or</i> individualized course of study .....	28
	<b>65</b>

**SUPPORT COURSES**

HIST 110/111 Western Civilization .....	4-5
Geography elective (300–400 level) .....	4
Anthropology/Sociology elective (300–400 level) ...	4
ENGL 302/310/318 .....	4
STAT 221 Introduction to Probability and Statistics (B1)* .....	5
	<b>21-22</b>

**GENERAL EDUCATION (GE)**

72 units required; 4 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300–400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

**Area B Science and Mathematics (16 units)**

B1 Mathematics/Statistics * 4 units in Support .....	4
B2 Life Science .....	4
B3 Physical Science .....	4
B4 One lab taken with either a B2 or B3 course	
B5 elective	
Area B elective (select one course from B1-B5) .....	4

**Area C Arts and Humanities (16 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4

**Area D/E Society and the Individual (16 units)**

D1 The American Experience (40404) * 4 units in Major .....	0
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)**

(4 units) ..... 4

**64**

**ELECTIVES** ..... **35-36**

**186**

**CONCENTRATIONS (select one)**

Select a concentration or individualized course of study.

**American Politics Concentration**

POLS 315 The American Presidency .....	4
POLS 316 Political Parties and Interest Groups <i>or</i> POLS 317 Campaigns and Elections .....	4
POLS 319 United States Congress .....	4
POLS 337 American Political Thought .....	4
POLS 470 Selected Advanced Topics .....	4
POLS 471 Urban Politics .....	4
Electives .....	4
	<b>28</b>

**International Affairs Concentration**

POLS 308 Collective Violence and Conflict Resolution .....	4
POLS 324 International Relations Theory .....	4
POLS 328 Politics of Developing Areas .....	4
POLS 420 Contemporary U.S. Foreign Policy .....	4
POLS 427 Politics of the Global Economy <i>or</i> POLS 426 International Organizations and Law .	4
Advisor approved electives .....	8
	<b>28</b>

**Pre-Law Concentration**

ENGL 302 Writing: Advanced Composition .....	4
POLS 341 American Constitutional Law .....	4
POLS 344 Civil Liberties .....	4
POLS 334 Jurisprudence .....	4
POLS 345 Judicial Process .....	4
Advisor approved electives .....	8
	<b>28</b>

# Psychology & Child Development

**Department Office**  
**Faculty Office Bldg. (47), Room 24**  
**805 756-2033**

## Department Chair, Donald H. Ryuji

Margaret M. Berrio	Daniel J. Levi
Robert L. Blodgett	J. Kelly Moreno
Shawn M. Burn	Linden L. Nelson
Harry J. Busselen	Kathleen A. Ryan
Denise H. Daniels	Ned W. Schultz
Patrice L. Engle	Michael J. Selby
David L. Englund	Charles M. Slem
Basil A. Fiorito	Lisa I. Sweatt
Laura A. Freberg	Bette J. Tryon
Laura M. King	Debra Valencia-Laver
Gary D. Laver	

## ACADEMIC PROGRAMS

**BS Child Development**  
**BS, MS Psychology**  
**Child Development Minor**  
**Gerontology Minor**  
**Psychology Minor**

The department consists of faculty with degrees in psychology, family studies, human development and education who direct programs leading to BS Child Development, BS Psychology, MS Psychology, and minors in Child Development, Psychology and Gerontology.

In addition, courses are offered which fulfill general education requirements, support other programs and serve as a personal development resource for all university students. These courses are designed to acquaint students with the facts, theories and contemporary trends in psychology and child development and how these principles can be incorporated into a more meaningful understanding of oneself and of one's interactions with others. 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.

## CHILD DEVELOPMENT MINOR

The minor is designed to give students in Liberal Studies and other majors a broad knowledge base in child development. Biological, cognitive, social, and emotional development are examined with opportunities to explore development in the contexts of family and culture. The minor builds upon students' critical thinking skills by stressing the research base of the current knowledge in the field. At the same time, applications of that research, especially as they apply to teaching, are explored. This minor complements one's training in majors such as Liberal Studies, Psychology, or Recreation Administration by its emphasis on approaching child development as a coherent

whole and as a scientific area of study. An application form must be approved by a Child Development Minor advisor.

Required Courses	Units
CD/EDUC 207/CD 209/PSY 256.....	4-5
CD 324 Guiding Children.....	4
CD 329 Research Methods - Child Development....	4
CD 350 Developmental Issues in Education.....	4
PSY 201 or PSY 202 General Psychology (D4).....	4
STAT 217 Intro to Statistical Concepts/Methods ....	4
<b>Elective</b> .....	4
PSY/CD 306, PSY 419, 420, 421, 456, 460	
	<b>28-29</b>

## GERONTOLOGY MINOR AND CERTIFICATE

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 psychological, biological, 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 the faculty coordinator.*

Required core	Units
KINE 408 Exercise/Health Promotion for Sr Adults	4
PSY 318 Psychology of Aging (D5).....	4
SOC 326 Sociology of the Life Cycle .....	4
FSN 315 Nutrition in Aging .....	4
<b>Advisor approved electives (choose two)</b> .....	8
May be selected from: PHIL 339; PSY 256, 310, 317, 459; SCOM 418	
<b>Gerontology-related Fieldwork</b> .....	4
May be fulfilled as an elective in the student's major or it may be challenged due to previous work.	
	<b>28</b>

## PSYCHOLOGY MINOR

The 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 Child Development Department for information and application forms. An application form must be approved by a Psychology Minor advisor. *Minimum of 16 units 300-400 level courses required.*

Required courses	Units
PSY 201/202 General Psychology (D4) .....	4
STAT 217/221/251 (B1) or STAT 321 (B6) .....	4-5
Select two of the following .....	8
PSY 252/PSY 254/PSY 256 (4)	
(Only one of PSY 252, 254 or 256 can be counted in the minor)	
PSY 305 Personality (4)	
PSY 340 Biopsychology (4) (B5)	
PSY 405 Abnormal Psychology (4)	
PSY elective courses (300-400 level) .....	12
	28-29

## BS CHILD DEVELOPMENT

The Child Development major is designed for students who are interested in working with children in educational settings. The major provides a background in how children learn and develop and serves as preparation for working in infancy through middle school programs. It prepares students for employment as developers of educational resources and software and for graduate study in teaching credential, child development, and child psychology programs.

The Child Development major is designed to enable students to develop a program of study suited to meet their individual needs. After completing major courses in child development, they will, with the assistance of an advisor, develop a personal program of study by selecting advisor approved electives, free electives, two internships, and a senior project and become part of a learning community of faculty and students engaged in a collaborative learning process. Each student graduates with a BS in Child Development and a minor in Psychology.

Goals of the Child Development major are for students to:

- Learn about children, how they learn and develop physically, emotionally, socially, and intellectually, and how adults can facilitate or hinder the process.
- Gain experience working with children of different ages in different settings.
- Develop expertise in the use of educational technology through developing competencies in accessing, processing, and disseminating information through the use of computers and video technology.
- Develop an understanding of multicultural and anti-bias issues and how to lead children into a celebration of cultural pluralism, transmitting ideals of fairness and respect.
- Develop skills in leadership and team and community building.

## BS CHILD DEVELOPMENT

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA      ☐ USCP  
 \* = Satisfies General Education requirement

### MAJOR COURSES

CD 102 Orientation to the Child Dev. Major .....	4
CD 128 Nurturing Relationships for Infants & Toddlers .....	4
CD 130 Supervised Study of Children: Infants and Toddlers .....	4
CD 203 Family Dev. or PSY 254 Family Psych. ....	4
CD 209 Early Development .....	4
CD 230 Supervised Study: Early Childhood .....	4
CD 306 Adolescence .....	4
CD 309 Learning, Development & Technology I ....	4
CD 310 Learning, Development & Technology II ...	4
CD 311 Learning, Development & Technology III..	4
PSY 323 The Helping Relationship .....	4
CD 324 Guiding Children .....	4
CD 329 Research Methods-Child Development .....	4
CD 330 Supervised Internship .....	4
PSY 351 Group Dynamics .....	4
CD 401 Perspectives on Childhood Education .....	4
CD 430 Advanced Internship .....	4
CD 461 Senior Project Seminar .....	2
CD 462 Senior Project .....	2
	72

### SUPPORT COURSES

* = Satisfies General Education requirement	
BIO 302 Human Genetics (B5)* .....	4
FSN 210 Nutrition .....	4
PSY 201/PSY 202 General Psychology (D4)* .....	4
PSY 252/305/340/456 .....	4
STAT 217 Intro to Statistical Concepts and Methods (B1)* .....	4
Advisor approved electives .....	16
	36

### GENERAL EDUCATION (GE)

- 72 units required; 12 units are in Support.  
 → See page 76 for complete GE course listing.  
 → Minimum of 12 units required at the 300-400 level.

#### Area A Communication (12 units)

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

#### Area B Science and Mathematics (12 units)

B1 Mathematics/Statistics * 4 units in Support .....	4
B2 Life Science .....	4
B3 Physical Science with lab .....	4
B4 One lab taken with either a B2 or B3 course	
B5 elective	
Area B elective (select one course from B1-B5)	
* 4 units in Support .....	0

#### Area C Arts and Humanities (16 units)

C1 Literature .....	4
C2 Philosophy .....	4

C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
<b>Area D/E Society and the Individual (16 units)</b>	
D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) * 4 units in Support.....	0
D5 Upper-division elective .....	4
<b>Area F Technology Elective (upper division) (4 units).....</b>	<b>4</b>
	<b>60</b>
<b>ELECTIVES .....</b>	<b>12</b>
	<b>180</b>

## BS PSYCHOLOGY

The Psychology major offers a broad preparation in the science of psychology, with concentrations in Applied Social Psychology, Counseling and Family Psychology, and Developmental Psychology. Theoretical approaches, research techniques, laboratory experiences and internships are hallmarks of the psychology program.

Graduates often pursue careers in mental health programs, social services agencies, public health settings, education institutions, and personnel-related settings. Many majors go on to graduate work in such fields of psychology as: counseling, developmental, family, social, clinical or experimental.

## CONCENTRATIONS

**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.

**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 related fields.

**Counseling and Family Psychology.** Interdisciplinary study that provides knowledge and experience necessary for a variety of careers in family, social, educational, clinical, and other health-related service agencies in the public and private sectors. Appropriate for students who wish to work in such settings, and who desire an applied approach to

understanding and modifying individual, interpersonal, and family systems. Students are prepared for graduate study in clinical psychology, counseling psychology, social work, and marriage and family counseling.

**Individualized Course of Study.** Permits students to pursue a course of study which meets their individual needs and interests. Courses are selected by the student with the advice and approval of the student's academic advisor and department chair.

## BS PSYCHOLOGY

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA      ☐ USCP  
 \* = Satisfies General Education requirement

## MAJOR COURSES

PSY 201/PSY 202 General Psychology (D4)* .....	4
PSY 252 Social Psychology.....	4
PSY 254 Family Psychology .....	4
PSY 256 Developmental Psychology .....	4
PSY 305 Personality .....	4
PSY 307 Memory and Cognition.....	4
PSY 323 The Helping Relationship.....	4
PSY 329 Research Methods in Psychology.....	3
PSY 333 Quant. Research Meth.-Behavioral Sci.....	3
PSY 340 Biopsychology (B5)*.....	4
PSY 351 Group Dynamics or PSY 366 Experimental Psychology .....	4
PSY 405 Abnormal Psychology .....	4
PSY 453 Supervised Fieldwork and/or PSY 449 Research Internship.....	5,5
PSY 458 Learning.....	4
PSY 461 Senior Project Seminar .....	1
PSY 462 Senior Project .....	3
PSY electives (300-400 level) .....	8
Concentration or individualized course of study .....	28
	<b>100</b>

## SUPPORT COURSES

BIO 302 Human Genetics .....	4
STAT 217 Intro to Statistical Concepts/Methods or STAT 251 and STAT 252 Stat. Inference- Mgt. I, II (B1)* .....	4-9
	<b>8-13</b>

## GENERAL EDUCATION (GE)

- 72 units required; 12 units are in Major/Support.  
 →See page 76 for complete GE course listing.  
 →Minimum of 12 units required at the 300-400 level.

## Area A Communication (12 units)

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing.....	4

## Area B Science and Mathematics (12 units)

B1 Mathematics/Statistics * 4 units in Support .....	4
B2 Life Science.....	4
B3 Physical Science .....	4
B4 One lab taken with either a B2 or B3 course	

B5 elective	
Area B elective (select one course from B1-B5)	
* 4 units in Major .....	0
<b>Area C Arts and Humanities (16 units)</b>	
C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
<b>Area D/E Society and the Individual (16 units)</b>	
D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) * 4 units in Major.....	0
D5 Upper-division elective .....	4
<b>Area F Technology Elective (upper division) (4 units) .....</b>	<b>4</b>
	<b>60</b>
<b>ELECTIVES .....</b>	<b>11-16</b>
	<b>184</b>

**CONCENTRATIONS OR ELECTIVES (select one)****Applied Social Psychology Concentration**

PSY 302 Behavior in Organizations .....	4
PSY 360 Applied Social Psychology .....	4
Select 2 of the following:.....	8
PSY 311 Environmental Psychology (4)	
PSY 317 Psychology of Stress (4)	
PSY 350 Teamwork (4)	
PSY 351 Group Dynamics (4)	
PSY 352 Conflict Resolution: Violent and Non-Violent (4)	
PSY 359 Appl. Psychology Research Methods (4)	
PSY 432 Psychological Testing (4)	
PSY 465 Cross-Cultural Issues in Psychology (4)	
PSY 494 Psychology of Technological Change (4)	
Advisor approved concentration electives .....	12
	28

**Counseling and Family Psychology Concentration**

PSY 370 Intro. Clinical & Counseling Psychology	4
Select 3 of the following:.....	12
PSY 330 Behav. Effects Psychoactive Drugs (4)	
PSY 413 Parent-Child Relationships (4)	
PSY 432 Psychological Testing (4)	
PSY 450 Family Intervention (4)	
PSY 456 Behavioral Disorders in Children (4)	
Advisor approved concentration electives	12
	28

**Developmental Psychology Concentration**

PSY 419 Self and Identity .....	4
PSY 420 Social and Emotional Development .....	4
PSY 421 Cognitive Development.....	4
PSY 459 Lifespan Theories.....	4
Advisor approved concentration electives.....	12
	28

**Individualized Course of Study .....** 28

*Courses are selected by the student with the approval of the student's academic advisor and the department chair. The ICS may include a Cal Poly minor, course prerequisites for graduate study, foreign language courses, and/or a coherent group of courses including a minimum of two upper division psychology courses and no more than nine units of lower division courses.*

**MS IN PSYCHOLOGY****General Characteristics**

The Master of Science in Psychology is a 90-quarter unit professional degree program designed to provide the state of California with highly competent master-level clinicians who are academically prepared to obtain the marriage and family therapy (MFT) license. The program places a heavy emphasis on clinical skill training and applied experience that 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:

- an acceptable baccalaureate degree from an institution accredited by a regional association;
- a minimum grade point average of 3.0 in the last 90 quarter units (60 semester units) attempted;
- satisfactory performance on the General Tests (Verbal, Quantitative, Analytical) of the Graduate Record Examination (GRE); the GRE Advanced Test in Psychology is not required;
- four letters of recommendation;
- autobiographical information;
- an on-campus screening interview.

Related work or volunteer experience is highly desirable as is having received professional counseling.

**Prerequisites.** Coursework in abnormal psychology, abnormal child psychology, personality, 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, fulfillment of the Graduation Writing Requirement, 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.

## PROGRAM OF STUDY

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 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 professional and personal growth of each graduate student is of major importance; consequently, candidates are 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.

## MFT LICENSING

The Master of Science in Psychology is designed to meet the educational requirements for the Marriage and Family Therapist license (MFT) in the State of California. Students are advised to acquire and read the laws governing MFT 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 graduation.

**Grades.** If a candidate for University recommendation for MFT 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 NC in field experience is on probation regarding continuation in the program. A second grade of NC will disqualify the student from the program and University recommendation for the license. Further candidates may be disqualified from this program for academic-related actions judged by the M.S. Program Committee to reflect unethical, unprofessional or incompetent clinical skills.

## CURRICULUM FOR MS PSYCHOLOGY

PSY 450 Family Intervention.....	4
PSY 459 Lifespan Theories .....	4
PSY 504 Psychopharmacology .....	4
EDUC/PSY 555 Counseling and Communication .....	4
EDUC/PSY 556 Ethnic Counseling .....	4
PSY 558 Career Counseling.....	4
PSY 560 Individual Therapy: Theory & Applic. ....	4
PSY 564 Ethics and the Law: MF Therapy .....	4
PSY 565 Diagnosis/Treatment Psychopathology .....	4
PSY 566 Group Therapy: Theory and Application ....	4
PSY 569 Counseling Clinic Practicum .....	3,3
PSY 571 Family Therapy: Theory and Application....	4
PSY 572 Child/Adolescent Therapy: Theory & Appl.	4
PSY 574 Psychological Assessment .....	4
PSY 575 Gender, Couple & Sexual Dysfunc. Therapy	4
PSY 576 Field Exp: Marital & Family Counseling ....	16
PSY 585 Research Methods-Counseling Psychology.	4
PSY 590 Research Appl. Psych. & Human Services .	4
<sup>1</sup> PSY 599 Thesis or approved electives and written comprehensive examination .....	4
	<u>90</u>

<sup>1</sup> Must register for thesis credit each quarter of advisement.

# Social Sciences

**Department Office**  
**Faculty Office Bldg. (47), Room 13-C**  
**805 756-2260**

## Department Chair, Patrick C. McKim

### Anthropology:

Barbara E. Cook  
 Terry L. Jones  
 Patrick C. McKim

### Geography:

Max A. Moritz  
 William L. Preston  
 George J. Suchand  
 Calvin H. Wilvert

### Sociology:

James W. Coleman  
 Laurel A. Duchowny  
 Harold R. Kerbo  
 John A. McKinstry  
 Barbara L. Mori  
 Leo W. Pinard II  
 Richard A. Shaffer

## ACADEMIC PROGRAMS

### BS Social Sciences

#### Anthropology-Geography Minor

#### Sociology Minor

The Social Sciences Department provides a broadly based, multicultural and multidisciplinary perspective on humanity, society and the environment. Since the BS degree program in Social Science consists of courses in anthropology, geography and sociology, students have an opportunity to examine human experience from a variety of viewpoints. In anthropology, humanity is studied from 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. Sociology coursework explores the nature and dynamics of human society and the interrelationship between individuals and their social groups. The department also offers minors in Sociology and Anthropology/Geography.

The department offers general education courses that provide an understanding of the complexity and diversity of the world's peoples and their problems. Some 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. Courses are also offered that stress environmental problems on both local and global levels.

## ANTHROPOLOGY-GEOGRAPHY MINOR

The minor provides the broadest possible spatial and cultural knowledge of our world. The program consists of foundation courses and directed electives that allow flexibility for students to tailor the program to meet their individual interests and goals. The objectives of the minor are to increase students awareness of the: (1) cultural and ecological diversity of the earth's surface; (2) inter-relationships

between peoples of varying cultures; (3) interactions of different cultures with their resource habitats and environmental alteration; and (4) methodologies and technologies used to evaluate cultures and environments. The goal is to instill a respect for cultural diversity and environmental sustainability. A minimum of 14 units must be upper division and taken at Cal Poly.

<b>Foundation Courses</b> .....	12
ANT 250 Biological Anthropology (4) (B2)	
GEOG 250 Physical Geography (4)	
<i>Select one:</i>	
ANT 201 Cultural Anthropology (4) (D3)	
ANT 202 World Prehistory (4)	
GEOG 150 Intro. Cultural Geography (4) (D3)	
<b>Ecological Courses (select one)</b> .....	4
ANT 360; GEOG 325, 333	
<b>Global and Regional Courses (select one)</b> .....	4
ANT 325 (D5), 415, 450; GEOG 300, 301, 308, 340, 360, 370, 401	
<b>Special Topics (select one)</b> .....	4
ANT 309, 310, 311, 312, 325, 344, 401, 433; ENVE 324; GEOG 414	
<b>Technical Skills</b> .....	3/4
GEOG/BIO/FNR/LA 317 The World of Spatial Data and Geographic Info. Technology (4) (F) <i>or</i> GEOG/FNR/LA 318 Apps in GIS (3)	

27/28

## SOCIOLOGY MINOR

The minor provides students with a broad understanding of contemporary society with a focus on the analysis of social change. The objectives of the program are to increase awareness of the: (1) nature of international social, economic and political structures and their consequences; (2) social results of emerging technology; (3) changes in family life, especially the role of women; and (4) changing ethnic mix in California and the United States and its implications. Coursework includes the study of the shifting demographic patterns in society, emerging life styles, the increase in the percentage of elderly in the population, and the nature of specific subculture influences.

<b>Required courses</b>	<b>Units</b>
SOC 105 Introduction to Sociology .....	4
SOC 106 Social Problems .....	4
SOC 309 World Systems and Its Problems .....	4
SOC 315 Global Race & Ethnic Relations (D5) <i>or</i> SOC 316 American Ethnic Minorities (USCP) ....	4
SOC 323 Social Stratification .....	4
<b>Electives (At least 4 units at 300-400 level)</b> .....	8
	28

## CONCENTRATIONS

Students may select one of the following concentrations or the individualized course of study.

**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.

**Environmental Geography.** Provides students with a conceptual understanding of environmental topics, placing current problems in a global and historic context. Students will also gain applied skills which will help them to obtain employment. Students will also be better prepared to gain admittance to graduate schools in geography.

**Individualized Course of Study.** An opportunity to pursue a course of study which meets their individual needs and interests. It consists of 28 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 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 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. For more information regarding teacher credential programs, please see the University Center for Teacher Education section.

**Other Concentrations.** With prior consultation and approval of the Social Sciences Department and the department offering the concentration, students may select one of the following: Public Administration, Pre-Law, International Affairs or Urban Studies (Political Science), Human Resources Management, Management, or International Business Management (Orfalea College of Business).

## BS SOCIAL SCIENCES

☐ 60 units upper division

☐ GWR

☐ 2.0 GPA

☐ USCP

\* = Satisfies General Education requirement

### MAJOR COURSES

ANT 201 Cultural Anthropology (D3)* .....	4
ANT 202 World Prehistory .....	4
ANT 250 Biological Anthropology (B2)* .....	4
Anthropology electives (300–400 level) .....	4
CSC 110 Computers/Computer Applications .....	3
GEOG 150 Intro. to Cultural Geography .....	4
GEOG 250 Physical Geography .....	4
GEOG 333 Human Impact on the Earth .....	4
Geography electives (300–400 level) .....	4
SOC 105 Introduction to Sociology .....	4
SOC 106 Social Problems .....	4
SOC 323 Social Stratification .....	4
SOC 355 Social Data Collection and Analysis .....	4
SOC 421 Social Theory .....	4
SOCS 461 Senior Project .....	2
SOCS 462 Senior Project .....	2
Sociology electives (300–400 level) .....	4
STAT 217/221 Intro. Statistics (B1)* .....	4/5
Concentration or individualized course of study ...	28

**95/96**

### GENERAL EDUCATION (GE)

72 units required; 12 units are in Major.

→ See page 76 for complete GE course listing.

→ Minimum of 12 units required at the 300–400 level.

#### Area A Communication (12 units)

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

#### Area B Science and Mathematics (12 units)

B1 Mathematics/Statistics * 4 units in Major .....	4
B2 Life Science * 4 units in Major .....	0
B3 Physical Science .....	4
B4 One lab taken with either a B2 or B3 course	
B5 elective	
Area B elective (select one course from B1–B5) .....	4

#### Area C Arts and Humanities (16 units)

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4

#### Area D/E Society and the Individual (16 units)

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions * 4 units in Major .....	0

D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4
<b>Area F Technology Elective (upper division)</b>	
<b>(4 units).....</b>	<b>4</b>
	<b>60</b>

<b>ELECTIVES .....</b>	<b>30/31</b>
	<b>186</b>

### CONCENTRATION OR INDIVIDUALIZED COURSE OF STUDY (select one)

#### Criminal Justice Concentration

SOC 402 Crime and Violence .....	4
SOC 406 Juvenile Delinquency .....	4
SOC 412 Criminal Justice .....	4
SOCS 440 Internship .....	8
<i>Applications and Issues courses to be selected from: SOC 315, SOC 413; SOCS 440 or other approved electives (internship units not to exceed 12 in concentration) .....</i>	<i>8</i>
	<b>28</b>

#### Cross-Cultural Studies Concentration

ANT 360 Human Cultural Adaptation .....	4
GEOG 308 Global Geography .....	4
SOC 309 The World System and Its Problems .....	4
<i>Problems and Issues courses to be selected from: ANT 325, 344, 401, 415, 433; GEOG 301, 325, 414; SOC 315, 350</i>	<i>8</i>
Advisor approved courses .....	<i>8</i>
	<b>28</b>

#### Environmental Geography Concentration

GEOG 301 Geography of Resource Utilization .....	4
GEOG/FNR/LA 318 Applications in GIS .....	4
GEOG 325 Climate and Humanity .....	4
GEOG 414 Climatology .....	4
<i>Applications and Issues courses to be selected from: ANT 309, 310, 311, 312, 360, 433; BIO 301; BRAE 237, 345; FNR 202, 300; GEOG 317; LA 321; EHS 121; SS 121, 202, 433</i>	<i>12</i>
	<b>28</b>

#### Organizations Concentration

<i>Select 20 units from the following courses:.....</i>	<i>20</i>
SOC 310 Self, Organizations and Society (4)	
SOC 350 Social Organization of Modern Japan (4)	
SOC 395 Sociology of Complex Organizations (4)	
SOCS 440 Internship (4)	
BUS 382 Organization and Mgmt. Theory (4)	
BUS 384 Human Resource Management (4)	
BUS 387 Organizational Behavior (4) or	
PSY 302 Behavior in Organizations (4)	
Advisor approved courses .....	<i>8</i>
	<b>28</b>

#### Social Services Concentration

SOC 301 Social Work and Social Welfare	
Institutions .....	4
SOC 316 American Ethnic Minorities (USCP) .....	4
SOC 413 Methods of Social Work .....	4
SOCS 440 Internship .....	8
Advisor approved course(s) (internship units not to exceed 12 in concentration) .....	<i>8</i>
	<b>28</b>

#### Teaching Concentration

GEOG 300 Geography of the United States .....	4
GEOG 308 Global Geography .....	4
GEOG 340 Geography of California .....	4
SOC 316 American Ethnic Minorities (USCP) .....	4
EDUC 300 Intr. Teaching Profession .....	3
Advisor approved courses .....	<i>9</i>
	<b>28</b>

#### Individualized Course of Study..... 28

28 units at the 300–400 level selected in consultation with advising faculty. A written justification for the courses selected and the way they constitute a cohesive, integrated study is required. One-half of courses selected are to be from major (major prefixes) and one-half related approved courses.

# Speech Communication

Department Office  
Faculty Office Bldg. (47), Room 33  
805 756-2553

## Department Chair, James R. Conway

Bernard K. Duffy  
Michael L. Fahs  
Lorraine D. Jackson  
Steven McDermott

Harry Sharp, Jr.  
Terrence C. Winebrenner  
Raymond F. Zeuschner

## ACADEMIC PROGRAMS

### BA 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. 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 advisor 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. It also offers

individual and sequenced courses to develop practical skills in oral composition, critical thinking, and effective human communication

## SPEECH COMMUNICATION MINOR

A 28-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.

	<i>Units</i>
<b>Required courses</b>	
SCOM 212 Interpersonal Communication .....	4
SCOM 311 Communication Theory .....	4
SCOM 322 Persuasion.....	4
SCOM 330 Classical Rhetorical Theory <i>or</i> SCOM 331 Political Advocacy and Contemporary Rhetoric .....	4
<b>Electives</b> .....	12
12 units of Speech Communication of which at least 8 units must be 300–400 level.	12
	28

**BA SPEECH COMMUNICATION**

☐ 60 units upper division      ☐ GWR

☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

**MAJOR COURSES**

SCOM 201/208/226 .....	4
SCOM 212 Interpersonal Communication .....	4
SCOM 213 Organizational Communication .....	4
SCOM 217 Small Group Communication.....	4
SCOM 250 Forensic Activity.....	2
SCOM 311 Communication Theory .....	4
SCOM 312 Communication Research .....	4
SCOM 322 Persuasion .....	4
SCOM 330 Classical Rhetorical Theory .....	4
SCOM 331 Political Advocacy and Contemporary Rhetoric <i>or</i>	
SCOM 435 American Political Rhetoric .....	4
SCOM 332 Rhetorical Criticism .....	4
SCOM 350 Advanced Forensic Activity.....	2
SCOM 460 Undergraduate Seminar.....	1
SCOM 461 Senior Project.....	3
Speech Communication electives (300–400 level) to be selected with advisor approval.....	16
<i>Only 4 units of supervised instruction, including SCOM 400, SCOM 450, and SCOM 485, may be counted here.</i>	

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**SUPPORT COURSES**

Upper division writing intensive class .....	4
Choose from the following:	
ENGL 302, 310, 386, or JOUR 407	
HIST 110 Western Civilization: Ancient to Renaissance .....	4
HIST 111 Western Civilization: Reformation to Twentieth Century .....	5
STAT 217 Intro to Statistical Concepts and Methods (B1)*.....	4

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17

**GENERAL EDUCATION (GE)**

72 units required; 4 units are in Support.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300–400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

**Area B Science and Mathematics (16 units)**

B1 Mathematics/Statistics * 4 units in Support .....	4
B2 Life Science.....	4
B3 Physical Science .....	4

B4 One lab taken with either a B2 or B3 course

B5 elective

Area B elective (select one course from B1–B5)..... 4

**Area C Arts and Humanities (16 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)**

(4 units)..... 4

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68

**ELECTIVES**..... 36

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185

# Theatre & Dance

**Office Department**  
**Davidson Music Center (45), Room 104**  
**805 756-1465**

## Department Chair (Interim), Maria L. Junco

Timothy J. Dugan  
 Kira Franz-Knight  
 Michael R. Malkin

Alvin J. Schnupp  
 Moon Ja Minn Suhr

## ACADEMIC PROGRAMS

### BA Theatre Arts Dance Minor Theatre Minor

The courses offered by the Theatre and Dance Department provide students with well-balanced programs of study, integrating practical production work with classes that examine the principles, theoretical aspects, and historical development of dance and theatre.

A full range of studio dance courses are offered. They include ballet, modern, jazz, ballroom, and folk. Composition and dance production are available, as well as courses designed for future elementary and secondary teachers of dance. The department also provides general education and breadth courses in the areas of dance history and dance appreciation.

Students who major in theatre study dramatic literature, technical theatre, design, acting, and directing. Participation in main-stage productions, as actors and members of the production staff, is a major aspect of each student's training. In addition, the department offers general education courses in introductory theatre, theatre history and literature, and specialized study of theatre such as Women's Theatre and Black Theatre.

The department also acts as a cultural focus for the campus and community. An annual dance concert is presented under the auspices of the Orchesis Dance Company. Every spring a student-directed dance concert is also produced. Each quarter the department presents a dramatic production. Recent productions include: *A Streetcar Named Desire*, *The Miser*, *Into the Woods*, and *The Importance of Being Earnest*. The department also produces original works; sponsors guest lecturers and career days; and manages a program of student-directed works, the theatre program's active alumni association, and entertainment industry field trips and internships.

## BA THEATRE ARTS

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA      ☐ USCP  
 \* = Satisfies General Education requirement

### MAJOR COURSES

TH 210 Introduction to Theatre (C3)* .....	4
TH 227 Theatre History: Classical.....	4
TH 228 Theatre History: 18th Century to Contemporary.....	4
TH 320 Black Theatre (USCP) .....	4
TH 330 Stagecraft .....	4
TH 340 Fundamentals of Acting.....	4
TH 342 Directing .....	4
TH 350 Seminar in Playwriting .....	4
TH 380 Children's Drama.....	4
TH 430 Introduction to Stage Design: Scenery .....	4
TH 460 Senior Project.....	4
ENGL 339 Introduction to Shakespeare .....	4
DANC 132 Beginning Modern Dance .....	2
Select 8 units from the following:.....	8
TH 240, 250, 260, 270	
Select 8 units from the following:.....	8
TH 310, 345, 370, 432, 434, 400, 440, 470, 471, 480	
Select 4 units from the following:.....	4
ARCH 217, 218, 219; ART 101, 111, 112; MU 154	
Select 4 units from the following:.....	4
ENGL 352, 370, 389, 431; LS/SCOM 310	
Advisor approved electives .....	8
	<b>82</b>

### GENERAL EDUCATION (GE)

- 72 units required; 4 units are in Major.  
 →See page 76 for complete GE course listing.  
 →Minimum of 12 units required at the 300-400 level.

#### Area A Communication (12 units)

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

#### Area B Science and Mathematics (20 units)

B1 Mathematics/Statistics .....	8
B2 Life Science.....	4
B3 Physical Science .....	4
B4 One lab taken with either a B2 or B3 course	
B5 elective	
Area B elective (select one course from B1-B5).....	4

#### Area C Arts and Humanities (12 units)

C1 Literature .....	4
C2 Philosophy .....	4

C3 Fine/Performing Arts * 4 units in Major.....	0
C4 Upper-division elective .....	4
<b>Area D/E Society and the Individual (20 units)</b>	
D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4
<b>Area F Technology Elective (upper division)</b>	
(4 units).....	4
	<b>68</b>
<b>ELECTIVES</b> .....	<b>32</b>
	<b>182</b>

### DANCE MINOR

The Dance Minor consists of 30 units designed to provide the student with a well-balanced program in the art and education of dance. Admission to the minor is contingent upon a departmental interview and review. Students must have more than a 2.0 GPA.

Core courses	Units
DANC 134 Beginning Ballroom Dance	
or DANC 234 Intermediate Ballroom Dance .....	2
DANC 221 Dance Appreciation (C3) .....	4
DANC 231 Intermediate Ballet .....	2
DANC 232 Intermediate Modern Dance .....	2
DANC 321 Cultural Influences on Dance in	
America (C4) (USCP) .....	4
DANC 340 Dance Composition .....	4
DANC 381 Dance for KINE/Dance Minors .....	4
<b>Elective courses to be selected from:</b> .....	<b>8</b>
(at least 3 elective units must be upper division)	
DANC 130 Pilates/Physicalmind Conditioning	
Method (2)	
DANC 139 Beginning Tap (2)	
DANC 135 International Folk Dance (2)	
DANC 211 Dance Fundamentals (2)	
DANC 233 Intermediate Jazz (2)	
DANC 234 Intermediate Ballroom Dance (2)	
DANC 311 Dance in American Musical	
Theatre (4) (C4)	
DANC 320 Dance Notation (3)	
DANC 331 Advanced Ballet and Repertory (2)	
DANC 332 Modern Dance Repertory (2)	
DANC 345 Choreography (4-12)	
DANC 346 Dance Production (4-12)	
DANC 400 Special Problems for Undergrads (1-4)	
DANC 470 Selected Advanced Topic (1-4)	
DANC 471 Selected Advanced Laboratory (1-4)	

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### THEATRE MINOR

The Theatre Minor is 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.

Core courses	Units
TH 210 Introduction to Theatre (C3).....	4
TH 227 Theatre History: Classical (C3) .....	4
TH 228 Theatre History: Contemporary (C3) .....	4
TH 320 Black Theatre (C4) (USCP).....	4
TH 330 Stagecraft .....	4
TH 340 Fundamentals of Acting .....	4
TH 430 Introduction to Stage Design: Scenery .....	4
<b>Elective course to be selected from the following ..</b>	<b>4</b>
TH 240 Improvisational Theatre (4)	
TH 250 Costume and Craft Construction (4)	
TH 260 Voice and Diction for the Stage (4)	
TH 270 Make-Up for Theatre and Film (4)	
TH 310 Women's Theatre (4) (C4)	
TH 342 Directing (4)	
TH 345 Rehearsal and Performance (4-12)	
TH 350 Seminar in Playwriting (4)	
TH 370 Costume History (4)	
TH 380 Children's Drama (4)	
TH 432 Introduction to Stage Design: Costume (4)	
TH 434 Intro. Stage Design: Lighting and	
Sound (4)	
TH 440 Advanced Acting (4)	
TH 470 Selected Advanced Topics (1-4)	
TH 480 Internship (4)	

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# Western Intellectual Tradition

Professor and Director, George M. Lewis

Program Office  
Faculty Offices East (Bldg. 25), Room 300  
805 756-2333

## WESTERN INTELLECTUAL TRADITION MINOR

This minor is designed to appeal to a cross-section of students, primarily in the College of Liberal Arts and the College of Science and Mathematics and complements major programs from throughout the university community. It focuses on the major accomplishments of the Western intellectual tradition through courses that trace the development of literary expression, philosophical and scientific thought, and historical understanding from their beginnings to the modern world. Courses in the minor provide direct experience with significant works of the tradition and expose students to ideas which are of abiding concern and to themes which endure in human affairs. Such exposure cultivates the intellectual skills of analysis and expression and promotes an understanding of the tradition, including its inherent intellectual diversity.

**Prerequisites.** Students must have completed one year of calculus (MATH 143) *or* the second year of a foreign language (FR 122, GER 122 or SPAN 122). The prerequisites reflect the centrality of both mathematics and language to the Western intellectual tradition. Mathematics pervades the modern world and has a particularly close connection with the human capacity for learning. To study a language other than English is to study English as well, and promotes insight into language in general as the articulation of experience and the discourse of reason.

Courses used to satisfy the required 12 units in Group A and 16 in Group B must be chosen outside the student's major and from at least two disciplines in each group.

<b>Group A</b> .....	Units 12
<i>Select 12 units from the following:</i>	
Great Books World Literature (C1)*:	
ENGL 251, 252, 253	
Western Civilization:	
HIST 110 or 111	
Philosophical Classics (C2)*:	
PHIL 230 or 231	
PHYS 211 Modern Physics I (4)	
POLS 230 Basic Concepts of Political Thought (4)	
<b>Group B</b> .....	16
<i>Select 16 units from the following:</i>	
British Literature (C4)*:	
ENGL 330, 331, 332, 333, 334, 335	
Shakespeare (C4)*:	
ENGL 338 or 339	
American Literature (C4)*:	
ENGL 340, 341, 342	
History:	
HIST 307 (D5)*, 343, 346, 347, 348, 349, 383	
MATH 419 Introduction to the History of Mathematics (4)	
Philosophy (C4)*:	
PHIL 311, 312, 313, 314, 315, 332	
Political Thought:	
POLS 330, 337	
SPAN 416 Don Quixote (4)	

# Women's Studies

**Program Office**  
**Faculty Office Building (Bldg. 47), Room 25H**  
**805 756-1525**

## Director, Mary A. Armstrong

The following faculty participate in the Women's Studies program and hold academic rank in a department outside the program:

<b>Art and Design</b>	Jean Wetzel
<b>English</b>	
Mary A. Armstrong	Nancy Lucas
Susann Cokal	Carol MacCurdy
Susan Currier	Johanna Rubba
Linda Halisky	Debora Schwartz
<b>Ethnic Studies</b>	
Charise Cheney	Victor Valle
Colleen O'Neill	Maliha Zulfacar
<b>History</b>	
Lynn Hudson	Carolyn Stefanco
<b>Kinesiology</b>	Camille O'Bryant
<b>Music</b>	Alyson McLamore
<b>Philosophy</b>	
Rachel Fern	Judy Saltzman
<b>Political Science</b>	
Alesha Doan	Jean Williams
<b>Psychology and Child Development</b>	Shawn Burn
	Laura King
<b>Social Sciences</b>	
Barbara Mori	Linda Ramos
<b>Speech Communication</b>	
Lorraine Jackson	B. Christine Shea
<b>Theatre</b>	Pamela Malkin

## WOMEN'S STUDIES MINOR PROGRAM

The Women's Studies Minor provides a thorough, interdisciplinary background in feminist thought and theory. Core (required) and elective courses interrogate the history and evolution of ideas about gender and sexual identity, and engage with these issues on multiple levels of inquiry. The Minor encourages active student learning and emphasizes sophisticated analysis of how gender and sexuality, as well as race, ethnicity and class (and other markers of identity) shape women's and men's lives. The program embraces the intellectual perspectives of faculty and students across the spectrum of Cal Poly's majors and colleges.

The Minor is housed within the College of Liberal Arts, and its courses are offered by Art and Design, English, Ethnic Studies, History, Kinesiology, Music, Philosophy, Political Science, Psychology and Child Development, Social Sciences, Speech Communication, Theatre and Dance, and Women's Studies.

<b>Required Courses (20)</b>	<i>Units</i>
WS 301 Intro to Women's Studies (D5) (USCP)....	4
WS 311 Women in Cross-Cultural Perspective (D5) or WS 401 Seminar in Women's Studies .....	4
WS 336 Religion, Gender and Society (C4) (USCP) or PSY 314 Psychology of Women or SOC 311 Sociology of Gender.....	4
WS/HIST 434 Amer. Women's History to 1870 or WS/HIST 435 Amer. Women's History from 1870 (USCP) or WS 350 Gender, Science and Race....	4
WS 450 Feminist Theory (USCP) .....	4
<b>Elective Courses</b> .....	8
Students select 8 units from the approved list of elective courses in consultation with their Women's Studies faculty advisor.	
ENGL 345 Women Writers of the Twentieth Century (4) (C4) (USCP)	
ENGL 349 Gender in 20 <sup>th</sup> Century Lit.(4)(C4) (USCP)	
ENGL The English Department offers topics courses, such as ENGL 439 Significant British Writers: Woman as Hero or the Novel of Female Development (4), ENGL 459 Significant World Writers: Literature and the Goddess (4), and ENGL 495 Language and Gender (4), which are approved as electives for the Women's Studies minor. See a Women's Studies advisor for topics courses.	
ES 300 Chicano/a Non-Fiction Lit. (4) (C4) (USCP)	
ES 325 African Amer. Women's Experiences (4) (USCP)	
KINE 323 Sport and Gender (4) (D5)	
MU 328 Women in Music (4) (C4)	
POLS 310 Politics of Ethnicity & Gender (4) (USCP)	
POLS 457 Politics of Reproductive Policy (4)	
PSY 314 Psychology of Women (4)	
SCOM 421 Gender and Communication (4)	
SOC 311 Sociology of Gender (4)	
SOC 351 Women in East Asia (4)	
TH 310 Women's Theatre (4) (C4)	
WS 311 Women in Cross-Cultural Perspective (4) (D5)	
WS/ART 316 Women as Subject and Object in Art History (4)	
WS/RELS 336 Religion, Gender and Society (3) (C4) (USCP)	
WS 350 Gender, Race, Science and Technology (4)	
WS 400 Special Problems for Adv. Undergrads (1-2)	
WS 401 Seminar in Women's Studies (4)	
WS/HIST 434 Amer. Women's History to 1870 (4)	
WS/HIST 435 American Women's History from 1870 (4) (USCP)	
WS 450 Feminist Theory (4) (USCP)	

## Endowed Professorships of Marine Science

Unocal Corporation has given Cal Poly \$4.5 million to establish two endowed professorships in marine science and provide an endowment for operations and maintenance of the Cal Poly Pier located at Avila Beach. The steel and concrete pier, donated to the College of Science and Mathematics by Unocal and valued at \$18 million, will be the platform for vast undergraduate research and learning opportunities once Cal Poly's Marine Science Education and Research Center is complete. The first Unocal Professors of Marine Science are Professor Emeritus Tom Richards and Associate Professor Mark Moline (below).

The Center will facilitate basic and applied interdisciplinary undergraduate studies of coastal marine systems for the purpose of addressing environmental concerns and fostering hands-on student learning through discovery and outreach. Current research projects including invertebrate development and ecology, bioluminescence and oceanographic time series measurements will now be centered at the pier. Program plans include facilitating student physics, chemistry, biology, mathematics and engineering based research projects and alliances with neighboring community colleges and local elementary, middle, and high schools. "The center will not only benefit Cal Poly students and faculty, but also will increase the understanding and stewardship of the Central Coast's marine life," says Cal Poly President Warren J. Baker.



*Photos courtesy of Jeff Greene*



College of  
*Science*  
& *Mathematics*

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# College of *Science and Mathematics*

**Faculty Offices East (25), Room 229  
(805) 756-2226**

**Philip S. Bailey, Dean  
Roxy L. Peck, Associate Dean**

## ACADEMIC PROGRAMS

Biochemistry .....	<i>BS</i>
Biological Sciences .....	<i>BS, MS</i>
Biotechnology .....	<i>Minor</i>
Chemistry .....	<i>BS</i>
Ecology and Systematic Biology.....	<i>BS</i>
Environmental Studies .....	<i>Minor</i>
Geology .....	<i>Minor</i>
Kinesiology .....	<i>BS, MS</i>
Mathematics .....	<i>BS, MS, Minor</i>
Microbiology .....	<i>BS, Minor</i>
Physical Science .....	<i>BS</i>
Physics.....	<i>BA, BS, Minor</i>
Polymers and Coatings Science .....	<i>MS</i>
Statistics .....	<i>BS, Minor</i>

The mission of the College of Science and Mathematics is to facilitate learning, understanding, and appreciation of science and mathematics as a basis for creative endeavors, intellectual pursuits, careers, and critical consideration of issues confronting society. The College has two equally important roles: (1) to provide specialized coursework for students enrolled in the College's undergraduate, graduate and minor programs, and (2) to provide support and breadth courses in science and mathematics for all students of the university. In cooperation with the University Center for Teacher Education, the College also offers programs leading to teaching credentials in mathematics, physical education, and three subjects in science – biology, chemistry and physics.

The College of Science and Mathematics has a tradition and reputation for excellence in teaching and is dedicated to undergraduate instruction. The College provides a student-centered learning environment consistent with the University's "learn by doing" philosophy. In laboratories, students have access to modern instrumentation and computer technology. Classroom instruction is done in relatively small classes so that a personal approach by instructors is possible. Because of the College's large role in offering support courses to the rest of the university community, the number of faculty in each department is relatively large and favors student-faculty interaction, both inside and outside of the classroom.

## BIOSPHERE 2

Cal Poly and more than a dozen other institutions have formed a partnership with the Columbia University Biosphere 2 Center in Oracle, Arizona. The partnership provides Cal Poly students with the opportunity to participate in the Center's educational programs, including Earth Semester, Universe Semester, Summer Field School, Biodiversity Institute, and NASA Internships. The partnership also allows Cal Poly to participate in the development of the research and instructional programs at this unique facility dedicated to education and research in planetary stewardship.

The Earth Semester is the largest of the Center's educational programs. This sixteen-week program is offered in both fall and spring semesters. The Earth Semester is a challenging interdisciplinary program that helps students understand global problems such as the rise in greenhouse gases, the depletion of natural resources, and loss of biodiversity. These programs develop critical leadership skills, such as team building, delivery of formal presentations, and research and analytical skills.

Students earn 24 quarter units for the Earth Semester by enrolling in courses at Biosphere 2 in earth system science, conservation biology, law, politics and economics of global change, independent research in environmental science and policy, and planetary management.

In addition, students have the opportunity to complete the senior project and conduct undergraduate research in this unique setting.

## STUDENT SERVICES

The College Office acts on various student-initiated petitions (change of major, curriculum substitutions, withdrawal from the university). In addition, the 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 to obtain academic advising prior to registration each quarter. The advisor-student relationship becomes important especially when the student needs a letter of reference for a potential employer or needs career advice.

**ADVISING CENTER**

Cynthia Jelinek, Director  
 Barbara Broersma, Advisor  
 Barbara Cheves, Secretary  
 Science North (Bldg. 53), Room 219  
 (805) 756-2615 or cjelinek@calpoly.edu  
 www.calpoly.edu/~cosamac

The College of Science and Mathematics Advising Center provides academic advising services to all students within the college. These services include help with scheduling classes and developing long-range academic plans, career advising; information on university policies and procedures, special programming to facilitate student success, and referral of students to other campus offices.

The Advising Center also has a library of materials for student use. This includes information on the health professions, graduate schools, job opportunities, internships, study abroad, and catalogs from junior colleges and other four-year institutions. Most student-related forms – curriculum substitutions, concentration forms, graduation evaluation forms – are also available.

**APPLYING TO GRADUATE SCHOOL**

College of Science and Mathematics faculty have earned advanced 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 PROFESSIONS ADVISING CENTER**

Science North (Bldg. 53), Room 219  
 (805) 756-2840  
 www.calpoly.edu/~cosamac/health

The Health Professions Advising Center provides advising to all students at Cal Poly interested in entering a health professions career. Support includes health careers advising; assistance in applying to internships, summer programs and research opportunities; and development of the application to professional school. Pre-health professions students are also advised to contact the Health Professions Peer Advisors and the members of the Health Professions Resource Committee.

**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.

The minor is open to any major, except students taking related concentrations in Biochemistry, Biology or Microbiology.

Students in the majors listed below should note the following recommendations:

*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 MCRO 224 as part of the life science electives in their major.

<b>Core courses (15-19)</b>	<b>Units</b>
SCM 201 Orientation to Biotechnology .....	1
BIO 375/CHEM 375 Molecular Biology Laboratory.....	2
CHEM 474 Protein Techniques Laboratory .....	2
BIO 351 Principles of Genetics <i>or</i> CHEM 373 Molecular Biology .....	3-5
ZOO 426 Immunology and Serology <i>or</i> CHEM 473 Immunochemistry.....	3-4
Select one course from the following:.....	4-5
BIO 452 Cell Biology (4)	
BOT 450 Plant Biotechnology (5)	
<sup>1</sup> MCRO 402 General Virology (5)	
<sup>1</sup> MCRO 424 Microbial Physiology (5)	
MCRO 433 Industrial Microbiology and Biotechnology (5)	

**Restricted electives** ..... 6-10

To be selected from the list of courses given below.  
 The number of units taken from the Restricted Electives list, when added with the units earned in the Core Courses, must total at least 25 units.

*Biochemistry Majors*

BIO 311, 322, 447, 452; BOT 323, 450;  
 BRAE 448; CHEM 377, 439, 477, 478; CSC 448;  
 MCRO 225, 402, 421, 423, 424, 430, 433, 436,  
 444; SCM 451; STAT 218

*Biological Science Majors*

BIO 311, 322, 433, 447, 452; BOT 323, 450;  
 BRAE 448; CHEM 372, 377, 439, 477, 478;  
 CSC 448; MCRO 225, 402, 421, 423, 424, 430,  
 433, 436, 444; SCM 451

*Microbiology Majors*

BIO 311, 322, 433, 447, 452; BOT 323, 450;  
 BRAE 448; CHEM 372, 377, 439, 477, 478;  
 CSC 448; MCRO 433; SCM 451

<sup>1</sup> Not open to Microbiology majors.

## ENVIRONMENTAL STUDIES MINOR

Students who complete a minor in Environmental Studies will be able to:

- Analyze, explain, and evaluate environmental issues from both scientific/technical and social/political/economic perspectives.
- Integrate and synthesize knowledge from multiple disciplines.
- Explain and apply the methodologies and approaches that different disciplines bring to bear on complex problems.
- Work productively and effectively with students from other disciplines and with other points of view.
- Confront and grapple with real issues of contemporary significance.
- Gain employment or pursue further study that emphasizes interdisciplinary knowledge and skills.

More information about the Environmental Studies Minor, including Subject Area Electives appropriate for students in each of the colleges, can be obtained from the College of Science and Mathematics Office in Building 25, Room 229C. Subject Area Electives **must be approved in advance** by an advisor for the minor.

*\*Satisfies General Education requirement.*

*Units*

### Subject Area Electives

Select one course from each subject area. Electives must be approved in advance by an advisor for the minor. For students attending Earth Semester at Biosphere 2, see below for substitute coursework.

<i>Biology and ecology: select one</i> .....	4
BIO 112 (B5)*, 227 (B2)*, 301, 325; FNR 306, 319 (B5)*	
<i>Earth science: select one</i> .....	3-4
GEOG 250; GEOL 102 (B3)*; PHYS 313; PSC 201 (B5)*; SS 202	
<i>Energy and pollution: select one</i> .....	3-4
BRAE 348; ENVE 324, 330, 331; ME 321; PHYS 310; PSC 320	
<i>Social, political, and ethical issues: select one</i> .....	3-4
CRP 404; ECON 431; HUM 303 (C4)*; PHIL 340 (C4)*; POLS 325 (D5)*, 333; REC 302; SOC 431	
<i>Environmental planning, management, and sustainability: select one</i> .....	3-4
AG 360; CRP 336; EDES 406; FNR 202; GEOG 301 (D5)*, 333; LA 321	
<b>Elective</b> .....	4
Choose one additional 300-400 level course from the above lists.	
<b>Capstone Course</b> .....	4
AG/BUS/EDES/ENGR/HUM/SCM 350 The Global Environment (F)*	

24-28

### Biosphere 2.

For students attending Earth Semester at Biosphere 2, substitute the following courses for the Subject Area Electives and Elective. All students in the Environmental Studies Minor must complete the Capstone Course, The Global Environment.

SCM 365 Biosphere 2: Earth Systems Science.....	6
SCM 366 Biosphere 2: Conservation Biology.....	6
SCM 367 Biosphere 2: Human Role in Environmental Change .....	5
SCM 368 Biosphere 2: Independent Research in Environmental Science and Policy .....	3
SCM 369 Biosphere 2: Planetary Management Seminar and Laboratory .....	4

# Biological Sciences

**Department Office**  
**Fisher Science Hall (33), Room 273**  
**(805) 756-2788**  
**Email address: [bio@calpoly.edu](mailto:bio@calpoly.edu)**  
**[www.calpoly.edu/~bio/BS\\_Intro.html](http://www.calpoly.edu/~bio/BS_Intro.html)**

## Department Chair, V. L. Holland

Nikki L. Adams	Christopher L. Kitts
Frederick P. Andoli	Anthony E. Knable
Michael W. Black	Charles A. Knight
Leslie S. Bowker	Mark Kubinski
Robert J. Brown	Kingston L. Leong
Raul J. Cano	Elena Levine
Jaime S. Colomé	Mark A. Moline
Alan F. Cooper	Royden Nakamura
Alvin A. De Jong	Lee R. Parker
Susan L. Elrod	Elizabeth K. Perryman
Maria Florez-Duquet	Thomas L. Richards
Dennis F. Frey	Matthew K. Ritter
Roger D. Gambs	Francis X. Villablanca
David V. Grady	Larisa K. Vredevoe
Michael T. Hanson	Dirk R. Walters
Peter Jankay	Archie M. Waterbury
David J. Keil	Michael A. Yoshimura

## ACADEMIC PROGRAMS

### BS, MS Biological Sciences

### BS Ecology and Systematic Biology

### BS Microbiology

### Microbiology Minor

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 Biological Sciences department teaches courses with the following prefixes: BIO (Biology), BOT (Botany), MCRO (Microbiology), and ZOO (Zoology).

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 with an academic major in biological sciences leading to a credential 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.** Designed for students who are interested in the biological sciences with an emphasis in the structure and function of animals and for preprofessional students interested in the health sciences.

**Biology.** 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.

**Molecular and Cellular Biology.** Designed for students who are interested in how genes and their products work to create cellular structures, activities and interactions in organisms ranging from microbes to plants and animals. This concentration augments the diverse biological sciences curriculum with laboratory courses in nucleic acid and protein techniques, along with additional courses in bioinformatics, industrial microbiology, immunology, virology, and plant biotechnology. An understanding of molecular and cellular biology is a cornerstone for various biotechnology, medical, and pharmaceutical industries as well as for graduate or professional study in biology, microbiology, biochemistry, the health professions or other related fields. Students electing this concentration are not eligible for the Biotechnology Minor.

**Individualized Course of Study.** Designed to allow students who do not select one of the above concentrations to design their own career track with approval of their faculty advisors.

## 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 diversity 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.** Prepares students for advanced training or professional employment in public or private agencies that deal with the interactions of organisms with their environment. Graduates may pursue careers in education, ecological monitoring or management, environmental impact analysis, and habitat restoration. A graduate may be academically qualified for professional certification as an Associate Ecologist by the Ecological Society of America.

**Marine Biology and Fisheries.** 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 judicious selection of electives, the student will be academically prepared to apply for professional certification as a Fisheries Biologist by the American Fisheries Society.

**Wildlife Biology.** 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 judicious selection of electives, the student will be academically prepared to apply for professional certification as an Associate Wildlife Biologist by the Wildlife Society.

**Systematics and Biodiversity.** Prepares students for advanced training or professional employment in public or private agencies that deal with the identification, relationships, and classification of organisms. Students develop an understanding of biological diversity, its origins, its significance, and how it is described and organized. Graduates may pursue careers in education, biotic inventories and assessment, museums, herbaria, zoos, and botanic gardens.

**Individualized Course of Study.** Allows students, in consultation with their advisors, the flexibility to design courses of study that prepare them for a diversity of career opportunities in ecology and systematic biology. Ecology stresses a broad understanding of the interactions of organisms with their environment; systematics stresses the identification and classification of living organisms. Graduates may pursue careers in education, ecology, environmental impact analysis, environmental monitoring or management, museums, herbaria, zoos and botanical gardens. A graduate will be academically prepared for professional certification as an Associate Ecologist by the Ecological Society of America.

### 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.

**Applied Microbiology and Biotechnology.** Designed for students interested in the application of microbiology to various fields, such as food microbiology, industrial microbiology, or biotechnology.

**General Microbiology.** Designed for students interested in a broad background in microbiology whose goals may include graduate school, professional studies, or post-baccalaureate professional employment.

**Medical and Public Health Microbiology.** Designed for students whose goals may include graduate or professional studies, or professional employment, in medical or public health microbiology, epidemiology, or medical laboratory technology.

### Biotechnology Minor

For information regarding the Biotechnology Minor, please see College of Science and Mathematics Section.

### MICROBIOLOGY MINOR

This minor is designed to give students from majors in which microbiology may be an important component increased exposure to factual information, concepts and skills in order to provide those students a more complete understanding of the roles of microorganisms as they pertain to studies in their chosen major. The emphasis areas of the minor allow students in the allied health and related fields to expand their breadth of knowledge in microbial diseases, transmission and prevention, and immunologic responses. Students in applied fields of study such as Food and Dairy Sciences, and various aspects of agriculture, would gain additional information in pertinent topics such as microbial involvement in water and wastewater treatment, the role of microorganisms in recycling of nutrients and soil fertility, microbial roles in food processing, spoilage, production and disease transmission.

Required Courses.	Units
MCRO 221 Microbiology <i>or</i>	
MCRO 224 General Microbiology .....	4/5
MCRO 225 General Microbiology II .....	5
MCRO 423 Medical Microbiology (for	
Medical/Health Science emphasis area), <i>or</i>	
MCRO 424 Microbial Physiology (for Applied	
and Environmental emphasis area) .....	5
<b>Emphasis area courses</b> .....	11-12
Select courses from one of the following emphasis areas:	
<i>Medical/Health Sciences</i>	
MCRO 320, 342, 402, 424, 430,	
ZOO 425, 426, 428	
<i>Applied and Environmental Sciences</i>	
MCRO 342, 421, 423, 433, 436, 444, SS 422	

**BS BIOLOGICAL SCIENCES**

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA                              ☐ USCP  
 \* = Satisfies General Education requirement  
 Course sequencing: See flowcharts at  
 www.calpoly.edu/~cosamarc

**MAJOR COURSES**

BIO 151 Introduction to Biology (B2 & B4)* .....	5
BIO 152 Biology of Plants & Fungi .....	5
BIO 153 Biology of Animals .....	5
MCRO 224 General Microbiology I .....	5
BIO 351 Principles of Genetics.....	5
BIO 414 Evolution .....	4
BIO 431 General and Cellular Physiology.....	4
BIO 452 Cell Biology .....	4
BIO 461 Senior Project .....	3
Ecology. BIO 325 or BOT 326 .....	4
Botany. Select one course from:.....	4
BOT 313, 323, 333, 335	
Zoology. Select one course from:.....	4
ZOO 321, 322, 323, 329, 335, 336, 341, 425	
Concentration or individualized course of study .	28-33
	<b>80-85</b>

**SUPPORT COURSES**

CHEM 127 General Chemistry (B3&B4)* .....	4
CHEM 128, 129 General Chemistry .....	4, 4
<sup>1</sup> MATH 161, 162 Calculus Life Sciences or	
MATH 118, 119 Pre-Calc Algebra, Trig (B1)* .....	4, 4
PHYS 121, 122, 123 College Physics .....	4, 4, 4
STAT 218 Appl Statistics-Life Sciences (B1)* ....	4
	<b>36</b>

**GENERAL EDUCATION (GE)**

- 72 units required; 16 units are in Major/Support.  
 →See page 76 for complete GE course listing.  
 →Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

**Area B Science and Mathematics (no add'l units req'd)**

B1 Mathematics/Statistics * 8 units in Support...	0
B2 Life Science * 4 units in Major.....	0
B3 Physical Science * 4 units in Support .....	0
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (20 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

Area F Technology Elective (upper division)(4 units) ..	4
	<b>56</b>
ELECTIVES.....	<b>9-14</b>
	<b>186</b>

**Concentration or Individualized Course of Study****Anatomy and Physiology Concentration**

<sup>2</sup> CHEM 316, 317 Organic Chemistry I, II .....	5,5
CHEM 371 Biochemical Principles.....	5
CHEM 372 Metabolism.....	3
Select three of the following courses:.....	12-13
BIO 432, 433, 434; ZOO 405, 422	
	<b>30-31</b>

**Biology Concentration**

Select one course from each of the following areas. A course cannot fulfill requirements for both the Major and the Concentration.

Botany .....	4
BOT 313, 323, 333, 334, 335, 437	
Zoology .....	4
ZOO 321, 322, 323, 329, 335, 336, 341, 425	
Anatomy/Physiology .....	4-5
BIO 432, 433, 434, 435; BOT 335;	
MCRO 424; ZOO 331, 332	
Organic Chemistry .....	5
<sup>2</sup> CHEM 312 or CHEM 316 & 317	
Biochemistry .....	5
CHEM 313 or CHEM 371 & 372	
Advisor approved electives.....	6
	<b>28-29</b>

**Molecular and Cellular Biology Concentration**

SCM 201 Orientation to Biotechnology .....	1
BIO/CHEM 375 Molecular Biology Laboratory..	2
<sup>2</sup> CHEM 316, 317 Organic Chemistry I, II .....	5,5
CHEM 371 Biochemistry .....	5
CHEM 372 Metabolism.....	3
CHEM 474 Protein Techniques Laboratory .....	2
Two of the following: BOT 450; MCRO 402,	
433; ZOO 426; CHEM 473 .....	8-10
	<b>31-33</b>

**Individualized Course of Study**

<sup>1</sup> CHEM 312 or CHEM 316 and CHEM 317 .....	5
CHEM 313 or CHEM 371 and 372.....	5
Advisor approved electives .....	20
300-400 level BIO, BOT, MCRO or ZOO courses with the following exceptions and qualifications: a) BIO 305, 302, 303, 306 or other courses aimed at a non-major audience are excluded. b) Only 2 units of supervised study (BIO 400, 450, 462, 485, 495) may be counted with advisor approval. c) Up to 4 units may be taken from the list of Approved Courses Offered by Other Departments, or by special petition.	<b>30</b>

<sup>1</sup> Recommended for students who have had a pre-calculus course and for those who plan to attend graduate or professional school.

<sup>2</sup> Transfer equivalents:  
 For CHEM 312: CHEM 212  
 For CHEM 316: CHEM 216  
 For CHEM 317: CHEM 217

**BS ECOLOGY AND SYSTEMATIC BIOLOGY**

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA                      ☐ USCP

\* = Satisfies General Education requirement

See flowcharts at [www.calpoly.edu/~cosamac](http://www.calpoly.edu/~cosamac)

**MAJOR COURSES**

BIO 151 Introduction to Biology (B2 & B4)* .....	5
BIO 152 Biology of Plants and Fungi.....	5
BIO 153 Biology of Animals .....	5
BIO 325 Gen. Ecology.....	4
BIO 343 Principles of Systematic Biology .....	4
BIO 351 Principles of Genetics.....	5
<sup>1</sup> BIO 391 Field Spring Quarter I – Field Ecology .....	4
<sup>1</sup> BIO 392 Field Spring Quarter II – Field Botany.....	4
<sup>1</sup> BIO 393 Field Spring Quarter III – Field Zoology ..	4
<sup>1</sup> BIO 400 Special Problems .....	2
BIO 414 Evolution .....	4
<sup>2</sup> <i>Physiology</i> . Select one course from:	
BIO 431, BIO 434, BIO 435.....	4
BIO 461 Senior Project.....	3
Concentration courses or advisor approved	
electives (see below) .....	26-28
	<b>79-81</b>

**SUPPORT COURSES**

<sup>3</sup> CHEM 127 General Chemistry (B3&B4)* .....	4
CHEM 128 General Chemistry .....	4
<sup>4</sup> CHEM 312 Survey of Organic Chemistry .....	5
BIO/FNR/GEOG/LA 317 World of Spatial Data and Geographic Information Technology.....	4
FNR 416 Environ. Impact Analysis & Mgt or FNR/GEOG/LA 318 App of GIS/Nat Resources	4/3
MATH 161 Calculus for the Life Sciences (B1)* ..	4
MATH 162 Calculus for the Life Sciences .....	4
<sup>5</sup> PHYS 121 College Physics .....	4
PSC 201 Intro to Phys. Oceanography or SS 121 Intro. Soil Science.....	4
STAT 218 Stat Methods in the Life Sciences (B1)*	4
STAT 313 App Expmntl Design/Regression Models	4

**44-45****GENERAL EDUCATION (GE)**

72 units required; 16 units are in Major/Support.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing.....	4

**Area B Science and Mathematics (no add'l units req'd)**

B1 Mathematics/Statistics * 8 units in Support ...	0
B2 Life Science * 4 units in Major.....	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (20 units)**

C1 Literature .....	4
C2 Philosophy .....	4

C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division).....****4****56****ELECTIVES.....****4-7****186****CONCENTRATION OR INDIVIDUALIZED COURSE OF STUDY (select one)****Ecology Concentration**

BIO 415 Biogeography.....	4
BIO 444 Population Ecology.....	3
ZOO 437 Animal Behavior .....	4
<i>Systems</i> . Select one course from :.....	4-5
BIO 328, 418; BOT 326; MCRO 436	
<i>Methods</i> . Select one course from:.....	3-5
BIO 207, 327, 342, 419, 420	
<i>Diversity</i> . Select one course from: .....	4-5
BOT 313, 437; MCRO 224; ZOO 321, 322, 323, 335, 336, 341, 425	
Advisor approved electives.....	4-0
	<b>26</b>

<sup>1</sup> BIO 391-393 are taught concurrently during spring quarter together with 2 units of BIO 400. Because the Field Spring Quarter courses involve several extended field trips, students taking BIO 391-393 should not enroll in any other classes during that quarter. Students who are unable because of financial or other constraints to take the Field Spring package may, with advisor approval, substitute one of the following four courses for BIO 391: BIO 328, BIO 418, BOT 326, or MCRO 436; plus BOT 333 for BIO 392; and two of the following courses for BIO 393: BOT 437, MCRO 224, ZOO 321, ZOO 322, ZOO 323, ZOO 335, ZOO 336, ZOO 341, or ZOO 425.

<sup>2</sup> BIO 434 or BIO 435 recommended for students in the Ecology concentration.

<sup>3</sup> CHEM 129 and 313 are recommended for students planning postgraduate training.

<sup>4</sup> Transfer equivalents:  
For CHEM 312: CHEM 212  
For CHEM 316: CHEM 216  
For CHEM 317: CHEM 217

<sup>5</sup> PHYS 122, 123 are recommended for students planning postgraduate training.

**Marine Biology and Fisheries Concentration**

BIO 328 Marine Biology.....	5
BOT 437 Phycology.....	4
ZOO 423 Fisheries Science and Resource Conserv.....	4
ZOO 322 Ichthyology.....	4
ZOO 336 Invertebrate Zoology.....	4
Select with advisor approval from:.....	7
BIO 227, 418, 434, 435, 437, 438, 444; FNR 203; MCRO 436; ZOO 321, 323, 341, 425, 436, 437	
	<hr/> 28

**Systematics and Biodiversity Concentration**

BIO 415 Biogeography.....	4
BOT 443 Systematic Botany.....	4
BOT 313 Taxonomy of Vascular Plants or BOT 437 Phycology.....	4
MCRO 224 General Microbiology I.....	5
Select one course from ZOO 321, 322, 323, 341.....	4
Select one course from ZOO 335, 336, 425, or MCRO 436.....	4
	<hr/> 27

**Wildlife Biology Concentration**

BIO 327 Wildlife Biology Methods.....	4
BIO 427 Wildlife Management.....	4
ZOO 321 Mammalogy.....	4
ZOO 323 Ornithology.....	4
ZOO 437 Animal Behavior.....	4
Select with advisor approval from:.....	7
BIO 207, 227, 444; CRP/FNR 404; FNR 203, 335, 435; MCRO 320; ZOO 341, 423	
For students seeking to be academically qualified for certification as Associate Wildlife Biologists, select BOT 313 plus 8 units from CRP/FNR 404, FNR 203, 335, and 435 in lieu of free electives.	
	<hr/> 28

**Individualized Course of Study**

Advisor approved electives.....	28
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**BS MICROBIOLOGY**

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA                      ☐ USCP  
 \* = Satisfies General Education requirement  
 Course sequencing: See flowcharts at  
[www.calpoly.edu/~cosamac](http://www.calpoly.edu/~cosamac)

**MAJOR COURSES**

BIO 151 Introduction to Biology (B2 & B4)*.....	5
BIO 351 Principles of Genetics.....	5
BIO 461 Senior Project.....	3
MCRO 224 General Microbiology I.....	5
MCRO 225 General Microbiology II.....	5
MCRO 402 General Virology.....	5
MCRO 423 Medical Microbiology.....	5
MCRO 424 Microbial Physiology.....	5

ZOO 426 Immunology and Serology.....	4
Concentration (see below).....	34
	<hr/> 76

**SUPPORT COURSES**

CHEM 127 General Chemistry (B3&B4)*.....	4
CHEM 128 General Chemistry.....	4
CHEM 129 General Chemistry.....	4
<sup>1</sup> CHEM 316 Organic Chemistry I ( <i>transfer</i> <i>equivalent CHEM 216</i> ).....	5
<sup>2</sup> CHEM 371 Biochemical Principles.....	5
<sup>3</sup> MATH 141 Calculus I or MATH 161 Calculus for the Life Sciences I (B1)*.....	4
PHYS 121, 122, 123 College Physics.....	4, 4, 4
STAT 218 Applied Statistics-Life Sciences (B1)*.....	4
	<hr/> 42

**GENERAL EDUCATION (GE)**

- 72 units required; 16 units are in Major/Support.  
 →See page 76 for complete GE course listing.  
 →Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing.....	4
A2 Oral Communication.....	4
A3 Reasoning, Argumentation, and Writing.....	4

**Area B Science and Mathematics (no add'l units req'd)**

B1 Mathematics/Statistics * 8 units in Support.....	0
B2 Life Science * 4 units in Major.....	0
B3 Physical Science * 4 units in Support.....	0
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (20 units)**

C1 Literature.....	4
C2 Philosophy.....	4
C3 Fine/Performing Arts.....	4
C4 Upper-division elective.....	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404).....	4
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<sup>1</sup> CHEM 312 may be substituted for students in the Medical and Public Health Microbiology concentration.

<sup>2</sup> CHEM 313 may be substituted for students in the General Microbiology or Medical and Public Health Microbiology concentrations.

<sup>3</sup> MATH 118 may be substituted.

D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4
<b>Area F Technology Elective (upper division) (4 units)</b> .....	<b>4</b>
	<b>56</b>
<b>ELECTIVES</b> .....	<b>9</b>
	<b>183</b>

**CONCENTRATION (select one)****Applied Microbiology and Biotechnology Concentration**

MCRO 433 Industrial Microbiology and Biotechnology.....	5
BIO 152 Biology of Plants <i>or</i> BIO 153 Biology of Animals.....	5
BIO/CHEM 375 Molecular Biology Laboratory .....	2
CHEM 317 Organic Chemistry II ( <i>transfer equivalent CHEM 217</i> ).....	5
CHEM 372 Metabolism .....	3
CHEM 474 Protein Techniques Laboratory.....	2
SCM 201 Orientation to Biotechnology.....	1
Advisor approved electives .....	11
	<b>34</b>

**General Microbiology Concentration**

MCRO 421 Food Microbiology .....	4
MCRO 436 Microbial Diversity and Ecology .....	5
MCRO 342 Sanitary Microbiology <i>or</i> MCRO 444 Dairy Microbiology .....	4
BIO/CHEM 375 Molecular Biology Laboratory .....	2
CHEM 317 Organic Chemistry II ( <i>transfer equivalent CHEM 217</i> ).....	5
Advisor approved electives .....	14
	<b>34</b>

**Medical and Public Health Microbiology Concentration**

BIO 153 Biology of Animals .....	5
MCRO 421 Food Microbiology .....	4
Select three of the following courses: .....	12
MCRO 342 Sanitary Microbiology (4)	
MCRO 430 Medical Mycology (4)	
ZOO 425 Parasitology (4)	
ZOO 428 Hematology (4)	
Advisor approved electives .....	13
	<b>34</b>

**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 Director of the Graduate and Research 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 MS BIOLOGICAL SCIENCES**

	Thesis Plan	Coursework Plan
BIO 501 Molecular and Cellular Biology .....	4	4
BIO 502 Biology of Organisms ...	4	4
BIO 503 Population Biology .....	4	4
BIO 590 Seminar in Biology .....	3	3
BIO 599 Thesis, including oral defense of thesis .....	9	—
BIO 500 Individual Study, including written report .....	—	4
Comprehensive Exam:		
GRE Advanced Biology .....	Yes	Yes
Essay .....	No	Yes
Electives from 500-level courses .	6	11
Electives from 400- and 500-level courses .....	15	15
	<b>45</b>	<b>45</b>

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 Chair of the Biological Sciences Department or with the Director of the Graduate and Research Committee.

# Chemistry and Biochemistry

**Department Office**  
**Faculty Offices East Bldg. (25), Room 125B**  
**(805) 756-2693**

## Department Chair, John C. Maxwell

Christina A. Bailey	David L. Keeling
Philip S. Bailey	Martin A. Kellerman
Theresa A. Bolaños	Kevin B. Kingsbury
Albert C. Censullo	John F. Marlier
Robert S. Cichowski	Margaret (Peggy) S. Rice
Lee C. Coombs	Mary (Sam) N. Rigler
Leland S. Endres	Rod W. Schoonover
Raymond Fernando	Michael G. Silvestri
Thomas G. Frey	Jan W. Simek
John W. F. Goers	Lisa M. Stevenson
Derek E. Gragson	Russell L. Tice
John P. Hagen	Nanine A. Van Draanen
Ralph A. Jacobson	Max T. Wills
Dane R. Jones	

## ACADEMIC PROGRAMS

### BS Biochemistry

### BS Chemistry

### MS Polymers and Coatings Science

The Chemistry and Biochemistry Department has two roles in the university: to provide professional education for students who are majors in chemistry and biochemistry and who plan careers in the natural sciences and related fields, and to provide instruction in the fundamentals of chemistry to students with majors in fields related to chemistry, especially in the life sciences, agriculture, and engineering.

The Chemistry and Biochemistry Department provides curricula leading to the Bachelor of Science in Chemistry, the Bachelor of Science in Chemistry with a certified concentration in Polymers and Coatings, the Bachelor of Science in Biochemistry, the Bachelor of Science in Biochemistry with a concentration in Polymers and Coatings, the Bachelor of Science in Biochemistry with a concentration in Molecular Biology, and the Master of Science in Polymers and Coatings Science. The BS in Chemistry and the concentration in Polymers and Coatings are 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 clinical chemistry, environmental chemistry, geochemistry, glass chemistry, immunochemistry, industrial catalysis, nuclear chemistry, nutritional

biochemistry, pharmacology, and polymer chemistry. 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 advisor. 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.

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 with a concentration in either polymers and coatings or molecular biology prepares students for direct entry into these careers, as well as for postgraduate education in a professional specialty.

## Curricular Concentrations

**Polymers and Coatings.** Includes the required courses in the chemistry or biochemistry curriculum and electives in the area of polymers, coatings, surface chemistry and materials engineering. The concentration 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.

**Molecular Biology.** Offers courses which investigate the chemical nature of biological molecules related to genes and their expressed products. It augments the already strong biochemistry curriculum by emphasizing laboratory techniques in nucleic acid and protein manipulation along with elective courses exploring the fields of bioinformatics, industrial microbiology, pharmacology, and cell biology. Molecular biology is essential for modern applications of biotechnology in the agricultural, pharmaceutical, and

medical industries and in pursuing research in all biochemistry related disciplines. It not only prepares students for advanced degrees in biology, microbiology, and biochemistry, but also for the large number of jobs in the biotechnology industry in California.

### Biotechnology Minor

For information regarding the Biotechnology minor, see College of Science and Mathematics section.

### BS CHEMISTRY

☐ 60 units upper division ☐ GWR

☐ 2.0 GPA ☐ USCP

\* = Satisfies General Education requirement

Course sequencing: See flowcharts at

[www.calpoly.edu/~cosamac](http://www.calpoly.edu/~cosamac)

#### MAJOR COURSES

CHEM 127 General Chemistry (B3 & B4)* .....	4
CHEM 128 General Chemistry .....	4
CHEM 129 General Chemistry .....	4
CHEM 313 Survey of Biochemistry and Biotechnology or CHEM 371 Biochemical Principles .....	5
CHEM 316 Organic Chemistry I .....	5
CHEM 317 Organic Chemistry II .....	5
CHEM 318 Organic Chemistry III .....	3
CHEM 319 Advanced Organic Chemistry Lab .....	2
<sup>1</sup> CHEM 331 Quantitative Analysis I .....	5
CHEM 351 Physical Chemistry I .....	3
CHEM 352 Physical Chemistry II .....	3
CHEM 353 Physical Chemistry III .....	3
CHEM 354 Physical Chemistry Laboratory .....	2
CHEM 357 Physical Chemistry III Laboratory .....	1
CHEM 439 Instrumental Analysis .....	5
CHEM 459 Undergraduate Seminar .....	2
<sup>2</sup> CHEM 460/461/462 Senior Project .....	1-2
CHEM 481 Inorganic Chemistry .....	3
CHEM 484 Inorganic Chemistry Lab .....	2
<sup>3</sup> Advanced advisor approved chemistry electives to complete major, or concentration .....	18
	<b>80-81</b>

#### SUPPORT COURSES

Life Sciences: (B2)\* Select one course from:

BIO 111, 115, 151; BOT 121; MCRO 221, 224 ..	4-5
MATH 141, 142, 143 Calculus I, II, III (B1)* .....	4,4,4
MATH 241 Calculus IV .....	4
MATH 244 or 200-400 level STAT or CSC course .....	4
PHYS 131 General Physics .....	4
PHYS 132 General Physics .....	4
PHYS 133 General Physics .....	4
Physics elective (200-level and above except PHYS 215) .....	3
	<b>39-40</b>

### GENERAL EDUCATION (GE)

72 units required; 16 units are in Major/Support.

→ See page 76 for complete GE course listing.

→ Minimum of 12 units required at the 300-400 level.

#### Area A Communication (12 units)

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

#### Area B Science and Mathematics (no additional units are required)

B1 Mathematics/Statistics * 8 units in Support ....	0
B2 Life Science * 4 units in Support .....	0
B3 Physical Science * 4 units in Major .....	0
B4 One lab taken with either a B2 or B3 course .....	

#### Area C Arts and Humanities (20 units)

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4) .....	4

#### Area D/E Society and the Individual (20 units)

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

#### Area F Technology Elective (upper division)

(4 units) .....	4
	<b>56</b>

<b>ELECTIVES</b> .....	<b>9-11</b>
	<b>186</b>

#### 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 210 Materials Engineering .....	3
	<b>18</b>

<sup>1</sup> Students should take CHEM 331 as soon as possible after completing CHEM 129.

<sup>2</sup> CHEM 462 is repeatable up to 4 units, with excess units counting as advanced chemistry electives.

<sup>3</sup> See department for advanced electives list.

**BS BIOCHEMISTRY**

☐ 60 units upper division      ☐ GWR

☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

Course sequencing: See flowcharts at  
www.calpoly.edu/~cosamac

**MAJOR COURSES**

CHEM 127 General Chemistry (B3 & B4)* .....	4
CHEM 128 General Chemistry .....	4
CHEM 129 General Chemistry .....	4
CHEM 316 Organic Chemistry I .....	5
CHEM 317 Organic Chemistry II .....	5
CHEM 318 Organic Chemistry III .....	3
CHEM 319 Advanced Organic Chemistry Lab .....	2
<sup>1</sup> CHEM 331 Quantitative Analysis I .....	5
CHEM 351 Physical Chemistry I .....	3
CHEM 352 Physical Chemistry II .....	3
CHEM 353 Physical Chemistry III .....	3
CHEM 354 Physical Chemistry Laboratory.....	2
CHEM 371 Biochemical Principles .....	5
CHEM 372 Metabolism .....	3
CHEM 373 Molecular Biology .....	3
Select one course from:	
CHEM 344, 374, 375 <sup>2</sup> , 474 .....	1-2
Select one course from:	
CHEM 344, 374, 375, 439 <sup>3</sup> , 474 <sup>2</sup> , BIO 432 <sup>3</sup> .....	2
CHEM 459 Undergraduate Seminar .....	2
<sup>4</sup> CHEM 460/461/462 Senior Project .....	1-2
<sup>5</sup> Advanced advisor approved chemistry electives to complete major, or concentration .....	8-24
	<b>68-86</b>

**SUPPORT COURSES**

BIO 151 Introduction to Biology (B2)* .....	5
MATH 141, 142, 143 Calculus I, II, III (B1)* .....	4,4,4
PHYS 121, 122, 123 College Physics <i>or</i> PHYS 131, 132, 133 General Physics .....	4,4,4
Life science elective (MCRO 221 or MCRO 224 <sup>2</sup> or 300-level) .....	4-5
	<b>33-34</b>

**GENERAL EDUCATION (GE)**

72 units required; 16 units are in Major/Support.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing.....	4

**Area B Science and Mathematics (no additional units are required)**

B1 Mathematics/Statistics * 8 units in Support ...	0
B2 Life Science * 4 units in Support .....	0
B3 Physical Science * 4 units in Major.....	0
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (20 units)**

C1 Literature .....	4
C2 Philosophy .....	4

C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)**

(4 units) .....	4
	<b>56</b>

<b>ELECTIVES</b> .....	<b>10-29</b>
	<b>186</b>

**Concentrations (select one)****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 210 Materials Engineering .....	3
	<b>18</b>

**Molecular Biology Concentration**

CHEM 377 Drugs and Poisons.....	3
CHEM 348 Bioinformatics <i>or</i> BIO 342 Computer Applications in Biology .....	3-4
BIO 452 Cell Biology.....	4
SCM 201 Orientation to Biotechnology .....	1
Advisor approved electives .....	12
(select 12 units from the following)	
CHEM 472 Plant Biochemistry (3)	
CHEM 473 Immunochemistry (3)	
CHEM 477 Biochemical Pharmacology (3)	
BOT 450 Plant Biotechnology (5)	
ENGR 581/582/583 Biochemical Engineering (4)(4)(4)	
MCRO 225 General Microbiology II (5)	
MCRO 433 Industrial Microbiology (5)	
MCRO 436 Microbial Diversity & Ecology (5)	
SCM 451 Ethics in the Sciences (3)	
	<b>23-24</b>

<sup>1</sup> Students should take CHEM 331 as soon as possible after completing CHEM 129.

<sup>2</sup> Required for Molecular Biology concentration.

<sup>3</sup> Excess units will count as approved advanced Biochemistry electives.

<sup>4</sup> CHEM 462 is repeatable up to 4 units, with excess units counting as advanced biochemistry electives.

<sup>5</sup> See department for advanced electives list for Biochemistry major.

## MASTER OF SCIENCE DEGREE IN POLYMERS AND COATINGS SCIENCE

### General Characteristics

A five-year pilot program, the MS in Polymers and Coatings Science offers a unique, focused program closely tied to industry. Students gain academic preparation in polymers and coatings science through lecture and laboratory courses, then undertake a rigorous industrial internship. While on the internship students specialize and develop advanced skills through directed study in areas related to their internship work. The program is designed to prepare students for challenging careers in the polymers and coatings industry. The program also provides excellent background for doctoral studies in areas related to polymer and coatings science. This program is unique in California and relies on the close relationship between the department and the polymers and coatings industry for its success.

### Prerequisites

Students entering the program 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 chemistry, biochemistry, materials engineering, chemical engineering or related fields will generally meet the prerequisites for courses in the program. Applicants with degrees in other areas may need to take supplemental courses in organic and physical chemistry and can be admitted conditionally. For information concerning additional departmental requirements, the student should contact the Graduate Advisor in the Chemistry and Biochemistry Department.

Advancement to candidacy requires completion of 12 units of an approved study plan with a minimum grade point average of 3.0.

### Blended BS + MS Program in Chemistry or Biochemistry (BS) and Polymers and Coatings Science (MS)

The blended program provides motivated students with an accelerated route to the MS in Polymers and Coatings Science, with simultaneous conferring of both bachelor's and master's degrees. Students in the blended program are provided with a seamless process whereby they can progress from undergraduate to graduate status.

### Eligibility

Students majoring in chemistry or biochemistry may be eligible to pursue the blended program toward the MS in Polymers and Coatings Science. Participation in the program is based on prior academic performance and other measures of professional promise, with a minimum GPA of 2.5 required (3.0 recommended). Students are generally selected for the blended program by a faculty committee during the junior year. Please see the catalog description on Blended Programs for eligibility criteria.

Students may begin taking the required graduate courses in either their junior or senior year depending on their

preparation. Students may not pursue both the Concentration in Polymers and Coatings and the MS in Polymers and Coatings Science. Students pursuing the concentration take the 400-level polymers and coatings courses while those pursuing the MS degree take the 500-level polymers and coatings courses. Students cannot receive credit for both 400 and 500-level courses in the same topic.

Students in the blended program are eligible to apply for the Graduate Internship upon completion of the required graduate-level chemistry courses.

	<i>Units</i>
<b>Required courses</b> .....	33
CHEM 544 Polymer Physical Chemistry and Analysis (3)	
CHEM 545 Polymer Synthesis and Mechanisms (3)	
CHEM 547 Polymer Characterization and Analysis Laboratory (2)	
CHEM 548 Polymer Synthesis Laboratory (2)	
CHEM 550 Coatings Formulation Principles (3)	
CHEM 551 Coatings Formulation Laboratory (2)	
CHEM 570 Directed Graduate Study (3 units per quarter for 3 quarters)	
CHEM 598 Graduate Internship (3 units per quarter for 3 quarters)	
STAT 512 Statistical Methods <i>or</i> STAT 513 Applied Experimental Design and Regression Models (4)	
<b>Restricted Electives</b> .....	12
12 units approved electives (400-500 level) chosen from: CHEM, MATE, Bioengineering, STAT 513.	
Examples of courses satisfying the elective requirement include:	
CHEM 405 Advanced Physical Chemistry (3)	
CHEM 420 Advanced Organic Chemistry (3)	
CHEM 439 Instrumental Analysis (5)	
CHEM 446 Surface Chemistry of Materials (3)	
CHEM 470 Selected Advanced Topics (1-4)	
MATE 530 Biomaterials (4)	
MATE 560 Thin Film Processing (3)	
ENGR 450 Special Topics in Bioengineering (4)	
IME 556 Technological Project Management (4)	
or other approved management course	
Satisfactorily complete the comprehensive examinations.	

# Kinesiology

**Department Office**  
**Kinesiology Bldg. (43), Room 453**  
**(805) 756-2545**  
**[www.calpoly.edu/~pek/](http://www.calpoly.edu/~pek/)**

## Department Chair, C. Andrea Brown

Steven C. Davis	Camille P. O'Bryant
Gerald E. DeMers	Andrew J. Proctor
Sonja S. Glassmeyer	Susan M. Puhl
Kellie Green Hall	Michael A. Sutliff
Dwayne Head	Kevin M. Taylor
Kristine Z. Jankovitz	James L. Webb
Raymond Nakamura	

## ACADEMIC PROGRAMS

### BS, MS Kinesiology

The Kinesiology Department offers undergraduate and graduate degree programs in kinesiology. The department also contributes to the general education and elective needs of all students by providing health education, kinesiology, physical education and first aid/CPR courses. Because of an ideal geographical location, the university has become a center for workshops held by many of the state's health and physical education organizations.

Kinesiology is housed in a large complex that was opened in 1993. The Kinesiology building provides state of the art laboratory and office space for the department, and the shared interest in the Recreation Center provides access to quality activity facilities.

The BS in Kinesiology is a broad based program offering students curricular choices for a wide range of career opportunities. Concentrations include teaching, health education, clinical and worksite health promotion, and pre-physical therapy/health care professions. Students also have the option of choosing an individualized course of study.

### CURRICULAR CONCENTRATIONS

#### Clinical and Worksite Health Promotion

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: worksite health promotion in public, private and governmental fitness facilities; and various clinical and rehabilitation programs.

**Health Education.** Prepares students for careers in public, private, and non-profit health agencies and for graduate school in community or public health. Coursework focuses

on mental health and promoting the health of individuals and communities.

**Pre-Physical Therapy/Health Care Professions.** Prepares students for admission to graduate/professional programs in physical therapy, allopathic or osteopathic medicine, podiatry, chiropractic medicine, and other allied health professions (e.g., occupational therapy, nursing, physician assistant). The course of study, which can vary depending on specific postgraduate goals and course requirements, focuses on the biological, physical, and psychosocial foundations for these careers. Allied and medical health professionals work with persons of all ages to optimize wellness, primarily through prevention, diagnosis, and treatment of disease. Additional coursework may be required for some graduate/professional programs. Check with your advisor for specific program requirements.

**Teaching.** Prepares students to meet subject matter competency required for application to the Single Subject Credential program in Physical Education. In order to meet Subject Matter competency to apply for the credential program, students must take specific courses. Please see an advisor as soon as possible.

**Individualized Course of Study.** Students may choose one of the above mentioned concentrations or pursue an individualized course of study which requires 36 units of coursework to be selected with advisor 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, aquatic facility manager, 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.

**BS KINESIOLOGY**

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA                              ☐ USCP

\* = Satisfies General Education requirement

Course sequencing: See flowcharts at  
[www.calpoly.edu/~cosamac](http://www.calpoly.edu/~cosamac)

**MAJOR COURSES**

<sup>1</sup> KINE 206–KINE 229 Professional Activity .....	6
KINE 250 Health Education (D4)* <i>or</i> KINE 255 Personal Health: A Multicultural Approach (D4)* (USCP) .....	4
KINE 280 Responding to Emergencies: First Aid/CPR .....	3
KINE 301 Muscle Anatomy .....	1
KINE 302 Biomechanics .....	4
KINE 303 Physiology of Exercise .....	4
KINE 307 Adapted Physical Activity .....	4
KINE 317 Computer Applications in Kinesiology ..	2
KINE 319 Measurement and Evaluation in Kinesiology .....	4
KINE 401 Managing Kinesiology Programs .....	3
KINE 402 Motor Learning and Control .....	4
KINE 411 Psycho/Social Aspects of Physical Act ..	3
KINE 451 Nutrition for Fitness and Sport .....	5
KINE 461 Senior Project .....	2
MATH 118 Pre-Calculus Algebra (B1)* (MATH 116 and MATH 117 are equivalent) .....	4
STAT 217 Intro to Statistical Concepts and Methods <i>or</i> STAT 218 Applied Statistics-Life Sciences (B1)* .....	4
ZOO 331, 332 Human Anatomy & Physiol I, II (transfer equivalent ZOO 240, 241) .....	5,5
Concentration courses (see below) (B2)* (B3 & B4)* .....	46-57
	<b>113-124</b>

**GENERAL EDUCATION (GE)**

72 units required; 20 units are in Major/Support.

→ See page 76 for complete GE course listing.

→ Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

**Area B Science and Mathematics (no add'l units req'd)**

B1 Mathematics/Statistics * 8 in Major .....	0
B2 Life Science * 4 in Major .....	0
B3 Physical Science * 4 in Major .....	0
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (20 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (16 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4

D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) * 4 in Major	0
D5 Upper-division elective .....	4
<b>Area F Technology Elective (upper division) (4 units) ..</b>	<b>4</b>

<b>ELECTIVES .....</b>	<b>52</b>
	<b>4-15</b>
	<b>180</b>

**CONCENTRATIONS (select one)****<sup>1</sup> Clinical and Worksite Health Promotion**

KINE 218 Aquatics .....	2
KINE 408 Exercise and Health Promotion for Senior Adults .....	4
KINE 434 Planning Health Promotion Programs: Theory and Practice .....	4
KINE 445 Electrocardiography .....	3
KINE 452 Testing & Exercise Prescription for Fitness Specialists .....	4
KINE 463 Clinical and Worksite Health Promotion Field Work .....	3
SCOM 301 Business/Professional Communication	4
BIO 111 General Biology <i>or</i> BIO 115 Animal/ Human Structure and Function (B2)* .....	4
CHEM 111 Survey of Chemistry (B3 & B4)* .....	5
Choose one of the following tracks: .....	18
<i>Clinical Health Promotion Track</i> KINE 446; CHEM 212/312, 313; PHYS 104/121	
<i>Worksite Health Promotion Track</i> KINE 450; IME 320; JOUR 312; BUS 387/488; 3 units advisor-approved electives	
	<b>51</b>

**Health Education Concentration**

KINE 218 Aquatics .....	2
KINE 305 Drug Education .....	2
KINE 405 Community Health Promotion .....	4
KINE 408 Exercise & Health Promotion Sr Adults	4
KINE 434 Planning Health Promotion Programs: Theory and Practice .....	4
KINE 436 Community Health Educ. Fieldwork ....	2-6
KINE 443 Comprehensive School Health Educ .....	4
KINE 450 Worksite Health Promotion Programs ...	3
BIO 111 General Biology <i>or</i> BIO 115 Animal/ Human Structure and Function (B2)* .....	4
CHEM 110 World of Chemistry <i>or</i> CHEM 111 Survey of Chemistry (B3 & B4)* ....	4/5
FSN 210 Nutrition .....	4
FSN 310 Maternal and Child Nutrition <i>or</i> FSN 315 Nutrition of Aging .....	4
MCRO 221 Microbiology .....	4
PSY 205 Human Sexuality .....	3
SCOM 418 Health Communication .....	4
	<b>52-57</b>

<sup>1</sup> Students following the Clinical and Worksite Health Promotion Concentration are to take KINE 219, KINE 220 and KINE 227, and one additional unit (see Major Courses, KINE 206-229).

**Teaching Concentration**

KINE 300 Planning Techniques in PE.....	5
KINE 309 Creative and Non-Traditional Games.....	3
KINE 315 Field Sports.....	3
KINE 356 Teaching Gymnastics.....	2
KINE 384 Water Safety Instructor.....	4
KINE 396 Outdoor Education.....	3
KINE 404 Motor Development.....	3
KINE 419 Physical Education Program Content in Elementary School.....	3
KINE 421 Strategies for Teaching PE.....	3
KINE 422 Teaching Elementary School PE.....	2
KINE 423 Teaching Middle School PE.....	3
KINE 425 Teaching High School PE.....	3
KINE 443 Comprehensive School Health Ed.....	4
BIO 111 General Biology (B2)*.....	4
CHEM 110 World of Chemistry (B3 & B4)*.....	4
DANC 381 Methods of Teaching Dance.....	4
	<hr/> 53

**Pre-Physical Therapy/Health Care Professions  
Concentration**

KINE 218 Aquatics.....	2
KINE 404 Motor Development.....	3
KINE 406 Neuroanatomy.....	4
KINE 408 Exercise/Health Promotion for Sr Adults.....	4
BIO 151 Introduction to Biology (B2)*.....	5
BIO 153 Biology of Animals.....	5
CHEM 127 General Chemistry (B3 & B4)*.....	4
CHEM 128 General Chemistry.....	4
CHEM 129 General Chemistry.....	4
PHYS 121 College Physics.....	4
PHYS 122 College Physics.....	4
PHYS 123 College Physics.....	4
MCRO 221 Microbiology <i>or</i> .....	4/5
MCRO 224 General Microbiology.....	
	<hr/> 51/52

**Individualized Course of Study**

KINE 218 Aquatics.....	2
BIO 111 General Biology <i>or</i> BIO 151 Introduction to Biology (B2)*.....	4/5
CHEM 110/CHEM 111/CHEM 127 (B3 & B4)* ..	4/5
Advisor approved electives.....	36
	<hr/> 46-48

**MASTER OF SCIENCE DEGREE IN  
KINESIOLOGY****General Characteristics**

The degree program is designed to offer advanced study in kinesiology 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 Clinical and Worksite Health Promotion Concentration under the BS degree program in Kinesiology. This emphasis prepares students to work in the health promotion field in diversified settings, including corporate, club, private, and governmental agencies. 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 further postgraduate study.

***Physical Education and Sport Studies***

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.

***Individual Course of Study***

Students develop programs of study that meet their projected career goals. Approval must come from the students' advisors and the department graduate coordinator. To be approved, students must present, in writing, proposals describing the interest area they intend to study. Students must have a strong focus outside the two traditional graduate emphases listed above. If students are interested in pursuing a degree beyond the MS, they may develop a course of study which best prepares them academically for further study. The thesis option is highly recommended.

**Conditionally Classified Standing**

Applicants to the MS degree program in Kinesiology should have an undergraduate degree in Kinesiology or equivalent academic preparation. Those applicants with undergraduate deficiencies must remove these deficiencies through coursework or examination before Advancement to Candidacy and may do this while enrolled as a graduate student at Cal Poly.

Information pertaining to specific requirements for admission may be obtained from the Graduate Coordinator of the Kinesiology Program ([www.calpoly.edu/~pek](http://www.calpoly.edu/~pek), and select "Master of Science").

**Classified Standing**

For admission to classified standing, an applicant must have an undergraduate major in kinesiology 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:

Successfully completed all conditionally classified requirements;

Successfully completed the Graduation Writing Requirement;

Filed a Formal Study Plan; and

Maintained a minimum 3.0 GPA for all course work completed on the 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 Kinesiology.

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 masters thesis or project must successfully defend the thesis or project in an oral examination, or (2) those students not presenting a masters 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 requirements are not completed within 7 years, the student may need to complete additional requirements.*

Up to 12 units may be taken in 400-level courses with advisor 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 advisor approved units may be taken outside of the Kinesiology Department.

**Curriculum For MS Kinesiology**

<b>Required courses</b> .....	23
KINE 510 Communication and Health Behavior Change (3)	
KINE 517 Research Methods in Kinesiology (3)	
KINE 519 Evaluation of Current Studies (3)	
KINE 522 Advanced Biomechanics (3)	
KINE 525 Human Performance & Learning (3)	
KINE 530 Adv Physiology of Exercise (4)	
STAT 512 Statistical Methods (4)	
<b>Area of Emphasis or course of study</b> .....	15-16
Choose one of the following:	
<i>Exercise and Health Promotion (16)</i>	
KINE 503 Seminar in Adult Wellness (3)	
KINE 504 Cardiopulmonary Physiology, Pathology and Exercise (3)	
KINE 514 Health Education Planning (3)	
KINE 516 Managing Clinical/Worksite Health Promotion Programs (3)	
KINE 536 Advanced Electrocardiography (4)	
<i>Physical Education and Sport Studies (15)</i>	
KINE 502 Current Trends and Issues in Physical Education and Sport (3)	
KINE 511 Administration of Athletics (3)	
KINE 526 Sport in American Society (3)	
KINE 539 Observation and Analysis of Teaching Physical Education and Coaching Sports (3)	
KINE 581 Grad. Seminar in Kinesiology (3)	
<i>Individual Course of Study (16)</i>	
Advisor and graduate coordinator approved electives	
<b>Advisor approved electives</b> .....	6-7
	45

For more detailed information or advisement, contact the Coordinator of Graduate Studies for Kinesiology.

# Mathematics

**Department Office**  
**Faculty Offices East Bldg. (25), Room 208**  
**(805) 756-2206**  
**[www.calpoly.edu/~math/](http://www.calpoly.edu/~math/)**

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Michael R. Colvin	Jean M. McDill
H. Arthur DeKleine	Elsa Medina
James E. Delany	James R. Mueller
Gary M. Epstein	Linda J. Patton
Gwen L. Fisher	Don P. Rawlings
Jack E. Girolo	Jonathan E. Shapiro
Stuart Goldenberg	Mark Stankus
Harvey C. Greenwald	Lawrence Sze
Caixing Gu	Raymond D. Terry
Donald G. Hartig	John Van Eps
Alan W. Holz	Matthew E. White
J. Myron Hood	Robert S. Wolf

## ACADEMIC PROGRAMS

### BS, MS 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 mix of pure and applied mathematics in these courses increases both the usefulness of and the demand for 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. Advanced coursework is chosen in close consultation with faculty advisors.

The rich variety of courses available in the department permits the student not only to obtain a broad exposure to those fields of mathematics which are most useful in the physical sciences and engineering, but also to obtain experience with the mathematics that is used in business, management sciences, and operations research.

Students wishing to prepare for a teaching career in junior or senior high school may make a selection of courses especially designed to satisfy California Single Subject Credential requirements. All of these programs provide a

strong mathematical foundation for the student contemplating the pursuit of an advanced degree in mathematics.

## MATHEMATICS MINOR

Students may earn a minor in mathematics by completing a coordinated course of study. 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.

<b>I. Required courses</b> .....	8
MATH 206 Linear Algebra I (4) <i>or</i> MATH 244 Linear Analysis I (4)	
MATH 248 Methods of Proof in Mathematics (4)	

## II. Complete at least two of the following tracks.... 16

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.

MATH 304 Vector Analysis (4) (B6)
MATH 344 Linear Analysis II (4)
MATH 418 Partial Differential Equations (4)
MATH 306 Linear Algebra II (4)
MATH 406 Linear Algebra III (4)
MATH 333 Numerical Analysis I (4)
MATH 433 Numerical Analysis II (4)
MATH 335 Graph Theory (4)
MATH 336 Combinatorial Mathematics (4)
MATH 437 Game Theory (4)
MATH 408 Complex Analysis I (4)
MATH 409 Complex Analysis II (4)
MATH 412 Introduction to Analysis I (4)
MATH 413 Introduction to Analysis II (4)
MATH 431 Mathematical Optimization I (4)
MATH 432 Mathematical Optimization II (4)
MATH 442 Euclidean Geometry (4)
MATH 443 Modern Geometries (4)
MATH 341 Theory of Numbers (4)
MATH 419 Intro. to History of Mathematics (4)
MATH 481 Abstract Algebra I (4)
MATH 482 Abstract Algebra II (4)

<b>III. Mathematics electives</b> .....	6
	30

**BS MATHEMATICS**

- ☐ 60 units upper division      ☐ GWR  
☐ 2.0 GPA                      ☐ USCP  
 \* = Satisfies General Education requirement

Course sequencing: See flowcharts at  
[www.calpoly.edu/~cosamac](http://www.calpoly.edu/~cosamac)

**MAJOR COURSES**

MATH 141 Calculus I (B1)* .....	4
MATH 142 Calculus II (B1)* .....	4
MATH 143 Calculus III .....	4
MATH 202 Orientation to the Mathematics Major .....	1
MATH 241 Calculus IV .....	4
Choose one of the following tracks: .....	8
MATH 206 and MATH 242	
MATH 244 and MATH 344	
MATH 248 Methods of Proof in Mathematics .....	4
MATH 336 Combinatorial Mathematics .....	4
MATH 412 Introduction to Analysis I .....	4
MATH 459 Undergraduate Seminar .....	4
MATH 461 Senior Project .....	2
MATH 462 Senior Project .....	2
MATH 481 Abstract Algebra I .....	4
<sup>1</sup> Advanced Work in Major .....	24-28
	<b>73-77</b>

**SUPPORT COURSES**

Choose one of the following tracks: .....	8
MATH 211 and MATH 212	
CSC 101 and CSC 102	
<sup>2</sup> CSC 103/MATH 300/MATH 350 .....	4
PHYS 131 General Physics (B3 & B4)* .....	4
PHYS 132 General Physics .....	4
PHYS 133 General Physics .....	4
STAT 321 Probability and Statistics for Engineers and Scientists .....	4
STAT 322 Statistical Analysis for Engineers & Scientists .....	4
<sup>1</sup> Advanced Work in Support .....	4-0
	<b>36-32</b>

**GENERAL EDUCATION (GE)**

- 72 units required; 12 units are in Major/Support.  
 →See page 76 for complete GE course listing.  
 →Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

**Area B Science and Mathematics (4 units)**

B1 Mathematics/Statistics * 8 units in Major/ Support .....	0
B2 Life Science .....	4
B3 Physical Science * 4 units in Support .....	0
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (20 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)**

(4 units) .....	4
	<b>60</b>

<b>ELECTIVES</b> .....	<b>17</b>
	<b>186</b>

<sup>1</sup> Advanced Work in Major and Support are to total 28 units.

<sup>2</sup> Students planning to seek the Single Subject Credential in Mathematics should take MATH 300, 341, 419, 442, and 443. Though not part of the curriculum for the BS in Mathematics, MATH 424 should also be taken by students seeking the teaching credential, and must be taken prior to the start of student teaching.

## ADVANCED WORK IN THE BS 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 Abstract Algebra II (4)

MATH 413, 414 Introduction to Analysis II, III (4) (4)

MATH 431, 432 Mathematical Optimization I, II (4) (4)

*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 333 Numerical Analysis I (4)  
MATH 433 Numerical Analysis II (4)

MATH 335 Graph Theory (4),  
MATH 437 Game Theory (4)

MATH 408 Complex Analysis I (4),  
MATH 409 Complex Analysis II (4)

MATH 442 Euclidean Geometry (4),  
MATH 443 Modern Geometries (4)

### Additional electives in Major. Select from:

<sup>1</sup> MATH 344, 417, 419, 470

### Additional electives in Support. Select from:

CSC 349, 361

IME 301

PHYS 301, 302, 323, 405, 408

STAT 425

## 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 MS MATHEMATICS

*Units*

**Required courses** ..... 24

MATH 540 Introduction to Topology (4)

MATH 550 Real Analysis (4)

MATH 560 Field Theory (4)

*Complete one of the following two tracks:*

MATH 520, 521, 522 Applied

Analysis I, II, III (12)

MATH 530, 531, 532 Discrete Mathematics with  
Applications I, II, III (12)

**MATH, CSC, STAT electives** ..... 12

Select 400–500 level MATH, CSC, or STAT  
courses as approved by the advising committee.

**Electives** ..... 9

Select additional units at the 400 or 500 level as  
approved by the advising committee.

**Satisfactorily complete the comprehensive  
examinations.**

45

<sup>1</sup> MATH 344 may be counted as an additional elective in the major only if not taken as a track with MATH 244 in the core.

# Physics

**Department Office**  
**Science Bldg. (52), Room D-37**  
**(805) 756-2448**  
**www.calpoly.edu/~phys; physics@calpoly.edu**

## Chair, Richard A. Saenz

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Anthony J. Buffa	Kenneth S. Ozawa
David H. Chipping	Ralph A. Peters
Gayle Cook	John E. Poling
Robert H. Dickerson	Thomas G. Schumann
Robert Echols	John P. Sharpe
Neil L. Fleishon	Keith S. Stowe
Theodore C. Foster	Nilgun Sungar
Richard B. Frankel	Willem L. van Wyngaarden
Antonio G. Garcia	Leonard W. Wall
Chance Hoellwarth	Ronald E. Zammit
Kenneth A. Hoffman	
<b>Affiliated Faculty:</b>	Lynn E. Moody

## ACADEMIC PROGRAMS

### BA Physics

### BS Physics

### BS Physical Science

### Geology Minor

### Physics Minor

The Physics Department offers the Bachelor of Arts and the Bachelor of Science degrees in Physics, and the Bachelor of Science degree in Physical Science.

The department provides a comprehensive laboratory program. Facilities include specialized laboratories in electrical measurements, optics, solid state physics, nuclear 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.

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.

## BA Physics

The BA in Physics provides the student with a solid foundation in physics. Its primary purpose is to serve students who plan to pursue a career teaching science at the high school level, and those who plan a career in science related fields for whom a physics background would be an asset.

The curriculum has fewer required upper division courses than the BS, which allows the student to choose from an extensive list of electives in consultation with an academic

advisor. In addition, the BA provides an attractive option for students in related disciplines who wish to pursue a double major.

## BS Physics

The BS in Physics is the appropriate choice for those students planning a career in industry or government laboratories, and those seeking a strong foundation in physics for graduate study.

Students have the choice of selecting one of the specialized concentrations or following the general physics curriculum, which offers a variety of elective coursework. All offer good preparation for graduate study in physics. The electronics concentration is designed for students wishing to acquire a working knowledge of electronics to use in experimental physics. The electro-optics concentration provides a background in optical devices and techniques used in this rapidly expanding field.

## BS Physical Science

The BS in Physical Science is designed primarily to serve students who plan to enter another field in which a physical science background would be useful. The program provides students an interdisciplinary mix of courses in physics, chemistry, astronomy, and geology. Students intending to do graduate study in either chemistry or physics should elect a chemistry or physics major. The Physical Science degree program is administered jointly by the Chemistry and Biochemistry Department and the Physics Department.

## GEOLOGY MINOR

The Geology Minor is offered in conjunction with the Earth and Soil Science Department. It provides a background useful for careers in environmental consulting or geotechnical fields. Interested students should consult with a geology advisor.

**Prerequisites** for the minor are SS 121, CHEM 111 or CHEM 128, and PHYS 132.

## Required Courses.

	<i>Units</i>
GEOL 201 Physical Geology .....	3
GEOL 203 Fossils and the History of Life .....	4
GEOL 241 Physical Geology Laboratory .....	1
GEOL 305 Fundamentals of Seismology .....	4
GEOL/ERSC 401 Field-Geology Methods .....	4
GEOL/ERSC 402 Geologic mapping .....	4
SS 223 Rocks and Minerals .....	4
SS 323 Geomorphology .....	4

28

**PHYSICS MINOR**

The Minor in Physics provides the student with the opportunity to build on the introductory physics core courses with a coordinated set of electives which are based on interests and career objectives selected in consultation with a physics advisor. It consists of 24 units in physics and astronomy (of which 12 units must be upper division).

**Required Courses.**

PHYS 133 General Physics.....	4
(Prerequisite: PHYS 131 and MATH 132/142)	
PHYS 211 Modern Physics.....	4

**Physics/Astronomy electives:** ..... 16

Minimum 12 units must be upper division,  
including at least one of the following courses:

PHYS 301 Thermal Physics (3)
PHYS 302 Analytical Mechanics (3)
PHYS 323 Optics (5)
PHYS 405 Quantum Mechanics (4)
PHYS 408 Electromagnetic Fields and Waves I (4)
PHYS 412 Solid State Physics (3)

24

**BA PHYSICS**

☐ 60 units upper division      ☐ GWR

☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

Course sequencing: See flowcharts at  
[www.calpoly.edu/~cosamac](http://www.calpoly.edu/~cosamac)

**MAJOR COURSES**

PHYS 131 General Physics (B3 & B4)*.....	4
PHYS 132 General Physics .....	4
PHYS 133 General Physics .....	4
PHYS 206 Instrumentation in Experimental Physics.....	3
PHYS 211 Modern Physics I .....	4
PHYS 212 Modern Physics II.....	4
PHYS 256 Electrical Measurements Laboratory ....	1
PHYS 301 Thermal Physics I .....	3
PHYS 302 Analytical Mechanics I .....	3
PHYS 323 Optics .....	5
PHYS 405 Quantum Mechanics I or PHYS 412 Solid State Physics .....	3-4
PHYS 461 Senior Project or PHYS 463 Senior Project - Lab Research .....	2
Select two from the following: .....	7-8
PHIL 230 Philosophical Classics (4) (C2*)	
PHIL 231 Philosophical Classics (4) (C2*)	
PHIL 321 Philosophy of Science (4) (C4*)	
SCM 451 Ethics in the Sciences (3)	
CHEM 127 General Chemistry .....	4
CHEM 128 General Chemistry .....	4
MATH 141 Calculus I (B1) * .....	4
MATH 142 Calculus II (B1)* .....	4
MATH 143 Calculus III .....	4

MATH 241 Calculus IV .....	4
MATH 244 Linear Analysis I.....	4
MATH/STAT elective (300-400 level; MATH 344 recommended) .....	4
PHYS/ASTR electives (200-400 level) .....	15

**94-96****GENERAL EDUCATION (GE)**

72 units required; 16 units are in Major.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

**Area B Science and Mathematics (4 units)**

B1 Mathematics/Statistics * 8 in Major .....	0
B2 Life Science.....	4
B3 Physical Science * 4 in Major.....	0
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (20 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective.....	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)**

(4 units) .....	4
	<b>60</b>

<b>ELECTIVES</b> .....	<b>24-26<sup>†</sup></b>
	<b>180</b>

<sup>†</sup> Care must be taken to ensure compliance with the "60 unit upper division" requirement.

**BS PHYSICS**

☐ 60 units upper division      ☐ GWR

☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

Course sequencing: See flowcharts at

[www.calpoly.edu/~cosamac](http://www.calpoly.edu/~cosamac)

**MAJOR COURSES**

PHYS 131 General Physics (B3 & B4)* .....	4
PHYS 132 General Physics .....	4
PHYS 133 General Physics .....	4
PHYS 202 Physics on the Computer .....	4
PHYS 206 Instrumentation in Experimental Physics .....	3
PHYS 211 Modern Physics I .....	4
PHYS 212 Modern Physics II .....	4
PHYS 256 Electrical Measurements Laboratory .....	1
PHYS 301 Thermal Physics I .....	3
PHYS 302 Analytical Mechanics I .....	3
PHYS 303 Analytical Mechanics II .....	3
PHYS 323 Optics .....	5
PHYS 340 Quantum Physics Laboratory I .....	2
PHYS 341 Quantum Physics Laboratory II .....	1
PHYS 342 Quantum Physics Laboratory III .....	2
PHYS 363 Undergraduate Seminar .....	2
PHYS 405 Quantum Mechanics I .....	4
PHYS 408 Electromagnetic Fields and Waves I .....	4
PHYS 461 Senior Project or PHYS 463 Senior Project - Lab Research .....	2
PHYS 462 Senior Project or PHYS 464 Senior Project - Lab Research .....	2
CHEM 127 General Chemistry .....	4
CHEM 128 General Chemistry .....	4
MATH 141 Calculus I (B1)* .....	4
MATH 142 Calculus II (B1)* .....	4
MATH 143 Calculus III .....	4
MATH 241 Calculus IV .....	4
MATH 244 Linear Analysis I .....	4
MATH 304 Vector Analysis .....	4
MATH 344 Linear Analysis II .....	4
Advanced Physics electives or Concentration courses (see below) .....	19-21

**116-118**

**GENERAL EDUCATION (GE)**

72 units required; 12 units are in Major.

→ See page 76 for complete GE course listing.

→ Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

**Area B Science and Mathematics (4 units)**

B1 Mathematics/Statistics * 8 units in Support ...	0
B2 Life Science .....	4
B3 Physical Science * 4 units in Major .....	0
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (20 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)**

(4 units) .....	4
-----------------	---

**60**

**ELECTIVES** ..... **8-10**

**186**

**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 424 or MATH 418.

In addition, select courses at the 300 or 400 level with the prefixes PHYS, MATH, STAT or CSC.

One of the following may also be chosen: CSC 101, 231, 234. At least 9 of these elective units must have the PHYS prefix. All courses must be taken for a letter grade.

For students anticipating an industrial career

PHYS 357, 412, 413, 423, and 452 are suggested electives.

For students anticipating graduate work in physics

PHYS 401, 406, 409, 424, and MATH 408 are suggested electives. In addition, PHYS 357 is suggested for students who anticipate becoming experimental physicists.

**Electronics Concentration**

Students will not be allowed to enroll in EE 301 until they have a) completed PHYS 357 and MATH 344, and b) received the approval of advisors 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 Systems 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	
	<hr/> 21

**Electro-optics Concentration**

Students will not be allowed to enroll in EE 301 until they have a) completed PHYS 357 and MATH 344, and b) received approval of advisors 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 Exp Physics	3
PHYS 423 Advanced Optics .....	4
EE 301 Linear Systems Analysis.....	3
EE 341 Linear Systems 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.	
	<hr/> 21

**BS PHYSICAL SCIENCE**

☐ 60 units upper division      ☐ GWR

☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

Course sequencing: See flowcharts at

[www.calpoly.edu/~cosamac](http://www.calpoly.edu/~cosamac)

**MAJOR COURSES**

ASTR 301 The Solar System or	
ASTR 302 Stars and Galaxies.....	3
Astronomy and/or earth science advisor approved elective.....	4
CHEM 127, 128, 129 Gen Chemistry (B3&B4)* ...	4,4,4
CHEM 351 Biophysical Chemistry or	
CHEM 305 Physical Chemistry for Engineers ...	3
<sup>1</sup> CHEM 312 Survey Organic Chemistry or	
CHEM 316 Organic Chemistry (transfer equivalents CHEM 212, 216).....	5

<sup>1</sup> CHEM 313 Survey of Biochemistry or	
CHEM 371 Biochemical Principles.....	5
<sup>2</sup> Chemistry approved elective (300-400 level).....	4
GEOL 201 Physical Geology .....	3
MATH 141, 142, 143 Calculus I, II, III (B1)* .....	4,4,4
MATH 241 Calculus IV .....	4
MATH/CSC/STAT 200-level electives.....	8
<sup>2</sup> Physical sciences approved electives (300- 400 level) .....	9
<sup>1</sup> PHYS 131, 132, 133 General Physics or	
PHYS 121, 122, 123 College Physics .....	4,4,4
PHYS 202 Physics on the Computer .....	4
PHYS 211 Modern Physics I.....	4
<sup>2</sup> Physics approved elective.....	3
<sup>2</sup> Physics approved elective (300-400 level) .....	3
PSC 461/CHEM 461/462/463/PHYS 461/PHYS 463	2
	<hr/> 100

**GENERAL EDUCATION (GE)**

72 units required; 12 units are in Major.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing .....	4

**Area B Science and Mathematics (4 units)**

B1 Mathematics/Statistics * 8 units in Major .....	0
B2 Life Science.....	4
B3 Physical Science * 4 units in Major .....	0
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (20 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective .....	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy .....	4
D3 Comparative Social Institutions .....	4
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective .....	4

**Area F Technology Elective (upper division)**

(4 units).....	4
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	60
<b>ELECTIVES</b> .....	20 <sup>†</sup>
	<hr/> 180

<sup>1</sup> A choice of the PHYS 121, 122, 123 sequence or CHEM 212/312 or CHEM 313 restricts the Physics and Chemistry electives available to the student later in this program.

<sup>2</sup> List of approved electives available online.

<sup>†</sup> Care must be taken to ensure compliance with the "60 unit upper division" requirement.

# Statistics

**Department Office**  
**Faculty Offices East (25), Room 107D**  
**(805) 756-2709**

## Department Chair, Jay L. Devore

Matthew A. Carlton	Steven Rein
Beth L. Chance	Allan J. Rossman
James C. Daly	Andrew A. Schaffner
John E. Groves	Robert K. Smidt
Ulric J. Lund	Kent D. Smith
Roxy L. Peck	John H. Walker

## ACADEMIC PROGRAMS

### BS 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 or a minor in the discipline.

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.

It has been projected that the job market for those with substantial statistical training will remain healthy into the foreseeable future. Recent graduates of the program at Cal Poly are working for companies in fields as varied as insurance, aircraft manufacturing, banking, computer manufacturing, and pharmaceutical development.

The statistics degree program requires students to have a solid foundation in mathematics and computer science. With this basis the students take courses in the following areas—analysis of variance, regression analysis, statistical use of computers, sampling methods, experimental design, analysis of categorical data, multivariate analysis, time series and forecasting, probability, and mathematical statistics. In the various courses the students make use of computing facilities 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 process.

## STATISTICS MINOR

The Statistics minor program allows students from across the University to acquire substantial statistical skills that can be applied in their own disciplines.

### Select one of the following introductory sequences.....

8-9

- STAT 217 Introduction to Statistical Concepts and Methods (4) *and* STAT 313 Applied Experimental Design and Regression Models (4)
- STAT 218 Applied Statistics-Life Sciences (4) *and* STAT 313 (4)
- STAT 221 Intro Probability and Statistics (5) *and* STAT 313 (4)
- STAT 251 Statistical Inference for Mgmt. I (4) *and* STAT 252 Statistical Inference for Mgmt. II (5)
- STAT 321 Probability and Statistics for Engineers and Scientists (4) *and* STAT 322 Statistical Analysis for Engineers and Scientists (4)

### Required Courses

STAT 330 Statistical Computing I: SAS.....	4
STAT 323 Design/Analysis of Experiments I <i>or</i>	
STAT 324 Applied Regression Analysis .....	4
STAT 400-level electives .....	4,4
Select one course from outside the Statistics Department, with the approval of the Statistics Minor Coordinator, that has substantial statistical applicability .....	3-4
	<hr/> 27-29

**BS STATISTICS**

☐ 60 units upper division      ☐ GWR

☐ 2.0 GPA      ☐ USCP

\* = Satisfies General Education requirement

Course sequencing: See flowcharts at  
www.calpoly.edu/~cosamac

**MAJOR COURSES**

STAT 150 Introduction to Statistical Investigations	4
MATH 141 Calculus I (B1)*	4
MATH 142 Calculus II (B1)*	4
MATH 143 Calculus III	4
MATH 206 Linear Algebra I	4
MATH 241 Calculus IV	4
STAT 321 Probability and Statistics for Engineers and Scientists	4
STAT 322 Statistical Analysis for Engineers and Scientists	4
STAT 323 Design and Analysis of Experiments I...	4
STAT 324 Applied Regression Analysis	4
STAT 330 Statistical Computing I: SAS	4
STAT 425 Probability Theory	4
STAT 426 Estimation and Sampling Theory	4
STAT 427 Mathematical Statistics	4
STAT 461 Senior Project	1
STAT 462 Senior Project	2
STAT 465 Statistical Communication and Consulting	4
<sup>1</sup> CSC, MATH, STAT electives	6-8
Statistics electives (400 level)	12
CSC 342 Numerical Analysis I or MATH 333 Numerical Analysis I	3/4
	<b>84-87</b>

**SUPPORT COURSES**

<sup>2</sup> CSC 234 C and UNIX	3
MATH 248 Methods of Proof in Mathematics	4
Advisor approved technical electives	12
	<b>19</b>

**GENERAL EDUCATION (GE)**

72 units required; 8 units are in Major.

→See page 76 for complete GE course listing.

→Minimum of 12 units required at the 300-400 level.

**Area A Communication (12 units)**

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing	4

**Area B Science and Mathematics (8 units)**

B1 Mathematics/Statistics * 8 units in Major	0
B2 Life Science	4
B3 Physical Science	4
B4 One lab taken with either a B2 or B3 course	

**Area C Arts and Humanities (20 units)**

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area C elective (Choose one course from C1-C4)	4

**Area D/E Society and the Individual (20 units)**

D1 The American Experience (40404)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

**Area F Technology Elective (upper division)**

(4 units)	4
	<b>64</b>

<b>ELECTIVES</b>	<b>10-13</b>
	<b>180</b>

<sup>1</sup> Selected from the following: CSC 101, 102, 231; MATH 242, 306, 335, 336, 406, 412, 431, 437; STAT 400 level courses.

<sup>2</sup> CSC 234 should be first CSC course taken.



Barbara Blanke's class, EDUC 432 Teaching Science and Mathematics with a Multicultural Perspective.

*Photo courtesy of Pat Repasi*

### **Expanding Our Educational Mission**

Teacher education at Cal Poly became a formal part of the curriculum when a new agricultural education program began in 1933. Over the decades, post-baccalaureate credential programs and master's degree specializations emerged to meet the growing demand for excellent teachers, administrators, counselors, and special education specialists. Now the University Center for Teacher Education (UCTE) is expanding its programs to include the undergraduate and doctoral levels.

At the undergraduate level, UCTE is partnering with the College of Liberal Arts to offer a "blended" program that integrates the multiple subject credential with the Liberal Studies undergraduate major.

UCTE also is proud to soon be offering the first doctoral degree program in Cal Poly's history. UCTE is collaborating with the University of California, Santa Barbara to offer the Doctor of Education (Ed.D.) in Educational Leadership. The program begins fall 2003, pending final approval.

University Center for

*Teacher Education*

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# University Center for Teacher Education

Education Bldg. (02), Room 120  
(805) 756-2126

**Dean, Bonnie Konopak**

**Associate Dean, Carl R. V. Brown**

## Faculty

MaryLud Baldwin	Rita M. King
Elaine Y. Chin	Donald K. Maas
Leonard Davidman	Susan L. McBride
Patricia Davidman	Patricia A. Mulligan
David Duran	Dennis M. Nulman
Anita C. Hernandez	Kenneth F. Palmer
Roberta J. Herter	Michael B. Ruef
Jodi Jaques	Alice T. Tomasini

## Teacher-in-Residence

Joan Fedewa-Scicchitano

## Affiliated Faculty

The following faculty participate with the University Center for Teacher Education and hold academic rank in a department outside the Center:

John Ashbaugh	William C. Kellogg
Frederick P. Andoli	Elsa Medina
John Battenburg	Sarah Stephens
C. Andrea Brown	Jeannine Richison
Carl R.V. Brown	Johanna Rubba
Glen R. Casey	Michael A. Sutliff
Gwen Fisher	Kevin Taylor
Robert A. Flores	Scott Vernon
Chance Hoellwarth	Raymond F. Zeuschner
Alan W. Holz	

## MISSION AND PROGRAMS

The University Center for Teacher Education exists to promote an all-university approach toward education. Its mission is to prepare *Educational Leaders* who create environments, practices, and policies to support the development of each and every learner; who strive for equity in schools and society; and who are committed to professional growth for themselves in the field education.

The Center accomplishes this mission by modeling leadership in its teaching, scholarship, and service, and in its collaborations with educational partners—Cal Poly education students; K-12, community college, and university colleagues; and local, state, and national agencies.

This mission supports Cal Poly's core values: (1) a learn-by-doing approach to education with students' unique, direct involvement in the practices of instruction, learning,

assessment, and leadership; (2) a polytechnic influence via the utilization and modeling of technological advances; and (3) responsive and responsible programs that anticipate and meet societal needs.

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 partnerships and collaboration, and to preparation for future educational challenges. As the state's population grows, enrollments in grades K-12 increase and with them the demand for excellent teachers, and for specialists in administration, curriculum planning, counseling or special education.

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 Center offers **basic credential programs** in Single Subject Instruction and Multiple Subject Instruction, and **advanced credential programs** in Administrative Services, Pupil Personnel Services, Education Specialist, and Agriculture.

The Center offers a **Master of Arts in Education** degree with specializations in Counseling and Guidance, Curriculum and Instruction, Educational Administration, Literacy and Reading, and Special Education.

A **Doctor of Education degree (Ed.D.)** with a specialization in Educational Leadership for working professionals is being developed by the Center in partnership with the Gevirtz Graduate School of Education at the University of California, Santa Barbara. The program is designed to prepare and support exemplary educational leaders and begins fall 2003, pending final approval.

Courses in these programs are offered to meet the needs of the students. To accommodate the working professional, courses in some programs are offered during the late afternoons, evenings, weekends, and during the summer.

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, city and rural fieldwork.

## Teaching Credential Programs

The Basic Credential Programs consist of coursework and field experiences, including student teaching, required to obtain the Multiple and Single Subject teaching credentials in California. Guidelines for all credentials are established by California's Commission on Teacher Credentialing (CCTC), and are subject to change. Cal Poly is authorized by the CCTC to prepare candidates and recommend for the following Basic credentials.

**NOTE:** Changes in credential requirements are expected during 2003-2005. Please check with program advisors for up-to-date information.

### Multiple Subject Instruction

Multiple Subject Credential  
Bilingual Crosscultural Language and Academic Development (BCLAD) Emphasis

### Single Subject Instruction

Agriculture  
English (includes Speech Communication)  
Mathematics  
Physical Education  
Science: Biological Science  
Science: Chemistry  
Science: Physics  
Social Science (includes History and Political Science)

Candidates for the Single Subject teaching credential in Agriculture or the Agricultural Specialist credential complete their preparation program through the Agricultural Education and Communication Department at Cal Poly and should communicate with the department credential advisor for further information or advisement (Dr. Glen Casey, at 756-2401).

The teaching credential programs typically take four or five quarters, depending on completed prerequisites. Applications are accepted during specific periods at the beginning of each fall, winter and spring quarter (for these dates contact the University Center for Teacher Education Services Center). Detailed information about other requirements can be found in the credential handbooks, "The Guide to the Multiple Subject Credential Program" and "Single Subject Teaching Credential Handbook," which are available at the Services Center and at El Corral Bookstore. Further information, requirements and procedures for entering a particular credential program may be obtained from the appropriate credential program advisor, or consult our web page at [www.ucte.calpoly.edu](http://www.ucte.calpoly.edu)

## Multiple Subject and Single Subject Teaching Credential Programs

### Admission Requirements

- Admission to Cal Poly as a postbaccalaureate student or as a Liberal Studies major in the junior year of the blended program<sup>1</sup>,
- 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 (MSAT/CEST) *or* an approved "Subject Matter" (coursework) statement (Multiple Subject only),
- Evidence of application for Certificate of Clearance,
- Attendance at a program information meeting, and
- One letter of recommendation.

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 requirements are available from the appropriate advisor and in the advisement handbook.

Admission to the university does not guarantee admission to either teacher education program.

### BCLAD Emphasis in Spanish (Multiple Subject only)

Cal Poly's Bilingual Crosscultural Language and Academic Development (BCLAD) emphasis 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.

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.

### STEP I - ADMISSION TO BASIC CREDENTIAL PROGRAM (UCTE)

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

<sup>1</sup> Cal Poly Liberal Studies students in the blended program complete a specific set of courses in preparation for a bachelor of science degree and a multiple subject credential. The program includes taking the CBEST before or during the first quarter of the junior year and applying to the credential program during the junior year. For additional information, refer to the Liberal Studies section in this catalog.

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 advisor and the credential handbook to be sure that all requirements are completed.

### Minimum Scholarship Standards

2.67 overall GPA or 2.75 in last 90 quarter units.

Students may enter the credential program as an undergraduate (under certain conditions) or as a postbaccalaureate candidate. Accepted postbaccalaureate candidates must maintain a 3.00 quarterly GPA.

### Step I Verifications Required

(refer to most recent student handbook for specifics)

- Completion of an approved early field experience
- A Certificate of Clearance
- Completion of a CCTC approved academic program of coursework in the single subject area, OR passing appropriate examinations for the subject matter
- Letters of recommendation
- A professional aptitude interview with advisor or designated faculty member
- Evidence of competency in reading, writing and speaking English
- Evidence of freedom from rubella and tuberculosis
- Evidence of mathematics competency (Multiple Subject candidates only)

### STEP II - ADMISSION TO STUDENT TEACHING

Students must complete all Step I requirements. Application for student teaching assignments must be made by Monday of the fourth week of the quarter before one plans to student teach. Student teaching consists of two consecutive quarters in public school classrooms, under the supervision of a master/cooperating teacher and a university supervisor. Applicants must pass CBEST prior to receiving a student teaching assignment.

**Multiple Subject** candidates will complete student teaching over a two-quarter period. The first quarter (10 weeks) consists of four days a week beginning with the teaching day and ending at 1:00 pm to attend classes on campus; the fifth day of the week is for the entire teaching day. The second quarter (11 weeks) consists of four full days a week and a fifth day ending at 2:00 pm to attend a seminar on campus.

**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.

### STEP III - APPLICATION FOR INITIAL CREDENTIAL

Candidates for the California Multiple or Single Subject Teaching Credential must submit an "Application for Credential Authorizing Public School Service" (form 41-4) and credential fee.

#### Basic Credential

Upon completion of the U.S. Constitution requirement, the Level I Technology Competency requirement, and Cal Poly's Teaching Credential Program (Multiple or Single Subject), each student may apply for his or her Preliminary Credential. These applications are available through the University Center for Teacher Education Student Information Center and may be submitted as early as two weeks prior to completing the final credential requirements. See the credential handbooks for more information.

#### Advanced Credential – Fifth Year of Study<sup>1</sup>

To qualify for the Professional Clear Multiple or Single Subject credential, candidates must complete the following requirements *beyond* the Basic credential requirements. This is also referred to as the Fifth Year of Study:

- 45 quarter units of advisor approved postbaccalaureate coursework
- Coursework in *Health Education*. And verification of completion of a training program in cardiopulmonary resuscitation (CPR) (American Red Cross Community CPR or American Heart Association "Heart Saver")
- Coursework in *Special Education*, including *Mainstreaming*
- Coursework in *Computer Education*, (*Level II Competency*) and
- Recommendation from a California college or university with a CCTC approved Teacher Preparation Program

<sup>1</sup> Requirements for the Clear, or Advanced Teaching Credential will change for students entering the program beginning fall of 2003. Check with a credential program advisor for new requirements.

## *Specialist Education Credentials*

### **Education Specialist**

Preliminary Level I  
Professional Clear Level II

### **Pupil Personnel Services**

### **Agriculture Specialist**

### **Administrative Services**

Administrative Intern  
Preliminary (Tier I)  
Professional (Tier II)

**The Education Specialist <sup>1</sup> (formerly known as Special Education)** credential authorizes the holder to teach in the area of specialization in the following settings: special day classes, special schools, home/hospital settings, correctional facilities, nonpublic schools and agencies, and resource rooms.

Cal Poly is authorized to offer programs in the specializations for mild/moderate disabilities and moderate/severe disabilities.

These programs prepare candidates to instruct pupils from ages 3–21 with conditions ranging from learning disabilities, delayed intellectual development, to behavioral, sensory and/or motor impairments, including mental retardation, autism and multiple disabilities.

A full-time candidate may complete the requirements in one calendar year. The Education Specialist program is heavily field based. Candidates who complete the Preliminary Level I program will be required to obtain a Professional Clear Level II Education Specialist credential within five years of employment as a special educator.

### **Admission Requirements**

- admission to Cal Poly as a postbaccalaureate student;
- 2.75 GPA in last 90 quarter units
- evidence of taking the California Basic Educational Skills Test (CBEST);
- early field experiences in general and special education;
- subject matter competency (exam or coursework);
- application for Certificate of Clearance;
- attendance at an information meeting; and
- meet personal and professional standards during an interview.

A Multiple or Single subject teaching credential is *not* required for admission. However, some coursework taken for the Single Subject or Multiple Subject Credential program may be applied to the Education Specialist Credential program.

### **Mild/Moderate Disabilities**

This program is designed to prepare candidates to work with pupils with mild/moderate disabilities which include specific learning disabilities; mild to moderate mental retardation; attention deficit and attention deficit hyperactivity disorders; and serious emotional disturbance, and authorizes serving individuals in kindergarten, grades one through twelve, and in classes organized for adults through age 22.

### **Moderate/Severe Disabilities**

This program is designed to prepare candidates to work with pupils with moderate/severe disabilities which include autism; deaf-blindness; moderate to severe mental retardation; multiple disabilities; and serious emotional disturbance, and authorizes serving individuals in kindergarten, grades one through twelve, and in classes organized for adults through age 22.

For more information regarding this program, contact the Coordinator, Special Education, University Center for Teacher Education.

### **Pupil Personnel Services**

The Pupil Personnel Services credential program 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-advisor 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.

### **Agriculture Specialist**

This program is usually taken as a co-requisite with the single subject credential in Agriculture. Contact Dr. Glen Casey, in the Agricultural Education and Communication Department, for more specific information.

### **Administrative Services**

Administrative Services offers three credential programs: one leading to recommendation for the Preliminary Administrative Services Credential; a second, the

<sup>1</sup> Credential requirements may change during 2003-2005. Check with the program advisor.

Administrative Intern Credential, for those persons earning their Preliminary Administrative Services Credential and who concurrently serve in an administrative position; and a third leading to recommendation for the Professional Clear Administrative Services Credential.

### **Preliminary Administrative Services**

The preliminary program emphasizes a comprehensive knowledge of public school administration including applied theory, administration and leadership, schools in contemporary society, and effective management related to educational outcomes. As a basis for credential recommendation, the preliminary program emphasizes applied theory with actual experience in fieldwork assignments and an evaluation of administrative competence.

To enter the Preliminary Administrative Services Credential program, a candidate must verify proof of a valid basic teaching credential or appropriate service credential and three years of teaching and/or related service, and satisfactorily complete all admissions requirements including 3.0 GPA in last 90 quarter units, and two letters of recommendation.

The credential program requires 45 quarter units, most of which are applicable to the MA in Education with a Specialization in Educational Administration. The Preliminary Administrative Services Credential authorizes service in any administrative position at any grade level in California.

A Certificate of Eligibility can be acquired upon successful completion of the Preliminary program if no employment in an administrative services position has been obtained.

**Administrative Internship Program.** California does not provide an emergency provision to hire someone to be a school administrator who does not possess an administrative credential. The Administrative Internship Program supports districts that have an immediate need for an administrator and are without suitable candidates. Applicants for this program must verify proof of a valid basic teaching credential or appropriate service credential and three years of teaching and/or related service, documentation of being offered an administrative position, and support for this Internship from the superintendent of schools in the employing district or county office of education. Students will earn the Preliminary Administrative Services Credential as they serve in an administrative capacity within a two year timeframe.

### **Professional Administrative Services**

To enter the Professional Administrative Services Credential program, applicants must verify proof of a valid basic teaching credential or appropriate service credential and Preliminary Administrative Services Credential, confirm current employment in an administrative position, and satisfactorily complete all admission requirements.

The professional credential program prepares candidates for the Professional Clear Administrative Services Credential. The program requires an equivalent of 36 quarter units of work. A minimum of 18 quarter units are appropriate coursework, 6 are induction planning and assessment, and 120 hours or 12 quarter units are professional development hours or university coursework that meet identified student goals.

The program emphasizes advanced skill development in building-level or central office administration with emphasis on the deepening of management and leadership skills.

For credential recommendation the candidate must, in addition to completing the program of study, have had two years of successful administrative experience and meet program competency review criteria.

For more information regarding this program, contact the Coordinator, Educational Administration program, University Center for Teacher Education.

## *Master of Arts in Education*

### **MA Education**

#### **with Specializations in:**

- Counseling and Guidance
- Curriculum and Instruction
- Educational Administration
- Literacy and Reading
- Special Education

### **GENERAL CHARACTERISTICS**

The Master of Arts degree program in Education is designed to provide 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 pursuits in the fields of education, counseling, college student affairs, and agencies involved with community affairs.

### **ADMISSION**

Admission to the MA in Education degree programs minimally require the following:

- 3.0 GPA in last 90 quarter units
- Letters of recommendation
- Bachelors degree from an accredited college or University

Each specialization below may list additional requirements for the specific program (see the Graduate section of this catalog for additional information).

### **PROGRAM OF STUDY**

All specializations 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 MA 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.

### **Advising**

The candidate must meet with his/her advisor on a regular basis. Continued consultation with the advisor will assist a smooth progression toward completion of the degree.

### **Formal Study Plan**

The candidate is required to file a formal study plan prior to completion of 12 units in his/her program. This Formal Study Plan is completed in consultation with the program advisor and helps the candidate schedule a set of courses and electives in a sequence that results in completion of an MA program in a timely manner. A Formal Study Plan is required prior to Advancement to Candidacy.

### **Advancement to Candidacy**

Advancement to master's degree candidacy requires:

- Completing at least 24 quarter units of program-required courses in residence, specified in a formal program of study, with minimum grade point average of 3.0;
- Having met the university Graduation Writing Requirements;
- Receiving formal recommendation of the specialization faculty.
- GPA of 3.0 in all coursework included on the formal program of study, and in all coursework completed subsequent to admission to postbaccalaureate standing.
- Having satisfactorily met any conditions of admission.

### **Culminating Experience**

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 for every quarter in which they are receiving advisement.

### **MA Education, Specialization in COUNSELING & GUIDANCE**

The program is designed to prepare students for careers in public or private school counseling or student affairs work in higher education. Admission to the program, which occurs only in spring quarter, 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. 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.

#### Education Core

EDUC 586 Introduction to Inquiry in Education .....	3
EDUC 587 Educ Foundations & Current Issues .....	4
EDUC 588 Education, Culture and Learning .....	4
EDUC 589 Educational Research Methods .....	3

#### 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
EDUC 590 Research Applications in Education ....	3

(If EDUC 599 Thesis/Project is selected in lieu of EDUC 590, the student must register for credit each quarter of advisement.)

**Electives** (to be selected with advisor's approval)..... 6  
48

#### MA 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 curriculum specialists or instructional team leaders; or they may seek employment in the private sector in curriculum development and training related positions. Courses taken in this program may be applied toward a fifth year of study for an advanced multiple or single subject 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.

#### Education Core

EDUC 586 Introduction to Inquiry in Education .....	3
EDUC 587 Educ Foundations & Current Issues .....	4
EDUC 588 Education, Culture and Learning .....	4
EDUC 589 Educational Research Methods .....	3

#### Required in Area of Specialization

EDUC 501 Problems and Practices in Curriculum Development.....	3
EDUC 503 Seminar in Language Arts Curriculum and Methods .....	4

EDUC 504 Seminar in Science and Mathematics Curriculum and Methods .....	4
EDUC 505 Seminar in Social Studies Curriculum and Methods .....	4
EDUC 506 Models of Instruction .....	4
EDUC 532 Adv. Field Experiences in Education ..	3
EDUC 590 Research Applications in Education ....	3
(If EDUC 599 Thesis/Project is selected in lieu of EDUC 590, the student must register for credit each quarter of advisement.)	

**Electives** (selected with advisor's approval)..... 4-6  
45

#### MA 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.

#### Education Core

EDUC 586 Introduction to Inquiry in Education ....	3
EDUC 587 Educ Foundations & Current Issues .....	4
EDUC 588 Education, Culture and Learning .....	4
EDUC 589 Educational Research Methods.....	3

#### Required in the Area of Specialization

EDUC 512 Educational Organization & Mgmt .....	4
EDUC 513 Educ. Planning & Decision Making ....	4
EDUC 590 Research Applications in Education ....	3

(If EDUC 599 Thesis/Project is selected in lieu of EDUC 590, the student must register for credit each quarter of advisement.)

**Electives** (to enhance candidate's career goal, with advisor approval)..... 20  
Possible electives: EDUC 501, 510, 511, 514, 515, 516, 518, 542.

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## MA Education, Specialization in LITERACY AND READING

The Master of Arts degree in Education with a specialization in Literacy and Reading is designed to provide teachers with professional development in research-based literacy practices and reading program development at the school and district level. Qualified candidates must have a minimum of three years classroom teaching experience before applying for admission to the program.

EDUC 590 and a comprehensive written examination, *or* EDUC 599 and a Literacy Instruction Portfolio are required for the completion of a master's degree with a specialization in Literacy and Reading.

### Education Core

EDUC 586 Introduction to Inquiry in Education .....	3
EDUC 587 Educ Foundations & Current Issues .....	4
EDUC 588 Education, Culture and Learning .....	4
EDUC 589 Educational Research Methods .....	3

### Required in Area of Specialization

EDUC 525 Literacy and Reading Processes, Programs, and Technology .....	4
EDUC 526 Diagnostic Procedures in Literacy and Reading .....	4
EDUC 530 Secondary, College, and Adult Literacy Practices .....	4
EDUC 532 Adv. Field Experiences in Education ...	3
EDUC 590 Research Applications in Education ....	3
(If EDUC 599 Thesis/Project is selected in lieu of EDUC 590, the student must register for credit each quarter of advisement.)	

**Electives** (to be selected with advisor's approval)..... 13  
Suggested electives: EDUC 529, 531.

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## MA Education, Specialization in SPECIAL EDUCATION

The Master of Arts degree with a specialization in Special Education is an academic program that offers the student an opportunity for advanced learning in Special Education. Applicants must meet personal and professional standards, including necessary qualifying examinations, presentation of personal recommendations, and a personal interview.

Approved units for the master's degree program can be applied towards the requirements for a Professional Clear Level II Education Specialist 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.

### Education Core

EDUC 586 Introduction to Inquiry in Education ....	3
EDUC 587 Educ Foundations & Current Issues .....	4
EDUC 588 Education, Culture and Learning .....	4
EDUC 589 Educational Research Methods.....	3

### Required in Area of Specialization

EDUC 547 Atypical Learning Patterns and Curricular Adaptations.....	4
EDUC 553 Current Issues, Emerging Research and Practices in Special Education .....	4
EDUC 590 Research Applications in Education ....	3/6
<i>or</i> EDUC 599 Thesis/Project (3) (3) (the student must register for credit each quarter of advisement)	

**Electives** (to be selected with advisor's approval) ..... 17/20

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## *Doctor of Education in Educational Leadership (Ed.D.)*

### PROGRAM OF STUDY

The Doctor of Education program begins fall 2003, **pending final approval**. Students should contact the Ed.D. Program Office for current status. The program consists of 72 quarter units (minimum) of coursework, field-based research, practica, summer institutes, and dissertation research and writing. Because the program is time delimited (expected completion within 36-42 months) there are no electives offered in the program. Students are expected to enroll in a minimum of 12 consecutive quarters (fall, winter, spring, summer) and satisfy all requirements for the degree in no more than four years plus two additional quarters.

Students enroll at UCSB, and classes are offered at both campuses. First- year courses are offered at the UCSB campus, second-year seminars and practica are offered at the Cal Poly campus, and third-year seminars are offered at both campuses and selected field locations. Students are required to participate in ongoing research projects in various K-14 Professional Development Districts and attend two summer institutes/sessions on the UCSB and Cal Poly campuses during the course of the program.

Detailed information about program coursework and requirements are available at the Program in Education Office at UCSB or the Ed. D. Program Office at Cal Poly.

*Courses*

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# Colleges, Departments, Units and Course Prefixes

## COLLEGE OF AGRICULTURE

Agriculture .....	AG
Agribusiness .....	AGB
Agricultural Education and Communication .....	AGC, AGED
Animal Science .....	ASCI, PM, VS
BioResource and Agricultural Engineering .....	BRAE
Dairy Science .....	DSCI
Earth and Soil Sciences .....	ERSC, SS
Food Science and Nutrition .....	FSN
Horticulture and Crop Science .....	CRSC, EHS, FRSC, HCS, PPSC, VGSC
Military Science .....	MSL
Natural Resources Management .....	FNR, REC

## COLLEGE OF ARCHITECTURE AND ENVIRONMENTAL DESIGN

Environmental Design .....	EDES
Architectural Engineering .....	ARCE
Architecture .....	ARCH
City and Regional Planning .....	CRP
Construction Management .....	CM
Landscape Architecture .....	LA

## ORFALEA COLLEGE OF BUSINESS

Business .....	BUS
Economics .....	ECON
Graduate Programs .....	GSB
Industrial Technology .....	IT

## COLLEGE OF ENGINEERING

Engineering .....	ENGR
Aerospace Engineering .....	AERO
Civil and Environmental Engineering ..	CE, ENVE
Computer Engineering .....	CPE
Computer Science .....	CSC
Electrical Engineering .....	EE
Industrial and Manufacturing Engineering .....	IME
Materials Engineering .....	MATE
Mechanical Engineering .....	ME

## COLLEGE OF LIBERAL ARTS

Art and Design .....	ART
English .....	ENGL
Ethnic Studies .....	ES
Graphic Communication .....	GRC
History .....	HIST
Humanities .....	HUM
Journalism .....	JOUR
Liberal Studies .....	LS
Modern Languages and Literatures .....	FORL, FR, GER, ITAL, JPNS, SPAN
Music .....	MU
Philosophy .....	PHIL, RELS
Political Science .....	POLS
Psychology and Human Development ..	CD, PSY
Social Sciences .....	ANT, GEOG, SOC, SOCS
Speech Communication .....	SCOM
Theatre and Dance .....	DANC, TH
Women's Studies .....	WS

## COLLEGE OF SCIENCE AND MATHEMATICS

Science and Mathematics .....	SCM
Biological Sciences .....	BIO, BOT, MCRO, ZOO
Chemistry and Biochemistry .....	CHEM
Kinesiology .....	PE, KINE
Mathematics .....	MATH
Physics .....	ASTR, GEOL, PHYS, PSC
Statistics .....	STAT

## UNIVERSITY CENTER FOR TEACHER EDUCATION

Education .....	EDUC
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ATHLETICS .....	PEM, PEW
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UNIVERSITY LIBRARY .....	LIB
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UNIVERSITY HONORS .....	HNRS
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# Course Descriptions

Courses are listed alphabetically by prefix abbreviation, as 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.

Certain courses may have miscellaneous course fees. Please see quarterly *Class Schedule* for more information.

## PREFIX TITLE

AERO	Aeronautical Engineering
AG	Agriculture
AGB	Agribusiness
AGC	Agricultural Communication
AGED	Agricultural Education
ANT	Anthropology
ARCE	Architectural Engineering
ARCH	Architecture
ART	Art
ASCI	Animal Science
ASTR	Astronomy and Astrophysics
BIO	Biology
BOT	Botany
BRAE	BioResource and Agricultural Engineering
BUS	Business
CD	Child Development
CE	Civil Engineering
CHEM	Chemistry
CM	Construction Management
CPE	Computer Engineering
CRP	City and Regional Planning
CRSC	Crop Science
CSC	Computer Science
DANC	Dance
DSCI	Dairy Science
ECON	Economics
EDES	Environmental Design
EDUC	Education
EE	Electrical Engineering
EHS	Environmental Horticultural Science
ENGL	English
ENGR	Engineering
ENVE	Environmental Engineering
ERSC	Earth Sciences
ES	Ethnic Studies
FNR	Forestry and Natural Resources
FORL	Foreign Language
FR	French
FRSC	Fruit Science

PREFIX	TITLE
FSN	Food Science and Nutrition
GEOG	Geography
GEOL	Geology
GER	German
GRC	Graphic Communication
GSB	Graduate Studies–Business
HCS	Horticulture and Crop Science
HIST	History
HNRS	Honors
HUM	Humanities
IME	Industrial and Manufacturing Engineering
IT	Industrial Technology
ITAL	Italian
JPNS	Japanese
JOUR	Journalism
KINE	Kinesiology
LA	Landscape Architecture
LIB	Library
LS	Liberal Studies
MATE	Materials Engineering
MATH	Mathematics
MCRO	Microbiology
ME	Mechanical Engineering
MSL	Military Science Leadership
MU	Music
PE	Physical Education
PEM	Physical Education Men
PEW	Physical Education Women
PHIL	Philosophy
PHYS	Physics
PM	Poultry Management
POLS	Political Science
PPSC	Plant Protection Science
PSC	Physical Science
PSY	Psychology
REC	Recreation Administration
RELS	Religious Studies
SCM	College of Science and Mathematics
SCOM	Speech Communication
SOC	Sociology
SOCS	Social Sciences
SPAN	Spanish
SS	Soil Science
STAT	Statistics
TH	Theatre
VGSC	Vegetable Science
VS	Veterinary Science
WS	Women's Studies
ZOO	Zoology

## AERO–AEROSPACE ENGINEERING

### AERO 102 General Aviation (4)

Fundamentals of flight aerodynamics and principles. Introduction to power systems, instrumentation, flight planning, modern air navigation, weather data interpretation, flight computer uses, meteorology. Hands-on cockpit/taxi familiarization. Private pilot's examination preparation. Not a technical elective for engineering students. Field trip may be required. 4 lectures.

### AERO 103 Instrument Aviation (4)

Introduction to advanced aircraft instrumentation, flight planning, interpretation of weather data, and meteorology. Instrument navigation, uses of flight computer, subjects covered in instrument pilot's examination. Not acceptable as technical elective to engineering students. 4 lectures. Prerequisite: Private pilot certification.

### AERO 121 Aerospace Fundamentals (2)

Introduction to the engineering profession including the aeronautical and aerospace fields. Engineering approach to problem-solving and analysis of data obtained from experiments. Basic nomenclature and design criteria used in the aerospace industry. Applications to basic problems in the field. 1 lecture, 1 laboratory.

### AERO 200 Special Problems for Undergraduates (1–4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units. Prerequisite: Consent of department head.

### AERO 210 History of Aviation (4)

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. 4 lectures.

### AERO 215 Introduction to Aerospace Design (2)

Introduction to problem solving techniques and team-centered design projects in aerospace engineering. Primary emphasis on the solution of design problems in aerospace engineering using computers. 2 laboratories. Prerequisite: AERO 121, MATH 143. Recommended: CSC 111, IME 144.

### AERO 240 Additional Engineering Laboratory (1–4) (CR/NC)

Total credit limited to four units. Credit/No Credit grading. 1–4 laboratories.

### AERO 300 Aerospace Engineering Analysis (5)

Analytical methods for aerospace engineering problems. Topics include vector calculus, linear algebra, differential equations, Laplace transforms and Fourier series. Computer tools and numerical methods as applied to problems in aerodynamics, structures, stability and control and astronautics. 5 lectures. Prerequisite: PHYS 133, MATH 244, AERO 215, ME 211. Corequisite: STAT 312, ME 212, CE 205.

### AERO 301, 302, 303 Aerothermodynamics (5) (5) (5)

Properties and characteristics of fluids, fluid statics and dynamics, the thermodynamic relations, laminar and turbulent flows, subsonic and supersonic flows as applied to flight vehicles. Introduction to heat transfer. 5 lectures, fall, winter and spring. Prerequisite: ME 211, AERO 300.

### AERO 304 Experimental Aerothermodynamics (2)

Laboratory experiments verify the momentum and energy equations. Fan performance, boundary layer measurements, diffuser performance, and induction pump performance experiments are evaluated. 1 lecture, 1 laboratory. Prerequisite: ENGL 148. Concurrent: AERO 302.

### AERO 306 Aerodynamics and Flight Performance (4)

Introduction to theoretical aerodynamics. Primary emphasis in the subsonic region, including compressibility effects. Basic aerodynamic theory: Airfoil theory, wing theory, lift and drag. Team-centered

aerodynamic design. Flight performance. 4 lectures. Prerequisite: AERO 215, AERO 301. Concurrent: AERO 302.

### AERO 307 Experimental Aerodynamics (2)

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. 2 laboratories. Prerequisite: AERO 302, AERO 306, ENGL 148.

### AERO 310 Air and Space (4)

(Also listed as HNRS 310)

GE Area F

Technological innovations that have led to modern aircraft and spacecraft as viewed from an historical perspective. Development of aerodynamics, propulsion systems, light-weight structures, and control systems. How aviation has affected, and been affected by, history. Impact of aviation on society, including civil and military aircraft/spacecraft. Federal regulation of aviation, including air traffic control and airlines. Future developments in air and space technology. Not open to students in engineering or computer science. 4 lectures. Prerequisite: Completion of GE Area B and junior standing.

### AERO 320 Fundamentals of Guidance and Control (4)

Introduction to state-space and transfer function models for aircraft, spacecraft, missiles, and helicopters. Elementary classical and modern analysis techniques using computers. 4 lectures. Prerequisite: AERO 215, AERO 300. Concurrent: ME 212.

### AERO 331 Aerospace Structural Analysis I (5)

Deflection analysis. Principles of fictitious displacement, virtual work, and unit load method. Energy methods: Dummy load method, Castigliano's theorem, Maxwell-Betti reciprocal theorem, minimum principles, Rayleigh-Ritz's method, Galerkin's method. Finite element analysis. Structural instability. Stress analysis of aircraft and spacecraft components. Structural constraint. Elementary aeroelasticity. 5 lectures. Prerequisite: AERO 300.

### AERO 360 Creative Problem Solving in Engineering Design (2)

The creative problem solving process for an engineering design team. How to explore context and causes as part of defining a design problem; the principles of brainstorming, synthesis, and judgment. Role of iteration, implementation, and communication. Importance of a diverse view, including: customers, products, processes, systems, ethics, and professional responsibility. Team-based applications to case studies and real-world engineering design problems. 2 laboratories. Prerequisite: PSY 350.

### AERO 400 Special Problems for Advanced Undergraduates (1–4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units.

### AERO 401 Propulsion Systems (4)

Power plant types, components, characteristics, and requirements. Principles of thrust and energy utilization. Thermodynamic processes and performance of turboprop, turboshaft, turbofan, turbojet, ramjet, and rocket engines. 3 lectures, 1 laboratory. Prerequisite: AERO 303, AERO 306, CHEM 124.

### AERO 404 Gas Dynamics (4)

Fundamental theory of one dimensional gas dynamics: Isentropic flow, flow in converging-diverging nozzles, shock propagation, normal and oblique shock theory, Prandtl-Meyer expansions, Fanno line flow, and measurement methods. 4 lectures. Prerequisite: AERO 302.

### AERO 405 Supersonic and Hypersonic Aerodynamics (4)

Review of gas dynamics, shock-wave and boundary-layer interaction, aerodynamic design. 2-dimensional supersonic flows around thin airfoil; finite wing in supersonic flow. Local surface inclination methods for high-speed flight, boundary-layer and aerodynamic heating, viscous interactions. 4 lectures. Prerequisite: AERO 303, AERO 306.

**AERO 407 Reentry Aerodynamics (4)**

Near planet environments. Transition from orbital to aero-dynamic motion. Aerodynamic heating and effects on design. 4 lectures. Prerequisite: AERO 405. Concurrent: AERO 451.

**AERO 409 Flight Test (4)**

Overview of flight tests, test equations, and supporting facilities. Principles of team-centered flight testing with applications to performance, stability and control, and avionics systems testing. Test planning, instrumentation, data analysis and reports. 2 lectures, 2 laboratories. Prerequisite: AERO 306. Concurrent: 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. 4 lectures. Prerequisite: AERO 306, AERO 300.

**AERO 419 Simulation of Aerospace Vehicles and Systems (4)**

Overview of flight simulators, aerospace avionics systems, and supporting facilities including simulation equations for flight mechanics and land navigation. Team-centered projects, reports, and presentations are emphasized with a strong focus on computer simulation of piloted flight. 2 lectures, 2 laboratories. Prerequisite: AERO 420.

**AERO 420 Stability and Control of Aerospace Vehicles (4)**

Stability and control derivatives, reference frames, steady-state static analysis and perturbed dynamic analysis for aircraft and spacecraft. Transfer function, state-space, and modal representations of system dynamics in response to control inputs. Design guidelines and introduction to augmentation systems. 4 lectures. Prerequisite: AERO 306, AERO 320, and ME 212.

**AERO 431 Aerospace Structural Analysis II (3)**

Basic concepts and governing equations with applications to typical aerospace structures. Concepts studied include analysis of aircraft and aerospace structures; airworthiness and airframe loads; stress analysis of aircraft components; structural constraints; elementary aeroelasticity; introduction to modern fatigue and fracture mechanics analysis; and introduction to composite structures analysis. 3 lectures. Prerequisite: AERO 331.

**AERO 432 Advanced Composite Structures Analysis (4)**

Review of isotropic material behavior. Behavior of unidirectional fiber composites. Properties of short-fiber composites and orthotropic lamina. Analysis of laminated composites. Residual stresses and strains of composites. Strength and hygrothermal behavior of composite materials. Optimization design of pressure vessels. Bending, buckling, and vibration of laminated plates, notched strength. Fatigue behavior and fracture mechanics of composite structure. 3 lectures, 1 laboratory. Prerequisite: AERO 331.

**AERO 433 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 331, AERO 431.

**AERO 435 Aerospace Numerical Analysis (4)**

Taylor series. Finite difference calculus. Interpolation and extrapolation. Finite difference method. Basic equations of elasticity. Global stiffness matrix. Rayleigh-Ritz method. Galerkin method. Bernoulli-Euler beam element. Finite element formulation. Dynamic analysis. 4 lectures. Prerequisite: AERO 300, AERO 331.

**AERO 443, 444, 445 Aircraft Design (2) (4) (4)**

Preliminary layout of a typical aircraft vehicle using design and calculation techniques developed in previous aerospace engineering courses. Design of a flight vehicle, including its structures and systems. Preparation of necessary drawings and a report. AERO 443: 2 laboratories. AERO 444 and AERO 445: 2 lectures, 2 laboratories. Prerequisite: Senior standing, IME 144, AERO 215, AERO 303, AERO 306, AERO 331.

Concurrent: AERO 401, AERO 405, AERO 420, AERO 431. Open to students enrolled in the multidisciplinary design minor.

**AERO 447, 448, 449 Spacecraft Design (2) (4) (4)**

Preliminary layout of typical space vehicle using design and calculation techniques developed in previous aerospace engineering courses. Design of selected components and preparation of necessary drawings. AERO 447: 2 laboratories. AERO 448 and AERO 449: 2 lectures, 2 laboratories. Prerequisite: IME 144, AERO 215, AERO 303, AERO 331, senior standing. Concurrent: AERO 401, AERO 420, AERO 431, AERO 451. Open to students enrolled in the multidisciplinary design minor.

**AERO 450 Aerospace Systems Engineering (4)**

Aerospace systems and subsystems. Systems integration. Development of system requirements. Analysis, modeling and simulation of complex systems. Project management. Cost analysis. Optimization and trade studies. 4 lectures. Prerequisite: Senior standing or consent of instructor.

**AERO 451 Spaceflight Dynamics I (4)**

Motion of a body in a central force field. Keplerian orbits. Orbital maneuvers. Launch vehicle trajectories. Rigid spacecraft attitude dynamics. Kinematic variables: Euler angles and quaternions. 4 lectures. Prerequisite: ME 212, AERO 215, AERO 300, AERO 320.

**AERO 452 Spaceflight Dynamics II (4)**

Orbital motion, perturbing forces. Asphericity of the earth, aerodynamic drag, third-body tidal forces, etc. Encke and Cowell solution techniques. Restricted 3-body problem. Satellite attitude dynamics, rigid body-symmetric and asymmetric semirigid bodies. Attitude control, spinning/fixed gravity gradient. 4 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 463, 464 Senior Project Laboratory (2) (3)**

Selection and completion of a project by individuals or team which is typical of problems which graduates must solve in their fields of employment. Project involves, but is not limited to, physical modeling and testing of integrated design and may include students from other disciplines. Formulation of outline, literature review, and project schedule. AERO 463: 2 laboratories. AERO 464: 3 laboratories. Prerequisite: Senior standing. Note: although AERO 463, 464 substitute for AERO 461, 462, students may not use repeat credit for the purpose of increasing GPA.

**AERO 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.

**AERO 471 Selected Advanced Laboratory (1-4)**

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 8 units. 1 to 4 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 (1-4)**

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. Total credit limited to 12 units. Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

#### **AERO 515 Continuum Mechanics (4)**

Vectors and tensors stress analysis. Analysis of deformation. Velocity fields and compatibility conditions. Constitutive equations. Isotropy. Mechanical properties of real fluids and solids. Field equations and boundary conditions in fluid mechanics problems and applications in elasticity. Active remodeling of structures. Distance Learning Lab fee may be required--see *Class Schedule*. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

#### **AERO 520 Applied Airplane Aerodynamics (4)**

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. Panel methods. Boundary-layer effects on aerodynamics. Viscous flow. Distance Learning Lab fee may be required--see *Class Schedule*. 4 seminars. Prerequisite: AERO 306, MATH 502, graduate standing or consent of instructor.

#### **AERO 521 Missile and Launch Vehicle Aerodynamics (4)**

The aerodynamics of missile configurations in subsonic, transonic, supersonic, and hypersonic flows. Slender bodies and wings at high angles of attack. Asymmetric flow separation and vortex shedding. Wing-body interactions. Control effectiveness. Drag prediction methods and aerodynamic heating. The impact of low observability on aerodynamic design. Missile configuration design. Distance Learning Lab fee may be required--see *Class Schedule*. 4 lectures. Prerequisite: AERO 405, graduate standing, or consent of instructor.

#### **AERO 522 Boundary-Layer Theory (4)**

Concept of boundary-layer. Boundary-layer equations, similarity transformation, integral and differential methods for steady, two-dimensional laminar and turbulent boundary layers. Distance Learning Lab fee may be required--see *Class Schedule*. 4 lectures. Prerequisite: AERO 302, graduate standing or consent of instructor. Concurrent: MATH 501.

#### **AERO 523 Turbulence (4)**

Flow physics of turbulence. Turbulence scales and structures. Reynolds equations. Vorticity dynamics. Energy production, convection, and dissipation. Similarity rules and turbulence modeling for jets, wakes, mixing and boundary layers. Effect of turbulence on noise, combustion, heat transfer, and flow control. Distance Learning Lab fee may be required--see *Class Schedule*. 4 lectures. Prerequisite: AERO 302, graduate standing or consent of instructor.

#### **AERO 524 Low Gravity Fluid Dynamics and Heat Transfer (4)**

Low gravity environment. Mass, momentum and energy transport equations. Free and forced convections. Materials processing. Two-phase flows. Combustion and flame propagation. Turbulence. Fluid management in space. Students are expected to do self-study and make a presentation for the seminar. Distance Learning Lab fee may be required--see *Class Schedule*. 3 lectures, 1 seminar. Prerequisite: AERO 301, AERO 302, and AERO 303, graduate standing or consent of instructor.

#### **AERO 525 Computational Fluid Dynamics (4)**

Classification of partial differential equations. Numerical methods applicable to the solution of elliptic, parabolic, and hyperbolic partial differential equations. Consideration of accuracy and stability of numerical methods. Application to the fundamental equations of fluid dynamics, grid generation, turbulence modeling. Distance Learning Lab fee may be required--see *Class Schedule*. 4 lectures. Prerequisite: AERO 303, CSC 340, graduate standing or consent of instructor.

#### **AERO 530 Inelastic Structural Analysis (4)**

Inelastic stress analysis. Yield criteria. Strain hardening. Plastic straining and bending. Elastic-plastic problems. Plastic instability. Slip-line fields for plains. Plastic strain problems and analysis and introduction to viscoplasticity. Distance Learning Lab fee may be required--see *Class Schedule*. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

#### **AERO 532 Advanced Aerospace Composite Design (4)**

Behavior of composite materials. ending, buckling, and vibration of laminated plates. Fatigue and fracture mechanics analysis of composite structures. Optimum design of composite pressure vessels. 2 seminars, 2 laboratories. Prerequisite: Graduate standing or consent of instructor.

#### **AERO 534 Aerospace Structural Dynamics Analysis (4)**

Fundamentals of structural dynamics and aeroelasticity of flight vehicles. Undamped and damped, free and forced vibration of a single and multi degree-of-freedom linear systems. Finite elements and vibrational analysis. Distance Learning Lab fee may be required--see *Class Schedule*. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

#### **AERO 535 Advanced Aerospace Structural Analysis (4)**

Types of failure. Theories of failure. Stability of structures. Advanced flight vehicle and fracture mechanics analysis and design. Fundamentals and applications of modern fatigue analysis in the aerospace industry. Distance Learning Lab fee may be required--see *Class Schedule*. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

#### **AERO 540 Elements of Rocket Propulsion (4)**

Thrust and impulse equations, propellant composition and mixture ratios, nozzle expansion ratios, solid and liquid propellant combustion, internal ballistics, thermo-chemical computations, chemical kinetics, and combustion instability, nozzle design and exhaust plumes. Distance Learning Lab fee may be required--see *Class Schedule*. 4 seminars. Prerequisite: AERO 303, AERO 401, graduate standing or consent of instructor.

#### **AERO 541 Air Breathing Propulsion (4)**

Aerothermodynamics of propulsion systems, power plant selection and design, on-off design performance, component characterization, component design, component matching, optimization, and introduction to power plant and airframe integration systems for aircraft. Distance Learning Lab fee may be required--see *Class Schedule*. 4 seminars. Prerequisite: AERO 401 or ME 443, graduate standing or consent of instructor.

#### **AERO 550 Analysis and Design of Flight Control Systems (4)**

Fundamental principles of flight control design and the application of the Cooper-Harper test and evaluation tool to modern aerospace vehicles. Human factors, issues, and automation, case study of the space shuttle. Distance Learning Lab fee may be required--see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: AERO 420 or ME 422, graduate standing or consent of instructor.

#### **AERO 551 Global Positioning Satellite Navigation Systems (4)**

Principles of Global Positioning Satellite navigation systems. Kalman filter design and application to integrated navigation and guidance systems. Statistical evaluation and test methods in aerospace. Interactive computer simulations. Distance Learning Lab fee may be required--see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: AERO 420, graduate standing or consent of instructor.

#### **AERO 552 Advanced Control of Spacecraft and Aircraft (4)**

Model following and digital control of aerospace craft, including dynamic estimation of vehicle states using Kalman filters and adaptive compensation. Team-centered projects involving optimal attitude control in deep space, hovering vehicles, and aeroelastic systems. Survey of non-linear, fuzzy, and neural net controllers for aerospace applications. 2 lectures, 2 laboratories. Prerequisite: AERO 550.

**AERO 555 Piloted Flying Qualities of Aerospace Vehicles (4)**

Flying qualities prediction from flight test data and reduced-order analytical models of vehicles, systems, and human pilots. Application of the Cooper-Harper flight test scale to fly-by-wire aircraft, the space shuttle, and remotely controlled vehicles include rotorcraft. Team-centered projects, reports, and presentations are required. 2 lectures, 2 laboratories. Prerequisite: AERO 420.

**AERO 560 Spacecraft Dynamics and Control (4)**

Orbit determination and control. Orbit maneuvering and rendezvous. Attitude control of rigid spacecraft via reaction wheels, control moment gyros and thrusters. Modeling, analysis and control of flexible spacecraft. Distance Learning Lab fee may be required—see *Class Schedule*. 4 lectures. Prerequisite: AERO 420, AERO 452, graduate standing or consent of instructor.

**AERO 565 Advanced Topics in Aircraft Design (4)**

Application of advanced analytic engineering methods to aircraft design problems. Analysis and synthesis of advanced topics related to design of aircraft. Distance Learning Lab fee may be required—see *Class Schedule*. 4 lectures. Prerequisite: AERO 522, AERO 530 and AERO 550, graduate standing or consent of instructor. Concurrent: AERO 520.

**AERO 570 Selected Advanced Topics (4)**

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 8 units. Distance Learning Lab fee may be required—see *Class Schedule*. 4 lectures. Prerequisite: Graduate standing or consent of instructor.

**AERO 571 Selected Advanced Laboratory (1–4)**

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 8 units. 1–4 laboratories. Prerequisite: Graduate standing or consent of instructor.

**AERO 599 Thesis (Design Project) (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 243 Competitive Intercollegiate Rodeo (2) (CR/NC)**

Beginning through advanced skills in the event areas of college rodeo. Areas include saddle bronc, bareback, and bull riding; calf, team, and breakaway roping; steer wrestling, goat tying, and barrel racing. Minimum of 10 hours of laboratory per week. Total credit limited to 8 units. Credit/No Credit grading. Enrollment limited to those qualified to compete in intercollegiate rodeo. Consent of coach required.

**AG 250 Computer Application to Agriculture (3)**

Microcomputers and commercial software used in agricultural industries. Word processing, spreadsheets, data base management programs, and programs applied to agriculturally oriented problems. 3 lectures.

**AG 301 Agriculture and American Life (4)**

Overview of agriculture and effect on American life; wise use of natural resources; animal and plant production; role of machines, labor, and chemicals in producing food and fiber; processing and marketing of commodities; nature of farm life; leadership development in agriculture. Not open to students with majors in agriculture. 4 lectures. Prerequisite: Junior standing.

**AG 315 Organic Agriculture (4)****GE Area F**

Origins, application, regulation and technology of organic agriculture. Theoretical and practical issues surrounding organic agriculture from a cross-disciplinary perspective. Topics include the history of the organic movement; current regulation and certification; and field management practices and technologies. Features industry guest lecturers. 3 lectures, 1 activity. Prerequisite: Junior standing and completion of GE Area B. Crop Science, Fruit Science and Soil Science majors will not receive GE Area F credit.

**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 350 The Global Environment (4)****GE Area F**

(Also listed as BUS/EDES/ENGR/HUM/SCM 350)

Interdisciplinary investigation of how human activities impact the Earth's environment on a global scale. Examination of population, resource use, climate change, and biodiversity from scientific/technical and social/economic/historical/political perspectives. Use of remote sensing maps. Sustainable solutions. 3 lectures, 1 activity. Prerequisite: Completion of GE Areas A and B and junior standing.

**AG 360 Holistic Management (4)****GE Area F**

Application of holistic management, a goal-oriented, value-driven framework for making decisions that are ecologically, economically, and socially sound. Impact of technology and other tools on ecosystem processes. Holistic approach to management, especially of land-based resources, aimed toward greater biodiversity and sustainability. 3 lectures, 1 laboratory. Prerequisite: Completion of GE Area B, and junior standing. Not open to students with credit in AG 450.

**AG 439 Internship in Integrated Ranch Operations (6–12) (CR/NC)**

Work experience in all activities/projects associated with the production of crops, livestock and timber at Swanton Pacific Ranch. Students will be responsible for all activities associated with ranch operation including supervising. For students working and living at Swanton Pacific Ranch. Credit/No Credit grading only. Total credit limited to 18 units. Prerequisite: Senior or graduate standing and consent of instructor.

**AG 450 Applied Holistic Management (4)**

Application of holistic management, a goal-oriented, value-driven framework for making decisions that are ecologically, economically, and socially sound. Impact of technology and other tools on ecosystem processes. Holistic approach to management, especially of land-based resources, aimed toward greater biodiversity and sustainability. 3 lectures, 1 laboratory. Prerequisite: Any life science course, and junior standing. Not open to students with credit in AG 360.

**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 college faculty. Total credit limited to 6 units.  
Prerequisite: Consent of department head, graduate advisor 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 advisor before the internship commences. Degree credit limited to 6 units.  
Prerequisite: Consent of internship instructor.

**AG 581 Graduate Seminar (1-3) (CR/NC)**

Advanced topics in agriculture and natural resources. Group study of current research and industry trends. Invited speakers covering a variety of topics. Total credit limited to 9 units. 1-3 hours seminar. Prerequisite: Graduate standing or consent of 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: Graduate 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 (4)**

Orientation to the agribusiness sector of agriculture. An overview of the breadth, size, scope and management aspects of the agricultural business complex. 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 202 Sales, Communication and Leadership in Agribusiness (4)**

Self management, communication, and interpersonal skills necessary in developing managerial abilities, leadership qualities, and facilitating teamwork within the agribusiness sector. Industry opportunities ranging from input and output products and services along with government and special interest groups will be surveyed. 4 lectures. Prerequisite: AGB 101.

**AGB 212 Agricultural Economics (4)**

Theoretical development of factors affecting demand and supply for food and fiber and for agricultural inputs. Methods of selecting optimal levels of agricultural production and consumption variables. Evaluation of market structure and price formulation for agricultural products and resources. 4 lectures.

**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. Can only be taken once for credit in the major.

**AGB 301 Food and Fiber Marketing (4)**

Food and fiber marketing, examining commodity, industrial, and consumer product marketing from a managerial viewpoint. A global perspective in understanding consumer needs and developing the knowledge of economic, political, social and environmental factors that affect food and fiber marketing systems. 4 lectures. Prerequisite: AGB 212/ECON 201.

**AGB 302 Agricultural Associations and Cooperatives (4)**

Purpose, kinds, organization and management of agricultural cooperatives. Evaluating cooperative performance. Emphasis on California cooperatives, international agricultural cooperatives, and strategic alliances. One-day field trip visiting agricultural cooperatives included. 4 lectures. Prerequisite: AGB 301.

**AGB 303 Introduction to the Horse Racing Industry (4)**

Descriptive analysis of horse racing industry: breeding farms, race tracks, trade associations, training issues, and auction sales. Industry structure, economic flows, contributions to state and local taxes, and racing law. Cultural influences of racing in Europe, Australasia, and Latin America. 4 lectures. Prerequisite: Junior standing.

**AGB 310 Agribusiness Credit and Finance (4)**

Financing California's agricultural industry. Sources of credit and types of loans used by agribusinesses. Costs of credit. Financial analysis of agricultural borrowers. Future and present value techniques used in evaluating agricultural investments. Agricultural financial management. Financial capital markets and leasing. 4 lectures. Prerequisite: One quarter of accounting or AGB 321.

**AGB 312 Agricultural Policy (4)**

Agricultural policy objectives and formulation, resource allocation and production adjustments. Survey of State and Federal agricultural policies as they influence the planning and practices of agribusiness. 4 lectures. Prerequisite: AGB 212; ECON 222.

**AGB 313 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 221.

**AGB 314 Fair and Fair Facility Management (4)**

Fundamentals of the year round operation of a fair facility to include rental opportunities, master planning, and maintenance. Principles and procedures in planning, organizing, operating, and evaluating a fair. One day field trip required. 4 lectures. Prerequisite: Upper division standing.

**AGB 315 Land Economics (4)**

Economics of agricultural and rural land use. Incorporates production economics with welfare theory to explore society's implicit and explicit land use decisions and problems in California, the West and nationwide. Incorporates land use planning and its implicit economic content. 4 lectures. Prerequisite: AGB 313.

**AGB 317 Agriculture-Consumer Relationships (2)**

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. 2 seminars. Prerequisite: Upper division standing.

**AGB 318 Global Agricultural Marketing and Trade (4)**

Analysis of international marketing opportunities for agricultural products. Strategies for enhancing the performance of U.S. agricultural exports/imports. Impact of government trade policies and regulations, distribution systems, and the changing consumer. 4 lectures. Prerequisite: AGB 301, 312.

**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: AGB 212/ECON 201.

**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 212 and BUS 212 or AGB 321.

**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: BUS 212.

**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 310.

**AGB 331 Farm Accounting (4)**

Application of commercial accounting process to farm and ranch accounting problems. Emphasis on accounting systems that facilitate financial statement presentation, tax preparation and ADP enterprise analysis. Income tax laws pertaining to agriculture. 3 lectures, 1 activity. Prerequisite: BUS 212.

**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 339 Internship in Agribusiness (1-12) (CR/NC)**

Selected students will spend up to 12 weeks with an approved agricultural firm engaged in production or related agribusiness. Time will be spent applying and developing agribusiness functional and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Degree credit limited to 6 units. Credit/No Credit grading only. Prerequisite: Consent of internship instructor.

**AGB 360 Agribusiness Information Technology (4)**

Use of information technologies and advanced computer applications in agribusiness decision-making. Information search and retrieval technologies. Computer languages and programs developed as tools to assist in agribusiness problem-solving. 4 lectures. Prerequisite: AGB 212/ECON 201.

**AGB 370 World Food Economy (4)**

International agricultural production, economics, and distribution. Comparative and competitive advantage in world agriculture. Food security issues and regional analysis of agriculture policies. The future of agriculture from a global perspective. 4 lectures. Prerequisite: AGB 312 and AGB 313.

**AGB 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head or instructor.

**AGB 401 Managing Cultural Diversity in Agricultural Labor Relations (4)**

USCP

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 (4)**

Agricultural marketing research data collection and analysis. Emphasis on food sector market segmentation, product positioning, new product testing, sales forecasting, and marketing plan development through secondary and primary data sources. Experimental research design and implementation. 4 lectures. Prerequisite: STAT 221, AGB 301, AGB 318.

**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 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 farm bankruptcy. Exploration of interest rate impacts on agricultural lending. 4 lectures. Prerequisite: BUS 212, 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 Seminar in U.S./World Agricultural Trade Issues (2)**

Comparative analysis of agricultural infrastructures and trade policies of major U.S. trading partners within specific world regions (e.g., Latin America, Asia Pacific, Europe, etc.). Particular emphasis on cultural and geo-political influences on the development of world agricultural policies. *Class Schedule* will list topic selected. 2 seminars. Prerequisite: AGB 318.

**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. 4 lectures. Prerequisite: AGB 313, STAT 221.

**AGB 422 Logistics in Global Agribusiness (4)**

Scope and elements of the agribusiness logistics system including supply and distribution channels, transportation, inventory, warehousing, packaging, and order processing. 4 lectures. Prerequisite: AGB 318, STAT 221.

**AGB 427 Agricultural Estate Planning (2)**

Principles of estate planning with special emphasis on needs of owners of closely held farming businesses. How wills, property ownership, gifts, trusts and continuation agreements affect estate plans. 2 seminars. Prerequisite: Upper division standing.

**AGB 433 Agricultural Price Analysis (4)**

Application of statistical tools for price analysis. Emphasis on price making process for specific agricultural commodities. Utilization of USDA and CDFA market price reports and production estimate data in price forecasting and analysis. 2 two-hour lectures. Prerequisite: STAT 221 and AGB 313.

**AGB 435 Linear Programming in Agriculture (4)**

Application of linear programming to decision making by contemporary farm businesses. Solutions by graphical and mathematical models including appropriate computer software. Economic interpretation of solutions. Applications for multi-product, multi-function farms. Includes introduction to goal and risk programming, transportation models, and multi-period programming. 4 lectures. Prerequisite: AGB 313.

**AGB 440 Field Studies in Agribusiness (2)**

Visitation to selected agribusinesses. Organization, operation, services and problems considered. Prerequisite: Senior standing or consent of instructor. Can only be taken once for credit in the major.

**AGB 442 Agricultural Policy Resolution (4)**

Local, state, national, and international agricultural policy issues. Extensive research on one or two policy issues. Work with various policy groups at the local and state level to assist in analyzing a policy issue, and observe how the analysis is used to develop possible consensus among the different stakeholders to be affected by the policy. Review of entire process upon completion. 4 lectures. Prerequisite: AGB 412.

**AGB 443 Branded Wine Marketing (2)**

Wine pricing as it relates to quality, packaging, and service. Distribution options with emphasis on the three tier system, promotional strategies, including public relations, mass media advertising, personal selling, and direct marketing. Domestic and international marketplaces. 4 lectures. Prerequisite: AGB 301 or BUS 346 or consent of instructor.

**AGB 444 Wine Compliance and Market Analysis (4)**

Legal aspects of wine marketing with emphasis on Federal (BATF) requirements. Application of statistical theory to the collection, interpretation, and forecasting of wine and grape industry data with emphasis on production and sales. Introduction to standard accounting ratios. 3 lectures, 1 activity. Prerequisite: STAT 221 or STAT 252 or equivalent.

**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 301 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 451 Strategy and Cases in International Agribusiness (4)**

Exploration of environment, opportunities, and strategic challenges in the rapidly changing global food and fiber system. Developing coordination and control, challenges of worldwide management of functional areas of agribusiness. Focus is practical and managerial through extensive use of case studies. 4 lectures. Prerequisite: Senior standing, AGB 318, 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. 4 lectures. Prerequisite: AGB 322 and senior status.

**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. 4 lectures. Prerequisite: AGB 322 and senior status.

**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. 4 lectures. Prerequisite: AGB 322 and senior status.

**AGB 460 Research Methodology in Agribusiness (2)**

Empirical application of the scientific method as it relates to the design and development of Senior Project. Research plan is developed. First quarter of Senior Project. 2 seminars. Prerequisite: Senior standing and AGB 313.

**AGB 461 Senior Project (2)**

Completion of a project under faculty supervision. Research topics or projects typical of problems which graduates must solve in the agricultural, food and fiber industries. Project results are presented in a formal report. Minimum 60 hours total time. Prerequisite: Senior standing and AGB 460.

**AGB 463 Senior Seminar (2)**

Individual or group presentation for discussion of subjects and problems within the agribusiness field. *Class Schedule* will list topic selected. Total credit limited to 4 units. 2 seminars. Prerequisite: Senior standing.

**AGB 485 Cooperative Education Experience in Agribusiness (6) (CR/NC)**

Part-time work experience with an approved Agribusiness firm engaged in production or related business, industry or governmental agency. 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. Degree credit limited to 6 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

**AGB 495 Cooperative Education Experience in Agribusiness (12) (CR/NC)**

Full time work experience with an approved Agribusiness firm engaged in production or related business, industry or governmental agency. 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. Degree credit limited to 6 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

#### **AGB 500 Individual Study in Agribusiness (1-6)**

Advanced independent study planned and completed under the direction of a member of the Agribusiness faculty. Total credit limited to 6 units. Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

#### **AGB 510 International Development and Agribusiness (4)**

Integration of agricultural development economics, developing economies, markets, and agribusiness with social and institutional limitations. 4 seminars. For students in MS in Agriculture Program/Specialization in Agribusiness. 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 539 Graduate Internship in Agribusiness (1-9)**

Application of theory to the solution of problems of agricultural production or related business in the field of Agribusiness. Analyze specific management problems and perform general management assignments detailed in a contract between the student, the firm or organization, and the faculty advisor before the internship commences. Degree credit limited to 6 units. Prerequisite: Consent of internship 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 Food System Marketing (4)**

Major issues facing the food system marketer. Vertical and horizontal linkages, pricing in agricultural markets, management of price risk through futures markets and hedging, and public policy and consumer impacts on the system. Student involvement through case studies simulations, and presentations. 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 Agribusiness Trade: Cases and Theory (4)**

Changing agricultural trade dynamics in a world economy. Evaluation of firm and government policy strategies in interacting with and expanding markets for agricultural trade. Emphasis on environmental and sustainable trade issues. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

#### **AGB 570 Selected Topics in Agribusiness (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 12 units. 1 to 4 seminars. Prerequisite: Graduate standing or consent of instructor.

#### **AGB 571 Selected Advanced Laboratory in Agribusiness (1-4)**

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 8 units. 1-4 laboratories. Prerequisite: Consent of instructor.

#### **AGB 585 Cooperative Education Experience in Agribusiness (6) (CR/NC)**

Advanced study, analysis and part-time work experience in the 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.

#### **AGB 595 Cooperative Education Experience in Agribusiness (12) (CR/NC)**

Advanced study, analysis and full-time work experience in the 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.

#### **AGB 599 Thesis in Agribusiness (1-9)**

Systematic research of a significant problem in Agribusiness. 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.

## **AGC-AGRICULTURAL COMMUNICATION**

#### **AGC 200 Special Problems in Agricultural Communication (1-4)**

Individual investigation, research, studies or surveys of selected problems in Agricultural Communication/Agricultural Education. Total credit limited to 8 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

#### **AGC 339 Internship in Agricultural Communication (1-12) (CR/NC)**

Selected Agricultural Communication 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. Degree credit limited to 6 units. Credit/No Credit grading only. Prerequisite: Consent of internship instructor.

#### **AGC 400 Advanced Special Problems in Agricultural Communication (1-4)**

Individual investigation, research, studies or surveys of selected problems in Agricultural Communication/Agricultural Education. Total credit limited to 8 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

#### **AGC 407 Agricultural Publications (3) (CR/NC)**

Integration of writing, editing, and layout skills in producing agricultural publications. Emphasis on using computer applications in desktop publishing. Credit/No Credit grading only. Total credit limited to 9 units; may be in same term. 1 lecture, 2 activities. Prerequisite: AG 250, CSC 113, or JOUR 205.

#### **AGC 426 Presentation Methods in Agricultural Communication (3)**

Development, delivery and evaluation of effective means of communication by use of a variety of presentation methods and the use of technology for effective communication. 3 activities. Prerequisite: SCOM 101.

#### **AGC 461 Senior Project (1)**

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 30 hours total time. Prerequisite: AGED 460.

#### **AGC 462 Senior Project (1)**

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 30 hours total time. Prerequisite: AGED 461 or consent of instructor.

#### **AGC 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.

#### **AGC 471 Selected Advanced Laboratory (1-4)**

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 8 units. 1-4 laboratories. Prerequisite: Consent of instructor.

#### **AGC 500 Individual Study in Agricultural Communication (1-3)**

Advanced independent study planned and completed under the direction of a member of the Agricultural Education and Communication faculty. Total credit limited to 6 units. Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

#### **AGC 539 Graduate Internship in Agricultural Communication (1-9)**

Application of theory to the solution of problems of agricultural production or related business in the field of Agricultural Communication. Analyze specific management problems and perform general management assignments detailed in a contract between the student, the firm or organization, and the faculty advisor before the internship commences. Degree credit limited to 6 units. Prerequisite: Consent of internship instructor.

#### **AGC 570 Selected Topics in Agricultural Communication (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 12 units. 1 to 4 seminars. Prerequisite: Graduate standing or consent of instructor.

#### **AGC 571 Selected Advanced Laboratory in Agricultural Communication (1-4)**

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 8 units. 1-4 laboratories. Prerequisite: Consent of instructor.

#### **AGC 580 Special Problems in Agricultural Communication (1-3)**

Individual study of modern issues and problems conducted through research, planning and development. Field problems and in-service study in agricultural industry encouraged. Final written report required. Total credit limited to 9 units with not more than 3 units in any one quarter. Prior approval of instructor required.

#### **AGC 581 Graduate Seminar in Agricultural Communication (3)**

Group study of selected developments, trends and issues in the field of Agricultural Communication. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

## **AGED-AGRICULTURAL EDUCATION**

#### **AGED 102 Personal Assessment (2) (CR/NC)**

Designed to increase the student's academic, career, and personal self-assessment as it relates to the educational process. Study skill methods, campus academic regulations, available resources and issues that face many university students. Credit/no credit grading only. 2 activities.

#### **AGED 200 Special Problems in Agricultural Education (1-4)**

Individual investigation, research, studies or surveys of selected problems in Agricultural Communication/Agricultural Education. Total credit limited to 8 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

#### **AGED 202 Introduction to Agricultural Education and Communication (2)**

Overview of agricultural education career pathways 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 agricultural communication or international agriculture. 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 supervised work. Prerequisite: AGED 202.

#### **AGED 339 Internship in Agricultural Education (1-12) (CR/NC)**

Selected Agricultural Education 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. Degree credit limited to 6 units. Credit/No Credit grading only. Prerequisite: Consent of internship instructor.

#### **AGED 400 Advanced Special Problems in Agricultural Education (1-4)**

Individual investigation, research, studies or surveys of selected problems in Agricultural Communication/Agricultural Education. Total credit limited to 8 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

#### **AGED 404 Agricultural Leadership (3)**

Emphasis upon equipping current and prospective leaders in agriculture with the background and skills to achieve their potential. Class members will assess their status as leaders and identify means to improve their effectiveness. Focus on the theoretical underpinnings of human motivation, personal leadership, and organizational development. 2 lectures, 1 activity. 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 438 Instructional Processes in Agricultural Education (3)**

Preparation for student teaching in agriculture. Orientation to classroom situation. Development of plans for teaching including daily lessons and unit plans; utilization of source information and resources. Class demonstration in teaching procedures; analysis and evaluation. 1 lecture, 2 activities.

**AGED 440 Student Teaching in Agricultural Education (6–12) (CR/NC)**

Off-campus assignment to a selected cooperating public school. Participation in all phases of agriculture teacher duties and activities including departmental organization and administration. Prior approval and appointment necessary. Total credit limited to 18 units. Credit/No Credit grading only.

**AGED 441 Student Teaching Practicum (2)**

Problems encountered and practices applied during student teaching. Methods, procedures and materials adapted for use by the teacher concurrent with student teaching. 2 activities. Prerequisite: Consent of instructor.

**AGED 460 Research Methodology in Agricultural Education and Communication (1)**

Introduction of the research process and topic selection as it relates to the design and development of the senior project within the Agricultural Sciences major. 1 lecture. Prerequisite: Junior standing.

**AGED 461 Senior Project (1)**

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 30 hours total time. Prerequisite: AGED 460.

**AGED 462 Senior Project (1)**

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 30 hours total time. Prerequisite: AGED 461 or consent of instructor.

**AGED 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.

**AGED 471 Selected Advanced Laboratory (1–4)**

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 8 units. 1–4 laboratories. Prerequisite: Consent of instructor.

**AGED 500 Individual Study in Agricultural Education (1–3)**

Advanced independent study planned and completed under the direction of a member of the Agricultural Education and Communication faculty. Total credit limited to 6 units. Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

**AGED 513 Field Experience–Vocational Agriculture (1–3)**

Practice and techniques in management and supervision of vocational agriculture programs. Relationships among students, staff, community and school groups. Budgeting, staffing, records, reporting. Student activities and Future Farmers of America programs. Total credit limited to 6 units. Prerequisite: Prior approval and appointment.

**AGED 520 Program Development in Agricultural Education (3)**

Development of up-to-date approaches to a total integrated program based on occupational opportunities and community needs. Philosophy, organization and administration of agricultural education programs. Development in such areas as curriculum, supervised occupational experience, Future Farmers of America, and summer programs. 3 seminars.

**AGED 522 Instructional Programs in Agricultural Mechanics (3)**

Organizing the vocational agriculture mechanics curriculum and determining course content. Student demonstrations and presentations; evaluation and analysis. 1 seminar, 2 laboratories.

**AGED 539 Graduate Internship in Agricultural Education (1–9)**

Application of theory to the solution of problems of agricultural production or related business in the field of Agricultural Education. Analyze specific management problems and perform general management assignments detailed in a contract between the student, the firm or organization, and the faculty advisor before the internship commences. Degree credit limited to 6 units. Prerequisite: Consent of internship instructor.

**AGED 570 Selected Topics in Agricultural Education (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 12 units. 1 to 4 seminars. Prerequisite: Graduate standing or consent of instructor.

**AGED 571 Selected Advanced Laboratory in Agricultural Education (1–4)**

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 8 units. 1–4 laboratories. Prerequisite: Consent of instructor.

**AGED 580 Special Problems in Agricultural Education (1–3)**

Individual study of modern issues and problems conducted through research, planning and development. Field problems and in-service study in agricultural industry encouraged. Final written report required. Total credit limited to 9 units with not more than 3 units in any one quarter. Prior approval of instructor required.

**AGED 581 Graduate Seminar in Agricultural Education (3)**

Group study of selected developments, trends and issues in the field of Agricultural Education. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**ANT-ANTHROPOLOGY****ANT 201 Cultural Anthropology (4)****GE D3**

Contemporary human cultures throughout the world. General patterns sought within the diversity of individual cultures. Includes such topics as: family organization; gender roles; adaptation to the environment; systems of economic exchange; political organization and leadership; religious beliefs and values; ethnicity and cultural pluralism; impact of Western culture on the developing world. 4 lectures.

**ANT 202 World Prehistory (4)**

Development of the diverse human cultures of both the Old and New Worlds from the earliest times until the dawn of history; cultural growth. 4 lectures. Prerequisite: ANT 201.

**ANT 250 Biological Anthropology (4)****GE B2**

Biological aspects of human unity and diversity. Primate and human evolution, including anatomical, physiological and behavioral adaptations. Origin and diversity of modern races. 4 lectures.

**ANT 309 Elements of Archaeology (4)**

Archaeological method and theory covering the history and development of archaeological thought, approaches to data recovery, dating and analysis of artifacts and ecofacts, the construction of models of prehistoric

human behavior through application of archaeological and anthropological theories. 4 lectures. Prerequisite: ANT 201 or ANT 202, or consent of instructor.

#### **ANT 310 Archaeological Field Methods (4)**

Hands-on introduction to the methods and techniques of archaeology with an emphasis on reconnaissance and survey. Training in artifact and ecofact identification with a focus on lithic technology. Practical experience in orienteering, map-reading, and simple cartography. Methodological approaches to both academic research questions and compliance with environmental planning mandates. 3 lectures, 1 laboratory. Prerequisite: ANT 202 or ANT 309, or consent of instructor.

#### **ANT 311 Archaeological Laboratory Methods (4)**

Hands-on introduction to the methods employed in post-field processing, classification, analysis, and preservation of archaeological materials. Compilation of quantitative and qualitative information in data base format to assist in the classification and interpretation of faunal remains and artifacts. 3 lectures, 1 laboratory. Prerequisite: ANT 309 or ANT 310.

#### **ANT 312 Introduction to Cultural Resources Management (4)**

Contemporary issues in the preservation of archaeological, historic, and ethnographic resources within the framework of legally mandated environmental planning. Introduction to federal, state, and local legislation pertinent to the identification, evaluation, and treatment of cultural resources. A history of preservation legislation, culminating with detailed discussion of Section 106 of the National Historic Preservation Act and the California Environmental Quality Act. 4 lectures. Prerequisite: ANT 201, ANT 202 or ANT 309, or consent of instructor.

#### **ANT 325 Precolumbian Mesoamerica (4)**

**GE D5**

Cultures of Mesoamerica (Mexico and Central America) from earliest times to the Spanish Conquest. Olmec, Teotihuacano, Zapotec, Maya and Aztec civilizations. Major topics include religion, politics, warfare, art, writing, calendrics, ecology and trade. 4 lectures. Prerequisite: Completion of GE Area A, one course in D2 and one course in D3. Social Sciences majors will not receive GE Area D5 credit.

#### **ANT 344 Sex, Death, and Human Nature (4)**

**GE D5**

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. 4 lectures. Prerequisite: Completion of GE Area A, one course in D3 and one course in D4. Social Sciences majors will not receive GE Area D5 credit.

#### **ANT 360 Human Cultural Adaptations (4)**

**GE D5**

Social and cultural evolution from Paleolithic times to the present. Interactions of demographic, economic and ecological factors are emphasized. Main topics include human nature/culture, sex and gender, cooperation and conflict, the "agricultural revolution", state formation, social inequality and globalization. 4 lectures. Prerequisite: Completion of GE Area A, one course in D2 and one course in D3. Social Sciences majors will not receive GE Area D5 credit.

#### **ANT 401 Culture and Health (4)**

Global perspective on the relationship between culture and health. Ecological factors influencing health and illness. Origins of disease and impact of diseases on society. Diet and nutrition. Classifications of illness causation. Kinds of curers. Relationship of gender and reproduction to illness. Pharmacology. Mental illness. Global health problems. Alternative health care modalities. Health-care needs of U.S. ethnic groups. 4 lectures. Prerequisite: Junior standing.

#### **ANT 405 Indonesia (4)**

Cultures and societies of Indonesia with particular emphasis on Bali. Topics include art and ritual, kinship, marriage, gender, politics, economics and colonialism. 4 lectures. Prerequisite: One upper division ANT course or consent of instructor.

#### **ANT 415 Native American Cultures (4)**

**USCP**

Survey of Native American cultures from earliest times to present, emphasizing regional diversity in traditional lifeways. Origins of New World peoples, domestication, war, social organization, trade and gender roles. 4 lectures. Prerequisite: One upper division ANT course or consent of instructor.

#### **ANT 433 Language and Culture (4)**

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 political persuasion; language and gender; language and social stratification; dialects; bilingualism and multilingualism; language and ethnic identity. 4 lectures. Prerequisite: Junior standing.

#### **ANT 435 Pacific Islands Cultures (4)**

Overview of Pacific Islands cultures. Individual cultures in each of the three major cultural and geographic areas – Micronesia, Melanesia, and Polynesia – will be studied in depth using the case study approach. The impact of Western culture on the Pacific from the early explorations through colonialism, World Wars I and II to independence. 4 lectures. Prerequisite: Junior standing.

#### **ANT 450 Area Studies (4)**

Comparative analysis of cultural diversity and uniformity within a selected region (e.g., Latin America, Sub-Saharan Africa). *Class Schedule* will list topic selected. Total credit limited to 12 units. 4 lectures. Prerequisite: ANT 201 or consent of instructor.

#### **ANT 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 topics selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

## **ARCE–ARCHITECTURAL ENGINEERING**

Note: All ARCE majors must obtain a grade of C- or better in ARCE courses that are prerequisites for other ARCE courses.

#### **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 (4)**

Advanced topics of stresses in beams. Plastic bending, unsymmetrical bending. Combined stresses. Stress transformation. Buckling. Deflection of beams. Analysis of indeterminate structures. Material test laboratory. 3 lectures, 1 laboratory. Prerequisite: ARCE 222. Concurrent: ARCE 351.

#### **ARCE 225 Dynamics (3)**

Dynamics of particles and rigid bodies. 3 lectures. Prerequisite: ARCE 221 and MATH 241.

#### **ARCE 226 Structural Systems for Architects (3)**

Description, behavior and comparison of structural building systems. Concepts of structural stability, load flow, framing schemes and building configuration related to vertical and lateral loads. For architecture and construction management students. 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 257 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. 1 lecture, 1 laboratory. Prerequisite: EDES 113. Recommended corequisite: ARCH 231.

**ARCE 302 Structural Analysis II (3)**

Analysis of statically indeterminate structures. Energy methods. Slope-deflection. Moment distribution including sidesway. 3 lectures. Prerequisite: ARCE 223 and ARCE 227. Concurrent: ARCE 352.

**ARCE 303 Steel Design I (3)**

Analysis and design of steel structural members subjected to bending, shear and axial forces. 3 lectures. Prerequisite: ARCE 227. Concurrent: ARCE 302 and ARCE 371.

**ARCE 304 Timber Design (3)**

Analysis and design of timber structural members subjected to bending, shear, and axial forces. Wood diaphragms, shear walls and their connections. 3 lectures. Prerequisite: ARCE 223, ARCE 227, and ARCE 371.

**ARCE 305 Masonry Design (2)**

Design of load-bearing walls, shear walls, columns and beams in masonry. 2 lectures. Prerequisite: ARCE 223, ARCE 227 and ARCE 371.

**ARCE 306 Matrix Analysis of Structures (3)**

Analysis of statically indeterminate structures by direct stiffness method including continuous beams, plane trusses, and frames. Introduction to finite-element methods. 3 lectures. Prerequisite: ARCE 302. Concurrent: ARCE 353.

**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 Structural Systems (3)**

Concepts related to system behavior; selection; design and construction specific to timber structures. Preliminary member design and detailing. Load flow implications related to building configurations; including vertical and lateral load resisting elements. For architecture and construction management students. 3 lectures. Prerequisite: ARCE 226. May not be taken concurrently with ARCE 322 or ARCE 323.

**ARCE 322 Steel Structural Systems (3)**

Concepts related to system behavior; selection; design and construction specific to steel structures. Preliminary member design and detailing. Load flow implications related to building configurations; including vertical and lateral force resisting elements. For architecture and construction management students. 3 lectures. Prerequisite: ARCE 226. May not be taken concurrently with ARCE 321 or ARCE 323.

**ARCE 323 Concrete Structural Systems (3)**

Concepts related to system behavior; selection; design and construction specific to concrete structures. Preliminary member design and detailing. Load flow implications related to building configurations; including vertical and lateral force resisting elements. Introduction to issues related to foundation design. For architecture and construction management students. 3 lectures. Prerequisite: ARCE 226. May not be taken concurrently with ARCE 321 or ARCE 322.

**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. 1 laboratory. Prerequisite: ARCE 222, CSC 231 or CSC 234 or approved equivalent. Concurrent: ARCE 223.

**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. 1 laboratory. Prerequisite: ARCE 222. Concurrent: ARCE 302.

**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. 1 laboratory. Prerequisite: ARCE 302. Concurrent: ARCE 306.

**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 and load flow. 3 laboratories. Prerequisite: ARCE 223 and ARCE 227. Co-requisite: ARCE 302.

**ARCE 372 Steel Structures Design Laboratory (3)**

Steel framed project incorporating structural system configuration and selection, structural analysis for gravity and lateral loads, and construction drawings and specifications. Integration of building services and architectural design, constructability issues, and relationships between construction methods and cost. 3 laboratories. Prerequisite: ARCH 231, ARCE 257, 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.

**ARCE 412 Dynamics of Framed Structures (3)**

Analysis of structures subjected to dynamic loads with single- and multi-degrees of freedom. Development of techniques for analysis of structures in response to seismic, wind, and moving loads. Solution of problems by digital computer. 3 lectures. Prerequisite: ARCE 225 or ME 212, MATH 244, CSC 342 and ARCE 306.

**ARCE 414 Precast Concrete (3)**

Precast and prestressed concrete principles, materials and techniques of construction. Design of basic precast elements and connections and prestressed concrete fundamentals as applied to precast concrete. Design potentials, aesthetics, cost and construction time as related to buildings and other structures. 3 laboratories. Prerequisite: ARCE 444.

**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.

**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, mat foundations, and combined footings. Pile foundations and sheet pile retaining structures. Deep foundation systems; piles and drilled piers. 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 302.

**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.

**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 yield line theory. 3 laboratories. Prerequisite: ARCE 444.

**ARCE 451 Timber and Masonry Structures Design Laboratory (3)**

Timber and masonry framed project incorporating structural system configuration and selection, structural analysis for gravity and lateral loads, and construction drawings and specifications. Integration of building services and architectural design, constructability issues, and relationships between construction methods and cost. 3 laboratories. Prerequisite: ARCH 231, ARCE 257, ARCE 302, ARCE 304, and ARCE 305.

**ARCE 452 Concrete Structures Design Laboratory (3)**

Cast in place concrete framed project incorporating structural system configuration and selection, structural analysis for gravity and lateral loads, and construction drawings and specifications. Integration of building services and architectural design, constructability issues, and relationships between construction methods and cost. 3 laboratories. Prerequisite: ARCH 231, ARCE 257, ARCE 444, and ARCE 372 or ARCE 451.

**ARCE 453 Senior Project Laboratory (3)**

Projects by individuals or teams under faculty supervision that go beyond topics covered in the ARCE curriculum. Projects may include analysis, design, experimental testing, research, or construction. Interdisciplinary projects encouraged. 3 laboratories. Prerequisite: ARCE 371, ARCE 451 or ARCE 452, ARCE 483.

**ARCE 460 Collaborative Design Laboratory (1)**

Investigation of the collaborative nature of the design process as it relates to the structural engineer and architect. Development of skills necessary to create a successful design team through the development of specific projects. Total credit limited to 2 units. 1 laboratory. Prerequisite: ARCE 371 and ARCE 372 or ARCE 451 or ARCE 452.

**ARCE 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: Consent of instructor.

**ARCE 471 Selected Advanced Laboratory (1-4)**

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 8 units. 1-4 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. 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 225 or ME 212, ARCE 372, ARCE 412, CSC 342.

**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. Credits to not count toward graduation in the ARCE Degree Program. Prerequisite: Sophomore standing and consent of department head.

**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. Credits to not count toward graduation in the ARCE Degree Program. 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 244, ARCE 306.

**ARCE 521 Architectural Structures (3)**

Static and dynamic loads, structural equilibrium and stability, structural configurations and systems, response to dynamic loads, behavior of structures. 2 seminars, 1 activity. Prerequisite: Graduate standing in Architecture.

**ARCE 522 Structural Systems (3)**

Exploration of the relationship between structural systems and architectural form. Understanding of structural stability and structural order is developed through construction of a series of small scale models. Historical perspectives are presented along with the effects of available materials and technology on structural possibilities. 3 seminars. Prerequisite: Graduate standing in Architecture.

**ARCE 523 Seismic Design for Architects (3)**

Introduction to the earthquake resistant design of buildings. Observed behavior of buildings during earthquakes. Recent developments of seismic design procedures, provisions, and building codes. Influence of architectural form on seismic response. 3 lectures. Prerequisite: Graduate standing in Architecture.

**ARCH-ARCHITECTURE****ARCH 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. Credit/No Credit grading only. This requirement may be replaced by a professional elective for upper division transfer students. 2 lectures.

**ARCH 106 Materials of Construction (3)**

Use and application of construction processes and materials. 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 121 Beginning Design and Drawing I (3)**

Principles, concepts, methods and skills pertaining to the freehand and drafted construction of drawings employing orthographic, axonometric, oblique, and lineal perspective drawings systems to visually represent ideas, objects and environments. Basic principles and concepts of two- and three-dimensional visual and architectural design. 3 laboratories.

**ARCH 122 Beginning Design and Drawing II (3)**

Continuation and development of content and issues introduced in ARCH 121, plus the principles, concepts, methods and skills pertaining to the freehand and drafted construction of shadows, physical model building, entourage and color theory. 3 laboratories. Prerequisite: ARCH 121.

**ARCH 123 Beginning Design and Drawing III (3)**

Continuation and development of content and issues introduced in ARCH 121 and ARCH 122, plus the principles, concepts, methods and skills pertaining to the freehand and visualization and communication of quantitative and qualitative information to support analyses and conceptualization. 3 laboratories. Prerequisite: ARCH 122.

**ARCH 131 Design and Visual Communication I (4)**

Principles, concepts, methods and skills pertaining to freehand, drafted and computer construction of drawings employing orthographic, axonometric, oblique, and lineal perspective drawings systems to representative ideas, objects and environments. Basic principles and concepts of two- and three-dimensional visual and architectural design. It is highly recommended that students purchase a computer, software and peripherals to participate in this course. 4 laboratories.

**ARCH 132 Design and Visual Communication II (4)**

Continuation and development of content and issues introduced in ARCH 131 plus the principles, concepts, methods and skills pertaining to freehand, drafted and computer construction of shadows, digital and physical model building, entourage and color theory. It is highly recommended that students purchase a computer, software and peripherals to participate in this course. 4 laboratories. Prerequisite: ARCH 131.

**ARCH 133 Design and Visual Communication III (4)**

Continuation and development of content and issues introduced in ARCH 131 and ARCH 132, plus the principles, concepts, methods and skills pertaining to freehand, drafted and computer visualization and communication of quantitative and qualitative information to support analysis and conceptualization. It is highly recommended that students purchase a computer, software and peripherals to participate in this course. 4 laboratories. Prerequisite: ARCH 132.

**ARCH 160 Digital Tools for Architecture (4)**

Substantive introduction to the use of digital tools in architectural design and visual communication in the areas of 3-D modeling, 2-D drawing, image editing and page layout. 4 seminars.

**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. Prerequisite: PHYS 131, PHYS 132 or PHYS 121, PHYS 122. Concurrent: ARCH 253.

**ARCH 217 History of World Architecture:****Prehistory – Middle Ages (4)****GE C3**

Architecture and urbanism in the ancient world, from prehistory to the Middle Ages. Social, cultural and physical conditions that influenced the built environment to the Mediterranean basis, plus Europe, Asia, Africa and Pre-Columbian America. 4 lectures.

**ARCH 218 History of World Architecture:****Middle Ages – 18th Century (4)****GE C3**

World architecture and urbanism from the Middle Ages until the end of the 18th century Baroque. Social, cultural and physical conditions which influenced the built environment of Europe, Asia, and the Pre-Columbian and Colonial Americas. 4 lectures.

**ARCH 219 History of World Architecture:****18th Century – Present (4)****GE C3**

Architecture and urbanism of the modern world, from the 18th century to the present. Social, cultural and physical conditions influencing the built environment of Europe, Asia, Africa and the Americas. 4 lectures.

**ARCH 221, 222 Architectural Design Fundamentals (3) (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, EDES 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 plus ARCH 122 or ARCH 132 or ARCH 111.

**ARCH 240 Additional Architectural Laboratory (1–2)**

Total credit limited to 4 units, with a maximum of 2 units per quarter. 1 or 2 laboratories.

**ARCH 250 Computer Applications (3)**

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. 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 123 or ARCH 133; prerequisite or concurrent: 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; prerequisite or concurrent: ARCH 160 or ARCH 133. Concurrent: ARCH 231.

**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. Concurrent: ARCH 207.

**ARCH 270 Selected Topics (1–4)**

Directed group study of selected topics. *Class Schedule* will list topic selected. Open to first-, second-, third-year students. Total credit limited to 8 units. 1 to 4 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. 2 lectures, 2 laboratories. Prerequisite: ARCH 207. Concurrent: 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 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)**

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 134.

**ARCH 320 History of Asian Architecture and the Built Environment (4) GE C4**

Architecture and the built environment of Asia from prehistory to the present. Major monuments, urbanism, and common building. Some important historical, geographic, religious and cultural factors that affected the shaping of the built environment. 4 lectures. Prerequisite: GE Area A1 and one of the following Area C3 courses: ARCH 217, 218, 219, or ART 112. Architecture majors will not receive GE C4 credit.

**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 121, ARCH 122, ARCH 123 or ARCH 131, ARCH 132, ARCH 133.

**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 121, ARCH 122, ARCH 123 or ARCH 131, ARCH 132, ARCH 133.

**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 121, ARCH 122, ARCH 123 or ARCH 131, ARCH 132, ARCH 133.

**ARCH 340 Architectural Photography (4)**

Photography specifically related to architecture and design. Advancement of students' technical skills in communicating design through the medium of photography. 2 lectures, 2 laboratories. Prerequisite: ARCH 337.

**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: Consent of instructor.

**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.-5 laboratories. Prerequisite: ARCE 226, ARCH 231, ARCH 253. Concurrent: 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. 5 laboratories. Prerequisite: ARCE 226, ARCH 231, ARCH 253. Concurrent: 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. 5 laboratories. Prerequisite: ARCE 226, ARCH 231, ARCH 253. Concurrent: ARCH 342.

**ARCH 363 Off-Campus Orientation Seminar (2) (CR/NC)**

Preparation for off-campus architectural study programs includes cultural orientation, an introduction to basic language skills, travel and housing protocols as well as academic and financial advising. Credit/No Credit grading only. Total credit limited to 4 units, with a maximum of 2 units per quarter. 2 seminars. Prerequisite: Consent of instructor.

**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. 2 lectures, 2 laboratories. Prerequisite: ARCH 307.

**ARCH 411 Climatic Determinants of Building Design (2)**

Influence of solar radiation and climatic conditions on siting and design of buildings. Architectural principles and energy conservation. 2 lectures. Prerequisite: ARCH 307, PHYS 132 or PHYS 122.

**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, Theory and Criticism (4)**

Special topics based on the exploration of specific approaches, periods of time, and cultural or geographic areas. *Class Schedule* will list topic selected. Total credit limited to 12 units; repeatable in same term. 4 seminars. Prerequisite: 4th year standing and ARCH 217, ARCH 218, and ARCH 219, or consent of instructor.

**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 342. Concurrent: 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: 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 134.

**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 (4) (Also listed as CRP 447)**

Practical application of fundamental zoning, subdivision, design/development standards, and building codes in the design review process, either in the form of a proposed development project or preparation of ordinances, codes, standards, and/or guidelines to apply to a project. 3 lectures, 1 activity. Prerequisite: Fourth year standing, or consent of instructor.

**ARCH 450 Digital Design and Visualization (5)**

Theory, principles and techniques of computer aided architectural or product design, visualization, and digital animation. Utilization of desktop computers and 2-D and 3-D software as integrated tools for development of a comprehensive computer enhanced design process. 5 laboratories. Prerequisite: For architecture majors, all prerequisites required by the year and course level for which the student is seeking credit; for non-architecture majors, junior standing or permission of instructor; for local professionals not seeking academic credit, permission of instructor.

**ARCH 451 Architectural Design (5)**

Continuation of ARCH 351, 352, 353. Problems of increasing architectural complexity involving the comprehensive integration of architectural theory, design processes, and building systems with emphasis placed on multifunction singular buildings. 5 laboratories. Prerequisite: ARCH 307, ARCH 341, ARCH 342, ARCH 351, ARCH 352, ARCH 353, ARCE 321, ARCE 322, ARCE 323.

**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 multibuilding, multifunctional projects. 5 laboratories. Prerequisite: ARCH 407 and ARCH 451. Concurrent: 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. 5 laboratories. Prerequisite: ARCH 441 and ARCH 452. Concurrent: 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 457 Computer Graphics in Architecture (4)**

Two-dimensional drawing systems in architectural practice with particular emphasis on office productivity in the production side of the design process; includes drawing database administration, local area networks, management and cost issues. 2 lectures, 2 laboratories. Prerequisite: Fourth year standing.

**ARCH 460 Advanced Computer Graphics in Architecture (3)**

Advanced methods in the application of computer graphics and multimedia techniques in architectural design. 2 lectures, 1 activity. Prerequisite: ARCH 133 or ARCH 160 or 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. 2 lectures, 1 activity. Prerequisite: ARCH 457 or equivalent and consent of instructor.

**ARCH 462 Topics in Architectural Practice (2)**

Directed group study of selected subtitles addressing various aspects of Architectural Practice for advanced students in CAED. Topics may include strategic planning, managing quality, ethics, portfolio preparation, and legal considerations. Open to undergraduate and graduate students. *Class Schedule* will list subtitle selected. Total credit limited to 6 units. 2 activities. Prerequisite: Consent of instructor.

**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. Total credit limited to 6 units. 2 seminars. Prerequisite: Fourth-year standing in architecture. Credit/No Credit grading only.

**ARCH 464 Computer Applications in Design (3)**

Exposure to all aspects of two-dimensional computer-aided design. Introduction to three-dimensional CAD through the use of AUTOCAD 12 software. *Class Schedule* will list topic selected. Total credit limited to 12 units. 3 lectures. Prerequisite: Junior standing and current participation in Washington Alexandria Architectural Consortium off-campus program.

**ARCH 465 Design Related Media (3)**

The role of various media of visual communication as tools of documentation, analysis and creation in the design visual environment. Skills in graphics, photography, product design, film, video techniques, and printmaking graphics will be developed in specific relation to environmental design study and presentation. *Class Schedule* will list topic selected. Total credit limited to 12 units. 3 lectures. Prerequisite: Junior standing and current participation in Washington Alexandria Architectural Consortium off-campus program.

**ARCH 466 Topics in Architectural History and Theory (3)**

Design from its beginning with the crafts design period to its expression of industrial design in its present form. Various stages in the evolution of design explored through analyzing the influences and contributions of leading artists. *Class Schedule* will list topic selected. Total credit limited to 12 units. 3 lectures. Prerequisite: Junior standing and current participation in Washington Alexandria Architectural Consortium off-campus program.

**ARCH 467 Undergraduate Research (3)**

Architecture and urban theoretical intentions and results in the context of the Capitol of the United States – Washington, DC. This theoretical and historical study will not occur within the confines of the classroom, but directly within the "laboratory" of the city. *Class Schedule* will list topic selected. Total credit limited to 12 units. 3 lectures. Prerequisite: Junior

standing and current participation in Washington Alexandria Architectural Consortium off-campus program.

#### **ARCH 468 Advanced Environmental Building Systems (3)**

Technologies which provide a "well building" environment by engaging in: weather protection; thermal/moisture control; natural and artificial lighting; and electrical and other "energy source" utility service. 3 lectures. Prerequisite: Junior standing and current participation in Washington Alexandria Consortium off-campus program.

#### **ARCH 469 Topics in Design Methods (3)**

Relationship of art and architecture addressed to encourage critical debate. Historically, the "art" and the "architecture" were not as polarized as today. Both historical perspective and practical issues concerning collaboration. *Class Schedule* will list topic selected. Total credit limited to 12 units. 3 lectures. Prerequisite: Junior standing and current participation in the Washington Alexandria Architectural Consortium off-campus program.

#### **ARCH 470 Selected Advanced Topics (1-4)**

Directed group study of selected topics for advanced students. *Class Schedule* will list topic selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

#### **ARCH 471 Selected Advanced Laboratory (1-4)**

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 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

#### **ARCH 472 Housing Design Concepts (3)**

For students preparing for further study or practice relating to housing, urban design and new communities. This course will address design objectives, concepts, and current theories and forms in housing and mixed-use projects. 3 activities. Prerequisite: Third-year standing or consent of instructor.

#### **ARCH 474 Collaborative Studio: Rendering, Animation and Modeling (4) (Also listed as ART 474/LA 474)**

A collaborative visualization and design studio focusing on rendering, animation and modeling. Modeling and animation software for design conceptualization and expression. Collaboration in teams with students from the College of Architecture and Environmental Design and the Art and Design Department. Total credit limited to 8 units. 2 lectures, 2 activities. Prerequisite: ART 335 or ARCH 350 or LA 310, ARCH 460 or 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 College of Liberal Arts. Total credit limited to 36 units. Prerequisite: Junior standing.

#### **ARCH 481 Senior Architectural Design 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. 5 laboratories. Prerequisite: ARCH 407, ARCH 441, ARCH 442, ARCH 451, ARCH 452, ARCH 453 and 5th-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 492 Senior Design Thesis (3)**

Development of the framework and format of a thesis project proposal related to the specific design option. Work to include: research topic, intent, scope, methodology, assumptions, outline of work program and documentation. To be taken concurrently with first quarter of ARCH 481. 3 seminars. Prerequisite: 5th year standing or consent of instructor.

#### **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 judgment 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 521 Graduate Architectural Design 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. 5 laboratories. Prerequisite: ARCH 407, ARCH 441, ARCH 442, ARCH 451, ARCH 452, ARCH 453 and 5th-year 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: ARCH 453.

#### **ARCH 537 Principles of Development (3)**

Theory and application of the architect's role in real estate development. Topics include financing, corporate structuring, feasibilities, market

studies, and proposal presentation. Emphasis on the influence of design on the success of the development process. 3 seminars. Prerequisite: Graduate standing in Architecture, or consent of instructor.

#### **ARCH 551 Architectural Design (5)**

Professional initiative and responsibility in integrating architectural design theory and practice with fields influencing the total environment. Building types considered as the coordinating factor. Total credit limited to 15 units with no more than 5 units in any one quarter. 5 laboratories. Prerequisite: Graduate standing.

#### **ARCH 561 Advanced Design (3)**

Continuation of ARCH 551. Advanced studies integrating architectural design theory and practice with fields influencing the shaping of the total environment. Total credit limited to 9 units. 3 laboratories. Prerequisite: Graduate standing.

#### **ARCH 563 Professional Seminar (2)**

Problems and topics in the field of the architectural profession. Seminar drawn upon expertise of visiting professionals in addition to topics presented by regular faculty and students. 2 seminars. Prerequisite: Graduate standing.

#### **ARCH 580 Seminar in Theory of Architecture (3)**

Directed group study of selected topics in the theory of architecture for graduate students. *Class Schedule* will list specific topics selected. Total credit limited to 9 units. 3 seminars. Prerequisite: ARCH 453.

#### **ARCH 592 Graduate Design Thesis (3)**

Development of the framework and format of a thesis project proposal related to the specific design option. Work to include: research topic, intent, scope, methodology, assumptions, outline of work program and documentation. To be taken concurrently with first quarter of ARCH 521. 3 seminars. Prerequisite: 5th year standing or consent of instructor.

#### **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 advisor.

#### **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 advisor.

## **ART**

#### **ART 101 Fundamentals of Drawing (4) GE C3**

Introduction to the artistic practice and cultural value of drawing from the Renaissance to the 21<sup>st</sup> Century. Emphasis and expansion of the practical skills of observation, rendering, and understanding the signs of meaning produced in visual art. Development of formal techniques, media experimentation, and content creation through personal expression. Exercises to encourage growth in technical skill, conceptual innovation, critical thinking, and visual communication. 1 lecture, 3 activities.

#### **ART 111 Introduction to Art (4) GE C3**

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 (4) GE C3**

History of major art movements in western civilization from ancient art to the twentieth century. Representative periods of western culture, such as the ancient world, the Middle Ages, the Renaissance, and the modern world. 4 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. 1 lecture, 2 laboratories.

#### **ART 148 Sculpture (4)**

**GE C3**

Exploration of three dimensional form through problems in modeling, casting, carving, and techniques of assembly. Historical and contemporary concepts as applied to the discipline of sculptural styles. 1 lecture, 3 activities.

#### **ART 181 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. 2 lectures, 1 laboratory. Prerequisite: ART 133 and CSC 113 or consent of the 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 203 Art Theory and Practice (3)**

Contemporary issues in art and design, linking "ideas" in art theory to problem-solving. Emphasis on creative expression through knowledge of contemporary thinking, aesthetics, techniques, and vocabulary. 1 lecture, 2 activities. Prerequisite: ART 101 and ART 148.

#### **ART 209 Beginning Painting (3)**

Introduction to technical and formal problems in painting. Physical characteristics of paint, various tools and substrates. Projects emphasize creative understanding of pictorial space, color and concept. 3 activities. Prerequisite: ART 101 and ART 132 or consent of instructor.

#### **ART 211 Art History--Ancient to Renaissance (4)**

Development of art from antiquity to the early stages of the Renaissance in Europe. Particular emphasis on European art with appropriate references to sources from antiquity which have been particularly influential on European painting and sculpture. 4 lectures.

#### **ART 212 Art History--Renaissance through Baroque Eras (4)**

The significant visual expressions of Northern and Southern European art of the Renaissance and Baroque period. Relevant parallel examples of the art of non-European cultures. 4 lectures.

#### **ART 221 Basic B/W Photography (3)**

Fundamental techniques in black and white photography. Mechanics of cameras and equipment, optics, composition, filters, subject content, developing, printing, and mounting. Understanding photographic principles, producing a quality continuous tone print, and print presentation. 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 or equivalent.

**ART 224 Introduction to Artificial Lighting for Photography (3)**

Tungsten and electronic strobe studio lights are used to introduce the student to contemporary professional studio photography. Quality developing and printing skills required. Introduction to current examples of professional studio lighting. Emphasizes photographic communication and expression of ideas through an understanding of controlled lighting. Color transparency materials are introduced in the studio environment. 2 lectures, 1 laboratory. Prerequisite: ART 222.

**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 181.

**ART 240 Introduction to Glassblowing (4)**

Survey of history of glass and introduction to contemporary glass art, presented through visual examples in slide/lecture format. Development of tools and forming processes introduced while student develops 3-dimensional projects. 3 lectures, 1 activity. Prerequisite: ART 101, ART 148 or ART 203.

**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. 1 lecture, 2 laboratories.

**ART 248 Intermediate Sculpture (3)**

Intermediate sculpture course in expressive use of form with modeling, casting, carving, and/or assembly. 3 activities. Prerequisite: ART 148.

**ART 255 Jewelry Design (3)**

Studio course in nonferrous metal techniques including cutting, forming, soldering, and forging with emphasis on creative design solutions. 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 309 Intermediate Painting (3)**

Continuation of study of technical and formal problems in painting. Expanded study of physical characteristics of paint, tools, and substrates. Emphasis on the creative process from concept to finished art. Contemporary issues in painting introduced. *Class Schedule* will list topic selected. Total credit limited to 9 units. 3 activities. Prerequisite: ART 209, 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 that have shaped images in American art. 4 lectures. Prerequisite: ART 111, ART 213, or consent of instructor.

**ART 311 Art History—Nineteenth Century Art (4)**

History of painting and sculpture from the French Revolution to the beginning of the 20th century. Significant movements such as Neo-Classicism, Romanticism, Realism, Impressionism and Post-Impressionism. 4 lectures. Prerequisite: One lower division Art History course, or consent of instructor.

**ART 312 Art History—Twentieth Century Art (4)**

History of major art movements from the beginning of the twentieth century to the present. Major emphasis will be placed on Fauvism, Expressionism, Dada, Surrealism, and the period of Post-World War II art

in Europe and the United States. 4 lectures. Prerequisite: ART 211 or ART 212 or consent of instructor.

**ART 313 Design History (4)**

Survey of graphic and product design from the Vienna Secession to the present, including the Russian avant-garde, art deco, streamlining, and development of Modernism. 4 lectures. Prerequisite: Any lower division art history course.

**ART 314 History of Photography (4)****GE C4**

In-depth survey of the artistic and cultural achievements in photography from its invention to the present day. Significant photographers, the evolution of aesthetic criteria in the context of other visual arts as well as social/cultural impact. 4 lectures. Prerequisite: Completion of GE Areas A and C3. Art and Design majors will not receive GE C4 credit.

**ART 316 Women as Subject and Object in Art History (4)**  
**(Also listed as WS 316)**

Exploration of the role of women in the visual arts. Women as artists, women as portrayed in art, and feminist theory as it applies to the study of the visual arts and art history. 4 lectures. Prerequisite: ART 111, ART 112 or consent of instructor.

**ART 317 Asian Art Survey (4)**

Survey of the traditional arts of Asia – primarily India, China and Japan. Emphasis on the connections between the visual arts in Asia and the philosophical, social and cultural environments in which they arose. 4 lectures. Prerequisite: ART 111 or ART 112, or ART 211, or consent of instructor.

**ART 318 Asian Art Topics: National, Religious, and Intellectual Movements (4)****GE C4**

In-depth examination of significant art movements in Asia. Each topic will focus on the development of art in Asia within the context of a specific geographical or theoretical framework. Details will vary depending on topic. *Class Schedule* will list topic selected. Total credit limited to 12 units. 4 lectures. Prerequisite: Completion of GE Areas A and C3. Art and Design majors will not receive GE C4 credit.

**ART 322 Color Photography (3)**

Fundamental techniques in color photography. Theory of color, visual concepts, exposing color transparencies and negatives, printing from color negatives, finishing and presentation. Studio electronic flash and available light. 2 lectures, 1 laboratory. Prerequisite: ART 222.

**ART 323 Introduction to Digital Image Making (3)**

Digital modification of color photography using transparency materials. Development of consistent control of 35mm color transparency films. Digital photographic vocabulary as well as theory of color in expression and communication. Survey of contemporary color photography and digital image making. 2 lectures, 1 laboratory. Prerequisite: ART 181, ART 222 or consent of instructor.

**ART 324 Photographic Expression (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 325 4x5 Camera Techniques (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 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 required for appropriate problems. 3 activities. Prerequisite: Junior standing. ART 133, ART 181, or consent of instructor.

### **ART 332 Symbolism (3)**

Use of symbolism and metaphor in graphic design. Communication of complex or abstract concepts with connotative/denotative imagery. Development of ideas from research, reference materials, and the imagination. Computer applications are required for appropriate problems. 3 activities. Prerequisite: ART 133, ART 331, junior standing.

### **ART 333 Corporate Identity (3)**

Design and implementation of corporate logos. Development of a graphic standards manual for use of identity in diverse applications. For Art and Design majors only. Computer applications are required for appropriate problems. 3 activities. Prerequisite: ART 134, ART 332, junior standing.

### **ART 335 Digital 3D Modeling and Design (4)**

Development of skills and techniques in the use of three-dimensional design and modeling via digital technology. Capabilities of current software in the design and modeling of three-dimensional form. 2 lectures, 2 activities. Prerequisite: ART 134 and ART 181, or consent of instructor.

### **ART 336 Exhibition Design/Museum Studies (3)**

Theory and applied principles of exhibition design for art objects in the museum or gallery setting. Class responsible for planning and installing actual gallery exhibitions. Total credit limited to 9 units. 2 lectures, 1 laboratory. Prerequisite: ART 148, ART 134, or consent of instructor.

### **ART 340 Glass Fusing and Forming (4)**

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. Total credit limited to 8 units. 1 lecture, 3 activities. Prerequisite: ART 148 or ART 240 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. Total credit limited to 6 units. 3 activities. Prerequisite: ART 148, 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. Total credit limited to 9 units. 1 lecture, 2 activities. Prerequisite: ART 148, or ART 134, or ART 245 or consent of instructor.

### **ART 353 Intermedia/Art (4)**

Studio course emphasizing individual and collaborative creative exploration with project content derived from student's experience. Focus on using traditional as well as new genres of artistic expression such as site specific installations, video art, book works, and performance art. *Class Schedule* will list topic selected. Total credit limited to 8 units. 1 lecture, 3 activities. Prerequisite: ART 101, ART 131, and ART 148.

### **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. Total credit limited to 9 units. 3 activities. Prerequisite: ART 148 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. Total credit limited to 9 units. 3 activities. Prerequisite: ART 148 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 402 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. Total credit limited to 6 units. 3 activities. Prerequisite: ART 302.

### **ART 406 Advanced Selected Topics in 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. *Class Schedule* will list topic selected. Total credit limited to 9 units. 3 activities. Prerequisite: ART 302, ART 304.

### **ART 409 Advanced Painting (3)**

Advanced problems in painting. Emphasis on the creative process from concept to finished art. Investigation of traditional, non-traditional and explorative work. to encourage development of personal approach. *Class Schedule* will list topic selected. Total credit limited to 9 units. 3 activities. Prerequisite: ART 309, or consent of instructor.

### **ART 427 Illustration Photography (3)**

Applied principles of design and color to produce a photograph that sells an idea, product, or service. Both traditional and digital applications used. Joint projects with ART 432, Advertising Design. Emphasis on thinking, planning, interpreting, and presenting an idea photographically. 2 lectures, 1 laboratory. Prerequisite: ART 326 and senior standing.

### **ART 428 Portfolio Production Photography (1)**

Physical production of final portfolio for the graduating senior in photography concentration. 1 laboratory. Prerequisite: ART 427 and senior standing; concurrent enrollment in ART 462 required.

### **ART 430 Advanced Typographic Design (3)**

Advanced principles of letterform design and modification related to the communication of ideas. Continuation of analysis of type characteristics. Emphasis on computer application to the typographic design processes. 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 Art and Design majors only. Computer applications are required for appropriate problems. 3 activities. Prerequisite: ART 232, ART 333 and senior standing.

### **ART 432 Advertising Design (3)**

Development of print advertising from concept to final presentation. Emphasis on art direction, photo direction and copywriting. For Art and Design majors only. Computer applications are required 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 Art and Design majors only. Computer applications are required for appropriate problems. 3 activities. Prerequisite: ART 431 and senior standing.

**ART 435 Illustration (3)**

Development of concept and illustration techniques for use in graphic design and advertising. Total credit limited to 6 units. For Art and Design majors only. 3 activities. Prerequisite: ART 209, ART 302, ART 333.

**ART 440 Advanced Selected Topics in Glass (4)**

Continued exploration into the expressive use of glass as a creative medium. Topics may include glass casting, glass blowing, mold making, and kiln work. Total credit limited to 12 units. 2 lectures, 2 activities. Prerequisite: ART 240 or ART 340, or consent of instructor.

**ART 448 Advanced Topics in Sculpture (3)**

Studio course specializing in three dimensional form. Materials include clay, plaster, metal, or wood. Course content will be selected from various topics that are representational, abstraction, non-objective, or conceptual. *Class Schedule* will list topic selected. Total credit limited to 9 units; may be in same term. 3 activities. Prerequisite: ART 248 and one of the following: ART 302 or ART 404.

**ART 460 Professional Practices (2)**

Professional practices in the art, photography, and design fields, including legal and ethical issues, taxes, contracts, fees and copyrights. Current job opportunities are researched and a business plan is prepared. Course lectures augmented by visiting professionals. For Art and Design majors only. 2 lectures. Prerequisite: Senior standing.

**ART 461 Senior Project (2)**

Selection and completion of a project under faculty super-vision. Minimum of 90 hours time. Results presented in a formal report. Prerequisite: Senior standing and ART 460.

**ART 462 Senior Portfolio Project (2)**

Preparation of portfolio system for entrance into the professional job market or graduate school. 2 activities. 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 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 (1-4)**

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.

**ART 471 Selected Advanced Laboratory (1-4)**

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 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

**ART 474 Collaborative Studio: Rendering, Animation and Modeling (4) (Also listed as ARCH 474/ LA 474)**

A collaborative visualization and design studio focusing on rendering, animation and modeling. Modeling and animation software for design conceptualization and expression. Collaboration in teams with students from the Art and Design Department and the College of Architecture and Environmental Design. Total credit limited to 8 units. 2 lectures, 2

activities. Prerequisite: ART 335 or ARCH 350 or LA 310, ARCH 460 or consent of instructor.

**ART 483 Video and Multimedia Production (4)**

Video and computer generated multimedia presentation scripting, editing, storyboarding and sound cutting. Emphasis on effective communication using presentation techniques and application software to create high impact applications. 2 lectures, 2 laboratories. Prerequisite: ART 181.

**ART 484 Animation and Interactive Design (3)**

Creation of in-depth animations and interactive presentations. Advanced scripting, storyboarding and interactive communication techniques. 2 lectures, 1 laboratory. Prerequisite: ART 181.

**ART 486 Advanced Digital Image Making (3)**

Expressive possibilities of latest image manipulation software. Advanced capabilities of this software explored with focus on development of conceptual and expressive abilities in the digital medium. Art and Design majors only. 2 lectures, 1 laboratory. Prerequisite: ART 181 or ART 323 and senior standing.

**ART 487 Web Design (3)**

Planning and implementation of web sites. Focus on site structure, navigation, HTML, animation, and design considerations. Art and Design majors only. 2 lectures, 1 laboratory. Prerequisite: ART 181 or ART 323 and senior standing.

**ART 488 Advanced Web Design (4)**

Conceptual and technical objectives: the development of the theoretical skills necessary to design a successful web user interface, information architecture and visual identity for digital projects, and the development of technical skills necessary to design advanced interactivity with Macromedia Flash and JavaScript. 2 lectures, 2 laboratories. Prerequisite: Art and Design majors only, ART 484, ART 487 and senior standing.

**ART 494 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 102 Principles of Animal Science (4)**

Economic and environmental roles of animal production and companionship to society. Introductory nutrition, genetics, reproduction, behavior, growth and development, animal products, biosecurity, and food processing and safety of animals. 4 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 instructor.

**ASCI 209 Animal Food Products (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 ASCI 211. 2 lectures, 1 laboratory.

**ASCI 211 Meats (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 ASCI 209. 2 lectures, 1 laboratory.

**ASCI 212 Livestock Show Management (3)**

Application of the management and operations of Cal Poly's Western Bonanza Livestock Show. Principles and procedures in planning, organizing, financing, promoting and managing a major livestock show and the fair industry. Total credit limited to 6 units. 1 lecture, 2 activities.

**ASCI 214 Equine Management (2)**

Application of safety, risk reduction, horsemanship skills. Develop a working equine/human relationship. Selection and application of nutrition, equipment, preventive health and farrier program, and equitation skills. 2 laboratories. Prerequisite: Consent of instructor.

**ASCI 216 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: ASCI 211.

**ASCI 220 Introductory Animal Nutrition and Feeding (4)**

Nutrient digestion and absorption; basic functions of major nutrient classes; NRC feed classification and feedstuff characteristics; Van Soest system of fiber analysis and practical applications; feed processing; effects on feeds and nutrient availability; nutrient requirements of animals; diet formulation techniques. 3 lectures, 1 laboratory.

**ASCI 221 Introduction to Beef Production (4)**

Survey of industry characteristics, breeds, market classes, production systems, and current issues facing the beef industry. 3 lectures, 1 laboratory. Prerequisite: ASCI 102 or ASCI 231.

**ASCI 222 Systems of Swine Production (4)**

Structure of the pork industry in the U.S.; production standards and new technologies; breed systems. Market classification, product quality and quality assurance. Swine behavior and husbandry systems; biosecurity, health and feeding systems and management. 3 lectures, 1 laboratory. Prerequisite: ASCI 102 or ASCI 231.

**ASCI 223 Systems of Sheep Management (4)**

Sheep industry overview, populations, trends, cultural implications, breed identification, nutritional, reproductive, health, and marketing management of sheep. 3 lectures, 1 laboratory. Prerequisite: ASCI 102 or ASCI 231.

**ASCI 224 Equine Science (4)**

History, status of the horse industry, breeds. Application of management skills, safety, conformation evaluation, hoof and leg conformation and care. Understanding equine behavior. Insurance and tax ramifications. Pedigree analysis. Alternate therapies. 3 lectures, 1 laboratory. Prerequisite: ASCI 102 or ASCI 231.

**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 232 General Animal Science Laboratory (1)**

Basic handling skills of livestock; introductory selection of livestock; basic feedstuff identification and processing; and health care practices. 1 laboratory.

**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 302 or BIO 303.

**ASCI 311 Advanced Beef Cattle System Management (4)**

Management principles for the sustainability of commercial beef cattle operations. Systems approach for goal setting, financial analysis, range management, breeding systems, nutrition, health programs, marketing, and production practices to enhance profitability of commercial cow-calf operations. 3 lectures, 1 laboratory. Prerequisite: ASCI 221 or consent of instructor.

**ASCI 315 Equine Biomechanics (4)**

Anatomy and physiology of the equine hoof and limb. An understanding of the art and science of the farrier's work. Evaluation of proper hoof care, trimming, and shoeing. Foot and leg conformation as it relates to sound locomotion. 3 lectures, 1 activity. Prerequisite: ASCI 224 or equivalent. Recommended: VS 223.

**ASCI 320 Physiological Chemistry of Animals (4)**

Interactions between the biological and chemical reactions in livestock. Physiology explained at the organ, tissue and cellular level as it relates to the whole animal system. 4 lectures. Prerequisite: BIO 111 or BIO 151, CHEM 312 or CHEM 316, VS 223.

**ASCI 324 Advanced Equine Evaluation (2)**

Appraising the relative merit of individual horses in halter and performance through the application, development and refinement of deductive and inductive logical processes. Oral and written expression of the selection rationale. 2 laboratories. Prerequisites: ASCI 226 and/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 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. 4 lectures, 1 laboratory. Prerequisite: ASCI 224.

**ASCI 339 Internship in Animal Science (1–12) (CR/NC)**

Selected Animal Science 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. Degree credit limited to 6 units. Credit/No Credit grading only. Prerequisite: Consent of internship instructor.

**ASCI 340 Computer Applications in Ration Formulation (2)**

Development of nutritionally balanced rations for livestock. Balancing of rations using Pearson Square, algebraic methods, linear programming methods, and commercial software. 2 activities. Prerequisites: ASCI 220 or DSCI 101, CSC 110 or consent of instructor.

**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 activities. Prerequisites: ASCI 214, or consent of instructor.

**ASCI 345 Equine Behavior Modification (5)**

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 different stimuli, management of young equine athlete. 5 activities. Prerequisite: ASCI 344 or consent of instructor.

**ASCI 346 Equine Nutrition (3)**

Equine digestion, diet development considerations and evaluations, nutritional management, and the relationship of respective topics to recommended feeding practices, research data, and nutritional portfolios. Information is based on recent advances in horse nutrition and the National Research Council's Nutrient Requirements for Horses. A distance learning course. 3 lectures. Prerequisite: ASCI 224 and ASCI 220.

**ASCI 347 Equine Exercise Physiology (3)**

Applied physiology of the exercising horse. Examine different physiological systems: muscular, cardiovascular, respiratory, and nutritional. Gait analysis, lameness, and treatment. The athletic horse: sports medicine, conditioning, drugs, and necropsy evaluation. A distance learning course. 3 lectures. Prerequisite: ASCI 224 and any human/animal physiology class.

**ASCI 350 Applied Nonruminant Nutrition (4)**

Comparison of nonruminant and ruminant digestive systems, nutrient requirements, risk management for ingredients, formulation and nutritional management. Influence of growth and production curves, consumption patterns, and feeding management in commercial poultry and swine industries. Feed manufacturing and governmental regulations. 3 lectures, 1 laboratory. Prerequisite: ASCI 220 or DSCI 101.

**ASCI 351 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 223.

**ASCI 355 Ruminant Nutrition (4)**

Digestive physiology and nutrition of ruminants. Anatomy and physiology of the digestive tract. Rumen microbial fermentation. Nitrogen utilization

and metabolism. Energy partitioning. Net energy system. Range livestock and feedlot nutrition. Supplementation. Common metabolic and nutritional dysfunctions. Diet formulation. 3 lectures, 1 laboratory. Prerequisite: ASCI 220 and ASCI 320 or CHEM 313 or CHEM 371.

**ASCI 384 Processed Meat Products (4)**

Physical, chemical and functional characteristics of meat food raw materials. Science and technology of value-added processing including curing, sausage manufacture, low moisture products, and restructuring. Quality assurance and related current industry topics. 3 lectures, 1 laboratory. Prerequisite: ASCI 209 or ASCI 211, junior standing.

**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: consent of instructor.

**ASCI 403 Applied Biotechnology in Animal Science (5)**

Biotechnology and its role in animal science. Applied techniques in gene identification, purification and amplification. 3 lectures, 2 laboratories. Prerequisite: BIO 151, BIO 153.

**ASCI 405 Domestic Livestock Endocrinology (4)**

Endocrine system and its role in the homeostasis of the animal. Use of hormones in increasing productivity of domestic animals. Endocrinology of reproduction, growth, metabolism and immunology. Discussions of cost-benefit relationships in the use of hormones. 4 lectures. Prerequisite: VS 223, ASCI 220.

**ASCI 406 Applied Animal Embryology (5)**

Technology of promoting oocyte development, fertilization, culturing, cryopreservation and micromanipulation of embryos. Mouse, cattle and horse embryos used for learning the techniques involved in embryology. 3 lectures, 2 laboratories. Prerequisite: VS 223, ASCI 351 recommended

**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 351, VS 223 and senior standing.

**ASCI 415 HACCP for Meat and Poultry Operations (3)**

Using Hazard Analysis and Critical Control Point (HACCP) principles to develop regulatory inspection plans for meat and poultry operations; development and use of prerequisite programs; microbiological and process overviews. 3 lectures. Prerequisite: ASCI 209 or ASCI 211; ASCI 384 or PM 320, or consent of instructor.

**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 212/312 (or CHEM 216/316 and CHEM 217/317).

**ASCI 450 Computer Applications in Animal Science: Spreadsheet Analysis (4)**

Development of spreadsheets relating to livestock production. Integration of database and analytical techniques. Cost-benefit analyses of livestock production systems. 2 lectures, 2 activities. Prerequisite: AG 250, CSC 110, or consent of instructor.

**ASCI 461 Senior Project (2)**

Selection of a project and an ASCI 462 advisor, 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. 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. Prerequisite: Senior standing.

**ASCI 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.

**ASCI 471 Selected Advanced Laboratory (1–4)**

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 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

**ASCI 476 Issues in Animal Agriculture (3)**

Exploration of social, political and environmental forces which will affect livestock production in the future. Roles played by advocacy groups and the media in influencing consumer demands and management practices. 3 seminars. Prerequisite: Upper division standing.

**ASCI 485 Cooperative Education Experience in Animal Science (6) (CR/NC)**

Part-time work experience with an approved Animal Science firm engaged in production or related business, industry or governmental agency. 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. Degree credit limited to 6 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

**ASCI 490 Advanced Livestock Management Enterprise (2–4) (CR/NC)**

Intensified management of specialized livestock enterprises in all species areas. Application of applied research and progressive husbandry practices employed. Industry contact and visitation encouraged. Specified class prerequisites and consent of instructor required. Total degree credit for 290/490 limited to 9 units. Credit/No Credit grading only. Prerequisite: Specified classes and consent of instructor.

**ASCI 495 Cooperative Education Experience in Animal Science (12) (CR/NC)**

Full time work experience with an approved Animal Science firm engaged in production or related business, industry or governmental agency. 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. Degree credit limited to 6 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

**ASCI 500 Individual Study in Animal Science (1–6)**

Advanced independent study planned and completed under the direction of a member of the Animal Science faculty. Total credit limited to 6 units. Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

**ASCI 570 Selected Topics in Animal Science (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 12 units. 1 to 4 seminars. Prerequisite: Graduate standing or consent of instructor.

**ASCI 581 Graduate Seminar in Animal Production (3)**

Current findings and research problems in the field and their application to the industry. 3 seminars.

**ASTR–ASTRONOMY AND ASTROPHYSICS****ASTR 101 Introduction to the Solar System (4)****GE B3**

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, ASTR 302, or PHYS 132. 4 lectures.

**ASTR 102 Introduction to the Stars and Galaxies (4)****GE B3**

Descriptive astronomical properties of the Sun, stars, galaxies and interstellar material. Expanding universe and cosmological models. Opportunities for telescope observations of the stars and constellation identification. Not open to students who have completed or are taking ASTR 301, ASTR 302, or PHYS 132. ASTR 101 is not a prerequisite. 4 lectures.

**ASTR 301 The Solar System (3)**

Quantitative and descriptive properties of the Solar System including the physics of the planets, their satellites, comets and interplanetary media. Possible origins of the Solar System. Not open to students who have completed ASTR 101. 3 lectures. Prerequisite: PHYS 132 or PHYS 123.

**ASTR 302 Stars and Galaxies (3)**

Quantitative and descriptive properties of the stars, galaxies and interstellar media; including stellar structure and evolution, structure and make-up of galaxies and cosmological models. Not open to students who have completed ASTR 102. 3 lectures. Prerequisite: PHYS 132 or PHYS 123. ASTR 301 is not a prerequisite.

**ASTR 326 Relativity and Cosmology (3)**

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.

**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 111 General Biology (4)****GE B2 & B4**

Principles of cellular biology, heredity, ecology, biological diversity, and evolution, with emphasis on their relationships to human affairs. A Saturday field trip may be required. Not open to students who have completed BIO 115, BIO 151, or BOT 121. 3 lectures, 1 laboratory.

**BIO 112 Environmental Biology and Conservation (4)****GE B5**

A biologically centered exploration of our planet focusing on natural resource conservation and contemporary environmental issues. Interactions between components of the biosphere and impacts of human society on interrelationships within ecosystems. Trends in natural resource conservation and biodiversity preservation. 4 lectures.

**BIO 113 Animal Diversity and Ecology (4)****GE B2 & B4**

Animal diversity and ecology in aquatic and terrestrial communities including structural and functional adaptations of animals to their environment. Identification of common invertebrate and vertebrate animals. Field experience in local ecosystems. Saturday field trips. 2 lectures, 2 laboratories.

**BIO 114 Plant Diversity and Ecology (4)****GE B2 & B4**

Plant diversity and ecology in aquatic and terrestrial plant communities including adaptations of plants to their environment. Identification of common, local native plants and plant communities, uses of native plants

by Native Americans, and human impacts on native plant communities. Saturday field trips. 2 lectures, 2 laboratories.

**BIO 115 Animal/Human Structure and Function (4) GE B2 & B4**

Survey of the structure and function of animal cells, tissues, organs, and organ systems, with examples drawn from vertebrates and invertebrates; emphasis will be on vertebrates, especially the human. Not open to students who have completed BIO 153. 3 lectures, 1 laboratory. Recommended prerequisite: a course in chemistry.

**BIO 151 Introduction to Biology (5) GE B2 & B4**

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)**

Structure, ecology, reproduction, and evolution of fungi, cyanobacteria, algae, and plants. 3 lectures, 2 laboratories. Prerequisite: BIO 151.

**BIO 153 Biology of Animals (5)**

Survey of the protist and animal kingdoms; fundamentals of animal form and function. 3 lectures, 2 laboratories. Prerequisite: BIO 151.

**BIO 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies or surveys of selected problems. Intended for lower division students in the Biological Sciences Department. Total credit limited to 4 units, with a maximum of 2 units per quarter. Credit does not apply to any concentration in the Biological Sciences Department. 1-2 laboratories. Prerequisite: Consent of department chair.

**BIO 207 Resource Survey (3)**

Introduction to survey and analysis methods used in locating and assessing biological resources. Map reading, compass and level surveys, map construction, descriptive statistics, and animal, plant, and social surveys. 2 lectures, 1 laboratory. Prerequisite: MATH 120.

**BIO 213 Life Science for Engineers (2) GE B2**

Fundamentals of life sciences: energetics, cell biology, molecular and classical genetics, microbiology, organismal biology, and ecology. For engineering students only. 2 lectures. Prerequisite: MATH 142 and CHEM 124. Co-requisite: ENGR/BRAE 213.

**BIO 227 Wildlife Conservation Biology (4) GE B2**

Historical development of wildlife biology and philosophies. Basic principles of ecology and evolution. Practices applied to wildlife. Current problems involving people-wildlife interactions with special reference to world biodiversity. 4 lectures.

**BIO 228 Wildlife Biology Laboratory (1)**

Recognition of important wildlife resources and presentation of life histories. Emphasis towards those forms that have been historically managed as game species and those currently considered endangered. Investigation of habitats common to various wildlife. 1 laboratory. Prerequisite: Concurrent or previous enrollment in BIO 227.

**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 115 or BIO 153.

**BIO 301 Environmental Science and Human Ecology (4)**

Introduction to natural processes regulating renewable and non-renewable physical, chemical, and biological resources. Human population ecology and the influence and interactions of human populations on/with physical, chemical, and non-human biological resources. Principles of management, environmental science, and conservation biology that lead to equilibrium or self-sustaining conditions. 4 lectures. Prerequisite: BIO 151.

**BIO 302 Human Genetics (4)**

**GE B5**

Basic principles of human inheritance, including the transmission of genetic traits, chromosomal abnormalities and their effects, gene structure and function, mutations and mutagenic agents, cancer genetics, population genetics, and principles of genetic counseling. 4 lectures. Prerequisite: one course from GE Area B1 (Recommended: STAT 217 or STAT 218), and one course from GE Area B2.

**BIO 303 Survey of Genetics (3)**

Principles of heredity and variation. 3 lectures. Prerequisite: One quarter of college biology and one quarter of college mathematics. Recommended: College level course in statistics.

**BIO 305 Biology of Cancer (4)**

**GE B5**

Introduction to the causes, characteristics and treatment of human cancer. Topics include effects of carcinogens and radiation; the genetics of cancer; molecular, cellular and physiological changes; common cancers such as lung, skin, and leukemia; conventional chemotherapy and new treatments. Not open for major credit in Biological Sciences, Microbiology or Biochemistry. 2 lectures, 2 seminars. Prerequisite: A college-level course in biology and junior standing.

**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: Two of the following: BIO 113, BIO 114, BIO 115.

**BIO 307 World Aquaculture: Applications, Methodologies and Trends (4) GE Area F**

Life histories and habitats of important species of fishes, invertebrates. Methodologies for the commercial propagation of specific forms. Global and regional coverage, including socioeconomic trends, controversies and applications in developed and less developed regions of the world. 3 lectures, 1 activity. Prerequisite: One course in biology (BIO, ZOO, BOT or MCRO prefix), completion of GE Area B, and junior standing. Biological Sciences majors will not receive GE Area F credit.

**BIO 311 Radiation Biology (3)**

Review of production and characteristics of non-ionizing and ionizing radiation; interaction and effect of radiation on living cells, tissues, organs, and organisms; introduction to use of radioisotopes; radiation protection and dosimetry; impact of nuclear energy on the biological world. 3 lectures. Prerequisite: CHEM 111 or CHEM 128 and one of the following: BIO 111, BIO 115, BIO 151, BOT 121.

**BIO 317 The World of Spatial Data and Geographic Information Technology (4) GE Area F  
(Also listed as FNR/GEOG/LA 317)**

Basic foundation for understanding the world through geographic information and the tools available to utilize spatial data. Application of Geographic Information Systems (GIS) and related technologies, including their scientific basis of operation. 3 lectures, 1 activity. Prerequisite: Any CSC course, completion of GE Area B, and junior standing. Earth Sciences, Forestry and Natural Resources, Landscape Architecture, and Social Sciences (Environmental Geography concentration) majors will not receive GE Area F credit.

**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 115 or BIO 151, BOT 121 or consent of instructor.

**BIO 325 General Ecology (4)**

Interactions between living organisms and their environment in terrestrial and aquatic habitats. 3 lectures, 1 laboratory. Prerequisite: BIO 152 and BIO 153.

**BIO 327 Wildlife Biology Methods (5)**

Methods for gathering information for management of wildlife. Use of the literature, inventory of plants and animal populations, use of maps, sexing and aging, trapping, handling, and marking techniques, physiological indices, and radio telemetry. 3 lectures, 2 laboratories. Prerequisite: BIO 227.

**BIO 328 Marine Biology (5)**

Introduction to the functional biology of marine plants and animals and the processes that underlie their distribution and abundance in open oceans, coastal regions, estuaries, and wetlands. 3 lectures, 2 laboratories. Several field trips. Prerequisite: BIO 152 and BIO 153.

**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 343 Principles of Systematic Biology (4)**

Introduction to the concepts, methods and data used to define and recognize the units of biological diversity, including a survey of various types of molecular and morphological data and computer programs used in their analysis. 3 lectures, 1 laboratory. Prerequisite: Completion of BIO 150 series, BIO 303 or BIO 351, and STAT 218 or equivalent.

**BIO 351 Principles of Genetics (5)**

Principles of genetics and genetic analysis, including underlying molecular mechanisms. Subjects include gene structure and function, inheritance patterns, regulation of gene expression, mutation, recombination, recombinant DNA technology and an introduction to population genetics. 5 lectures. Prerequisite: BIO 151 and CHEM 212/312 or CHEM 217/317. Recommended: BIO 152, BIO 153, statistics, biochemistry.

**BIO 375 Molecular Biology Laboratory (2)**  
(Also listed as CHEM 375)

Techniques used in molecular biology and biotechnology, plasmid DNA extraction, agarose gel electrophoresis, restriction endonuclease mapping, transduction, transformation, and gene cloning. 2 laboratories. Prerequisite: MCRO 221 or MCRO 224, and BIO 351 or CHEM 373.

**BIO 391 Spring Field Quarter I – Field Ecology (4)**

Field studies of terrestrial and aquatic ecosystems of California. Investigation of habitat diversity, environmental factors, composition and functional biology, and seasonal progression of animal and plant communities. Several extended field trips. 2 lectures, 2 laboratories. Prerequisite: Completion of introductory biology series (BIO 151, BIO 152, BIO 153), BIO 325; corequisite: BIO 392, BIO 393, BIO 400 (2 units). Spring quarter only.

**BIO 392 Spring Field Quarter II – Field Botany (4)**

Terrestrial and aquatic plant communities of California. Field identification of native and introduced plants in nature. Factors affecting plant distribution and relationships. Several extended field trips. 2 lectures, 2 laboratories. Prerequisite: Completion of introductory biology series (BIO 151, BIO 152, BIO 153), BIO 325, BIO 343; corequisite: BIO 391, BIO 393, BIO 400 (2 units); recommended: BOT 313. Students completing BIO 392 will not be able to receive degree credit for BOT 333 as well. Spring quarter only.

**BIO 393 Spring Field Quarter III – Field Zoology (4)**

Terrestrial and aquatic animal communities of California. Natural history, population and community ecology, and identification of vertebrates and invertebrates. Determinants of animal distribution. Major mechanisms determining diversity. Several extended field trips. 2 lectures, 2 laboratories. Prerequisite: Completion of introductory biology series (BIO 151, BIO 152, BIO 153), BIO 325, BIO 343; corequisite: BIO 391, BIO 392, BIO 400 (2 units). Spring quarter only.

**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. 1-2 laboratories. Prerequisite: Consent of department chair.

**BIO 414 Evolution (4)**

Scientific evaluation of the theories, mechanisms, and evidences concerning biological evolution. 3 lectures, 1 activity. Prerequisite: BIO 303 or BIO 351.

**BIO 415 Biogeography (4)**

Plant and animal distribution patterns in relation to past and present physical and biotic factors; survey of major biomes with major emphasis on North and South America. 4 lectures. Prerequisite: BIO 325.

**BIO 418 Limnology (4)**

Biological, physical, and chemical dynamics of aquatic systems surrounded by land including lakes, streams and estuaries. 3 lectures, 1 laboratory. Prerequisite: BIO 325. Recommended: One college level course in chemistry.

**BIO 419 Ecological Methodology (4)**

Introduction to quantitative methods used in ecology with an emphasis on the design and analysis of field studies. Population estimates, sampling design and analysis, and the determination of community structure. 4 lectures. Prerequisite: STAT 218 or equivalent. and one course in upper division ecology. Recommended: (BIO 325, BOT 326, or BIO 418) and STAT 313.

**BIO 420 Spatial Information in Ecology (4)**

Concepts and applications of Global Positioning Devices, Geographical Information Systems (GIS) and Image Analysis in addressing spatial questions within the fields of wildlife management, ecology and field botany. Emphasis on actual case studies. 4 lectures. Prerequisite: BIO 325 or equivalent.

**BIO 421 Wetlands (4)**

(Also listed as FNR/SS 421)

The formation, characteristics, and functions of wetlands. Genesis of hydric soils. Plant adaptations to saturated soils. Wetlands as wildlife habitat. Policies and social issues associated with wetlands. The procedures of wetland delineations. 3 lectures, 1 laboratory. Prerequisite: CHEM 128, BOT 223, SS 321.

**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 427 Wildlife Management (4)**

Important habitats, such as riparian, wetlands, etc. and habitat features important to wildlife, such as vegetation types and snags. Basic concepts of wildlife management. Emphasis on planning and designing habitats to meet the needs of wildlife. 3 lectures, 1 laboratory. Prerequisite: BIO 325.

**BIO 431 General and Cellular Physiology (4)**

Physiological processes in cells and organisms, including membrane phenomena, metabolism, enzyme kinetics, and cellular events associated with excitable cells and tissues. Current theories of biochemical, cellular, and organ system control mechanisms. Classical and current experimental techniques. 2 lectures, 2 laboratories. Prerequisite: BIO 152 or BIO 153, and CHEM 212/312. Recommended: STAT 218.

**BIO 432 Vertebrate/Human Systems Physiology (4)**

Physiological mechanisms associated with several of the organ systems of humans and other vertebrates, including respiration and metabolism, circulation, digestion, water/ion regulation, and excretion. Various functional aspects, including cellular mechanisms, and how the mechanisms are integrated into the organism as a whole. 3 lectures, 1 laboratory. Prerequisite: BIO 431.

**BIO 433 Endocrinology and Reproductive Physiology (4)**

Introduction to the endocrine and reproductive systems of vertebrates, particularly humans. Topics include actions of hormones, mechanisms of hormone action, relationship between nervous and endocrine systems, assays of hormones, selected clinical aspects of endocrinology and in vitro fertilization experiments. 3 lectures, 1 laboratory. Prerequisite: BIO 431.

**BIO 434 Environmental Physiology (4)**

Comparative physiological mechanisms involved in the regulation of oxygen uptake, water and ion balance, and temperature regulation in animals. Emphasis is placed on physiological adaptations which maintain or restore homeostasis in animals which are subjected to environmental changes. 3 lectures, 1 laboratory. Prerequisite: BIO 153, CHEM 212/312. Recommended: BIO 325 and BIO 431.

**BIO 435 Plant Physiology (4)**

Consideration of the principal physiological and biochemical processes of plants with emphasis on water relations, mineral nutrition, photosynthesis, and the physiology of plant development. 3 lectures, 1 laboratory. Prerequisite: BOT 121 or BIO 152, CHEM 212/312.

**BIO 437 Marine Resources (4)**

Biology of historical, current and potential marine resources including both technical means used to harvest and biological factors important in achieving a sustainable yield. Identification, life histories, ecology, culture and economics of pertinent organisms. 3 lectures, 1 laboratory. Prerequisite: BIO 152, BIO 153.

**BIO 438 Aquaculture (4)**

Propagation and rearing of fishes, invertebrates and algae from marine, freshwater and estuarine habitats. Current methodologies and general life histories. Global perspective including aquacultural development in developed and developing countries. 3 lectures, 1 laboratory. Prerequisite: BIO 153, ZOO 322, ZOO 336 or consent of instructor.

**BIO 444 Population Ecology (3)**

Growth, fluctuations, balance, and natural mechanisms controlling terrestrial wildlife populations. 3 lectures. Prerequisite: BIO 325 or one course in ecology.

**BIO 447 Bioinformatics Applications (4)**

Introduction to new problems in molecular biology and current computer applications for genetic database analyses. Use of software for: nucleic acid, genome and protein sequence analysis; genetic databases, database tools; industrial applications in bioinformatics; ethical and societal concerns. 3 lectures, 1 laboratory. Prerequisite: Basic biology (BIO 111 or BIO 151), or consent of instructor; basic genetics (BIO 351 or CHEM 373) recommended.

**BIO 450 Undergraduate Laboratory Assistantship (1-4) (CR/NC)**

Assisting the instructor in teaching and supervising undergraduate laboratories in the Biological Sciences Department. Total credit limited to 8 units, with a maximum of 4 units per quarter. Credit/No Credit grading only. Prerequisite: Consent of instructor and department chair.

**BIO 452 Cell Biology (4)**

Introduction to cell structure and function, energy conversions, protein sorting, signaling, cytoskeleton, cell adhesion and the cell cycle. 3 lectures, 1 laboratory. Prerequisite: BIO 351 or CHEM 373 and CHEM 212/312 or CHEM 217/317. Recommended: Course in biochemistry.

**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. BIO 461: 3 laboratories. BIO 462: 2 laboratories.

**BIO 465 Communicating Biology (4)**

Intensive approach designed to improve communication skills in biology. A combination of writing assignments and oral presentations to target a range of audiences and scientific sub-disciplines. 2 lectures, 2 activities. Prerequisite: completion of GE Area A, junior standing in biology and consent of instructor.

**BIO 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.

**BIO 471 Selected Advanced Laboratory (1-4)**

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 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

**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 3 units. 1-3 laboratories. Prerequisite: Graduate standing and consent of instructor.

**BIO 501 Molecular and Cellular Biology (4)**

Principles of molecular and cellular biology including gene function and regulation, energetics, protein trafficking, cytoskeleton, signaling, adhesion and the cell cycle. 3 lectures, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

**BIO 502 Biology of Organisms (4)**

Genes and proteins that regulate the development and evolution of animals and plants. Role of homeotic and nonhomeotic genes. Importance of signal transduction pathways and regulation of the cell cycle. Role of oncogenes and mutant tumor suppressor genes in the development of cancer. 3 lectures, 1 laboratory. Prerequisite: Graduate standing or consent of instructor; BIO 501, BIO 351, or CHEM 373.

**BIO 503 Population Biology (4)**

Considerations of theory and practice in population ecology, evolutionary biology and biosystematics. 3 lectures, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

**BIO 515 History of Biology (3)**

Analysis of historical attempts to solve biological problems. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**BIO 524 Developmental Biology (4)**

Consideration of developmental phenomena and principles with an emphasis on the underlying cellular and molecular mechanisms. Focus on animals, both vertebrate and invertebrate. Topics include fertilization, gastrulation, axis determination, cell differentiation and organ formation. 3 seminars, 1 activity. Prerequisite: Graduate standing or consent of instructor. Recommended: BIO 501 and BIO 502.

**BIO 531 Theory and Prediction in Ecology (3)**

Directed group study and lectures on selected topics in ecology. Emphasis on an in-depth study of a restricted topic. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**BIO 542 Multivariate Biometry (4)**

Studies in continuous multivariate statistics, including the multivariate linear model, principal components and factor analysis, discriminant analysis, clustering, and canonical correlation. Use of MINTAB and SAS throughout. 4 lectures. Prerequisite: Two courses in statistics or consent of instructor.

**BIO 570 Selected Topics in Biology (1–4)**

Directed group study of selected topics for graduate students. *Class Schedule* will list topics for selection. Total credit limited to 12 units. 1 to 4 seminars. Prerequisite: Graduate standing or consent of instructor.

**BIO 575 College Teaching Practicum (4) (CR/NC)**

Part-time teaching assignment in an undergraduate college classroom. Includes teaching and related activities under the supervision of a professor in Biological Science. Total credit limited to 8 units. Credit/No Credit grading only. 4 activities. Prerequisite: Graduate standing and evidence of satisfactory preparation in biology. Department chair and graduate coordinator's approval required.

**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. Credit/No Credit grading only. Prerequisite: Graduate standing and 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 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 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. 3 laboratories. Prerequisite: Graduate standing, consent of instructor, and consent of thesis committee.

**BOT–BOTANY****BOT 121 General Botany (4)****GE B2 & B4**

The anatomy, physiology, reproduction, and importance of seed plants. 2 lectures, 2 laboratories.

**BOT 221 Native Plants for Landscape Architects (3)**  
(Also listed as LA 221)

Introduction to the horticultural characteristics and landscape design potential of California native plants. Includes experiences in field identification, basic planting design, installation and maintenance techniques. Required field trips. 2 lectures, 1 laboratory. Prerequisite: BIO 114 or BOT 121 or consent of instructor.

**BOT 238 Native Plant Materials (3)**

Classification, identification, and associations of native plants. Factors which affect plant growth in natural environments. 2 lectures, 1 laboratory. Prerequisite: BOT 121.

**BOT 313 Taxonomy of Vascular Plants (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 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: BIO 114, BIO 151, or BOT 121.

**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. 2 lectures, 2 laboratories. Prerequisite: BOT 121 or BIO 152. Recommended: BOT 313.

**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 313.

**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 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 Phycology (4)**

Comprehensive examination of the ecology, life histories, functional morphology, physiology and taxonomy of marine and freshwater algae. Laboratories emphasize species endemic to the central coast of California. 2 lectures, 2 laboratories. Prerequisite: BIO 152.

**BOT 443 Systematic Botany (4)**

Current theory of and approaches to botanical systematics, including use of morphological, cytological, biochemical, ecological and evolutionary data in classification. Literature of systematic botany and rules of botanical nomenclature. 3 lectures, 1 laboratory. Prerequisite: BIO 343; BOT 313 or BOT 437.

**BOT 450 Plant Biotechnology (5)**

Principles and methods of plant tissue culture and transformation; current topics and applications, such as plant defense and genomics, and applications of DNA technology. 3 lectures, 2 laboratories. Prerequisite: BIO 435.

## BRAE-BIORESOURCE and AGRICULTURAL ENGINEERING

### BRAE 121 Agricultural Mechanics (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. 1 lecture, 1 laboratory.

### BRAE 124 Small Engines (2)

Operating principles of the small internal combustion engine. Maintenance and trouble-shooting applications of small power units to all types of engine applications. Repair procedures related to economic justifications. 1 lecture, 1 activity.

### BRAE 128 Careers in Bioresource and Agricultural Engineering (2)

Introduction to careers associated with BioResource and Agricultural Engineering, and Agricultural Systems Management. Professional engineering registration process. Engineering problem solution and report format. Design procedures. Engineering fundamentals. Laboratory includes visits to facilities relating to career opportunities. 1 lecture, 1 laboratory.

### BRAE 129 Laboratory Skills and Safety (1)

Introduction to fabrication and construction materials used in the field of Agricultural Engineering. Fabrication skills in the development of wood, metal, concrete projects, and creative design. Strength tests of wood, fasteners, concrete, and student design projects. 1 laboratory. Prerequisite: BRAE and ASM majors only.

### BRAE 133 Engineering Design Graphics (3)

Visual communication in engineering design and problem solving. Principles of freehand sketching, engineering graphics, and computer-aided-drafting. Perspective and orthographic sketching, orthographic drawing with instruments and computer, applied descriptive geometry. 1 lecture, 2 laboratories.

### BRAE 141 Agricultural Machinery Safety (3)

Evaluation of safe tractor and equipment operation. Supervised field operation emphasizing the safe and efficient performance of modern farm and utility-industrial equipment. 2 lectures, 1 laboratory.

### BRAE 142 Agricultural Power and Machinery Management (4)

Evaluation of agricultural machinery and tractor power performance. Equipment studied includes primary and secondary tillage tools, grain drills, row crop planters, sprayers, grain and forage harvesters, and specialty crop harvesters. Emphasis on management, selection, cost analysis using computers and efficient operation of agricultural machinery. 3 lectures, 1 laboratory. Prerequisite: MATH 116 or equivalent.

### BRAE 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. 3 lectures, 1 laboratory. Prerequisite: BRAE 128, MATH 119 or equivalent.

### BRAE 151 CAD for Agricultural Engineering (1)

Computer aided drafting on a desktop personal 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: BRAE 133 or equivalent.

### BRAE 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.

### BRAE 201 Enterprise Project (1-4) (CR/NC)

Introductory experience in a bioresource/agricultural engineering or agricultural systems management project. Project participation is subject to approval by the department head and the Cal Poly Foundation. Credit/No Credit grading only. Prerequisite: BRAE 129 or consent of instructor.

### BRAE 203 Agricultural Systems Analysis (3)

Agricultural Systems Analysis investigates the interrelationships between sub-components in an overall system. Problem solving algorithms, network analysis, project planning techniques, and optimization. 2 lectures, 1 laboratory. Prerequisite: MATH 118 or equivalent.

### BRAE 213 Bioengineering Fundamentals (2) GE B2 (Also listed as ENGR 213)

Treatment of the engineering applications of biology. Genetic engineering and the industrial application of microbiology. Systems physiology with engineering applications. Structure and function relationships in biological systems. The impact of life on its environment. 2 lectures. For engineering students only. Prerequisite: MATH 142, CHEM 124. Co-requisite: BIO 213.

### BRAE 216 Fundamentals of Electricity (4)

Application of electricity in BioResource and Agricultural Engineering, including basic electric circuits. Will include wiring materials, code regulations, electrical measurements, R-L-C circuit fundamentals, system planning, motors, basic electronics, and an introduction to computer usage. 3 lectures, 1 laboratory. Prerequisite: BRAE 128, BRAE 129, MATH 142, PHYS 131.

### BRAE 226 Introduction to Principles of Bioresource Engineering (4)

Introduction to principles of engineering as applied to biological and agricultural systems as found in industry. Engineering properties of conventional and biological materials. Introduction to basic unit processes in industrial, agricultural, and biological systems. Special requirements of agricultural and biological processes. 3 lectures, 1 laboratory. Prerequisite: BRAE 128, BRAE 129, PHYS 131, BIO 213 and BRAE 213 or ENGR 213.

### BRAE 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: BRAE 129 or consent of instructor.

### BRAE 232 Agricultural Structures Planning (4)

Planning of facilities required in production systems. Materials and processes used in construction of agricultural structures. Environmental factors affecting crop storage structures and animal housing. Design of structural environments to meet the needs of commodities, animals, and plants. 3 lectures, 1 laboratory. Prerequisite: BRAE 151, PHYS 132.

### BRAE 234 Introduction to Mechanical Systems in Agriculture (4)

Introduction to elements used in the mechanical transmission of power and force in agricultural systems. Power transmission using v-belts, roller chain, gear and shaft drives, hydraulic actuators. Linear and nonlinear actuation devices including linkages, cams, and hydraulic/pneumatic cylinders. 3 lectures, 1 laboratory. Prerequisite: BRAE 128, BRAE 129, PHYS 131.

### BRAE 236 Principles of Irrigation (4)

Land grading design, operation, management, and evaluation of irrigation methods. 3 lectures, 1 laboratory. Prerequisite: MATH 141, BRAE 237, SS 121, a computer programming course.

### BRAE 237 Engineering Surveying I (2)

Use and care of tapes, levels, theodolites and Global Positioning System (GPS) receivers. Keeping field notes, measurements by tape. Differential leveling. Turning angles and determining directions of lines. GPS measurements. Map reading. Introduction to electronic distance

measurement (EDM), photogrammetry, and land modeling. 1 lecture, 1 laboratory. Prerequisite: MATH 119 or an understanding of trigonometric functions.

### **BRAE 238 Engineering Surveying II (2)**

Traverses by theodolite. Adjustments, coordinates, and area calculations. Earthwork and landgrading. Topographic mapping. Triangulation and trilateration using electronic distance measurement. Horizontal and vertical curve layout. 1 lecture, 1 laboratory. Prerequisite: BRAE 237.

### **BRAE 239 Engineering Surveying (4)**

Use and care of tapes, levels, theodolites, Global Positioning system (GPS) receivers, Electronic Distance Measurement instruments (EDM) and electronic field books. Traverses, triangulation, trilateration, earthwork and associated calculations. Topographic mapping, photogrammetry, map reading and land descriptions. 2 lectures, 2 laboratories. Prerequisite: MATH 119 or equivalent.

### **BRAE 240 Agricultural Engineering Laboratory (1)**

Individual projects. Total credit limited to 4 units. 1 laboratory. Prerequisite: Consent of instructor.

### **BRAE 247 Forest Surveying (2) (Also listed as FNR 247)**

Use and care of tapes, staff compass, abney levels, theodolites, and GPS receivers. Keeping field notes, measurements by tape. Closed and open traverse by compass and theodolite. Turning angles and determining directions of lines. Map reading and public land description. GPS measurements. 1 lecture, 1 laboratory. Prerequisite: MATH 119, FNR 215 or consent of instructor.

### **BRAE 301 Hydraulic and Mechanical Power Systems (4)**

Selection, application and use of hydraulic components and mechanical power transmission equipment. Use of standardized circuit design procedures. 3 lectures, 1 laboratory. Prerequisite: PHYS 121.

### **BRAE 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.

### **BRAE 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. Safety program development. 2 lectures, 1 activity. Prerequisite: Junior standing.

### **BRAE 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 121.

### **BRAE 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 121, BRAE 142.

### **BRAE 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: BRAE 143, ME 211, ME 302. ME 302 may be taken concurrently.

### **BRAE 328 Measurements and Computer Interfacing (4)**

Transducers and engineering measurements in agricultural engineering. Covering transducer characteristics, signal processors and controllers, instrumentation techniques, and the use of the computer in the measurement and control of typical engineering problems. 3 lectures, 1 laboratory. Prerequisite: PHYS 206, PHYS 256, a computer programming course.

### **BRAE 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. 3 lectures. Prerequisite: BRAE 236, or BRAE 340.

### **BRAE 335 Internal Combustion Engines (4)**

Principles of operation of internal combustion engines. Theory of operation and diagnosis evaluation and repair of small engines, gasoline and diesel engines and economics of operation, use and repair. Power analysis and application. 3 lectures, 1 laboratory. Prerequisite: Junior standing.

### **BRAE 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.

### **BRAE 339 Internship in BioResource and Agricultural Engineering (1-12) (CR/NC)**

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. Degree credit limited to 6 units. Credit/No Credit grading only. Prerequisite: Consent of internship instructor.

### **BRAE 340 Irrigation Water Management (4)**

### **GE Area F**

Soil-plant-water relationships; evapotranspiration; irrigation schedules; salinity and drainage; irrigation efficiency. Water measurement; soil moisture measurement; irrigation systems and practical constraints affecting scheduling. California water supply and budget; water rights; local, state and federal water institutions; California water issues. 3 lectures, 1 laboratory. Prerequisite: Junior standing, completion of GE Area A1, A3, and Area B, including Math 118 or better. Agricultural Systems Management majors will not receive GE Area F credit.

### **BRAE 343 Mechanical Systems Analysis (4)**

Use of statics and dynamics to make original calculations, plans, sketches, graphics, drawings, schemes and layouts for the fabrication and construction of machines. 3 lectures, 1 laboratory. Prerequisite: MATH 119, BRAE 203, BRAE 301 or concurrent. Junior standing.

### **BRAE 344 Fabrication Systems (4)**

Fabrication systems including cutting, sawing, shearing, bending, welding, grinding, cleaning and proper safety procedures. Experimental projects to include team design and construction, presentation, organization, and evaluation. 2 lectures, 2 laboratories. Prerequisite: BRAE 343.

### **BRAE 345 Aerial Photogrammetry and Remote Sensing (3)**

Object recognition, three-dimensional equipment, and interpretation of aerial photographs. Print alignment, stereoscopic viewing, scales, elevation determination, and application. Orthophotos and their relationship to Geographic Information Systems (GIS). Application of aerial photos to regional studies. 2 lectures, 1 laboratory. Prerequisite: MATH 119.

### **BRAE 348 Energy for a Sustainable Society (4)**

### **GE Area F**

Study of how the transition can be made from fossil fuels 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, 1 activity. Prerequisite: Completion of GE Area B and junior standing. Agricultural Systems Management majors will not receive GE Area F credit.

### **BRAE 400 Special Problems for Advanced Undergraduates (1-4)**

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.

**BRAE 401 Enterprise Project Management (1-4) (CR/NC)**

Advanced experience in a bioresource/agricultural engineering or agricultural systems management project. Project leadership and management are stressed. Project participation is subject to approval by the department head and the Cal Poly Foundation. Credit/No Credit grading only. Prerequisite: BRAE 201 or consent of instructor.

**BRAE 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: BRAE 325.

**BRAE 403 Agricultural Systems Engineering (4)**

Engineering and economic 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. Professional responsibilities in Agricultural Engineering including ethics, patents, copyrights, liability. 3 lectures, 1 laboratory. Prerequisite: ECON 201/211, MATH 242 or MATH 244.

**BRAE 405 Chemigation (1)**

Fertilizer and chemical injection through irrigation systems. Hardware, fertilizer compounds, and distribution uniformity. Matching chemicals and equipment to specific irrigation methods. Safety. 1 laboratory. Prerequisite: BRAE 236 or BRAE 340.

**BRAE 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. 3 lectures, 1 laboratory. Prerequisite: BRAE 331 or BRAE 340; hydraulics.

**BRAE 415 Hydrology (4)**

Collection, organization and use of precipitation and runoff data, flood frequency, stream gauging and use of hydrograph, principles of groundwater and flood routing, sizing and economics of soil and water conservation structures. 3 lectures, 1 laboratory. Prerequisite: Junior standing, MATH 141, and SS 121 or consent of instructor.

**BRAE 418, 419 Agricultural Systems Management I, II (4) (4)**

Project management of agricultural systems. Emphasis placed on a team approach to problem solution. Case studies and student projects used to explore the following topics: project leadership, project organization, communication, needs assessment, feasibility studies, cost analysis, decision making, solution implementation, and evaluation. BRAE 418: 3 lectures, 1 laboratory. BRAE 419: 2 lectures, 2 laboratories. Prerequisite: BRAE 203, AGB 301, AGB 310 and ENGL 148. For BRAE 419: BRAE 418.

**BRAE 421 Equipment Engineering (3)**

Design and construction of specialized agricultural components and equipment. 2 lectures, 1 laboratory. Prerequisite: BRAE 328, CE 205, ME 212.

**BRAE 422 Equipment Engineering (4)**

Design and construction of specialized agricultural components and equipment. 2 lectures, 2 laboratories. Prerequisite: BRAE 421.

**BRAE 425 Computer Controls for Agriculture (3)**

Computer activated controls as applied to agricultural machinery, agricultural structures, processing and irrigation industries. Encompassing control logic to evaluate stability behavior of systems of computer interfacing, data input and control output. 2 lectures, 1 laboratory. Prerequisite: BRAE 324, CSC 110 or CSC 119 or AG 250.

**BRAE 427 Agricultural Process Engineering (3)**

Agricultural engineering principles applied to air, water, air-water mixtures, drying, heating, refrigeration, fluid flow, size reduction, fan laws and materials handling. 2 lectures, 1 laboratory. Prerequisite: BRAE 312, BRAE 430, ME 302.

**BRAE 430 Finite Element Analysis (3)**

Introduction to the theory of finite element analysis and its application to drainage, pipe flow, fruit and vegetable damage predictions, structural strength, heat transfer, and other agricultural engineering applications. 2 lectures, 1 laboratory. Prerequisite: CE 204, MATH 242 or MATH 244, ME 302.

**BRAE 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 121, BRAE 402.

**BRAE 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: BRAE 232, CE 205.

**BRAE 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: BRAE 312, BRAE 331, or BRAE 340 or SS 432 and consent of instructor.

**BRAE 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: BRAE 312, BRAE 415, SS 121, or consent of instructor.

**BRAE 438 Drip/Micro Irrigation (4)**

Drip/micro irrigation hardware and management. Emphasizes agricultural drip/micro irrigation with some landscape application. Filtration, emitters, chemical injection, agronomic constraints, and scheduling. Field trip(s) included. 3 lectures, 1 laboratory. Prerequisite: BRAE 236 or BRAE 340.

**BRAE 439 Vineyard Water Management (4)**

Management of rain and irrigation water in vineyards. Irrigation scheduling, managing water stress, climate control with irrigation methods commonly used. Management for wine, table grapes, and raisins. 3 lectures, 1 laboratory. Prerequisite: BRAE 340 or BRAE 236.

**BRAE 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. 3 lectures, 1 laboratory. Prerequisite: BRAE 340 or consent of instructor.

**BRAE 446 CAD Software for Land Modeling (2)**

Techniques for preparing data for geographic information systems using TERRAMODEL. Digital data from surveying, orthophotography, and government data sources will be entered, displayed, edited and translated for use in other software packages. Transformation of coordinate systems. Earthwork and hydrologic examples. 1 lecture, 1 laboratory. Prerequisite: BRAE 239.

**BRAE 447 Advanced Surveying with GIS Applications (4)**

Collecting field data; processing the data; generating graphical representation of the data; design based on the data and laying out the design in the field; and available record resources for use in GIS systems and their accuracy. 2 lectures, 2 laboratories. Prerequisite: BRAE 239.

**BRAE 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. 2 lectures, 1 laboratory. Prerequisite: MATH 117 or equivalent, or consent of instructor.

**BRAE 452 Legal Aspects/Data Accuracy for GIS (3)**

Research of boundary descriptions, record maps, and existing survey data. Value and implications of the data. Local and state requirements and restrictions on use of data. Procedures for incorporation of data into Arc/Info. 2 lectures, 1 laboratory. Prerequisite: BRAE 237 or BRAE 239.

**BRAE 460 Senior Project Organization (1)**

Selection and organization of senior project. Involves time management, research techniques, budgeting and project presentation. 1 lecture. Prerequisite: ENGL 148, junior standing.

**BRAE 461, 462 Senior Project (2) (2)**

Solution of an engineering or systems management problem in agriculture. May involve research methodology, problem statement, analysis, synthesis, project design, construction, and evaluation. Project requires 150 hours with a minimum of faculty supervision. Prerequisite: BRAE 460.

**BRAE 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.

**BRAE 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.

**BRAE 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: Consent of instructor.

**BRAE 471 Selected Advanced Laboratory (1-4)**

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 8 units. 1-4 laboratories. Prerequisite: Consent of instructor.

**BRAE 481 Advanced Agricultural Mechanics (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.

**BRAE 485 Cooperative Education Experience in BioResource and Agricultural Engineering (6) (CR/NC)**

Part-time work experience with an approved BioResource and Agricultural Engineering firm engaged in production or related business, industry or governmental agency. 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. Degree credit limited to 6 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

**BRAE 495 Cooperative Education Experience in BioResource and Agricultural Engineering (12) (CR/NC)**

Full time work experience with an approved BioResource and Agricultural Engineering firm engaged in production or related business, industry or governmental agency. 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. Degree credit limited to 6 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

**BRAE 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.

Total credit limited to 6 units, repeatable in same term. Prerequisite: Consent of instructor.

**BRAE 521 Systems Analysis of Agricultural Systems (4)**

Principles and methods of creative problem solving and systems analysis as applied to the design of agricultural systems. Problem solving using the engineering design process to analyze the need, establish boundaries, and generate creative alternative solutions. Examples worked through in feasibility analysis, transportation and network problems, linear programming, project planning, human factors and ergonomics, and system analysis with an emphasis on optimum system operation. 3 lectures, 1 laboratory. Prerequisite: Consent of instructor.

**BRAE 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.

**BRAE 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: BRAE 143 or equivalent, graduate standing, or consent of instructor.

**BRAE 532 Water Wells and Pumps (4)**

Water well drilling, design, and development. Pump characteristics and system head. Series and parallel operation. Design of pump intakes. Variable speed electric drives and engines. Pump testing. 3 lectures, 1 laboratory. Prerequisite: BRAE 340 or equivalent, or BRAE 312 or equivalent.

**BRAE 533 Irrigation Project Design (4)**

Engineering solutions and social aspects of improved water delivery to farms and canal automation. Flow measurement. Water user associations. Unsteady canal and pipeline controls. PID controls and modeling. Miscellaneous course fee required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: BRAE 340, hydraulics/fluid mechanics.

**BRAE 570 Selected Topics in BioResource and Agricultural Engineering (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 12 units. 1 to 4 seminars. Prerequisite: Graduate standing or consent of instructor.

**BRAE 571 Selected Advanced Laboratory in BioResource and Agricultural Engineering (1-4)**

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 8 units. 1-4 laboratories. Prerequisite: Consent of instructor.

**BRAE 581 Graduate Seminar in BioResource and Agricultural Engineering (3)**

Group study of current problems of the bioresource and agricultural engineering industry; current experimental and research findings as applied to field of bioresource and agricultural engineering. *Class Schedule* will list topic selected. Total credit limited to 9 units. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**BRAE 599 Thesis in BioResource and Agricultural Engineering (1-9)**

Systematic research of a significant problem in bioresource and agricultural engineering. 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.

## 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 178 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.

### **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 area coordinator.

### **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 212 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.

### **BUS 214 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.

### **BUS 215 Managerial Accounting (4)**

Applications of accounting for management decision-making, planning and control including cost behavior, budget preparation, performance reporting, motivational and behavioral considerations, and ethics. 4 lectures. Prerequisite: Demonstrated competency in electronic spreadsheet, word processing, and presentation applications. BUS 212 or BUS 214 or equivalent.

### **BUS 245 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.

### **BUS 271 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.

### **BUS 276 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.

### **BUS 302 International and Cross Cultural Management (4)**

Dimensions of culture and its variations within and across nations. Impact of culture on managing in a global context. Development of managerial competencies requisite to working in and supervising multicultural groups in international corporations. Frameworks for analyzing cultural and contextual influences on organizational behavior, culture shock and readjustment, expatriation and repatriation, cultural change and innovation, intercultural conflict, and ethical dilemmas. Case studies, behavioral simulations, self-assessments and fieldwork. 4 lectures. Prerequisite: Junior standing or consent of instructor.

### **BUS 303 Introduction to International Business (4)**

Special terms, concepts, and institutions associated with the environment in which international companies operate. Students will be enabled to understand, analyze and offer solutions to global business problems. 4 lectures. Prerequisite: Junior 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 311 Managing Technology in the International Legal Environment (4)**

**GE D5**

Analysis of U.S. and international laws regarding technological innovations from economic, social and political perspectives. Copyrights, patents, trademarks, trade secrets, contracts, products liability and privacy. The Internet, computer programs and biotechnology. 4 lectures. Prerequisite: Completion of GE Areas A, D1 and D2. Business Administration majors will not receive GE Area D5 credit.

### **BUS 320 Taxation of Business Entities (4)**

Federal income taxation of the various forms of business entities. Introduction to broad range of tax concepts and types of taxpayers. Role of taxation in the business decision-making process. 4 lectures. Prerequisite: BUS 212 or BUS 214 or consent of instructor.

### **BUS 321, 322 Intermediate Accounting I, II (4) (4)**

Comprehensive coverage of financial reporting. 321 covers financial statements, assets, and current liabilities. 322 covers long-term debt, equities, accounting changes, cash flows and consolidations. 323 covers accounting for inflation, leases, interim and segment reporting, measurement problems, and financial disclosures. 4 lectures. Prerequisite: 321: BUS 214 and junior standing; 322: BUS 321 with minimum grade of C-.

### **BUS 342 Fundamentals of Corporate Finance (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: A grade of C- or better in all of the following: ECON 222, MATH 221, STAT 252, BUS 215. Junior standing required.

### **BUS 343 Quantitative Methods in Finance (4)**

Basic mathematical foundations for 400-level courses in finance: mathematical finance -- dealing with elementary materials (time value of money, single multiple period portfolio choice, and application of arbitrage), and risk management -- dealing with value-at-risk, stressing current industry practices. 4 lectures. Prerequisite: STAT 252.

### **BUS 346 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: A grade of C- or better in all of the following: ECON 222, STAT 252, BUS 207, junior standing, or equivalent.

**BUS 347 Marketing Information and Analysis (4)**

Market planning and information systems. Survey and experimental 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. 3 lectures, 1 activity. Prerequisite: BUS 346.

**BUS 348 Buyer Behavior (4)**

Applied study of individual and group psychological and behavioral group processes that affect marketing decisions in both consumer and business markets. 4 lectures. Prerequisite: BUS 346.

**BUS 349 Selling: Building Partnerships (4)**

Basic skills and tools for successfully planning and conducting sales calls, building long-term buyer/seller relationships and territory, time and career management. Emphasis on sales roleplays. 4 lectures. Prerequisite: Junior standing.

**BUS 350 The Global Environment (4)** **GE Area F**  
**(Also listed as AG/EDES/ENGR/HUM/SCM 350)**

Interdisciplinary investigation of how human activities impact the Earth's environment on a global scale. Examination of population, resource use, climate change, and biodiversity from scientific/technical and social/economic/historical/political perspectives. Use of remote sensing maps. Sustainable solutions. 3 lectures, 1 activity. Prerequisite: Completion of GE Areas A and B and junior standing.

**BUS 360, 361 Undergraduate Integrated Core Curriculum I, II (12)**

The foundation knowledge and skills required of all business concentrations. Integration of accounting, finance, marketing, operations management, government and social influences. Organizational behavior and international topics in one two-quarter curriculum, based on the approved business core. 10 lectures, 2 activities per course. Prerequisite: BUS 207, BUS 214, BUS 215, BUS 391, ECON 221, ECON 222, MATH 221, STAT 251, STAT 252.

**BUS 371 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: A grade of C- or better in all of the following: MATH 141 or MATH 221, and STAT 211 or STAT 252, and junior standing.

**BUS 381 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.

**BUS 382 Organization and Management Theory (4)**

Examination of macro dimensions of organizations including environment, mission, goals, structure, technology, and internal management systems and processes. Case analysis, simulation. Application to business firms, government, voluntary organizations. 4 lectures. Prerequisite: Junior standing.

**BUS 383 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.

**BUS 384 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.

**BUS 387 Organizational Behavior (4)**

Application of behavioral science concepts to management. Motivation, perception, communications, leadership style, group dynamics. Effectiveness: individual, interpersonal, team, intergroup and organizational. 4 lectures. Prerequisite: Junior standing. Recommended: A grade of C- or better in STAT 252.

**BUS 390 Data Structures for Business Systems (4)**

Algorithmic processes related to business practices. Analysis techniques for managing data structures such as lists, stacks, queues and trees. Algorithms to perform common programming tasks such as sorting, searching and hashing. 4 lectures. Prerequisite: CSC 102.

**BUS 391 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, functional information systems, data communications and networks, database organization, presentation systems, and web development. 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: Junior standing.

**BUS 392 Functional Information Systems (4)**

Organizational support systems, including decision support systems, data warehouses, online analytical processing, data mining and project management. Overview of functional information systems. Various arrangements of course are designed for functional areas (e.g. accounting, marketing, and finance). 4 lectures. Prerequisite: A grade of C- or better in BUS 391 and junior standing.

**BUS 393 Database Systems in Business (4)**

Data base systems, data analysis and modeling for business applications. Relational, post-relational and object-oriented. Entity-relationship diagrams and CASE tools. Information systems architecture, object modeling, Web-based database systems and a database project. 4 lectures. Prerequisite: BUS 391, CSC 101, CSC 102, CSC 103 or BUS 390, and junior standing.

**BUS 394 System Analysis and Design (4)**

Systems analysis and design. Project team creation and performance monitoring. Systems development life cycle and project management, process modeling using data flow diagrams, data modeling with E/R diagrams, CASE tools, object modeling with UML, and prototype development. 4 lectures. Prerequisite or corequisite: BUS 393 and junior standing.

**BUS 395 Systems Design and Implementation (4)**

Continuation of BUS 394. Project management, software testing, documentation, help facility creation, implementation, and maintenance. Development of fully operational application. 4 lectures. Prerequisite: BUS 393 and BUS 394.

**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 401 Seminar in General Management and Strategy (4)**

Application of interdisciplinary skills to business and corporate strategy formulation and implementation. Analysis of interdependence between external environments and internal systems. Focus on responsibilities, tasks, and skills of general managers. Case studies, group problem solving. Integrating course of Business core curriculum. 4 seminars. Prerequisite: A grade of C- or better in all 300-level Business core courses, BUS 391, and senior standing.

**BUS 402 International Business Management (4)**

Managerial concepts and techniques for analysis and decision making within international businesses. Environmental and organizational factors influencing multinational operations. Assessing international market

opportunities and entry modes. Complexities of multinational management strategy, structure and systems, especially during initial stages of internationalization. Case studies and simulations. 4 lectures. Prerequisite: BUS 342, BUS 346, BUS 387 or consent of instructor.

**BUS 403 Advanced Seminar in International Management (4)**

Integration of management concepts within complex multinational organizations. Interdisciplinary approach to identifying and assessing multinational and global competitive environments and strategies; structuring and managing interdependent multinational operations; addressing conflicts between domestic and international policies and practices in multinational enterprises. Case studies, simulations, group analysis and problem solving. 4 seminars. Prerequisite: BUS 302 and BUS 402 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 405 Joint Ventures and Alliances (4)**

Examination of joint ventures and alliances between organizations, using cross-cultural, interdisciplinary perspective. Alliance motives, types and traits. Processes for partner selection, negotiation, structure, operation, and performance assessment of international and cross-cultural alliances. Lectures, case studies, and simulation. 4 lectures. Prerequisite: Senior standing and completion BUS 342, BUS 346, and BUS 387, or consent of instructor.

**BUS 406 Managing Mergers, Acquisitions and Divestitures (4)**

Issues associated with analyzing, negotiating, and managing mergers, acquisitions and divestitures (MADS) using cross-cultural, interdisciplinary perspective. Rationale for decision to pursue MADS and processes for identifying targets; valuing and negotiating MADS; staffing and human resource management issues; strategic control and integration; and cross-cultural conflict and divided loyalties in domestic and international MADS. Lectures, case studies and simulation. 4 lectures. Prerequisite: Senior standing and completion of BUS 342, BUS 346, and BUS 387, or consent of instructor.

**BUS 407 Managing People in Global Markets (4)**

Impact of cultural and strategic differences on management of people in multinational organizations. Critical human resource issues in domestic and international operations. 4 lectures. Prerequisite: Senior standing and completion of BUS 387 or consent of instructor.

**BUS 409 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. Prerequisite: Senior standing.

**BUS 410 The Legal Environment of International Business (4)**

U.S., foreign, and international law affecting international business transactions. U.S. and foreign cultural, ethical, and political norms and legal institutions, and their effect on law and business. 4 lectures. Prerequisite: Senior standing, a course in American business law, one Political Science course, or consent of instructor.

**BUS 412 Advanced Managerial Accounting (4)**

Product costing systems including hybrid costing systems, management control systems, cost allocation, activity based costing, cost information for decision making, new manufacturing environments, and strategic control systems. International dimension integrated in the course content. 4 lectures. Prerequisite: BUS 215.

**BUS 414 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: BUS 320 or equivalent.

**BUS 415 Corporate Tax Accounting and Tax Administration (4)**

Federal income taxation of regular corporations, tax research, tax administration, and IRS practice. 4 lectures. Prerequisite: BUS 320 or equivalent.

**BUS 416 Volunteer Income Tax Assistance (4)**

Coverage of the deductions and credits applicable to individuals. Training and practice in the preparation of state and federal income tax returns. Under supervision of qualified professionals, tax preparation sites are operated to provide free tax assistance to community residents. 2 lectures, 2 activities. Prerequisite: BUS 320 or equivalent.

**BUS 420 Advanced Financial Reporting (4)**

Comprehensive coverage of selected advanced financial accounting and reporting topics. Topics include revenue recognition, software development costs, employee stock option plans, pensions and posts retirement benefit plans, accounting for income taxes, leases, specialized inventory issues and advanced consolidation issues. 4 lectures. Prerequisite: BUS 322.

**BUS 422 Government and Not-For-Profit Entities (4)**

Accounting and reporting by state and local governments and not-for-profit entities. State and local governmental topics include: fund structures, budgetary accounting, the modified accrual basis of accounting, reporting entity issues. Not-for-profit topics include: financial and reporting concepts and practices, contributions, restricted resources, endowments. 4 lectures. Prerequisite: BUS 321.

**BUS 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: Consent of instructor.

**BUS 424 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: Consent of instructor.

**BUS 425 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: BUS 322.

**BUS 427 International Accounting (4)**

Consideration of conceptual, managerial, professional and institutional issues of international accounting. 4 lectures. Prerequisite: BUS 321 or equivalent.

**BUS 428 Accounting Policy (4)**

Role of management in establishing and directing accounting policy. Coverage includes impact of management decisions on external reporting and taxes and the impact of financial reporting requirements on management decisions. 4 seminars. Prerequisite: BUS 322.

**BUS 429 Accounting Process Analysis (4)**

Comprehensive coverage of accounting processes. Computerized accounting processes, internal controls, process mapping and audit considerations. Auditor risk analysis of control weaknesses within ERP accounting processes. 3 lectures, 1 activity. Prerequisite: BUS 321 with a minimum grade of C-.

**BUS 430 Cooperative Education/Internship (2–12) (CR/NC)**

Work experience in business, industry, government and other areas of student career interest. Periodic written progress reports, final report, and evaluation by work supervisor required. Credit/No Credit grading. Total credit limited to 16 units. Prerequisite: Approval of area chair, sophomore standing, and a CPSLO cumulative GPA of at least 2.5 without being on academic probation.

**BUS 431 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: BUS 342.

**BUS 432 Insurance Planning and Risk Management (4)**

Introduction to insurance planning and risk management and its role in financial planning. Key concepts include determining risk exposure and selecting insurance products. Legal aspects of property and liability policy, life, health, and social insurance. 4 lectures. Prerequisite: BUS 342.

**BUS 433 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: BUS 342.

**BUS 434 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: BUS 342.

**BUS 435 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 real estate and property management. 4 lectures. Prerequisite: BUS 342. Recommended: BUS 434.

**BUS 436 Entrepreneurial Finance (4)**

Process of financing new and fast-growing firms. Readings on the venture capital process, from seed capital through the initial public offering. Valuation of firms seeking venture capital, and those planning their initial public offering. Valuing convertible securities. Real options valuation. 4 seminars. Prerequisite: BUS 342.

**BUS 437 Retirement and Estate Planning (4)**

Retirement planning and employee benefits; Social Security and Medicare; types of retirement plans; qualified plan characteristics; distribution options; and group insurance benefits. Trusts, power of attorney, and probate. 4 lectures. Prerequisite: BUS 342.

**BUS 438 Advanced Corporate Finance (4)**

Corporate finance with an emphasis on managing the corporation to create shareholder value. Detailed treatment of topics such as capital budgeting, capital structure, economic value-added, corporate distribution policy, financial distress, and mergers and acquisitions. 4 lectures. Prerequisite: BUS 321, BUS 342, BUS 431.

**BUS 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, BUS 342, and ECON 337.

**BUS 441 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: BUS 342 and BUS 391.

**BUS 442 Introduction to Futures and Options (4)**

An in-depth analysis of derivatives markets and instruments. Emphasis on the valuation of futures, options, swaps, and other derivative securities. 4 seminars. Prerequisite: BUS 431.

**BUS 443 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: BUS 321, BUS 342, and BUS 431.

**BUS 444 Financial Engineering and Risk Management (4)**

Advanced course synthesizing concepts from corporate finance, derivative securities, statistics, and computer science. Emphasis on both computer programming in a matrix programming language (Matlab) to solve practical risk management and valuation problems, and analytical training in the area of stochastic calculus, and its application to derivative security pricing. Practical applications of derivatives for controlling risk in an international corporate environment. 4 lectures. Prerequisite: BUS 343, BUS 422 or BUS 433, CSC 234 or equivalent.

**BUS 446 International Marketing (4)**

Basic skills and tools needed to evaluate the cultural factors that impact the acceptance of products and services in markets around the world. Understanding consumers and marketing in various countries. 4 lectures. Prerequisite: BUS 346 and senior standing.

**BUS 447 Advanced Techniques in Marketing Research (4)**

Emphasizes customer data analysis and data mining. Includes current marketing research techniques. Regression, conjoint, and multidimensional scaling analysis. 3 lectures, 1 activity. Prerequisite: BUS 347 and senior standing.

**BUS 448 Services Marketing (4)**

Examines service organizations such as banks, hotels, hospitals and professional service organizations, and the distinctive approach required for marketing strategy which is unique to service companies. 4 lectures. Prerequisite: BUS 346 and senior standing.

**BUS 449 Sales Management (4)**

Management of the field sales force, including staffing, training, directing, evaluating and control of sales personnel. 4 lectures. Prerequisite: BUS 346, BUS 349, and senior standing.

**BUS 450 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: BUS 346, BUS 348 or equivalent.

**BUS 452 Product Management (4)**

New product development process, building and maintaining brands, and managing life cycles for goods and services. 4 lectures. Prerequisite: BUS 346 and senior standing.

**BUS 454 Developing and Presenting Marketing Projects (4)**

Development and presentation of marketing projects. Analysis of information pertaining to a products'/service's environment, its customers and competitors. Identifying problems and opportunities and developing strategies and tactics to move the company forward. 4 lectures. Prerequisite: BUS 346, BUS 347, BUS 348 and senior standing.

**BUS 455 Marketing Management (4)**

Integration of key marketing concepts using tools such as computer simulations, readings, and/or case studies. Participants develop and implement strategic and tactical decisions for companies and brands. 4 lectures. Prerequisite: BUS 347, BUS 348, and senior standing.

**BUS 456 Industrial Customer Interfacing (4)**

Focus on managing aspects of the customer interface for strategic advantage. Emphasis on building and maintaining customer data bases. Establishing and maintaining customer service centers. Providing technical support services. Conference and trade show planning and development. 4 lectures. Prerequisite: BUS 346 or consent of instructor.

**BUS 457 Business Marketing (4)**

Industrial markets and product classifications as they relate to industrial markets. Chain of derived demand. Industrial buying, buyer/seller relationships, and purchasing. Market information sources. Segmentation, competition/cooperation, and technology. Distribution and logistics management. Industry communication and strategic planning as related to industrial markets. 4 lectures. Prerequisite: BUS 346 or consent of instructor.

**BUS 458 Global Electronic Marketing (4)**

Becoming familiar with the companies and people leading innovation and establishing best practice on the Web. Exploring marketing tactics and capabilities enabled by interactive technologies. Developing an understanding of Web-based business models and building a profitable e-business strategy. 4 lectures. Prerequisite: BUS 346 or equivalent.

**BUS 461, 462 Senior Project (2) (2)**

Selection and analysis of a problem under faculty supervision. Problems typical of those which graduates must solve in their fields of employment. Formal report is required. Minimum 120 hours total time.

**BUS 463 Applied Accounting and Auditing Research (4)**

Practice with multiple authoritative accounting and auditing databases, actual published financial reports, and business writing. Real world accounting and auditing issues, including revenue recognition and ethics issues. Federal and state regulation of securities transactions. Prerequisite: BUS 322 and Graduation Writing Requirement.

**BUS 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: Consent of instructor.

**BUS 471 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: BUS 384 and STAT 252, or equivalent.

**BUS 472 Labor Relations (4)**

Union organizing. Negotiation and administration of collective agreements. Simulation of bargaining, grievance, and arbitration processes. 4 lectures. Prerequisite: BUS 384 or equivalent.

**BUS 473 Employment Law (4)**

Federal and state labor policy as expressed in common law, relevant statutes, and executive orders. Effects upon employees, management, protected groups, and the public. Current rules analyzed in a contemporary and historical context. Understanding important workplace and employment problems. 4 lectures. Prerequisite: BUS 207, BUS 384 or equivalent.

**BUS 475 Staffing (4)**

Processes by which individuals and organizations become matched to form the employment relationship. Specific issues related to human resources planning, internal and external recruitment and selection. 4 lectures. Prerequisite: BUS 384 and STAT 252, or equivalent.

**BUS 476 Employee Training and Development (4)**

Design, delivery and evaluation of employee training and human resource development in an organizational setting. 4 lectures. Prerequisite: BUS 384.

**BUS 477 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: BUS 387 or consent of instructor.

**BUS 478 Organization Design (4)**

Impact of changing business environment on design of organizations. Alternative design models, redesign processes, and guiding principles. Application to case studies, current redesign projects and field studies. 4 lectures. Prerequisite: BUS 382 or consent of instructor.

**BUS 479 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.

**BUS 480 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: BUS 371.

**BUS 481 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: BUS 371.

**BUS 482 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: BUS 371, and senior standing.

**BUS 483 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: Senior standing or consent of instructor.

**BUS 484 Corporate Training (4)**

Developing and managing curriculum for an industrial setting. Developing a philosophy, assessing resources, developing and sequencing objectives, developing and properly using materials in training, evaluating and reporting effectiveness. Managing people and resources within this process in an industrial setting. 4 lectures. Prerequisite: Senior standing.

**BUS 486 Human Resource Information Systems (4)**

Application of computers to the management of human resources. Human resource decision support systems and routine transaction processing. Basic system design decisions. Use of information systems to support traditional human resource functional areas. Exposure to enterprise-wide, integrated software. 2 lectures, 2 activities. Prerequisite: BUS 384 and BUS 392.

**BUS 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, BUS 371.

**BUS 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.

**BUS 491 Modeling and Analysis Using Computer Simulation (4)**

Modeling organizational systems and processes such as computer networks, transportation systems, manufacturing systems, retail systems, etc. Developing computer simulation models and animation of systems to provide decision support in selecting system design alternatives. Applying quantitative methods to model uncertainty and conduct statistical performance analysis. 4 lectures. Prerequisite: BUS 391, STAT 251 or equivalent.

**BUS 492 Applications of Intelligent Systems in Business (4)**

Impact of expert systems and neural networks on business. History, structure, development and functions of business, rule-based, expert systems and neural networks. 4 lectures. Prerequisite: BUS 391.

**BUS 494 Small Business Information Systems (4)**

Information systems in a small business environment. Collaborative learning with teams analyzing, designing and implementing accounting and management reporting software. Determine and implement organizational policies and procedures. Coverage of business processes in the areas of accounting, procurement, human resource, and production. 4 lectures. Prerequisite: BUS 391 or consent of instructor.

**BUS 495 Software Testing (4)**

Theory and practice of software testing, including state-of-the-art practices, design issues, staffing issues, test management issues, and other related areas. Software testing tools utilized for applications testing, load-stress testing, and test management. 4 lectures. Prerequisite: BUS 391, CSC 101, CSC 102.

**BUS 496 Electronic Commerce (4)**

Focus on the technology of electronic commerce, including programming, development environments and security, through a series of lectures, guest speakers, demonstrations, exercises and case studies. Networking, client/server computing, and web/database design concepts. Working e-commerce application required at end of course. 4 lectures. Prerequisite: BUS 391, CSC 101, CSC 102, CSC 103 or BUS 390, and junior standing.

**BUS 497 Multimedia Presentation Systems in Business (4)**

Use of front-end software animation development tools, such as Director, to explore computer multimedia environments with an emphasis on visual programming for business applications. Methods for integrating text, graphics, animation, sound and video to construct desktop and web based presentations. 4 lectures. Prerequisite: BUS 391.

**BUS 498 Directed Topics in MIS (4)**

Specialized MIS topic will be selected from the MIS areas of current interest. Intended for proficient and advanced MIS concentration students who want to learn and acquire in-depth MIS information and skills. *Class Schedule* will list topic selected. 4 lectures. Prerequisite: MIS concentration students only, and permission of instructor.

**BUS 499 Data Communications and Networking (4)**

Combines the fundamental concepts of data communications and networking with practical applications in business. Provides a basic understanding of the technical and managerial aspects of business telecommunication. Introduction to data communications and applications and technical fundamentals, and to network products, technologies, applications, and services. 4 lectures. Prerequisite: BUS 391, BUS 392, BUS 215 or consent of instructor.

**BUS 501 Managerial Accounting and Managerial Economics I (5)**

Accounting portion of course covers applications of accounting to management decision-making, planning, and control. Cost behavior analysis, budgets, performance reporting, plus motivational and

behavioral considerations. Economics portion of course covers demand and supply analysis, static and dynamic market equilibrium analysis, and elasticities. 5 lectures. Prerequisite: Graduate standing.

**BUS 502 Managerial Finance and Managerial Economics II (4)**

Finance portion of course covers short-term financial management, investment decisions, and cost of capital determination. Economics portion of course covers consumer choice analysis, theory of the firm, production theory, and market structures. 4 lectures. Prerequisite: BUS 501.

**CD-CHILD DEVELOPMENT****CD 102 Orientation to the Child Development Major (4)**

Introduction to child development, including methods and theories, career opportunities and the program at Cal Poly. Information on intellectual and attitudinal development during the college years, and a series of assessments to aid in setting goals. 4 lectures. Prerequisite: CD majors only or consent of instructor.

**CD 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 CD majors. 3 lectures.

**CD 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.

**CD 128 Nurturing Relationships for Infants and Toddlers (4)**

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. 1 lecture, 3 activities.

**CD 130 Supervised Study of Children: Infants and Toddlers (4)**

Faculty supervised experience with young children, emphasizing infants and toddlers. Participant observation, data collection skills, planning and conducting activities for individuals and groups in educational or childcare facilities.

**CD 200 Special Problems for Undergraduates (1-4)**

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 4 units per quarter.

**CD 203 Family Development (4)**

Examination of how families live out alterations experienced over the life cycle. Emphasis on using family development concepts to clarify central questions facing families over time. A model will be presented that will apply to the diversity found in society. 4 lectures.

**CD 207 Introduction to the Learner's Development, Culture, Language, and Identity (5) (Also listed as EDUC 207)**

Theoretical background of child development for teaching-learning in aspects of development that influence the teaching-learning process. Special emphasis on multicultural, language, and other diversity issues. Fieldwork activities in public school classrooms. 4 lectures, 1 activity. Prerequisite: PSY 201 or PSY 202. Not open to CD majors.

**CD 209 Early Development: Conception through Childhood (4)**

Human development from conception through childhood. Discussion and analysis of research and theory regarding physiological, cognitive and psychosocial domains of development, especially as they apply to working with children and families in educational settings. 4 lectures. Prerequisite: CD 102, PSY 201 or PSY 202, or consent of instructor.

**CD 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. Observation is used as the basis for planning for the development of the whole child. 4 laboratories. Prerequisite: CD 209, or consent of instructor.

**CD 306 Adolescence (4) (Also listed as PSY 306)**

Psychological analysis of the years from prepubescence to young adulthood. Current research on behavior and development during adolescence with emphasis on physical, affective, cognitive, sociocultural, historical, family, peer and school aspects of life during the post-child, pre-adult years. 4 lectures. Prerequisite: PSY 201 or PSY 202, junior standing.

**CD 309 Learning, Development, and Technology I (4)**

Introduction to relationship between development and learning, and to application of developmental principles to the creation of age appropriate curriculum. Principles illustrated through examination of sensory-motor development and appropriate activities for promoting gross motor, fine motor, perceptual, and volitional development. 4 activities. Prerequisite: CD 209, computer literacy (Recommended: CSC 111, CSC 113 or CSC 118).

**CD 310 Learning, Development, and Technology II (4)**

Examination of developmental learning and the activities, organizational practices, and methods which promote or hinder it, with a special examination of the influence of development in the process of children learning to read. 4 activities. Prerequisite: CD 309.

**CD 311 Learning, Development, and Technology III (4)**

Examination of the concept of learning competence and its relation to creativity. 4 activities. Prerequisite: CD 310.

**CD 324 Guiding Children (4)**

Group process and guidance techniques for adults working with 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 children. 4 lectures. Prerequisite: CD 209, or consent of instructor.

**CD 329 Research Methods in Child Development (4)**

Introduction to research methods in child development. Critically evaluating research literature, generating research questions, and conducting observations and interviews with children and adolescents. 3 lectures, 1 activity. Prerequisite: CD 209 or PSY 256 or CD/EDUC 207, STAT 217.

**CD 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: CD major, CD 230, CD 309, CD 324, PSY 323, KINE 280 or equivalent first aid certification, junior standing and consent of instructor.

**CD 350 Developmental Issues in Education (4)**

Current issues concerning how human beings develop and learn. Topics may include motivation, intelligence, peer relations, creativity, learning competence, moral development, and the implications these topics have for education. 4 lectures. Prerequisite: CD 209 or PSY 256 or CD/EDUC 207.

**CD 390 Career Planning (2) (CR/NC) (Also listed as PSY 390)**

Individual career and graduate school planning. Current employment issues for college graduates such as career profiles, trends and work environments. Credit/No Credit grading only. 2 seminars. Prerequisite: Junior or senior standing or consent of instructor.

**CD 400 Special Problems for Advanced Undergraduates (1-4)**

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 4 units per quarter. Prerequisite: Junior standing.

**CD 401 Perspectives on Childhood Education (4)**

Past, present and future perspectives in theory and practice of childhood education. Analysis of current research issues and applications. 4 seminars. Prerequisite: CD 310, CD 329, CD 330 or consent of instructor.

**CD 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: CD 102.

**CD 405 Advanced Administration of Child Development Centers (3)**

Problems of organization in site-specific child care programs. Personnel and child care legal issues. Finance and tax concerns. Public policy and current research. 3 seminars. Prerequisite: CD 404.

**CD 430 Advanced Internship (4) (CR/NC)**

Faculty-supervised preprofessional experience in a career-related setting which complements the CD 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: CD major, CD 330, and consent of instructor.

**CD 461 Senior Project Seminar (2)**

Senior project expectations and skills. Students work alone or in groups to identify appropriate topics, methods and content for the senior project; to be presented in a series of progress reports. 2 seminars. Prerequisite: CD major, completion of GWR, CD 309, CD 329, and consent of instructor.

**CD 462 Senior Project (2)**

Completion of a project under faculty supervision. Prerequisite: CD 461.

**CD 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: Consent of instructor.

## CE-CIVIL ENGINEERING

**CE 111 Introduction to Civil Engineering (1) (CR/NC)**

Broad overview of the field of civil engineering, including professional societies and their student chapters, professional licensing and registration, professional codes of ethics, the elements of engineering design, and the scope of analysis and design activities undertaken by private- and public-sector civil design professionals. Credit/No Credit grading only. 1 lecture.

**CE 114 Introduction to CAD in Civil and Environmental Engineering (4)**

The Civil and Environmental Engineering design process. Use of AutoCAD to illustrate and quantify design alternatives. Practice in creating and evaluating typical designs drawn from different specialty areas of the field. Related topics in information technology. 2 lectures, 2 laboratories. Prerequisite: MATH 141; CSC 110 or equivalent or passing score on qualifying test of basic computer skills.

**CE 200 Special Problems for Undergraduates (1-2) (CR/NC)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Credit/No Credit grading only. Prerequisite: Consent of department chair.

**CE 201 Strength of Materials (5)**

Stresses, strains, and deformations associated with axial, torsional, and flexural loading of bars, shafts, and beams. Mohr's Circle representations of the state of stress and strain at a point. Buckling of rigid and deformable columns. Analysis of elementary determinate and indeterminate mechanical and structural systems. Equivalent in content to CE 204 and CE 205. 5 lectures. Prerequisite: ME 211.

**CE 204 Strength of Materials I (3)**

Stresses, strains, and deformations associated with axial, torsional, and flexural loading of bars, shafts, and beams. Analysis of elementary determinate and indeterminate mechanical and structural systems. 3 lectures. Prerequisite: ME 211.

**CE 205 Strength of Materials II (2)**

Mohr's Circle representations of the state of stress and strain at a point. Analysis of beam deflections and rotations. Shear force and bending moment diagrams for indeterminate beams. Buckling of rigid and deformable columns. 2 lectures. Prerequisite: CE 204.

**CE 206 Strength of Materials Laboratory (1)**

Introduction to experimental stress analysis. Verification of analytical equations through strain gage measurements of axially, torsionally, and flexurally loaded specimens. 1 laboratory. Prerequisite or concurrent: CE 201 or CE 205.

**CE 221 Fundamentals of Transportation Engineering (3)**

The characteristics and functions of highway, air, rail, transit and other modes of urban and intercity transportation. History of transportation design, operations, and planning. Evaluation of costs, benefits, and environmental considerations. 3 lectures. Prerequisite: MATH 141.

**CE 222 Fundamentals of Transportation Engineering Laboratory (2)**

Application of principles of transportation planning, operations, and design. Emphasis on urban transportation planning and operations, and the design of urban and intercity highway and rail facilities. 2 laboratories. Prerequisite: CE 221.

**CE 259 Civil Engineering Materials (2)**

Experimental determination of mechanical properties of concrete, asphalt, and soils as required for engineering applications. Experimental verification of assumptions made in mechanics of materials procedures. Use of strain measuring devices. Preparation of technical reports. 2 laboratories. Prerequisite: CE 204.

**CE 336 Water Resources Engineering (4)**

Hydraulics of open channel flow, flow through hydraulic structures, stream flow and stream flow hydrographs, hydrologic routing. 4 lectures. Prerequisite: ME 341.

**CE 337 Hydraulics Laboratory (1)**

Application of basic fluid dynamic principles to various mechanical systems. Exposure to experimental problems and techniques with guided laboratory projects related to civil engineering discipline. 1 laboratory. Prerequisite: ME 341.

**CE 351 Structural Analysis (5)**

Analysis for member forces and deflections of determinate and indeterminate structures, including trusses, beams, and frames. General theorems, influence diagrams, and energy methods. 5 lectures. Prerequisite: CE 201 or 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 351.

**CE 381 Geotechnical Engineering (4)**

Engineering geology, elementary mass-volume relations, clay-water interaction, soil classification, soil compaction, geostatic stress distributions, 1-D and 2-D steady-state flow, shear strength under drained and undrained conditions. 4 lectures. Prerequisite: CE 205, ME 341.

**CE 382 Geotechnical Engineering Laboratory (1)**

Use of standard laboratory test methods to determine physical, mechanical, and hydraulic properties of soil. 1 laboratory. Co-requisite: CE 381.

**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 chair.

**CE 401 Linear Elasticity (4)**

The concept of stress and the development of balance laws. Development of displacement; strain and compatibility relations. Material response and constitution. Solution formulations and uniqueness. Two-dimensional problems in elasticity. 4 lectures. Prerequisite: CE 351.

**CE 402 Advanced Strength of Materials (4)**

Development of reduced order theories such as torsion, beams and columns from the general three-dimensional continuum. Application and limitation of these theories are discussed. Similarities are drawn between analytical formulas and code base rules and/or formulas. 4 lectures. Prerequisite: CE 401.

**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 351, ME 212.

**CE 421 Traffic Engineering (4)**

Improvement of urban circulation on freeways, city streets, and parking facilities. Traffic monitoring and control. Traffic data systems. Centralized versus decentralized control. Use of traffic simulation. New technologies. 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, intersections, interchanges, and freeways in urban and rural areas. 2 lectures, 2 laboratories. 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 I (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 432 Coastal Hydraulics II (3)**

Reformed breaker height determination, wave runup analysis using a reformed breaker height. Wave setback analysis. Pile height determination. Criteria for types of breaking waves. Revetment analysis, rip-rap revetment design, wave forces on pilings. 3 lectures. Prerequisite: CE 431.

**CE 434 Groundwater Hydraulics and Hydrology (3)**

Differential equations of groundwater flow, Darcy Law, solutions of the steady and unsteady flow, differential equations for confined and unconfined flows. Pumping test design. Groundwater models, leaky aquifers. Saltwater intrusion. 3 lectures. Prerequisite: CE 336.

**CE 440 Hydraulic Systems Engineering (3)**

Water and wastewater flows. Design of water distribution systems, transmission and storage reservoirs, wastewater collection systems, and storm water systems. Pumps and pump systems, flow measurements. Water sources for municipal supply. 3 lectures. Corequisite: CE 336.

**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 351.

**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 351, CE 355, CE 453.

**CE 457 Bridge Engineering (4)**

Fundamentals of the structural analysis and design of highway bridges. Construction materials in bridges. Loads on highway bridges. Load path and distribution in bridge superstructure. Design of reinforced concrete, pre-stressed concrete, steel plate girder, and composite bridges. 3 lectures, 1 laboratory. Prerequisite: CE 351, CE 355, CE 453.

**CE 458 Fiber Reinforced Polymer (FRP) Design (4)**

Properties and mechanical characteristics of Fiber Reinforced Polymer (FRP) composite materials; applications in civil engineering structures as primary or secondary reinforcement; and design techniques based on newly developed ACI 440 design guidelines and worldwide experience in FRP design. 3 lectures, 1 laboratory. Prerequisite: CE 351 and CE 355.

**CE 459 FRP Strengthening of Reinforced Concrete Structures (4)**

Flexural and shear strengthening reinforced and prestressed concrete members using fiber reinforced polymer composite plates and laminates; seismic repair and rehabilitation of columns, slabs, beams and structures. Focus on design philosophy and design methodology, based on the current understanding of FRP-strengthening techniques. 3 lectures, 1 laboratory. Prerequisite: CE 355.

**CE 461, 462 Senior Project (2) (2)**

Completion of a 120-hour integrated civil research, analysis, and/or design project that is representative of those encountered in professional practice. Prerequisite: Senior standing and consent of the supervising faculty member.

**CE 464 Professional Practice (3)**

Examination of the non-technical issues that are dealt with on a regular basis by the design professional, including professional ethics, marketing and business development, professional engagement, personnel and project management, risk management, professional liability insurance, and dispute resolution. 3 seminars. Prerequisite: Senior standing.

**CE 466 Senior Project Design Laboratory I (2)**

Selection and initial work on a project by individuals or team which is typical of problems graduates must solve in their fields of employment. Project involves, but is not limited to, physical modeling, testing and design. The project may include students/elements from other disciplines. Formulation of outline, literature review, project schedule, initial analyses and interim report. 2 laboratories. Prerequisite: Senior standing and consent of instructor. Note: although CE 466, 467 substitute for CE 461, 462, students may not use repeat credit for the purpose of increasing GPA.

**CE 467 Senior Project Design Laboratory II (2)**

Continuation of CE 466. Continuation of research methodology: problem statement, method, results, analysis, synthesis, project design, construction (when feasible), and evaluation/conclusions. Project results are presented in formal written reports for reference library and formal oral reports. 2 laboratories. Prerequisite: CE 466.

**CE 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.

**CE 471 Selected Advanced Laboratory (1-4)**

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 8 units. 1 to 4 laboratories.

Prerequisite: Consent of instructor.

**CE 481 Analysis and Design of Shallow Foundations (4)**

Immediate settlement, consolidation settlement, rate of consolidation, and creep. Stress distributions beneath loaded areas. Methods for accelerating and/or reducing settlement.

Analysis of bearing capacity for generalized conditions. Design of reinforced concrete spread footings. Standard field and laboratory testing. 3 lectures, 1 laboratory. Prerequisite: CE 381, CE 382.

**CE 482 Conventional Subsurface Exploration (4)**

Subsurface exploration and sampling techniques. Laboratory analysis of material variability. Preparation of subsurface exploration reports. 2 lectures, 2 laboratories. Prerequisite: CE 481.

**CE 483 Environmental Geotechnology (4)**

Application of geotechnical engineering principles to environmental engineering problems. Site characterization and assessment. Sampling and monitoring procedures. Design of waste containment systems. Site remediation. Computer-aided analysis. 4 lectures. Prerequisite: CE 481.

**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 chair, graduate advisor and supervising faculty member.

**CE 501 Advanced Matrix Analysis of Structures I (4)**

Matrix terminology and operations. Matrix procedures for analysis of two-dimensional frameworks. Development of stiffness, flexibility and mixed methods. Development of algorithms and programs for use in the analysis of structural frameworks. Discussion of modeling issues and limitations. 3 lectures, 1 laboratory. Prerequisite: CE 351 or consent of instructor.

**CE 502 Advanced Matrix Analysis of Structures II (4)**

Matrix procedures for analysis of three-dimensional frameworks. Development of algorithms and programs for use in the analysis of structural frameworks. Additional topics to include: member releases, nonprismatic members, elastic supports, offset connections and oblique supports. 3 lectures, 1 laboratory. Prerequisite: CE 501 or consent of instructor.

**CE 504 Advanced Finite Element Analysis I (4)**

Finite element theory and analysis for one-dimensional equations. Strong, weak and variational formulations. Physical and isoparametric spaces. Error estimates and numerical integration. Development of one-dimensional finite element algorithms using industry based software. Discussion modeling issues and limitations. 3 lectures, 1 laboratory. Prerequisite: CE 501.

**CE 505 Advanced Finite Element Analysis II (4)**

Finite element theory and analysis for multi-dimensional equations. Variational formulations and their significance. Isoparametric formulation and numerical integration. Development of two and three-dimensional

finite element algorithms using industry based software. Discussion modeling issues and limitations. 3 lectures, 1 laboratory. Prerequisite: CE 504.

**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 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, 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 221, 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 535 Water Resources Systems Planning and Analysis (3)**

Water resources planning, development, system analysis and optimization. Dynamic programming, multi-objective water resource systems. 3 lectures. Prerequisite: CE 336.

**CE 537 Groundwater Contamination (3)**

Sources and types of groundwater contamination, contamination transport mechanisms. Sorption and other chemical reactions. Numerical modeling of contaminant transport. Nonaqueous phase liquids. Groundwater remediation and design. 3 lectures. Prerequisite: CE 114; co-requisite: CE 434 or equivalent.

**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 557 Seismic Analysis and Design for Civil Engineers (4)**

Extension of the basic principles of structural dynamics to analysis of civil structures (buildings, bridges, tanks, etc.) to earthquake loading. Code based (Uniform Building Code and AASHTO) earthquake resistant design of civil structures. 3 lectures, 1 laboratory. Prerequisite: CE 407.

**CE 559 Advanced Structural Design (4)**

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 prestressed concrete components of civil engineering systems for buildings and highway construction. Beams, slabs, columns, continuous systems, walls, connections, and composite systems. 4 lectures. Prerequisite: CE 355 or graduate standing.

**CE 570 Selected Advanced Topics (1-4)**

Directed group study of selected topics for advanced students. Open to graduate students. *Class Schedule* will list topic selected. Total credit limited to 8 units. 1-4 seminars. Prerequisite: Graduate standing or consent of instructor.

**CE 571 Selected Advanced Laboratory (1-4)**

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 8 units. 1-4 laboratories. Prerequisite: Graduate standing or consent of instructor.

**CE 573 Public Works Administration (3)**

Management and engineering of infrastructure and related systems in public jurisdictions. Utility 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 (4)**

Advanced topics in saturated flow, unsaturated flow, and consolidation. Stress-strain-deformation response of soils under both drained and undrained loading. Soil stabilization, and ground modification. Conventional and advanced field and laboratory strength testing. 2 lectures, 2 laboratories. Prerequisite: CE 481 or graduate standing.

**CE 582 Advanced Geotechnical Testing (4)**

Standard penetration, cone penetration, and flat-plate dilatometer testing. Equipment operation and maintenance. Interpretation of SPT/CPT/DMT sounding data. Stratigraphic analysis. CPT/DMT-based analysis and design of shallow and deep foundations. 2 lectures, 2 laboratories. Prerequisite: CE 481 or graduate standing.

**CE 583 Geotechnical Earthquake Engineering (4)**

Introduction to engineering seismology, dynamic behavior of soils, seismic site response analysis, seismic dynamic pressures, seismic stability of slopes, soil liquefaction and lateral spreading, and mitigation techniques. Computer-aided analysis. 4 lectures. Prerequisite: CE 481 or graduate standing.

**CE 584 Lateral Support Systems (4)**

Classical and modern earth pressure theories. Lateral earth pressure calculations for general subsurface conditions. Analysis and design of reinforced concrete cantilever walls, sheetpile walls, soldier-pile walls, tie-back walls, and mechanically-stabilized earth. Computer-aided analysis and design. 4 lectures. Prerequisite: CE 481 or graduate standing.

**CE 585 Slope Stability Analysis (4)**

Analysis of stability by planar, circular arc, piecewise-linear, and composite-surface techniques. Analysis of earth-fill dams and reservoirs for static, steady flow, sudden drawdown, and seismic loading conditions.

Field instrumentation. Methods for slope remediation and stabilization. Computer-aided analysis. 4 lectures. Prerequisite: CE 481 or graduate standing.

#### **CE 586 Analysis and Design of Deep Foundations (4)**

Bearing capacity and settlement analysis of drilled shafts and driven piles. Analysis and design of single piles and pile groups for vertical, lateral, and combined loading. Construction procedures, field inspection, and load-testing. Computer-aided analysis and design. 4 lectures. Prerequisite: CE 481 or graduate standing.

#### **CE 591 Graduate Seminar (1)**

Examination of current research activities and analysis/design philosophies in civil and environmental engineering practice. 1 seminar. Prerequisite: Graduate standing.

#### **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 110 World of Chemistry (4)**

**GE B3 & B4**

The fundamentals of chemical cause and effect-structure/function relationships. The basic principles of chemistry and their applications to solving human problems in organic materials science, biochemistry, toxicology, environmental science, agriculture, nutrition, and medicine. Not open to students majoring in Chemistry or Biochemistry. 3 lectures, 1 laboratory. Prerequisite: Appropriate score on the ELM examination for MATH 116 eligibility, or an ELM exemption, or MATH 104.

#### **CHEM 111 Survey of Chemistry (5)**

**GE B3 & B4**

Introduction to atomic theory, chemical reactions, bonding, stoichiometry, nomenclature, and solutions. Intended for students who are preparing for CHEM 212/312. Not open to students with credit for CHEM 128. 4 lectures, 1 laboratory. Prerequisite: High school chemistry or CHEM 106 or equivalent, and appropriate score on the ELM examination for MATH 116 eligibility, or an ELM exemption, or MATH 104.

#### **CHEM 124 General Chemistry for the Engineering Disciplines (4)**

**GE B3 & B4**

General chemistry concepts presented using a materials science approach with engineering applications. Thermochemistry, bonding, solid-state structures, fundamentals of organic chemistry including polymers. Classwork is presented in an integrated lecture-laboratory format, with an emphasis on computer-based data acquisition, collaborative methods and multimedia-based presentation. Not open to students with credit for CHEM 111 or CHEM 127. 3 lectures, 1 laboratory. Prerequisite: High school chemistry or CHEM 106 or equivalent, and appropriate score on the ELM examination for MATH 116 eligibility or an ELM exemption or MATH 104.

#### **CHEM 125 General Chemistry for the Engineering Disciplines (4)**

**GE B3 & B4**

A continuation of general chemistry designed for engineering students. Topics include solution chemistry, thermodynamics, kinetics, equilibrium, acids and bases, electrochemistry, and nuclear chemistry. Integration of laboratory with theoretical concepts. Use of computers for data acquisition and multimedia resources. Guided inquiry and collaborative methods emphasized. Not open to students with credit for CHEM 128. 3 lectures, 1 laboratory. Prerequisite: CHEM 124 or equivalent.

#### **CHEM 127 General Chemistry (4)**

**GE B3 & B4**

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 College of Science and Mathematics. Not open to students with credit in CHEM 111 or CHEM 124. 3 lectures, 1 laboratory. Prerequisite: High school chemistry or CHEM 106 or equivalent, and appropriate score on the ELM examination for MATH 116 eligibility or an ELM exemption or MATH 104.

#### **CHEM 128 General Chemistry (4)**

Continuation of CHEM 127. Oxidation-reduction reactions, electrochemistry, kinetics, equilibria, thermodynamics, acids and bases. Intended primarily for students whose majors are in the College of Science and Mathematics. Not open to students with credit in CHEM 125. 3 lectures, 1 laboratory. Prerequisite: CHEM 127.

#### **CHEM 129 General Chemistry (4)**

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 College of Science and Mathematics. 3 lectures, 1 laboratory. Prerequisite: 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 111, CHEM 124, or CHEM 127 and consent of department head.

#### **CHEM 212 Introduction to Organic Chemistry (5)**

Introduction to the fundamentals of organic chemistry nomenclature and selected reactions for the major functional groups. Promotes an understanding of how the structure and reactions of selected organic molecules relate to living systems and our environment. CHEM 212 accepted in lieu of CHEM 312, but not for upper division credit. Not open to students with credit in CHEM 312, CHEM 216/316. 4 lectures, 1 laboratory. Prerequisite: CHEM 111 or CHEM 128 or equivalent.

#### **CHEM 216 Introduction to Organic Chemistry I (5)**

Basic principles of the bonding, isomerism and stereochemistry in compounds of carbon. Essentials of organic nomenclature. Representative reactions and mechanisms for selected aliphatic and aromatic compounds. Introduction to the physical analysis and synthesis of organic compounds. CHEM 216 accepted in lieu of CHEM 316, but not for upper division credit. Not open to students with credit in CHEM 316. 4 lectures, 1 laboratory. Prerequisite: CHEM 111 or CHEM 125 or CHEM 128.

#### **CHEM 217 Introduction to Organic Chemistry II (5)**

Properties and reactions of carbonyl compounds, alcohols, and organic halides with an overview of the mechanisms of the reactions. Introductory concepts and applications of infrared and NMR spectroscopy. CHEM 217 accepted in lieu of CHEM 317, but not for upper division credit. Not open to students with credit in CHEM 317. 3 lectures, 2 laboratories. Prerequisite: CHEM 216/316.

#### **CHEM 218 Introduction to Organic Chemistry III (3)**

Properties and reactions of amines, heterocyclic and aromatic compounds with an overview of the mechanisms of the reactions. Introductory concepts and applications of ultraviolet spectroscopy and mass spectrometry. CHEM 218 accepted in lieu of CHEM 318, but not for upper division credit. Not open to students with credit in CHEM 318. 3 lectures. Prerequisite: CHEM 217/317.

#### **CHEM 231 Introduction to Quantitative Analysis (5)**

Fundamental theory for common titrimetric and spectrophotometric methods in analytical chemistry. Essentials of chemical equilibria as it applies to titration curves. The laboratory focuses on precision and accuracy for common, practical methods in analytical chemistry. CHEM 231 accepted in lieu of CHEM 331, but not for upper division credit. Not

open to student with credit in CHEM 331. 3 lectures, 2 laboratories.  
Prerequisite: CHEM 129.

### **CHEM 252 Laboratory Glassblowing (1)**

Techniques of glassblowing applied to the making of simple laboratory apparatus. 1 laboratory. Prerequisite: CHEM 111, CHEM 124 or CHEM 127.

### **CHEM 305 Physical Chemistry for Engineers (4)      GE B6**

Fundamentals and applications of chemical thermodynamics of particular interest to engineers. Chemical and phase equilibria. 4 lectures.  
Prerequisite: PHYS 123 or PHYS 133, CHEM 125 or CHEM 129, MATH 143.

### **CHEM 306 Physical Chemistry (3)**

Applications of chemical thermodynamics. Electrochemistry. Kinetic theory of gases. Chemical kinetics. 3 lectures. Prerequisite: CHEM 305, or CHEM 351 or ME 302.

### **CHEM 312 Survey of Organic Chemistry (5)**

Structure, isomerism, nomenclature, fundamental reactions of major functional groups and applications of organic chemicals in agriculture, medicine, industry, and the home. Not open to students with credit in CHEM 212 or CHEM 216/316. 4 lectures, 1 laboratory. Prerequisite: CHEM 111 or CHEM 127 or equivalent.

### **CHEM 313 Survey of Biochemistry and Biotechnology (5)**

Chemistry of biomolecules including carbohydrates, proteins, fats, vitamins, enzymes and hormones. Basic molecular biology with applications to biotechnology and genetic engineering. Practical intermediary metabolism of prokaryotic and eukaryotic systems. 4 lectures, 1 laboratory. Prerequisite: CHEM 212/312 or equivalent.

### **CHEM 316 Organic Chemistry I (5)**

Structure, bonding, nomenclature, isomerism, stereochemistry and physical properties of organic compounds. Introduction to spectroscopy. Reactions and mechanisms of alkanes, alkenes, alkynes, cycloalkanes and aromatic compounds. Laboratory techniques in organic preparations. 4 lectures, 1 laboratory. Prerequisite: CHEM 111 or CHEM 125 or CHEM 128.

### **CHEM 317 Organic Chemistry II (5)**

Reactions and reaction mechanisms of organic halides, alcohols, phenols, epoxides, ethers, carboxylic acids and their derivatives, aldehydes, ketones; acidity and basicity; infrared and NMR spectroscopy. 3 lectures, 2 laboratories. Prerequisite: CHEM 216/316.

### **CHEM 318 Organic Chemistry III (3)**

Chemistry of amines, aromatic compounds, heterocycles, macromolecules, some biomolecules, carbanions, rearrangement and ultraviolet and mass spectrometry. 3 lectures. Prerequisite: CHEM 217/317.

### **CHEM 319 Advanced Organic Chemistry Laboratory (2)**

Practice in multiple step organic synthesis, column chromatography, vacuum distillation, enzymes as chemical reagents, inert atmosphere techniques, introduction to FT NMR spectroscopy and mass spectrometry, survey of organic chemical literature. 2 laboratories. Prerequisite: Concurrent or prior enrollment in CHEM 218/318.

### **CHEM 331 Quantitative Analysis (5)**

Theory and application of chemical equilibrium to analytical problems. Survey of important analytical methods with stress placed on the theory and application associated with titrimetric and spectrophotometric analysis. 3 lectures, 2 laboratories. Prerequisite: Students should take CHEM 331 as soon as possible after completing CHEM 129.

### **CHEM 341 Environmental Chemistry: Water Pollution (3)**

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 212/312 or CHEM 216/316.

### **CHEM 342 Environmental Chemistry: Air Pollution (3)**

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 212/312 or CHEM 216/316.

### **CHEM 344 Environmental Chemistry Laboratory (1)**

Applicability of modern chemical instrumentation to the solution of present-day environmental problems. Includes instruction in operation of instrumentation, calculations, and interpretation of results from environmental analyses of a variety of air, water, and solid samples. 1 laboratory. Prerequisite: CHEM 341 or CHEM 342.

### **CHEM 349 Chemical and Biological Warfare (4)      GE Area F**

History, development, and use of chemical and biological warfare (CBW). Chemical and biological disarmament. Production and destruction of CBW agents. Uses of CBW. CBW terrorism. Ethics of CBW. Not available for GE Area F credit to Chemistry and Biochemistry majors. 2 lectures, 2 seminars. Prerequisite: Completion of GE Area B, including a chemistry course (CHEM), a course in biology (BIO, MCRO or ZOO), and junior standing.

### **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 212/312 or equivalent.

### **CHEM 351 Physical Chemistry I (3)**

Basic physical chemistry for the study of chemical and biochemical systems. Kinetic-molecular theory, gas laws, principles of thermodynamics. Not open to students with credit in CHEM 305. 3 lectures. Prerequisite: CHEM 129, PHYS 123 or PHYS 133; MATH 143.

### **CHEM 352 Physical Chemistry II (3)**

Application of physical chemistry to chemical and biochemical systems. Electrochemistry, kinetics, viscosity, surface and transport properties. Not open to students with credit in CHEM 306. 3 lectures. Prerequisite: CHEM 305 or CHEM 351.

### **CHEM 353 Physical Chemistry III (3)**

Principles and applications of quantum chemistry. Chemical bonding and molecular structure. Spectroscopy and diffraction. 3 lectures. Prerequisite: CHEM 352, or CHEM 306, or consent of instructor.

### **CHEM 354 Physical Chemistry Laboratory (2)**

Experimental studies of gases, solutions, thermochemistry, chemical and phase equilibria, electrochemistry, chemical and enzyme kinetics, computational methods and applications to chemistry and biochemistry. Use of applicable literature and databases. 2 laboratories. Prerequisite: CHEM 231/331 and CHEM 306 or CHEM 352.

### **CHEM 357 Physical Chemistry III Laboratory (1)**

Experimental and computational investigations of quantum chemistry, spectroscopy, symmetry and statistical chemistry. 1 laboratory. Corequisite: CHEM 353.

### **CHEM 371 Biochemical Principles (5)**

Chemical and physical factors in biological processes. Chemistry and function of major cellular constituents: proteins, lipids, carbohydrates. 4 lectures, 1 laboratory. Prerequisite: CHEM 212/312 or CHEM 217/317. Recommended: CHEM 231/331.

**CHEM 372 Metabolism (3)**

Intermediary metabolism, regulation and integration of metabolic pathways, bioenergetics, photosynthesis, electron transport, nitrogen fixation, biochemical function of vitamins and minerals. 3 lectures. Prerequisite: CHEM 371.

**CHEM 373 Molecular Biology (3)**

Structure of nucleic acids and chromosomes. Mechanisms and regulation of nucleic acid and protein synthesis. Molecular biology techniques and protein targeting. 3 lectures. Prerequisite: CHEM 371.

**CHEM 374 Biochemistry Laboratory (2)**

Experiments in microbial metabolism, purification, analysis and manipulation of proteins and nucleic acids. 2 laboratories. Prerequisite: CHEM 371.

**CHEM 375 Molecular Biology Laboratory (2)**  
(Also listed as BIO 375)

Introduction to techniques used in molecular biology and biotechnology; plasmid DNA extraction, characterization and use in transformation. Gene cloning, southern blotting, reverse transcription, and polymerase chain reaction. 2 laboratories. Prerequisite: MCRO 221 or MCRO 224, and BIO 351 or CHEM 373.

**CHEM 377 Chemistry of Drugs and Poisons (3)**

Introduction to pharmacology: history, sources, development and testing, physical and chemical properties, biochemical and physiological effects, mechanisms of action, and the therapeutic uses and toxicology of common drugs and poisons acting on the nervous, cardiovascular, immune and hormone systems, and on cancer, infectious disease, etc. Especially applicable to students in nonbiochemical disciplines. 3 lectures. Prerequisite: CHEM 313 or CHEM 371 or consent of instructor.

**CHEM 385 Geochemistry (3)**

Application of chemical principles to terrestrial and extraterrestrial systems. Formation of the elements; chemical influences on the earth's formation; chemical evolution studies; age-dating techniques; reactions in sea water; petroleum and ore formation; distribution and movement of the elements. 3 lectures. Prerequisite: CHEM 216/316, CHEM 231/331.

**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. 1-3 laboratories. Prerequisite: Junior standing and consent of department head.

**CHEM 405 Advanced Physical Chemistry (3)**

Selected advanced topics in physical chemistry, which may include statistical mechanics, computational chemistry, nonequilibrium thermodynamics, lasers in chemistry, solid-state and/or advanced spectroscopy. Total credit limited to 6 units. 3 lectures. Prerequisite: CHEM 353 or consent of instructor.

**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 218/318.

**CHEM 420 Advanced Organic Chemistry-Synthesis (3)**

Modern methods of organic synthesis. Carbon-carbon bond forming reactions, functional group transformations, protecting groups, strategies of total synthesis of natural products. 3 seminars. Prerequisite: CHEM 218/318.

**CHEM 437 Clinical Chemistry (3)**

Advanced principles of physiologic chemistry including clinical significance of medical laboratory data. Theoretical and practical aspects of biochemical profiling. Theory of biochemical techniques in clinical chemistry and pathology, metabolic and organ-specific investigations and interpretation of results, clinical instrumentation, serum enzyme and

hormone assay techniques. 3 lectures. Prerequisite: CHEM 313 or CHEM 372 or consent of instructor.

**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 231/331, CHEM 354. Recommended: CHEM 353.

**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 217/317.

**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 217/317.

**CHEM 446 Surface Chemistry of Materials (3)**  
(Also listed as MATE 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 305 or CHEM 351 or course in engineering thermodynamics.

**CHEM 447 Polymers and Coatings Laboratory I (2)**

Synthesis and characterization of polymers. Experimental techniques of step growth and chain growth polymerization. Experimental methods of molecular weight determination. Experimental methods of thermal, spectroscopic, and mechanical analysis. 2 laboratories. Prerequisite: CHEM 444. Recommended: CHEM 445 or concurrent.

**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 444, CHEM 445.

**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 217/317 or consent of instructor.

**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. Not open to students with credit for CHEM 458. 1 laboratory. Prerequisite: CHEM 319.

**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 319.

**CHEM 459 Undergraduate Seminar (2)**

Oral presentation of current developments in chemistry based on current literature. Searching, organizing and presenting chemical information. Preparation for employment and for independent work, including senior project, in chemistry. 2 seminars. Prerequisite or corequisite: CHEM 318 and junior standing.

**CHEM 460 Senior Project – Extended Report (1)**

Extended report on a topic from either an elective laboratory course or an off-campus laboratory experience. Consent of a supervising faculty member must be obtained prior to enrollment in the laboratory course or the off campus experience. Minimum 30 hours time commitment. Prerequisite: CHEM 459 and consent of instructor.

**CHEM 461 Senior Project – Literature Review (2)**

Completion of a written literature review project under faculty supervision. Written report includes analysis of experimental results presented in the chemical or biochemical literature. Minimum 60 hours time commitment. Prerequisite: CHEM 459 and consent of instructor.

**CHEM 462 Senior Project – Laboratory Research (2)**

Completion of a laboratory research project and written report under faculty supervision. Minimum 60 hours time commitment. Total credit limited to 4 units. Prerequisite: CHEM 459 and consent of instructor.

**CHEM 463 Senior Project – Honors Research (2)**

Advanced laboratory research. Results are presented in a poster session or other public forum. Minimum 60 hours time commitment. Prerequisite: 4 units of CHEM 462 and consent of instructor.

**CHEM 465 College Teaching Practicum (1–2) CR/NC**

Teaching assignment in an undergraduate college classroom. Includes teaching and related activities under the direction of a permanent faculty member in the Department of Chemistry and Biochemistry. Total credit limited to 4 units. Prerequisite: Junior standing, CHEM 231/331 (or permission of instructor), evidence of satisfactory preparation in chemistry. Department chair approval required.

**CHEM 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: CHEM 305, or CHEM 351, or CHEM 217/317 or consent of instructor.

**CHEM 471 Selected Advanced Laboratory (1–4)**

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 8 units. 1–4 laboratories. Prerequisite: Consent of instructor.

**CHEM 472 Plant Biochemistry (2)**

Application of plant biochemistry, molecular biology and physiology to topics, including plant secondary metabolism, defense mechanisms, drought tolerance, functional genomics, advanced photosynthesis, circadian rhythms, manipulation of plants for improved nutrition, other current research topics. 3 lectures. Prerequisite: CHEM 313 or CHEM 371 or BIO 435.

**CHEM 473 Immunochemistry (3)**

Theory and practice of immunochemistry including the structure, genetics, chemical modification and production of antibodies, immunochemical techniques and the biochemistry of the immune defense process. 3 lectures. Prerequisite: CHEM 371 or consent of instructor.

**CHEM 474 Protein Techniques Laboratory (2)**

Experiments in protein affinity chromatography, electrophoresis and blotting, immunoprecipitation techniques, antibody-enzyme conjugation, and immunoassay. 2 laboratories. Prerequisite: CHEM 313 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 478 Pharmaceutical Development (3)**

Process of drug development from research clinical candidate to market. Chemical process development, including synthesis optimization, scale up, pilot plant work, manufacturing, and good manufacturing procedure (GMP's). Role of pharmaceuticals in drug development, including various forms of formulation, analytical development requirements, and quality assurance. Project planning and timeline management, clinical trials, and regulatory affairs, including FDA filings. 3 lectures. Prerequisite: CHEM 318.

**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, or CHEM 352, and CHEM 231/331 or consent of instructor.

**CHEM 484 Inorganic Chemistry Laboratory (2)**

Laboratory techniques in inorganic chemistry. Synthetic and analytic techniques as applied to inorganic and organometallic chemistry. 2 laboratories. Prerequisite: 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 313 or CHEM 372 or consent of instructor.

**CHEM 544 Polymer Physical Chemistry and Analysis (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, atomic force microscopy. Not open to students with credit in CHEM 444. 3 lectures. Prerequisite: CHEM 351.

**CHEM 545 Polymer Synthesis and Mechanisms (3)**

Polymerization methods and mechanisms; chemistry of initiators, catalysts and inhibitors; use of representative types; synthesis, film formation, structure and properties of polymers commonly used in coatings and adhesives. Polymer nomenclature. Not open to students with credit in CHEM 445. 3 lectures. Prerequisite: CHEM 317 or equivalent.

**CHEM 547 Polymer Characterization and Analysis Laboratory (2)**

Polymer characterization and analysis. Molecular weight analysis using viscometry, light scattering, and gel permeation chromatography. Thermal analysis using differential scanning calorimetry, thermal mechanical analysis and dynamic mechanical analysis. Polymer rheology. Infrared, Raman and FT-NMR spectroscopy. Atomic force microscopy. Fabrication and testing of conducting polymeric materials. Not open to students with credit in CHEM 447. 2 laboratories. Corequisite: CHEM 544.

**CHEM 548 Polymer Synthesis Laboratory (2)**

Polymer synthesis using solution, suspension, bulk, emulsion techniques. Synthesis of chain growth polymers using free radical, anionic, cationic, and other catalysts. Synthesis of step-growth polymers. Kinetics of polymer reactions. Synthesis of resins used in modern coatings. Not open to students with credit in CHEM 448. 2 laboratories. Prerequisite: CHEM 317; corequisite: CHEM 545.

**CHEM 550 Coatings Formulation Principles (3)**

Formulation of modern coatings. Raw materials including resins, solvents, pigments, and additives. Formulation principles for solvent-borne and high solids coatings, water-borne coatings, powder coatings, radiation cure coatings and architectural coatings. Regulatory issues; VOC's. Coating properties, film formation, film defects, application methods, color and color acceptance. 3 lectures. Prerequisite: CHEM 444 or CHEM 544.

**CHEM 551 Coatings Formulation Laboratory (2)**

Laboratory formulation of modern coatings. Formation of pigment dispersions. Formulation of solvent-borne and high solids coatings, water-borne coatings, powder coatings, radiation cure coatings and architectural coatings. VOC measurements. Measurement of coating properties, film formation, film defects, application methods, color and color acceptance, hiding, gloss. Accelerated weathering. 2 laboratories. Corequisite: CHEM 550.

**CHEM 570 Directed Graduate Study (3)**

Directed graduate study in specialized advanced topics related to graduate internship. Topics developed jointly by faculty research advisor and industrial research supervisor. Available only to students while on graduate industrial internship. Topics chosen to highlight the industrial experience. Student expected to work independently and report weekly to faculty advisor and industrial supervisor. Total credit limited to 9 units. Corequisite: CHEM 598.

**CHEM 598 Graduate Internship (3)**

Supervised industrial graduate internship in polymers and coatings science. Provides students with industrial research experience. Requires approval of graduate advisor. Students engage in industrial research and development at an approved industry, make regular reports back to graduate advisor, and present formal report and seminar on work each quarter. Total credit limited to 9 units. Prerequisite: CHEM 545, CHEM 547, CHEM 548, CHEM 550, CHEM 551.

**CM-CONSTRUCTION MANAGEMENT****CM 211 Construction Contract Documents (4)**

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. 4 laboratories. Prerequisite: ARCH 106, ARCH 111.

**CM 212 Fundamentals of Construction Management (3)**

Introduction to the basic concepts of construction management. Areas of focus to include quantity analysis, productivity, work activity sequencing, network scheduling and computer applications specific to construction management. 3 laboratories. Prerequisite: CM 211 and BRAE 237.

**CM 221 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: ARCH 106.

**CM 315 Fiscal and Project Feasibility (4) (Also listed as CRP 315)**

Analysis of the revenue streams and costs involved in project development. Impact analysis of costs and revenues on private and public sectors included. Impact analysis of costs and revenues on private and

public sectors included. Construction of pro-formas for various project types. 3 lectures, 1 laboratory. Prerequisite: ECON 201 or ECON 221.

**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: BUS 214 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 222 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 207 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 344 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: ARCE 226 and CM 221.

**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 Electrical Support System Construction Practices (3)**

Equipment, materials and techniques of installation and construction of electrical utilities and electrical power systems. Includes electrical and gas distribution, communications, CATV and conveyance systems. Emphasis on the role of specialty contractors in the construction process. 3 laboratories. Prerequisite: Third-year standing.

**CM 353 Building Mechanical Support System Construction Practices (3)**

Equipment, materials and techniques of installation and construction of environmental systems. Includes commercial and industrial piping, plumbing, fire protection, mechanical and other environmental systems controls. Emphasis on the role of specialty contractors in the construction process. 3 laboratories. 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 constructor, architect, engineers and owner. 3 laboratories. 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 430 Capital Projects Planning (4)**

Planning, programming, and management requirements of owner and end users in relationship to the design and construction of capital projects, improvements, and facilities. Identification of facility requirements, and coordination of the physical workplace, its people, and the work of the organization with the design and construction process. 4 activities. Prerequisite: CM 332, CM 431.

#### **CM 431 Integrated Project Services (3)**

Overview of project delivery methods with an emphasis on trends in integrated services project delivery. Integrated services entity organization structures, process variations, procurement and selection methodologies. Integration of planning, design and construction efforts to achieve maximum project quality and value. 3 laboratories. Prerequisite: Upper division standing.

#### **CM 432 Design-Build Project Management (3)**

Management issues applicable to the design and construction integration method of project delivery. Project sponsor/project advocate techniques, monitoring the evolving design, detecting and controlling change, early warning systems, cost trending, schedule impacts, cost impacts, systems integration, contract/scope modifications, procurement, contingencies, quality, and overall process control. 3 activities. Prerequisite: CM 431.

#### **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 452 Project Controls (3)**

Planning, organization, scheduling, and control of construction projects. 3 laboratories. Prerequisite: Fourth-year standing or consent of instructor.

#### **CM 453 Project Development (4)**

Methods and procedures used in the development of a residential, commercial, or industrial project. 4 laboratories. Prerequisite: Fourth-year standing, CRP 212 or consent of instructor.

#### **CM 454 Building Estimating (3)**

Procedures for analyzing materials and methods involved in estimating costs for construction projects. 3 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 463 Professional Practice for Senior Construction Project Managers (4)**

Practical application of construction management theory and practice solving problems in a simulated professional environment. Computer applications used in the decision making process. 4 laboratories. Prerequisite: CM 443, CM 452, CM 454.

#### **CM 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.

#### **CM 471 Selected Advanced Laboratory (1–4)**

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 8 units. 1–4 laboratories. Prerequisite: Consent of instructor.

#### **CM 475 Real Property Development Principles (4)**

Development process and its major actors: investors, developers, government agencies, environmental and local stakeholders; their development roles, objectives, approaches. Basics of urban markets and economics, financing, regulation, public planning; value added, contractual, environmental and community context factors. 4 lectures. Prerequisite: Upper-division standing.

#### **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 Advanced Construction Estimating (3)**

Advanced theory and practice of cost estimating techniques. Includes standard, conceptual and parameter estimating; bidding strategies, value engineering concepts, and risk analysis. Emphasis on computer applications. 2 lectures, 1 activity. Prerequisite: CM 454 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 (4)**

Directed study of selected topics in Construction Management. *Class Schedule* will list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

## **CPE—COMPUTER ENGINEERING**

#### **CPE 100 Computer Engineering Orientation (1) (CR/NC)**

Introduction to the computer engineering discipline. Success skills and curricular information. Career paths and opportunities. Professional aspects of engineering and computer science. Interaction with upper

division students, alumni, faculty and staff. Introduction to computer software and hardware. Credit/No Credit grading only. 1 lecture.

**CPE 101 Fundamentals of Computer Science I (4)**  
(Also listed as CSC 101)

Basic principles of algorithmic problem solving and programming using methods of top-down design, stepwise refinement and procedural abstraction. Basic control structures, data types, and input/output. Introduction to the software development process: design, implementation, testing and documentation. The syntax and semantics of a modern programming language. 3 lectures, 1 laboratory. Prerequisite: MATH 118 (or equivalent) with a grade of C- or better, and basic computer literacy (CSC 100 or CSC 111 or equivalent).

**CPE 102 Fundamentals of Computer Science II (4)**  
(Also listed as CSC 102)

Basic design, implementation, testing, and documentation of object-oriented software. Introduction to classes, interfaces, inheritance, algorithms (sort, search, recursion), data structures, abstract data types (lists, stacks, queues), file I/O, exceptions, and graphical user interfaces. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 101 with a C- grade or better and either MATH 141 or MATH 221 with a C- grade or better.

**CPE 103 Fundamentals of Computer Science III (4)**  
(Also listed as CSC 103)

Continuation of material from CPE 102: abstract data types specification and implementation, the analysis of algorithms and the software development process. Introduction to a specific high level design notation. Recursive algorithms. Software design case studies and practice. Software testing and program verification. 3 lectures, 1 laboratory. Prerequisite: CPE 102 with a C- grade or better and CSC 141 with a C- grade or better.

**CPE 109 Accelerated Introduction to Computer Science (5) (Also listed as CSC 109)**

Accelerated coverage of the material in CPE 101, CPE 102, and CPE 103. 4 lectures, 1 activity. Corequisite: CSC 141, significant background in computer science, and consent of instructor.

**CPE 129 Digital Design (3) (Also listed as EE 129)**

Number systems, Boolean algebra, Boolean functions, and minimization. Analysis and design of combinational logic circuits. Feedback circuits. Analysis and design of sequential logic circuits. Applying Hardware Description Language (HDL) to synthesize digital logic circuits in Programmable Logic Devices (PLDs). 3 lectures. Prerequisite: An orientation course in student's major (EE 111/151 for EE students, CPE/CSC 101 for CPE students), CPE/CSC 101. Concurrent: CPE 169.

**CPE 169 Digital Design Laboratory (1) (Also listed as EE 169)**

Experiments to analyze and design combinational and sequential logic circuits with discrete ICs and PLDs. Introduction to laboratory equipment such as the logic state analyzer for testing circuits. Introduction to a hardware description language for logic simulation and design. 1 laboratory. Prerequisite: An orientation course in student's major (EE 111/151 for EE students, CPE/CSC 101 for CPE students), CPE/CSC 101. Concurrent: CPE 129.

**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 205 Software Engineering I (4) (Also listed as CSC 205)**

Introduction to the software lifecycle. Methods and tools for the analysis, design, and specification of large software systems. Project planning, documentation, communication, and time/cost estimates. Group laboratory project. Graphical User Interface Design. Technical presentation methods. Software design case studies. 3 lectures, 1 laboratory. Prerequisite: CPE/CSC 103 with a grade of C- or better or CPE/CSC 109 and CSC 141, with a grade of C- or better.

**CPE 206 Software Engineering II (4) (Also listed as CSC 206)**

Continuation of the software lifecycle. Methods and tools for the implementation, integration, testing and maintenance of large software systems. Software development and test environments. Software quality assurance. Group laboratory project. Technical presentation methods and practice. 3 lectures, 1 laboratory. Prerequisite: CPE/CSC 205.

**CPE 229 Computer Design and Assembly Language Programming (3) (Also listed as EE 229)**

Design and implementation of digital computer circuits via CAD tools for programmable logic devices (PLDS). Basic computer design with its data path components and control unit. Introduction to assembly language programming of an off-the-shelf RISC-based microcontroller. 3 lectures. Prerequisite: CPE 129/169. Concurrent: CPE 269.

**CPE 250 Systems Programming (4) (Also listed as CSC 250)**

C programming language from a system programming perspective. Standard C language including operators, I/O functions, and data types in the context of system functions. Unix commands, shell scripting, file system, editors. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103 or CSC/CPE 109, EE/CPE 229.

**CPE 269 Computer Design and Assembly Language Programming Laboratory (1) (Also listed as EE 269)**

Experiments to design and test digital computer circuits and systems with programmable logic devices (PLDs). Design projects to implement a basic computer with data path components and control. Assembly language programming projects for an off-the-shelf RISC-based microcontroller. 1 laboratory. Prerequisite: CPE 129/169. Concurrent: CPE 229.

**CPE 270 Computer Graphics Applications (4)**  
(Also listed as CSC 270)

Use of common graphics applications packages. Business graphics, figure editing, animation and image editing, photorealistic image generation, scientific visualization and multimedia. 2 lectures, 2 activities.

**CPE 305 Individual Software Design and Development (4)**  
(Also listed as CSC 305)

Practical software development skills needed for construction of mid-sized production-quality software modules, using the CSC upper division programming language. Topics include inheritance, exceptions, and memory and disk-based dynamic data structures. Students must complete an individual programming project of mid-level complexity. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103.

**CPE 315 Computer Architecture (4) (Also listed as CSC 315)**

In-depth study of the instruction set architecture and hardware design of a specific CPU. Introduction to pipelines, input/output and multi-processors. Computer abstractions and performance measurement. 3 lectures, 1 laboratory. Prerequisite: CPE 103, CPE 229.

**CPE 316 Micro Controllers and Embedded Applications (4) (Also listed as CSC 316)**

Introduction to micro controllers and their applications as embedded devices. Hardware/software tradeoffs, micro controller selection, use of on-chip peripherals, interrupt driven real-time operation, A/D conversion, serial and parallel communications, watch-dog timers, low power operation and assembly language programming techniques. 3 lectures, 1 laboratory. Prerequisite: CPE/CSC 315 or CPE/EE 329.

**CPE 329 Programmable Logic and Microprocessor-Based Systems Design (4) (Also listed as EE 329)**

Design, implementation and testing of programmable logic microprocessor-based systems. Hardware/software tradeoffs (such as timing analysis and power considerations), system economics of programmable logic and microprocessor-based system design. Interfacing hardware components (such as ADCs/DACs, sensors, transducers). 3 lectures, 1 laboratory. Prerequisite: EE 307/347.

**CPE 336 Microprocessor System Design (4) (Also listed as EE 336)**

Introduction to microcontrollers and integrated microprocessor systems. Emphasis on the Intel 8051 and Motorola 68HC11 families and derivatives. Hardware/software trade-offs, system economics, and functional configurations. Interface design, real-time clocks, interrupts, A/D conversion, serial and parallel communications, watch-dog timers, low power operation, and assembly language programming techniques. Architecture and design of sampled data and digital control systems. Case studies of representative applications. 3 lectures, 1 laboratory. Prerequisite: CPE/EE 129/169.

**CPE 350 CPE Capstone Preparation (1)**

Definition and specification of a system to be constructed in CPE 450; requirements elicitation techniques, research and data gathering methods; project planning, time and budget estimating; project team organization. Ethics and professionalism. 1 laboratory. Prerequisite: CPE/EE 329 and CPE/CSC 316; either or both may be concurrent.

**CPE 353 Systems Programming for Software Engineers (4) (Also listed as CSC 353)**

Introduction to assembly language and C programming; use of linkers and loaders; I/O and systems level programming; interrupt handlers. Technical elective credit not allowed for CSC/CPE majors. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103.

**CPE 365 Introduction to Database Systems (4) (Also listed as CSC 365)**

Basic principles of database management systems (DBMS) and of DBMS application development. 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/CPE 103.

**CPE 366 Database Modeling, Design and Implementation (4) (Also listed as CSC 366)**

The database modeling problem. Database modeling levels: external, conceptual, logical and physical. Database models: entity-relationship, relational, object-oriented, semantic, and object-relational. Normal forms. Distributed database design. Functional analysis of database applications and transaction specification, design, and implementation. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 365.

**CPE 369 Distributed Computing I (4) (Also listed as CSC 369)**

Introduction to distributed computing paradigms and protocols: interprocess communications, group communications, the client-server model, distributed objects, and Internet protocols. Emphasis on distributed software above the operating system and network layers. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103.

**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 402 Software Requirements Engineering (4) (Also listed as CSC 402)**

Software requirements elicitation, analysis and documentation. Team process infrastructure and resource estimation to support appropriate levels of quality. Software architectural design. 3 lectures, 1 laboratory. Prerequisite: CPE/CSC 206, CPE/CSC 305.

**CPE 405 Software Construction (4) (Also listed as CSC 405)**

Design and construction of sizeable software products. Technical management of software development teams. Software development process models, software design, documentation, quality assurance during development, software unit and integration testing; CASE tools, development environments, test tools, configuration management. 3 lectures, 1 laboratory. Prerequisite: CPE/CSC 402.

**CPE 406 Software Deployment (4) (Also listed as CSC 406)**

Deployment of a sizeable software product by a student team. Software maintenance and deployment economic issues. Management of deployed software: version control, defect tracking and technical support. 3 lectures, 1 laboratory. Prerequisite: CPE/CSC 405.

**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 427 Digital Computer Subsystems (3) (Also listed as EE 427)**

Design of components and subsystems in digital computers. Use of modern techniques and devices (CPLDs and FPGAs) in implementation. Consideration given to cost/speed tradeoffs. Implementation of a basic digital computer using pre-designed subsystems. 3 lectures. Prerequisite: EE 307/347. Concurrent: CPE/EE 467.

**CPE 430 Programming Languages II (4) (Also listed as CSC 430)**

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 330 and CSC 445.

**CPE 431 Programming Languages III (4) (Also listed as CSC 431)**

Intermediate translation forms. Runtime representations. Generation of object code by compilers. Local optimization: constant propagation, folding, common subexpression removal. Global optimization, invariant code removal, operator strength reduction. Register allocation. 3 lectures, 1 laboratory. Prerequisite: CPE 430.

**CPE 434 Compilers – Hardware/Software Interface (4) (Also listed as CSC 434)**

Block structured programming languages, their design and implementation via retargetable compilers, with emphasis on code generation for a variety of contemporary computer architectures. 3 lectures, 1 laboratory. Prerequisite: CPE 205 and CPE 315.

**CPE 435 Introduction to Object Oriented Design Using Graphical User Interfaces (4) (Also listed as CSC 435)**

Principles of object-oriented design, with emphasis on use of these principles in the design of graphical interfaces. Comparison and contrasting of two major object-oriented languages and their corresponding GUI class libraries. Language-independent object-oriented design methods, and application of these methods in the construction of a GUI-based project. 3 lectures, 1 laboratory. Prerequisite: CPE 103 or equivalent and CPE 305.

**CPE 438 Digital Computer Systems (3) (Also listed as EE 438)**

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 427 or consent of instructor.

**CPE 439 Computer Peripheral Interfacing (3) (Also listed as EE 439)**

Design of the more common computer peripherals 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/EE 329, or consent of instructor.

**CPE 448 Bioinformatics Algorithms (4) (Also listed as CSC 448)**

Introduction to the use of computers to solve problems in molecular biology. The algorithms, languages, and databases important in determining and analyzing nucleic and protein sequences and their structure. 3 lectures, 1 laboratory. Prerequisite: Consent of instructor or the following: CSC/CPE 103 or BIO 447 and senior standing.

**CPE 450 CPE Capstone Project (4)**

Team-based design, construction and deployment of an embedded system that includes a custom-built computer. Technical management of product

development teams. Technical documentation, configuration management, quality assurance, integration and systems testing. Professionalism. 3 lectures, 1 laboratory. Prerequisite: CPE 350.

**CPE 453 Introduction to Operating Systems (4)**  
(Also listed as CSC 453)

Introduction to sequential and multiprogramming operating systems; kernel calls, interrupt service mechanisms, scheduling, files and protection mechanisms, conventional machine attributes that apply to operating system implementation, virtual memory management, and I/O control systems. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 315 and either CSC/CPE 250 or CSC/CPE 353.

**CPE 454 Implementation of Operating Systems (4)**  
(Also listed as CSC 454)

Design and implementation of multiprogramming kernels, systems programming methodology, interprocess communications, synchronization, device drivers and network access methods. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 453.

**CPE 459 Real-Time Systems (4) (Also listed as CSC 459)**

Analysis and synthesis of robust real-time systems including embedded systems, real-time architectures, and programming, parallel processing, specification techniques, algorithms for guaranteeing stringent timing constraints. Understanding of the trade-offs between robustness and response times of time-critical systems. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 315.

**CPE 461, 462 Senior Project (3) (2)**

Selection and completion of an individual or team project in laboratory environment. Project results are presented in a formal report. CPE 461: 3 laboratories. CPE 462: 2 laboratories. Prerequisite: CPE 450.

**CPE 464 Introduction to Computer Networks (4)**  
(Also listed as CSC 464)

Computer network architectures; communications protocol standards; services provided by the network; historical and current examples presented. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 250 and CSC/CPE 315.

**CPE 465 Advanced Computer Networks (4) (Also listed as CSC 465)**

Advanced topics in computer networks; greater detail of protocol standards and services provided by the network; focus on current industry and research topics. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 464 and CSC/CPE 453.

**CPE 467 Digital Computer Subsystems Laboratory (1)**  
(Also listed as EE 467)

Introduction to industrial grade CAD tools. Design and implementation of digital computer subsystems using SPLDs, CPLDs, and FPGAs. 1 laboratory. Prerequisite: CPE/EE 307/347. Concurrent: CPE/EE 427.

**CPE 468 Database Management Systems Implementation (4)**  
(Also listed as CSC 468)

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, 1 laboratory. Prerequisite: CSC/CPE 365.

**CPE 469 Distributed Computing II (4) (Also listed as CSC 469)**

Continued exploration of topics in distributed computing in greater depth, with emphasis on object-based and component-based software development. Introduction to fault-tolerance and distributed algorithms. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 369.

**CPE 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.

**CPE 471 Introduction to Computer Graphics (4)**  
(Also listed as CSC 471)

Graphics hardware and primitives. Modeling and rendering, geometric transforms, hidden-surface removal, the graphics pipeline, scan-conversion and graphics applications. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 205 or CSC/CPE 250.

**CPE 473 Advanced Rendering Techniques (4)**  
(Also listed as CSC 473)

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/CPE 471.

**CPE 474 Computer Animation (4) (Also listed as CSC 474)**

Basic and advanced algorithms for generating sequences of synthetic images. Interpolation in time and space, procedural and keyframe animation, particle systems, dynamics and inverse kinematics, morphing and video. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 471.

**CPE 475 Multimedia Tool Development (4)**  
(Also listed as CSC 475)

Algorithms and techniques for creating multimedia applications. Topics include audio and video compression techniques, multimedia network architectures, synchronization of audio and video, multimedia toolkits, user interfaces and file systems. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 471.

**CPE 477 Computer Vision (4) (Also listed as CSC 477)**

Fundamental issues in computer vision. Convolution, edge detection and image segmentation. Pattern classification methods and neural networks. Stereoscopic vision and optical flow. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103 and MATH 206.

**CPE 480 Artificial Intelligence (4) (Also listed as CSC 480)**

Programs and techniques that characterize artificial intelligence. Programming in a high level language. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103 and CSC 141.

**CPE 481 Knowledge Based Systems (4) (Also listed as CSC 481)**

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/CPE 480.

**CPE 484 User-Centered Interface Design and Development (4)**  
(Also listed as CSC 484)

Introduction to the importance of user-centered principles in the design of good interfaces and effective human-computer interaction. Topics include: study of human characteristics affected by interface design, effective requirements data collection and analysis, user-centered approaches to software engineering, and evaluation of interface and interaction quality. 3 lectures, 1 laboratory. Prerequisite: Junior standing and CSC/CPE 205.

**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 487 Graphical User Interface Systems (4)**  
(Also listed as CSC 487)

Further study of graphical user interface (GUI) programming systems. Structure of tools and underlying systems to build such interfaces. Human factors including considerations of good and bad interfaces. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 435.

**CPE 488 Performance Analysis (4) (Also listed as CSC 488)**

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 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.

**CPE 520 Computer Architecture (4) (Also listed as CSC 520)**

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: CPE 315 and graduate standing, or consent of instructor.

**CPE 564 Computer Networks: Research Topics (4)  
(Also listed as CSC 564)**

Exploration of advanced topics in emerging computer networking technologies; focus on leading edge computer network research topics. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 464 and graduate standing, or consent of instructor.

**CPE 580 Artificial Intelligence (4) (Also listed as CSC 580)**

Current research in the field of artificial intelligence with emphasis on cooperative agents, distributed agents, and decision making in complex, concurrent environments. AI programming in a distributed environment. 3 lectures, 1 laboratory. Prerequisite: CPE 481.

**CRP-CITY AND REGIONAL PLANNING****CRP 101 Introduction to the Profession of City and Regional Planning (1) (CR/NC)**

Introduction to what professional planners do in the public and private sectors and how they help manage growth and change. Credit/No Credit grading only. 1 lecture. Required of freshmen in the major; optional course for transfer students and non-majors.

**CRP 201 Basic Graphic Skills (4)**

Basic techniques used in graphic communication for representation of the real world on two-dimensional planes. Use of scale, drawing conventions, orthographic and isometric projections, perspective drawings. Sketching, delineation and rendering including the use of black and white and color techniques. 4 laboratories.

**CRP 202 Introduction to Environmental Design (4)**

Exploring elements and principles of environmental design. Understanding the form and character of the designed urban environment. Introduction to problem analysis and problem solving in environmental design. Implications of design decisions and solutions on urban context. Assignments of object, project and system scale in an urban context. 4 laboratories. Prerequisite: CRP 201.

**CRP 203 Intermediate Environmental Design (4)**

Applications of basic design fundamentals and skills to the design of environments through design exercises applied to planning. Problem analysis and problem solving skills as applied to environmental design issues. 4 laboratories. Prerequisite: CRP 202.

**CRP 211 Cities: Form, Culture and Evolution (4)**

Historical overview of the evolution of cities – how the form and function of cities evolved among different societies from antiquity to contemporary times. Includes early cities in Mesopotamia, Central America; Greece and Rome; Renaissance, Baroque; and North and South America. 4 lectures.

**CRP 212 Introduction to Urban Planning (4)**

Understanding the issues of contemporary urban growth and change. Development of theories of urban planning and design. Introduction to zoning, planning regulations and codes, and professional practice. Relationship of environmental design disciplines, citizen groups, and individuals to urban planning. 4 lectures.

**CRP 213 Population, Housing and Economic Applications (4)**

Collection, organization, and presentation of information and data related to population, housing and employment. Analytical applications to estimate population over time, housing demand by type and income and employment by standard classification. Application of urban economic theory related to jobs and housing. 3 lectures, 1 activity. Prerequisite: CRP 212, ECON 201 or consent of instructor.

**CRP 214 Land Use and Transportation Studies (4)**

How cities and regions work. Relationship between human activities and patterns of land use and circulation. Spatial analysis and location theories. Methods for conducting studies to describe, analyze, and map land uses. Regional-scale transportation analysis, traffic impact studies, and multimodal transportation plans. 3 lectures, 1 activity. Prerequisite: CRP 212.

**CRP 215 Planning for and with Multiple Publics (4)  
(Also listed as ES 215)**

USCP

How the social/spatial relationships among racial/ethnic and gender groups are expressed in terms of human settlement patterns, civic involvement and everyday negotiations. Ways in which segregation and marginalization are expressed in western and non-western contexts. 3 lectures, 1 activity. Prerequisite: Completion of GE Area D1.

**CRP 216 Computer Applications for Planning (4)**

Introduction to the use of computer applications for planners. Includes spreadsheets, statistical applications, database, geographic information systems, and graphics. 2 lectures, 2 laboratories.

**CRP 240 Additional Planning Laboratory (1–2)**

Total credit limited to 4 units, with a maximum of 2 units per quarter. 1 or 2 laboratories.

**CRP 310 Community Development and Civic Life (4)**

Examination of role of citizen in the planning, design and development of communities. Development of informed, responsible participation in civic life by a diverse citizenry committed to democratic principles. Focus on land use, transportation, and environmental issues. 3 lectures, 1 activity. Prerequisite: Completion of GE Areas A, D1 and D3.

**CRP 314 Planning Theory (3)**

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.

**CRP 315 Fiscal and Project Feasibility (4) (Also listed as CM 315)**

Analysis of the revenue streams and costs involved in project development. Impact analysis of costs and revenues on private and public sectors included. Impact analysis of costs and revenues on private and public sectors included. Construction of pro-formas for various project types. 3 lectures, 1 laboratory. Prerequisite: ECON 201 or ECON 221.

**CRP 334 Cities in a Global World (4)**

GE D5

Examination of the changes in the social and spatial organization of urban settlements in the twenty-first century caused by the urbanization and globalization processes. Comparative analysis of the traditional and contemporary cities in the Pacific Rim, South America and Eastern Europe. 3 lectures, 1 activity. Prerequisite: Completion of Area A and two courses from D1, D2, D3, D4. City and Regional Planning majors will not receive GE Area D5 credit.

**CRP 336 Regional and Environmental Planning Foundations (4)**

Theories, institutional frameworks, and technologies used in environmental planning for human settlements. Comparative study of

practices at international, national, bioregional and state/local levels. Impact assessment technologies used in impact analysis for plan administration. Application of environmental mitigation to community planning. 3 lectures, 1 laboratory. Prerequisite: LA 213 or LA 114 or consent of instructor.

#### **CRP 338 Digital Cities (4)**

Explores changes in urban form and urban experience associated with advances in digital technology. Implications for the design of places and the distribution of economic and social benefit. Lecture-discussions and opportunities to explore technology initiatives in community building. 3 lectures, 1 activity. Prerequisite: Junior standing; completion of Area B.

#### **CRP 341 Community Design Laboratory (4)**

Built environment of the suburb. Urban theories and design methods related to suburban development. Technical aspects of subdivision site planning. 4 laboratories. Prerequisite: CRP 201, CRP 202, CRP 203.

#### **CRP 342 Regional and Environmental Planning (4)**

Case studies and applications of theory and methods to regional and environmental systems. Interrelationships between natural, economic, and social and political systems. Application of California Environmental Quality Act and environmental impact assessment methods. Environmental equity and sustainable bioregions. 2 lectures, 2 laboratories. Prerequisite: CRP 336.

#### **CRP 375 Technology and the Environment: A Seminar on Contemporary Issues (4) (Also listed as HNRS 375)**

Interdisciplinary exploration of significant environmental issues (local, regional, national, or global) where technology is a major cause and/or offers a possible solution. 4 seminars. Prerequisite: Completion of GE Area A and two courses from Areas D1, D2, D3. Honors Program membership or nomination by CRP department head.

#### **CRP 400 Special Problems for Advanced Undergraduates (1–2)**

Individual or group investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

#### **CRP 402 Contemporary Urban Design in the Americas (4)**

Study of contemporary urban design in North, Central and South America through the detailed examination of major cities and country case studies. Analysis of the cultural, social and political factors influencing the practice of urban design and its major trends in different countries. 4 lectures. Prerequisite: ENGL 134.

#### **CRP 404 Environmental Law (3) (Also listed as FNR 404)**

Analysis and critique 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.

#### **CRP 408 Water Resource Law and Policy (3) (Also listed as FNR 408)**

Detailed examinations of the various legal systems of water use, regulation and management in California and the United States. Discussion of the key concepts and principles of state, federal and interstate water 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.

#### **CRP 409 Planning Internship (2–4) (CR/NC)**

Work experience as a supervised employee in a planning-related agency or private 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.

#### **CRP 410, 411 Community Planning Laboratory (5) (5)**

Application of planning theory to the community, its components, and to the city and its region. Relationships of city spaces and structures. Emphasis on developing basic planning studies and plan-making. Field

trips. Individual, team, and interdisciplinary approaches utilizing digital methods for analysis and presentation. 5 laboratories. Prerequisite: CRP 341, CRP 342.

#### **CRP 412 Implementation (4)**

Theory and practice of plan implementation. Regulation and nonregulatory approaches to plan implementation, including development regulation, economic development, growth management, habitat conservation planning, capital improvement planning, redevelopment programs, and transportation system management. The California Specific Plan will serve as the course model. 3 lectures, 1 activity. Prerequisite: CRP 410, CRP 411, or consent of instructor.

#### **CRP 420 Land Use Law (4)**

Public controls protecting natural environmental systems. Land use and environmental controls. Review of control mechanisms. State and federal legislation. Legal implications of controls, public planning and policy issues. 4 lectures. Prerequisite: senior standing, or consent of instructor.

#### **CRP 427 Local Economic Development Planning (3)**

Processes, skills and approaches for planning local economic development. Analysis of theoretical principles and assumptions underlying local economic development programs. Practical applications of alternative strategies and techniques for implementing economic development. 3 seminars. Prerequisite: Senior standing or consent of instructor.

#### **CRP 430 Public Sector Planning Practice (3)**

Relationships of planning agencies to other governmental bodies, public agencies and citizen groups. The public planning agency and the private practitioner. Public and personnel relations. Current topics in public sector planning practice. 3 lectures. Prerequisite: CRP 212.

#### **CRP 435 Transportation Theory (3)**

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.

#### **CRP 436 Collaborative Planning (4)**

Focus on processes and skills of citizen participation and consensus building. Application of mediation and negotiation techniques. Use of collaboration in forming visions of the future and reaching agreements among multiple interests. Use of group process skills to establish effective communication and agreements. Organizing and operating public meetings. 3 lectures, 1 laboratory. Prerequisite: CRP 212 or consent of instructor.

#### **CRP 438 Pollution Prevention and Control (4)**

Interdisciplinary exploration of policy and planning associated with pollution prevention and control, including institutional, legal, economic, political, social, and technology-related aspects. Includes hands-on activity in small groups. 3 lectures, 1 activity. Prerequisite: Senior standing or consent of instructor.

#### **CRP 442 Housing and Planning (3)**

Understanding housing issues, policies and programs from a planning perspective. Analysis of the economic underpinnings of land markets and housing markets, housing plans, finance, public programs, affordable housing. 3 seminars. Prerequisite: Upper division standing.

#### **CRP 444 Infrastructure and Planning Management (4)**

Basic infrastructure systems necessary to support urban development. Basic components of systems and how they are planned, financed and managed. 4 seminars. Prerequisite: CRP 410, ENVE 331 or senior standing.

**CRP 446 Development Review and Entitlement (4)**

Application of zoning regulations, subdivision ordinances, design standards, building codes, exactions, fees, and related requirements within the development review process leading to land use entitlement. Land development is evaluated from permit application submittal to condition compliance during the plan check, construction, and operational phases of a project. 3 lectures, 1 activity. Prerequisite: Upper division standing.

**CRP 447 Design Regulations (4) (Also listed as ARCH 447)**

Practical application of fundamental zoning, subdivision, design/development standards, and building codes in the design review process, either in the form of a proposed development project or preparation of ordinances, codes, standards, and/or guidelines to apply to a project. 3 lectures, 1 activity. Prerequisite: Fourth year standing, or consent of instructor.

**CRP 453 Planning and Design Laboratory (4)**

Selected advanced laboratory applications, including urban and regional design. 4 laboratories. Prerequisite: CRP 341, CRP 342.

**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. 2 seminars, 1 laboratory. Prerequisite: Upper-division standing. Basic GIS course.

**CRP 461, 462 Senior Project (2) (2)**

Research and problem analysis in planning. Selection and completion of a project under faculty supervision. Projects typical of problems addressed in planning practice. Project results presented in a formal report. To be completed in two quarters. Minimum 120 hours time. Prerequisite: CRP 341, CRP 342.

**CRP 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.

**CRP 471 Selected Advanced Laboratory (1-4)**

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 8 units. 1-4 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 483 Special Studies in City and Regional Planning (1-12)**

Study of special issues and problems through field research and other forms of investigation and involvement in an off-campus setting. Requirements determined prior to individual project through contractual arrangement between the student and the department. Departmental Off-Campus Study Program guidelines apply. *Class Schedule* will list topic selected. Prerequisite: Junior or senior 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 221 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.. 2 laboratories. Prerequisite: Graduate standing.

**CRP 515 Planning Presentation and Communication Techniques (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. 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. 3 seminars, 1 laboratory. Prerequisite: CRP 514, graduate standing or consent of instructor.

**CRP 518 Public Policy Analysis (4) (Also listed as POLS 518)**

Analysis of the social, economic, environmental, political contexts of public policy decisions. Public policy issues and use of concepts and tools related to monitoring and assessment. 4 lectures. Prerequisite: CRP 501 or POLS 360 or consent of instructor.

**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, especially within the land use planning context. Application of California Environmental Quality Act and environmental impact assessment methods. 3 seminars, 1 laboratory. 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 the human environment related to physical design requirements. 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)**

Application of planning theory and methods to community planning. Analysis of issues, consideration of future alternatives, preparation of plan elements. Interrelationships and impacts of natural and built environments, economic and social conditions. Field trips. Individual, team and interdisciplinary approaches. 4 laboratories. Prerequisite: CRP 501.

**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. 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. 3 seminars, 1 laboratory. Prerequisite: CRP 501.

**CRP 570 Selected Topics in Planning (4)**

Directed group study of selected planning topics. Total credit limited to 12 units. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

**CRP 596 Professional Project (4)**

Completion of professional project based on a real world planning task or carefully constructed simulation. Requires demonstration of planning judgment and competence through application of a defined and rigorous planning approach. Can be taken in lieu of a thesis. Prerequisite: CRP 553, advancement to candidacy, and consent of department head.

**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 514, CRP 516, advancement to candidacy, consent of department head.

**CRSC—CROP SCIENCE****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. Antiquity factors. 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. 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. 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. 3 lectures, 1 laboratory. Prerequisite: CRSC 131 or VGSC 230.

**CRSC 202 Enterprise Project (2–4) (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. 1 lecture, variable practicum. Prerequisite: CRSC 201, or consent of instructor.

**CRSC 230 Agronomic Crop Production (4)**

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. 3 lectures, 1 laboratory.

**CRSC 244 Precision Farming (4)**

Precision agriculture applications. Integrating GIS, GPS, and remote sensing technologies with site-specific farming practices to optimize agricultural productivity. Field trip required. 3 lectures, 1 laboratory. Prerequisite: CRSC 230 or other plant production course.

**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. 3 lectures, 1 laboratory. Prerequisite: CRSC 131 and BIO 303.

**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. 3 lectures, 1 laboratory. Prerequisite: CRSC 123, CRSC 131 or CRSC 230 or consent of instructor.

**CRSC 331 Commercial Seed Production and Conditioning (4)**

Production and conditioning of field and vegetable seed. Seed technology, germination, quality control, seed enhancement, storage and handling of seed, and seed laws. Field trip to a seed conditioning/seed enhancement facility required. 3 lectures, 1 laboratory. Prerequisite: CRSC 131, CRSC 230 or VGSC 230, EHS 121 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. 3 lectures,

1 laboratory. Prerequisite: CHEM 111, CRSC 133, SS 221 or consent of instructor.

**CRSC 402 Enterprise Project Management (2-4) (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. 1 lecture, variable practicum. Prerequisite: CRSC 202, and consent of instructor.

**CRSC 410 Crop Physiology and Ecology (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 212/312.

**CRSC 411 Experimental Techniques and Analysis (4)**

Principal experimental designs used in agriculture and methods of statistical analysis of data collected from each. Practice with statistical software. Field practice in planning and layout of typical experiments. 3 lectures, 1 laboratory. Prerequisite: Junior standing and MATH 117 or equivalent, and STAT 218 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. 3 lectures, 1 laboratory. Prerequisite: CRSC 133, PPSC 321 and BOT 121.

**CRSC 422 Tropical and Subtropical Crop and Fruit Production (4)  
(Also listed as FRSC 422)**

Production, distribution and utilization of major agronomic, vegetable, fruit and nut crops of economic importance in tropical and subtropical areas. Weather systems, climates, soils, and cropping systems of tropical and subtropical areas. Field trip required. 3 lectures, 1 laboratory. Prerequisite: 100/200-level plant production course, or consent of instructor.

**CRSC 445 Cropping Systems (4)**

Classification and description of agricultural systems of the world. Cropping systems as land management plans. 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. 3 lectures, 1 activity. Prerequisite: SS 121 and BOT 121, or CRSC 131, or BOT 326, or 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. 3 lectures, 1 laboratory. Prerequisite: Graduate standing and 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.

**CRSC 599 Thesis in Crop Science (1-9)**

Systematic research of a significant problem in Crop Science. 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.

## CSC-COMPUTER SCIENCE

**CSC 100 Computer Science Orientation (2)**

Introduction to the computer science discipline for majors. Computer problem solving and the use of computers. Success skills for computer science majors. Career paths and opportunities. Ethical behavior in the computer science discipline. Interaction with upper division students, alumni and faculty. 2 seminars. Prerequisite: Computer science major.

**CSC 101 Fundamentals of Computer Science I (4)  
(Also listed as CPE 101)**

Basic principles of algorithmic problem solving and programming using methods of top-down design, stepwise refinement and procedural abstraction. Basic control structures, data types, and input/output. Introduction to the software development process: design, implementation, testing and documentation. The syntax and semantics of a modern programming language. 3 lectures, 1 laboratory. Prerequisite: MATH 118 (or equivalent) with a grade of C- or better, and basic computer literacy (CSC 100 or CSC 111 or equivalent).

**CSC 102 Fundamentals of Computer Science II (4)  
(Also listed as CPE 102)**

Basic design, implementation, testing, and documentation of object-oriented software. Introduction to classes, interfaces, inheritance, algorithms (sort, search, recursion), data structures, abstract data types (lists, stacks, queues), file I/O, exceptions, and Graphical User Interfaces. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 101 with a C- grade or better and either MATH 141 or MATH 221 with a C- grade or better.

**CSC 103 Fundamentals of Computer Science III (4)  
(Also listed as CPE 103)**

Continuation of material from CSC/CPE 102: abstract data types specification and implementation, the analysis of algorithms and the software development process. Introduction to a specific high level design notation. Recursive algorithms. Software design case studies and practice. Software testing and program verification. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 102 with a C- grade or better and CSC 141 with a C- grade or better.

**CSC 109 Accelerated Introduction to Computer Science (5) (Also listed as CPE 109)**

Accelerated coverage of the material in CSC/CPE 101, CSC/CPE 102, and CSC/CPE 103. 4 lectures, 1 activity. Corequisite: CSC 141, significant background in computer science, and consent of instructor.

**CSC 110 Computers and Computer Applications: Windows (3)**

The computer as a problem-solving tool. A working introduction to microcomputers and fundamental computer concepts. Use of applications software. Credit not allowed for CSC or Software Engineering majors. 2 lectures, 1 activity. Prerequisite: Completion of ELM requirement.

**CSC 111 Computer Applications for Scientists and Engineers (3)**

Customization of applications using a hosted programming language such as Visual Basic. Use of spreadsheet and other applications software in science and engineering. Credit not allowed for CSC or Software Engineering majors. 2 lectures, 1 activity. Prerequisite: MATH 118 or equivalent.

**CSC 113 Computers and Computer Applications: Macintosh (3)**

The computer as a problem-solving tool. A working introduction to microcomputers and fundamental computer concepts. Use of applications software. Credit not allowed for CSC or Software Engineering majors. 2 lectures, 1 activity. Prerequisite: Completion of ELM requirement.

**CSC 119 Information Retrieval and Management (4)**

Use of applications software, including database software, to create and manage information. Credit not allowed for CSC or Software Engineering majors. 4 lectures. Prerequisite: Completion of ELM requirement.

**CSC 141 Discrete Structures I (4)**

Introduction to structures of computer science: logic, sets, relations, functions, graphs and trees. Propositional and predicate logic. Applications of predicate logic to preconditions, postconditions, and proof techniques. Introduction to complexity of algorithms. 4 lectures. Corequisite: CSC/CPE 102. Prerequisite: MATH 118 and MATH 119, or high school equivalent, and CSC/CPE 101 or equivalent.

**CSC 142 Discrete Structures II (4)**

Advanced structures of computer science: sequences, strings, graphs, networks. Recursion and recurrence relations. Introduction to combinatorics. Proof techniques. Complexity of algorithms. Advanced application to verification of algorithms. 4 lectures. Prerequisite: CSC/CPE 102 and CSC 141.

**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 instructor.

**CSC 205 Software Engineering I (4) (Also listed as CPE 205)**

Introduction to the software lifecycle. Methods and tools for the analysis, design, and specification of large software systems. Project planning, documentation, communication, and time/cost estimates. Group laboratory project. Graphical User Interface Design. Technical presentation methods. Software design case studies and practices. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103 with a grade of C- or better or CSC/CPE 109 and CSC 141, with a grade of C- or better.

**CSC 206 Software Engineering II (4) (Also listed as CPE 206)**

Continuation of the software lifecycle. Methods and tools for the implementation, integration, testing and maintenance of large software systems. Software development and test environments. Software quality assurance. Group laboratory project. Technical presentation methods and practice. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 205.

**CSC 231 Fortran for Engineering Students (2)**

Programming techniques and procedures with applications to engineering problems in Fortran90. Introduction to numerical methods and simulation. Credit not allowed for CSC, Software Engineering or CPE majors. 2 activities. Prerequisite: MATH 142 or MATH 132; PHYS 121 or PHYS 131.

**CSC 233 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 234 C and Unix (3)**

The C programming language and the UNIX programming environment. Operators, standard I/O functions, strings, pointers and arrays, data types and storage classes. Unix shell programming and basic I/O system calls. Credit not allowed for CSC, Software Engineering or CPE majors. 3 lectures. Prerequisite: MATH 142 or MATH 132.

**CSC 239 Selected Programming Languages (4)**

A programming language selected from languages of current interest. Intended for students who want to learn another programming language. *Class Schedule* will list selected language. 3 lectures, 1 laboratory. Prerequisite: Knowledge of a programming language.

**CSC 250 Systems Programming (4)  
(Also listed as CPE 250)**

C programming language from a system programming perspective. Standard C language including operators, I/O functions, and data types in the context of system functions. Unix commands, shell scripting, file system, editors. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103 or CSC/CPE 109, EE/CPE 229.

**CSC 270 Computer Graphics Applications (4)  
(Also listed as CPE 270)**

Use of common graphics applications packages. Business graphics, figure editing, animation and image editing, photorealistic image generation, scientific visualization and multimedia. 2 lectures, 2 activities.

**CSC 300 Professional Responsibilities (4)**

The responsibilities of the computer science professional. The IEEE/ACM Software Engineering Code of Ethics, quality tradeoffs, software safety, intellectual property, history of computing and the social implications of computers in the modern world. Technical presentation methods and practice. 4 lectures. Prerequisite: CSC/CPE 206.

**CSC 302 Computers and Society (4)****GE Area F**

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. Case study review and analysis. Not open to students in engineering or computer science. 4 lectures. Prerequisite: Completion of GE Area B, and junior standing.

**CSC 305 Individual Software Design and Development (4)  
(Also listed as CPE 305)**

Practical software development skills needed for construction of mid-sized production-quality software modules, using the CSC upper division programming language. Topics include inheritance, exceptions, and memory and disk-based dynamic data structures. Students must complete an individual programming project of mid-level complexity. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103.

**CSC 310 Computers for Poets (4)****GE Area F**

How computers and computer devices work. Introduction to software systems and applications. How computers connect with various media including images, speech and data. How information is encoded and transmitted across networks. Relationship between the computer and human information processing. Not open to students in engineering or computer science. 4 lectures. Prerequisite: Junior standing and completion of GE Area B.

**CSC 315 Computer Architecture (4) (Also listed as CPE 315)**

In-depth study of the instruction set architecture and hardware design of a specific CPU. Introduction to pipelines, input/output and multi-processors. Computer abstractions and performance measurement. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103, CPE/EE 229.

**CSC 316 Micro Controllers and Embedded Applications (4) (Also listed as CPE 316)**

Introduction to micro controllers and their applications as embedded devices. Hardware/software tradeoffs, micro controller selection, use of on-chip peripherals, interrupt driven real-time operation, A/D conversion, serial and parallel communications, watch-dog timers, low power operation and assembly language programming techniques. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 315 or CPE/EE 329.

**CSC 330 Programming Languages I (4)**

Comparison of structure and semantics of various high level programming languages. BNF grammars. Language design issues and techniques, including parameter passing, storage allocation, storage mapping and binding concepts. 4 lectures. Prerequisite: CSC/CPE 103 and CSC/CPE 250.

**CSC 334 Advanced Topics in Unix (4)**

Advanced topics in Unix, system calls, library functions, shell scripts, and selected Unix tools. 4 lectures. Prerequisite: CSC/CPE 103 or CSC 234.

**CSC 341 Numerical Engineering Analysis (4)****GE B6**

An intensive survey of numerical analysis techniques used for solving engineering problems. Topics include solution of nonlinear equations, solution of linear systems, interpolation, numerical quadrature, ordinary differential equations and boundary value problems. Not open to students who have completed CSC 342. 4 lectures. Prerequisite: MATH 242 and

knowledge of a high level programming language, or ability to use one of the following systems: Maple, MatLab, Mathematica, or Mathcad.

#### **CSC 342 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 and knowledge of a high level programming language, or ability to use one of the following systems: Maple, MatLab, Mathematica, or Mathcad.

#### **CSC 343 Numerical Analysis II (3)**

Solution of systems of differential equations, predictor-corrector methods, stiff equations. Approximation methods: cubic splines, B-splines, Bezier curves, least squares, methods for solving boundary value problems. 3 lectures. Prerequisite: CSC 342 or equivalent.

#### **CSC 349 Design and Analysis of Algorithms (4)**

Intermediate and advanced algorithms and their analysis. Mathematical, geometrical, and graph algorithms. NP-complete problems. Additional topics will be chosen from pattern matching, file compression, cryptography, dynamic and linear programming, and exhaustive search. 4 lectures. Prerequisite: CSC/CPE 103, MATH 142 and completion of all mathematics/statistics support courses.

#### **CSC 353 Systems Programming for Software Engineers (4)** (Also listed as CPE 353)

Introduction to assembly language and C programming; use of linkers and loaders; I/O and systems level programming; interrupt handlers. Technical elective credit not allowed for CSC/CPE majors. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103.

#### **CSC 358 Computer System Administration (2)**

Fundamental concepts of Unix system administration. Use of shell scripts and utilities. Techniques of networks and data communications. Methods of system maintenance and accounting. 2 seminars. Prerequisite: CSC/CPE 103 or permission of instructor.

#### **CSC 361 File Structures (4)**

External storage devices. Character, record, and block I/O. Blocking and buffering. File structures: sequential, indexed sequential, B trees, hashing, multi-key and linked. Primary and secondary indexing. Design and implementation of record and object storage managers. Data compression. Multi-media file formats. 4 lectures. Prerequisite: CSC/CPE 103.

#### **CSC 365 Introduction to Database Systems (4)** (Also listed as CPE 365)

Basic principles of database management systems (DBMS) and of DBMS application development. 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/CPE 103.

#### **CSC 366 Database Modeling, Design and Implementation (4)** (Also listed as CPE 366)

The database modeling problem. Database modeling levels: external, conceptual, logical and physical. Database models: entity-relationship, relational, object-oriented, semantic, and object-relational. Normal forms. Distributed database design. Functional analysis of database applications and transaction specification, design, and implementation. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 365.

#### **CSC 369 Distributed Computing I (4)** (Also listed as CPE 369)

Introduction to distributed computing paradigms and protocols: interprocess communications, group communications, the client-server model, distributed objects, and Internet protocols. Emphasis on distributed software above the operating system and network layers. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103.

#### **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 instructor.

#### **CSC 402 Software Requirements Engineering (4)** (Also listed as CPE 402)

Software requirements elicitation, analysis and documentation. Team process infrastructure and resource estimation to support appropriate levels of quality. Software architectural design. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 206, CSC/CPE 305.

#### **CSC 405 Software Construction (4)** (Also listed as CPE 405)

Design and construction of sizeable software products. Technical management of software development teams. Software development process models, software design, documentation, quality assurance during development, software unit and integration testing; CASE tools, development environments, test tools, configuration management. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE/CSC 402.

#### **CSC 406 Software Deployment (4)** (Also listed as CPE 406)

Deployment of a sizeable software product by a student team. Software maintenance and deployment economic issues. Management of deployed software: version control, defect tracking and technical support. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 405.

#### **CSC 430 Programming Languages II (4)** (Also listed as CPE 430)

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 330 and CSC 445.

#### **CSC 431 Programming Languages III (4)** (Also listed as CPE 431)

Intermediate translation forms. Runtime representations. Generation of object code by compilers. Local optimization: constant propagation, folding, common subexpression removal. Global optimization, invariant code removal, operator strength reduction. Register allocation. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 430.

#### **CSC 434 Compilers – Hardware/Software Interface (4)** (Also listed as CPE 434)

Block structured programming languages, their design and implementation via retargetable compilers, with emphasis on code generation for a variety of contemporary computer architectures. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 205 and CSC/CPE 315.

#### **CSC 435 Introduction to Object Oriented Design Using Graphical User Interfaces (4)** (Also listed as CPE 435)

Principles of object-oriented design, with emphasis on use of these principles in the design of graphical interfaces. Comparison and contrasting of two major object-oriented languages and their corresponding GUI class libraries. Language-independent object-oriented design methods, and application of these methods in the construction of a GUI-based project. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103 or equivalent and CSC/CPE 305.

#### **CSC 445 Theory of Computing (4)**

Theory of formal languages and automata. Decidability and computability. Turing machine as a universal model of computation. 4 lectures. Prerequisite: CSC/CPE 103.

#### **CSC 448 Bioinformatics Algorithms (4)** (Also listed as CPE 448)

Introduction to the use of computers to solve problems in molecular biology. The algorithms, languages, and databases important in determining and analyzing nucleic and protein sequences and their structure. 3 lectures, 1 laboratory. Prerequisite: Consent of instructor or the following: CSC/CPE 103 or BIO 447 and senior standing.

**CSC 453 Introduction to Operating Systems (4)**  
(Also listed as CPE 453)

Introduction to sequential and multiprogramming operating systems; kernel calls, interrupt service mechanisms, scheduling, files and protection mechanisms, conventional machine attributes that apply to operating system implementation, virtual memory management, and I/O control systems. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 315 and either CSC/CPE 250 or CSC/CPE 353.

**CSC 454 Implementation of Operating Systems (4)**  
(Also listed as CPE 454)

Design and implementation of multiprogramming kernels, systems programming methodology, interprocess communications, synchronization, device drivers and network access methods. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 453.

**CSC 459 Real-Time Systems (4) (Also listed as CPE 459)**

Analysis and synthesis of robust real-time systems including embedded systems, real-time architectures, and programming, parallel processing, specification techniques, algorithms for guaranteeing stringent timing constraints. Understanding of the trade-offs between robustness and response times of time-critical systems. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 315.

**CSC 464 Introduction to Computer Networks (4)**  
(Also listed as CPE 464)

Computer network architectures; communications protocol standards; services provided by the network; historical and current examples presented. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 250 and CSC/CPE 315.

**CSC 465 Advanced Computer Networks (4) (Also listed as CPE 465)**

Advanced topics in computer networks; greater detail of protocol standards and services provided by the network; focus on current industry and research topics. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 464 and CSC/CPE 453.

**CSC 468 Database Management Systems Implementation (4)**  
(Also listed as CPE 468)

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, 1 laboratory. Prerequisite: CSC/CPE 365.

**CSC 469 Distributed Computing II (4) (Also listed as CPE 469)**

Continued exploration of topics in distributed computing in greater depth, with emphasis on object-based and component-based software development. Introduction to fault-tolerance and distributed algorithms. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 369.

**CSC 471 Introduction to Computer Graphics (4)**  
(Also listed as CPE 471)

Graphics hardware and primitives. Modeling and rendering, geometric transforms, hidden-surface removal, the graphics pipeline, scan-conversion and graphics applications. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 205 or CSC/CPE 250.

**CSC 473 Advanced Rendering Techniques (4)**  
(Also listed as CPE 473)

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/CPE 471.

**CSC 474 Computer Animation (4) (Also listed as CPE 474)**

Basic and advanced algorithms for generating sequences of synthetic images. Interpolation in time and space, procedural and keyframe animation, particle systems, dynamics and inverse kinematics, morphing and video. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 471.

**CSC 475 Multimedia Tool Development (4)**  
(Also listed as CPE 475)

Algorithms and techniques for creating multimedia applications. Topics include audio and video compression techniques, multimedia network architectures, synchronization of audio and video, multimedia toolkits, user interfaces and file systems. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 471.

**CSC 476 Real-Time 3D Computer Graphics Software (4)**

Basic and advanced algorithms for real-time, interactive, 3D graphics software. Modeling (polygon mesh, height field, scene graph, LOD), real-time rendering (visibility processing, shadows, multi-pass algorithms), complexity management, bounding volumes and collision detection, interactive controls, multi-player game technology, game engine architecture. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 471.

**CSC 477 Computer Vision (4) (Also listed as CPE 477)**

Fundamental issues in computer vision. Convolution, edge detection and image segmentation. Pattern classification methods and neural networks. Stereoscopic vision and optical flow. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103 and MATH 206.

**CSC 479 Computer Graphics Seminar (2)**

Current topics in computer graphics. Total credit limited to 4 units. 2 seminars. Prerequisite: CSC/CPE 471.

**CSC 480 Artificial Intelligence (4) (Also listed as CPE 480)**

Programs and techniques that characterize artificial intelligence. Programming in a high level language. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103 and CSC 141.

**CSC 481 Knowledge Based Systems (4) (Also listed as CPE 481)**

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/CPE 480.

**CSC 484 User-Centered Interface Design and Development (4)**  
(Also listed as CPE 484)

Introduction to the importance of user-centered principles in the design of good interfaces and effective human-computer interaction. Topics include: study of human characteristics affected by interface design, effective requirements data collection and analysis, user-centered approaches to software engineering, and evaluation of interface and interaction quality. 3 lectures, 1 laboratory. Prerequisite: Junior standing and CSC/CPE 205.

**CSC 486 Human-Computer Interaction Theory and Design (4)**

Application of the theories of human-computer interaction to the task of user-centered design. Survey of techniques for studying and involving users in different aspects of the design process, and demonstration of where and when applicable. Combining of theoretical understanding with practical experience to design solutions to problems facing interactive systems designers. 4 seminars. Prerequisite: CSC/CPE 484.

**CSC 487 Graphical User Interface Systems (4)**  
(Also listed as CPE 487)

Further study of graphical user interface (GUI) programming systems. Structure of tools and underlying systems to build such interfaces. Human factors including considerations of good and bad interfaces. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 435.

**CSC 488 Performance Analysis (4) (Also listed as CPE 488)**

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.

**CSC 490 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.

**CSC 491, 492 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: CSC/CPE 206 and consent of instructor. Note: although CSC 491, 492 substitute for CSC 461, 462, students may not use repeat credit for the purpose of increasing GPA.

**CSC 494 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 508 Software Engineering I (4)**

In-depth study of requirements engineering, software project management, formal specifications and object-oriented analysis. 4 seminars. Prerequisite: CSC/CPE 205 and graduate standing, or consent of instructor.

**CSC 509 Software Engineering II (4)**

In-depth study of software modeling and design. Formal design methodologies. Design patterns. Detailed case studies of existing projects. Tools and methods for designing large software systems. 4 seminars. Prerequisite: CSC 508 and graduate standing, or consent of instructor.

**CSC 520 Computer Architecture (4) (Also listed as CPE 520)**

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/CPE 315 and graduate standing, or consent of instructor.

**CSC 530 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 430 and graduate standing, or consent of instructor.

**CSC 540 Theory of Computing (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 and graduate standing, or consent of instructor.

**CSC 541 Numerical Methods (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 342 and graduate standing, or consent of instructor.

**CSC 550 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/CPE 453 and graduate standing, or consent of instructor.

**CSC 560 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/CPE 468 and graduate standing, or consent of instructor.

**CSC 564 Computer Networks: Research Topics (4)  
(Also listed as CPE 564)**

Exploration of advanced topics in emerging computer networking technologies; focus on leading edge computer network research topics. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 464 and graduate standing, or consent of instructor.

**CSC 569 Distributed Computing (4)**

Principles and practices in distributed computing: interprocess communications, group communications, client-server model, distributed objects, message queue system, distributed services, mobile agents, object space, Internet protocols. Distributed algorithms: consensus protocols, global state protocols. Fault tolerance: classification of faults, replication. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103 and graduate standing, or consent of instructor.

**CSC 570 Current Topics in Computer Science (2-4)**

Directed group study of selected topics for graduate students. Topics will normally consist of continuations of those in CSC 520, CSC 530, CSC 540, CSC 550, CSC 560 and CSC 580, and other topics as needed. *Class Schedule* will list topic selected. Topic credit limited to 12 units. 2 to 4 seminars. Prerequisite: Graduate standing and evidence of satisfactory preparation in computer science.

**CSC 580 Artificial Intelligence (4) (Also listed as CPE 580)**

Current research in the field of artificial intelligence with emphasis on cooperative agents, distributed agents, and decision making in complex, concurrent environments. AI programming in a distributed environment. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 481 and graduate standing, or consent of instructor.

**CSC 583 Computer-Based Educational Systems (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: Graduate standing, or consent of instructor.

**CSC 587 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 588 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 587, graduate standing or 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 or consent of instructor.

**CSC 594 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 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 130 Pilates/Physicalmind Conditioning Method (2)**

Introduction to Joseph Pilates Physicalmind conditioning method, providing the ideal physical fitness for the attainment and maintenance of a uniformly developed body and sound mind. Total credit limited to 6 units. 2 activities.

**DANC 131 Beginning Ballet (2)**

Fundamentals of ballet technique stressing alignment, turn-out, five basic positions, seven movements of dance, and terminology. Total credit limited to 6 units. 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. Total credit limited to 6 units. 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. Total credit limited to 6 units. 2 activities.

**DANC 134 Beginning Ballroom Dance (2)**

Selected ballroom dances including the cha-cha-cha, foxtrot, merengue, rumba, samba, swing, tango, waltz, and line dance hustle. Emphasis on alignment, etiquette, leading and following, performance techniques, and presentation of simple dance phrases. Total credit limited to 6 units. 2 activities.

**DANC 135 International Folk Dance (2)**

Introduction to international folk dances including round, longway, and square sets. Study of various dance steps, formation, positions, historical and cultural background. Total credit limited to 6 units. 2 activities.

**DANC 139 Beginning Tap (2)**

Introduction to tap dance technique stressing rhythms and breaks, syncopation, and improvisation. Study of different tap styles and related cultural influences. Performance of beginning tap dance phrases. Total credit limited to 6 units. 2 activities.

**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 (4)****GE C3**

Diverse dance forms. Focus on major western dance artists and their works from the 19<sup>th</sup> century to the present. Cultural context, style and forms in dance. Introductory survey of major experiments in dance. 4 lectures.

**DANC 231 Intermediate Ballet (2)**

Continuation of training in basic technical skills in ballet stressing phrasing, performance, and more complex step patterns. Total credit limited to 6 units. 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. Total credit limited to 6 units. 2 activities. Prerequisite: Consent of instructor.

**DANC 233 Intermediate Jazz Dance (2)**

Continuation of DANC 133 with emphasis on more extensive movement vocabulary. Total credit limited to 6 units. 2 activities. Prerequisite: Consent of instructor.

**DANC 234 Intermediate Ballroom Dance (2)**

Continuation of DANC 134. Selected ballroom dances: cha cha, foxtrot, merengue, rumba, swing, tango, hustle, paso doble, polka and samba. Emphasis on variations, styles, and performance skill. Total credit limited to 6 units. 2 activities. Prerequisite: DANC 134 or consent of instructor.

**DANC 311 Dance in American Musical Theatre (4)****GE C4**

Cultural norms portrayed through dance and musical production. Major works with multicultural, racial, class, and gender issues associated with American themes. The artists, the role of dance in the musical theatre, and the significance of dance in human society. 4 lectures. Prerequisite: Completion of GE Area A and one course in Area C3. Theatre Arts majors will not receive GE C4 credit.

**DANC 320 Dance Notation (3)**

Introduction to the major dance notation systems, emphasizing the theory, reading and writing of Labanotation. 1 lecture, 2 activities. Prerequisite: One DANC activity class or consent of instructor.

**DANC 321 Cultural Influence on Dance in America (4)****GE C4 USCP**

A multicultural approach to the history of dance in America, with emphasis on American Indian, West African, Caribbean, Mexican, European, and Asian contributions and influences. Explores culture through dance in lecture, readings, video samples, and written observations of dance performance. Purchase of concert ticket(s) required. 4 lectures. Prerequisite: Completion of GE Area A and one lower division Area C course. Theatre Arts majors will not receive GE C4 credit.

**DANC 331 Advanced Ballet and Repertory (2)**

Advanced ballet technique and reconstruction of historical ballet repertoires from the romantic, classical, neoclassical, and modern periods. Participation in dance performance of selected repertory. Total credit limited to 6 units. 2 activities. Prerequisite: DANC 231 or consent of instructor.

**DANC 332 Modern Dance Repertory (2)**

Intermediate to advanced dance skills learned through the study and performance of selected modern dance repertory. Addresses problems in advanced performance technique. Informal presentation in performance situation. Total credit limited to 6 units. 2 activities. Prerequisite: Intermediate dance technique level or consent of instructor.

**DANC 340 Dance Composition (4)**

Principles of dance composition. Exploration of the creative potential of movement and development of movement motifs through choreographic studies. Preparation for informal public presentation of student generated solo or group choreographic works. Total credit limited to 8 units. 1

lecture, 1 laboratory, 2 activities. Prerequisite: Intermediate dance level training or consent of instructor.

**DANC 345 Choreography and Workshop in Dance Concert Preparation (4)**

Problems connected with dance choreography. Workshop in concert preparation for major public dance production. Attendance of professional dance concert required. Attendance of professional dance concert(s) required. Total credit limited to 16 units. 2 activities, 2 laboratories. Prerequisite: By audition only.

**DANC 346 Dance Production (4)**

Directed experience in production of annual Orchestis Dance Company Concert and other public performances. Attendance of professional dance concert(s) required. Total credit limited to 16 units. 1 activity, 3 laboratories. Prerequisite: DANC 345.

**DANC 381 Dance for KINE/Dance Minors (4)**

Dance skills and techniques. Experience in selected dance forms. Rhythmic structure and analysis of dance steps. Includes introduction to dance pedagogy, curricular materials and evaluative procedures. 2 lectures, 2 activities. Prerequisite: KINE 419 or KINE 310 or consent of instructor.

**DANC 400 Special Problems for Advanced Undergraduates (1-4)**

Individual investigation, research and studies or survey of selected problems in dance and related areas. Total credit limited to 8 units with a maximum of 4 units per quarter. Prerequisite: Consent of instructor and department head.

**DANC 470 Selected Advanced Topics (1-4)**

Directed study of selected topics for advanced dance students. *Class Schedule* will list topics selected. Total credit limited to 8 units. 1-4 lectures. Prerequisite: Consent of instructor.

**DANC 471 Selected Advanced Laboratory (1-4)**

Directed group laboratory study of selected topics for dance students. *Class Schedule* will list topics selected. Total credit limited to 8 units. 1-4 laboratories. Prerequisite: Consent of instructor.

## 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 Promotion and Marketing (4)**

National and state dairy promotional programs, advertising and merchandising. Marketing and pricing of milk and dairy products at the state and national level. 4 lectures. Prerequisite: DSCI 134 or consent of instructor.

**DSCI 223 Frozen Dairy Foods (4)**

Technology, equipment, mix calculations and preparation required to process, freeze, package, harden and distribute ice cream and related products. 3 lectures, 1 laboratory. Prerequisite: DSCI 134.

**DSCI 230 General Dairy Husbandry (4)**

Selection, breeding, feeding, and management of dairy cattle. Composition and food value of dairy products. Milk pricing, political influences, dairy industry statistics and opportunities. Producing and handling products. Intended as introductory course 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. Intended as introductory course for non-dairy science students. Survey course for dairy husbandry majors. 3 lectures, 1 laboratory.

**DSCI 233 Milk Processing and Inspection (4)**

Composition and properties of fluid milk and its constituents. Equipment used to handle, process, and distribute fluid milk and related products. California dairy codes used for dairy farms and plants, with practice inspections of dairy farms and factories. 3 lectures, 1 laboratory. Prerequisite: DSCI 134.

**DSCI 234 Dairy Foods Evaluation (2)**

Basic principles of sensory evaluation of dairy foods, physiology of various senses and their relationship to distinguishing the quality of dairy products by sight, flavor, body and texture. Product defects, causes, and methods of prevention. 1 lecture, 1 laboratory.

**DSCI 241 Dairy Cattle Selection, Breeds, Fitting and Showing (4)**

Selection of dairy cattle on type conformation and the correlation between type and production. Dairy cattle breeds and breed comparisons. Techniques to properly condition, groom and present dairy cattle for evaluation and merchandising. 2 lectures, 2 activities. Prerequisite: DSCI 121 or DSCI 230.

**DSCI 301 Dairy Cattle Nutrition (4)**

Principles of dairy cattle nutrition and management and their application to economical feeding practices and computerized ration formulation. 3 lectures, 1 activity. Prerequisite: DSCI 101 and DSCI 121 or DSCI 230.

**DSCI 321 Lactation Physiology (4)**

Mechanisms of milk component secretion, including protein, lactose and fat metabolism. Disorders of the mammary gland (mastitis) and control strategies. Endocrine aspects of mammary gland development and lactogenesis. 4 lectures. Prerequisite: DSCI 101, DSCI 121, BIO 151, CHEM 111.

**DSCI 330 Artificial Insemination and Embryo Biotechnology (4)**

Techniques in the collection, evaluation and processing of semen, along with embryo culturing and manipulation. Insemination procedures, fertility problems, record keeping, estrous synchronization, endocrine control of reproduction, treating reproductive disorders and embryo transfer. 3 lectures, 1 laboratory. Prerequisite: DSCI 121 or DSCI 230 or VS 223 or consent of instructor.

**DSCI 333 Dairy Cattle Management, Safety and Animal Well-Being (4)**

Modern dairy management techniques, livestock handling and animal comfort. Dairy safety and development of an injury illness prevention program. Animal well-being issues and the Pasteurized Milk Ordinance. 3 lectures, 1 activity. Prerequisite: DSCI 121 or DSCI 230.

**DSCI 339 Internship in Dairy Science (1–12) (CR/NC)**

Selected Dairy Science 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. Degree credit limited to 12 units. Credit/No Credit grading only. Prerequisite: Consent of internship instructor.

**DSCI 350 Dairy Industry Communications (2)**

Application of information and computer technology to creation of dairy publications. Exploration of Web resources for dairy-related current events and information. Financial, promotional, creative and technical aspects of producing dairy brochures, catalogs, annuals and pamphlets. Total credit limited to 8 units. 2 activities. Prerequisite: ENGL 134, DSCI 121, AG 250 or consent of instructor.

**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 (4)**

Composition, structure and properties of milk and milk products. Physical and chemical changes that occur during processing and storage of dairy products. Objective measurement of chemical and physical properties. 3 lectures, 1 laboratory. Prerequisite: CHEM 212/312 or consent of instructor.

**DSCI 402 Quality Assurance and Control of Dairy Products (4)**

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. 3 lectures, 1 laboratory. Prerequisite: DSCI 233 and MCRO 221.

**DSCI 422 Breeding and Genetics 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: 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. 4 lectures. Prerequisite: DSCI 301, DSCI 241, DSCI 330, and DSCI 422.

**DSCI 433 Dairy Plant Management and Equipment (4)**

Basic management principles applied to the dairy industry. Industrial organization and control. Dairy plant design, facilities, layout. Inventory control and records. Milk pooling and stabilization records. Maintenance and operation of equipment. 3 lectures, 1 laboratory. Prerequisite: DSCI 233, DSCI 434.

**DSCI 434 Cheese and Fermented Dairy Foods (4)**

Scientific methods, ingredients, and equipment used in the manufacture of various fermented dairy products, including cheeses, buttermilk, sour cream, and yogurt. 3 lectures, 1 laboratory. Prerequisite: DSCI 134, MCRO 221.

**DSCI 435 Concentration/Fractionation and Butter Technology (4)**

Technology of evaporation, drying and membrane separation processes applied to dairy fluids. Design and performance of evaporators, driers, and membrane processing systems. Equipment, ingredients, and methods needed to manufacture butter and dairy spreads. 3 lectures, 1 laboratory. Prerequisite: DSCI 134.

**DSCI 444 Dairy Microbiology (4)**

(Also listed as MCRO 444)

Microorganisms involved in the fermentation and ripening processes in the dairy industry, as well as those involved in spoilage of milk and dairy products, in the transmission of disease through these products, and

indicator systems used to determine sanitary quality of these products. 2 lectures, 2 laboratories. Prerequisite: MCRO 221 or MCRO 224.

**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 seminars.

**DSCI 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.

**DSCI 500 Individual Study in Dairy Science (1–6)**

Advanced independent study planned and completed under the direction of a member of the Dairy Science faculty. Total credit limited to 6 units. Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

**DSCI 522 Bioseparation Processes in Dairy Product Technology (4)**

Physical and chemical principles governing bioseparation processes in dairy product technology. Factors influencing mass transport phenomena as it relates to filtration, chromatography, ion exchange, dialysis, centrifugation, adsorption, crystallization and other unit operations. Laboratories to emphasize application of bioseparations of commercial importance. Field trips to be required. 3 lectures, 1 laboratory. Prerequisite: DSCI 401, FSN 444.

**DSCI 539 Graduate Internship in Dairy Science (1–9)**

Application of theory to the solution of problems of agricultural production or related business in the field of Dairy Science. Analyze specific management problems and perform general management assignments detailed in a contract between the student, the firm or organization, and the faculty advisor before the internship commences. Degree credit limited to 6 units. Prerequisite: Consent of internship instructor.

**DSCI 560 Recent Developments in Dairy Science and Technology (1–3)**

Presentation and critical review of current research publications. Methodological advances and applications in dairy food systems. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 seminars. Prerequisite: Senior or graduate standing and approval of instructor.

**DSCI 570 Selected Topics in Dairy Science (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 12 units. 1 to 4 seminars. Prerequisite: Graduate standing or consent of instructor.

**DSCI 571 Selected Advanced Laboratory in Dairy Science (1–4)**

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 8 units. 1–4 laboratories. Prerequisite: Consent of instructor.

**DSCI 581 Graduate Seminar in Dairy Science (1–3) (CR/NC)**

Current findings and research problems in the field and their application to industry. Group study of current problems of industry. Current experimental and research findings as applied to production and marketing. Credit/No Credit grading only. 1 or 3 seminars. Credit/ no

credit grading only. Prerequisite: Graduate standing or consent of instructor.

**DSCI 585 Cooperative Education Experience in Dairy Science (1-6) (CR/NC)**

Advanced study, analysis and part-time work experience in the 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.

**DSCI 599 Thesis in Dairy Science (1-9)**

Systematic research of a significant problem in Dairy Science. 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.

## ECON-ECONOMICS

**ECON 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Sophomore standing and consent of department head.

**ECON 201 Survey of Economics (4) GE D2**  
(Also listed as HNRS 201)

Basic principles of microeconomics and macroeconomics. Emphasis on applications to current national and global economic issues. For majors requiring one quarter of economics. Not open to students having previous credit in ECON 222 or equivalent. 4 lectures.

**ECON 205 Personal and Consumer Economics (4)**

Personal choices—goals, savings, investment, buying methods, borrowing, taxes, insurance. Practical applications of principles of marginalism, present value indexing, expected value, etc. Emphasizes personal welfare with some social welfare analysis and contemporary consumer issues. 4 lectures.

**ECON 221 Microeconomics (4)**

Microeconomic principles. Marginal and equilibrium analysis of commodity and factor markets in determination of price and output. Normative issues of efficiency and equity. 4 lectures.

**ECON 222 Macroeconomics (4) GE D2**

Introduction to economic problems. Macroeconomic analysis and principles. Aggregate output, employment, prices, and economic policies for changing these variables. International trade and finance. Issues of economic growth and development. Comparative economic systems and economies in transition. 4 lectures.

**ECON 303 Economics of Poverty, Discrimination and Immigration (4) (Also listed as HNRS 303) GE D5 USCP**

Economic analysis of the cause, extent and impact of poverty, discrimination and immigration and of the policies designed to address these socioeconomic issues. Emphasis on the experience of African-Americans, Latinos, and women in the United States. 4 lectures. Prerequisite: Completion of GE Areas A, D1, and ECON 201 or 222. Economics majors will not receive GE Area D5 credit.

**ECON 304 Comparative Economic Systems (4) GE D5**

Analysis of economic systems as a set of mechanisms and institutions for decision making, and the implementation of decisions regarding income distribution, the levels of consumption and production, and the level of economic welfare. 4 lectures. Prerequisite: Completion of GE Areas A, D3, and ECON 201 or 222. Economics majors will not receive GE Area D5 credit.

**ECON 310 Quantitative Methods in Economics (4)**

Applications of quantitative techniques to topics in microeconomic and macroeconomic theory. Use of multivariate calculus and linear algebra in formulating static economic models. Applications of statistical inference, estimation and forecasting in economic models. 4 lectures. Prerequisite: MATH 221, STAT 252, ECON 221, ECON 222.

**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 310. For ECON 312: ECON 311.

**ECON 313, 314 Intermediate Macroeconomics (4) (4)**

Analysis of national income, price level, employment, international trade and economic growth. Development of the theory of national income determination. Evaluation of roles of monetary and fiscal policy. Applications of computer simulation for analysis, forecasting and control. 4 lectures. Prerequisite: ECON 222, MATH 221, STAT 252. For ECON 314: ECON 313.

**ECON 322 Economic History of the Advanced World (4) GE D5**

Analysis of the growth of economic institutions from about 600. Includes the spread of economic structures and institutions to colonies. Analyzes the internal development of the industrial economy in Europe and its expansion to other parts of the globe. 4 lectures. Prerequisite: Completion of GE Areas A, D1, and ECON 201 or 222. Economics majors will not receive GE Area D5 credit.

**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 agriculture, transportation, industrial and government sectors and their interconnections. 4 lectures. Prerequisite: ECON 201 or ECON 221 or ECON 222.

**ECON 325 Economics of Development and Growth (4)**

Analysis of the economy of less developed countries, and a survey of public policies designed to stimulate economic growth and reduce poverty. Topics include financing development, technology, population problems, human capital, rural and urban development, trade policy and the economic relationships between developed and developing nations. 4 lectures. Prerequisite: ECON 201 or ECON 221 or ECON 222.

**ECON 337 Money, Banking and Credit (4)**

Financial markets and institutions. Structure of the banking industry and impacts of technological change in banking. Structure and operations of the Federal Reserve. Impacts of monetary policy on the economy. 4 lectures. Prerequisite: 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: MATH 221, MATH 222, STAT 251, STAT 252, or consent of instructor.

**ECON 340 Advanced Econometrics (4)**

Advanced topics in undergraduate econometrics. Single equation estimation topics including: distributed lag models, causality, cointegration and error correction models and nonlinear estimation. Forecasting with a single equation model. Simultaneous equation estimation, including instrumental variables, two stage least squares and seemingly unrelated regression. 3 lectures, 1 activity. Prerequisite: ECON 339.

**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 221.

**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 221.

**ECON 404 International Trade Theory (4)**

Theory of comparative advantage, neoclassical model of trade, offer curves and terms of trade, edgeworth boxes, valuation of factor inputs, effects of migration and mobility of funds, emerging growth and trade distortions, welfare effects of trade, and recent developments in trade theory. 4 lectures. Prerequisite: ECON 312 or equivalent.

**ECON 405 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 222, ECON 401.

**ECON 406 Applied Forecasting (4)**

Causes and measurement of business fluctuations. Techniques of forecasting with microcomputer applications. 3 lectures, 1 activity. Prerequisite: ECON 201 or ECON 222, and STAT 252.

**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. 4 lectures. Prerequisite: ECON 201 or ECON 221.

**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 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 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 area chair. 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 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 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 222.

**ECON 434 Urban Economics (4)**

Application of basic tools of economic analysis to problems of urban regions. Causes and possible cures for inadequate growth rate, income levels, and the quality of life in urban regions. 4 lectures. Prerequisite: ECON 201 or ECON 221.

**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 8 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 333 Professional Presentations (4)**

Skills and tools for employment acquisition or graduate school admissions. Individual resume design and production. Documentation of personal, professional and academic experience via written, oral and image based systems. Employment interview dynamics. Electronic and hardcopy portfolio production. Internet marketing. 1 lecture, 3 activities. Prerequisite: Third-year standing or permission of instructor.

**EDES 350 The Global Environment (4) GE Area F  
(Also listed as AG/BUS/ENGR/HUM/SCM 350)**

Interdisciplinary investigation of how human activities impact the Earth's environment on a global scale. Examination of population, resource use, climate change, and biodiversity from scientific/technical and social/economic/historical/political perspectives. Use of remote sensing maps. Sustainable solutions. 3 lectures, 1 activity. Prerequisite: Completion of GE Areas A and B and junior standing.

**EDES 406 Sustainable Environments (4)**

Collaboration of interdisciplinary faculty and guest speakers/panelists. Introduction, illustration and analysis of concepts and principles for sustainability to be used in all aspects of environmental design. Integration and application of knowledge of human and natural systems with environmental, social and economic concerns, from a global-to-local perspective. 4 lectures. Prerequisite: Third or fourth year or graduate standing, or consent of instructor.

**EDES 408 Implementing Sustainable Principles (3)**

A primarily project-based course, intended to aid students who wish to collaborate with the purpose of implementing sustainability principles by developing tools, process or designs, for community-based projects and proposals at various scales of planning, architecture and design of the human environment to address social, environmental and economic issues. 3 lectures. Prerequisite: Third year standing or consent of instructor.

**EDES 410 Advanced Implementation of Sustainable Principles (4)**

Advanced continuation of community-based projects defined and initiated in EDES 408. Ongoing projects, individual and group, address variable scales of planning, architecture, and environmental design, with required completion at the end of the course. 2 seminars, 2 supervision. Prerequisite: EDES 408.

**EDES 420 Historic Preservation and Adaptive Reuse in the Built Environment (4)**

Historic preservation, restoration, and rehabilitation issues in the built environment. Focus on the process and issues of preserving cultural heritage through preserving environmental artifacts (i.e., structure and landscape). The importance of preserving historical districts, buildings and landscapes as well as techniques for accomplishing preservation goals within the existing regulatory environments. Total credit limited to 8 units. 2 lectures, 2 seminars. Prerequisite: Any GE Area D course or consent of instructor.

**EDES 430 Collaborative Process (3)**

A comprehensive set of tools and practices that allow for high performance, interdisciplinary collaborative teams to focus on extraordinary outcomes at each step of project development, including the planning, design, bidding, permitting, construction and management phases. 3 laboratories. Prerequisite: Fourth-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 207 Introduction to the Learner's Development, Culture, Language, and Identity (5) (Also listed as CD 207)**

Theoretical background of child development for teaching-learning in all aspects of development that influence the teaching-learning process. Special emphasis on multicultural, language, and other diversity issues. Fieldwork activities in public school classrooms. Not open to CD majors. 4 lectures, 1 activity. Prerequisite: PSY 201 or PSY 202.

**EDUC 300 Introduction to the Teaching Profession (3) (CR/NC)**

Supervised observation and participation in cooperating schools. Discussion focuses on instructional practice and subject matter taught in grades observed, as well as the history of American public education. 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. 2 lectures, 1 activity.

**EDUC 304 Orientation to the Teaching of Students with Disabilities (2) (CR/NC)**

Introduction to the Education Specialist Credential and role of special education in the public school. Required first course in program. Orientation to program and study of self and others, laws and current conditions of special education. Required field observations and activities. 1 seminar, 1 activity. Credit/No Credit grading only. Prerequisite: Acceptance into Level I Special Education Credential Program, and must have fulfilled early field experience requirement.

**EDUC 310 Effective Teaching and Classroom Management with a Multicultural Perspective in K-3 and 4-8 Settings (4)**

Knowledge, theory, fieldwork and research related to effectively managing, planning, and teaching in K-3 and 4-8 classrooms; connections between preventing discipline problems and choices about curriculum, instruction, and management, creating a positive learning environment for all students. 2 seminars, 2 activities. Prerequisite: LS 230.

**EDUC 400 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: Junior standing and consent of instructor.

**EDUC 402 English Language Development (ELD) (4)**

English as a Second Language (ESL) and bilingual methodologies. Focus on the practical aspects of teaching, organizing, and managing English language instruction for the second language learner. 4 seminars. Prerequisite: Admission to teaching credential program or possession of a basic teaching credential.

**EDUC 404 Culture and Diversity (4)**

Cultural, linguistic and exceptionality issues. Theoretical and historical foundations for pedagogical practices which meet the sociocultural, cognitive and language needs of an increasingly diverse student population. 4 seminars. Prerequisite: Admission to teaching credential program or possession of a basic teaching credential.

**EDUC 405 Multicultural Field Experience (1–3) (CR/NC)**

Supervised advanced field experience and practical application for classroom teachers of culturally and linguistically diverse student populations. 30 hours work per quarter unit. Scheduled meetings between course instructor and student. Credit/No Credit grading only. Prerequisite: Admission to teaching credential program or possession of a basic teaching credential.

**EDUC 406 Specially Designed Academic Instruction in English (SDAIE) (4)**

Teaching methods appropriate for content area instruction through specially designed academic instruction delivered in English (SDAIE). Making learning strategies explicit for students. Includes alternative assessment and classroom organization. 4 seminars. Prerequisite: Admission to teaching credential program or possession of basic teaching credential.

**EDUC 423 Bilingual Literacy (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. 3 seminars, 1 activity. Prerequisite: Junior status, Spanish proficiency and/or consent of instructor.

**EDUC 427 Theories, Methods, and Assessment for First and Second Language Acquisition in Secondary Schools (3)**

Theories, methods, materials and assessment involved in the instruction of limited English proficient (L.E.P.) students. Bilingual, transitional, and English only programs compared across a historical framework. An integrated language arts approach emphasized, including application of reading programs based on theories of language acquisition. 2 seminars, 1 activity. Prerequisite: Admission to single subject teaching credential program or junior standing in agricultural education major.

**EDUC 428 Teaching K-3 Reading, Language Arts, and Children's Literature with a Multicultural Perspective (4)**

Knowledge and skills for planning, teaching, and evaluating in a balanced, comprehensive, research-based primary (K-3) language arts program, with fieldwork, to ensure children of all abilities and backgrounds success as citizens who read, write, speak, listen and think effectively. 2 seminars, 2 activities. Prerequisite: Must meet all requirements for acceptance into the Multiple Subject Credential Program and ENGL 209/303/391/395 (linguistics), EDUC 310, EDUC/CD 207, and junior standing.

**EDUC 429 Teaching 4-8 Grade Reading, Language Arts, and Children's Literature with a Multicultural Perspective (4)**

Knowledge and skills for planning, teaching, and evaluating in a balanced, comprehensive, research-based 4-8 grade language arts program, with fieldwork, to ensure children of all abilities and backgrounds success as citizens who read, write, speak, listen and think effectively. 2 seminars, 2 activities. Prerequisite: Must meet all requirements for acceptance into the Multiple Subject Credential Program and EDUC 310 and EDUC 428.

**EDUC 431 Teaching Social Science and the Arts with a Multicultural Perspective (4)**

Development of knowledge and skills related to planning, implementing and evaluating integrated social science units of instruction; effects of culture on the selection and implementation of curriculum; knowledge and integration of physical education, art, and music. 2 seminars, 2 activities. Prerequisite: EDUC 207, EDUC 310, EDUC 428; and application for Multiple Subject Credential program.

**EDUC 432 Teaching Science and Mathematics with a Multicultural Perspective (4)**

Curriculum and methods in teaching science and mathematics. Selecting, organizing, presenting science and mathematics lessons at the appropriate level throughout the curriculum. Emphasis on thinking processes, manipulative and process skills within the context of the curriculum frameworks. 2 seminars, 2 activities. Prerequisite: EDUC 207, EDUC 310, EDUC 428, and EDUC 429; and MATH 327, MATH 328 and MATH 329; and application for Multiple Subject Credential program.

**EDUC 433 Bilingual Foundations (2)**

Limited to students seeking BCLAD Certification. Theories, methods, and techniques in bilingual education. 2 seminars. Prerequisite: Spanish proficiency, junior status and/or consent of instructor.

**EDUC 434 Student Teaching – Multiple Subject Credential (10) CR/NC**

Field assignment involving observation, teaching, research and related activities in public elementary and middle school classrooms. Credit/No Credit grading only. Concurrent: EDUC 435. Prerequisite: EDUC 428 and EDUC 429; EDUC 431, EDUC 432.

**EDUC 435 Issues in the K-8 Classroom (4)**

Curriculum, community and school site issues related to the K-8 curriculum in multicultural settings. Teacher responsibilities, unit development, and lesson implementation. 3 seminars, 1 activity. Concurrent: EDUC 434. Prerequisite: EDUC 207, EDUC 310, EDUC 428 and EDUC 429, EDUC 431, EDUC 432.

**EDUC 440 Educating Individuals with Exceptional Needs (4)**

Characteristics, incidence, and etiology of individuals with exceptional needs. Problems, assessment, and approaches toward accommodating students with exceptional needs in the regular classroom. 4 seminars. Prerequisite: Any course in GE Area D4, EDUC 300, EDUC 301 or EDUC 305.

**EDUC 441 Education Specialist Level II Induction Seminar (2) (CR/NC)**

Orientation class to develop a two (minimum) to five (maximum) year plan that will result in a Professional Clear Education Specialist Credential. Plan to contain elements that extend the learning of the Level I

credential, foster critical reflection, include involvement of employer (i.e., school district) representatives, and include both university and non-university academic work. Credit/No Credit grading only. 1 seminar, 1 activity. Prerequisite: Admission into Level II Special Education Credential Program.

**EDUC 442 Field Experience in General and Special Education (2-4) (CR/NC)**

Public school classroom experiences in both general education classrooms and special education classrooms. Teaching individuals and small groups, emphasis on reading skills. Minimum 20 hours per week. Total credit limited to 8 units. Credit/No Credit grading only. Prerequisite: Acceptance into Level I Special Education Credential Program, EDUC 304, EDUC 440. Must be taken concurrently with EDUC 451.

**EDUC 443 Assessment of Level II Education Specialists (2) (CR/NC)**

Use of multifaceted assessment process to verify that candidates have met the Level II Performance standards, including portfolio review, coursework competency review, and oral presentation before an assessor panel composed of trained professional practitioners. Credit/No Credit grading only. 1 seminar, 1 activity. Prerequisite: Admission into the Professional Level II Special Education Credential Program and completion of all Level II coursework and related activities.

**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 CD 209, and EDUC 440 or consent of instructor.

**EDUC 445 Reading/Language Arts Instruction for Special Educators (5)**

Diagnostic and remediation of reading problems. Review of phonic and other reading programs. General education (K-12) reading instructions. Alternative methods of developing English language reading skills. Field activities required. 4 seminars, 1 activity. Prerequisite: Acceptance into Level I Special Education Credential Program, EDUC 304, EDUC 440, EDUC 446.

**EDUC 446 Special Education and Instruction in the K-12 Curriculum (4)**

For Level I Special Education Credential candidates. Curriculum and method in teaching science, social science, mathematics, and the arts at the elementary schools including scope and sequence. The learning environment in the middle, junior high school, and secondary school with emphasis on specific single subject teaching area. 3 seminars, 1 activity. Prerequisite: Acceptance into Level I Special Education Credential Program, EDUC 304, EDUC 440.

**EDUC 447 Special Education Field Experience (4) (CR/NC)**

Public school classroom experiences in both general education classrooms and special education classrooms. Teaching individuals and small groups, emphasis on behavior management. Minimum 20 hours per week. Total credit limited to 8 units. Credit/No Credit grading only. Prerequisite: Acceptance into Level I Special Education Credential Program, EDUC 304, EDUC 440, EDUC 442, EDUC 446. Must be taken concurrently with EDUC 451.

**EDUC 449 Special Education Student Teaching (4) (CR/NC)**

Participation in public schools as a student teacher in activities representing different roles of special education teachers. Assumption of a teacher's responsibility for individual and small groups. Minimum 20 hours per week. Total credit limited to 8 units. Credit/No Credit grading only. Prerequisite: Acceptance into Level I Special Education Credential Program, EDUC 304, EDUC 440, EDUC 442, EDUC 445, EDUC 446, EDUC 447 and completion of all program requirements. Must be taken concurrently with EDUC 451.

#### **EDUC 450 Behavior Disorders and Positive Behavior Support Strategies (4)**

Assessment of students with disruptive classroom performance. Strategies for facilitating protective educational, environmental and social-emotional techniques which shift disruptive behavior to appropriate behavior. Evaluation of classroom modifications. 3 seminars, 1 activity. Prerequisite: Acceptance into Level I Special Education Credential Program, EDUC 304, EDUC 440, EDUC 445, EDUC 446.

#### **EDUC 451 Special Education Fieldwork Seminar (2) (2) (2) (CR/NC)**

First enrollment emphasizes the support and understanding of field experiences and the role of special education. Second enrollment emphasizes behavior management. and third enrollment emphasizes instructional strategies. Credit/No Credit grading only. Total credit limited to 6 units. 2 seminars. Must be taken concurrently with EDUC 442, EDUC 447, EDUC 449.

#### **EDUC 452 Support and Transition Strategies in Special Education (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: Acceptance into Level I Special Education Credential Program, EDUC 440, EDUC 445, EDUC 446, EDUC 450.

#### **EDUC 454 Multiple Subject Student Teaching I (7) (CR/NC)**

Field assignment involving observation, teaching, professional growth and related activities in public K-8 classrooms. Taken concurrently with EDUC 455 and EDUC 432. Credit/No Credit grading only. Prerequisite: Senior standing in BS in Liberal Studies and completion of LS 461, acceptance in STEP II of the Multiple Subject Credential Program, EDUC 310, EDUC 428, EDUC 429.

#### **EDUC 455 Multiple Subject Student Teaching Seminar I (2)**

Educational issues and research; rights and legal responsibilities (teachers and students); reform movements and moral dimensions in education; self evaluation based on domains from standards for the teaching profession; student assessment and evaluation; professional growth; and preparing a job search. 2 seminars. Prerequisite: Senior standing in BS in Liberal Studies and completion of LS 461, acceptance in STEP II of the Multiple Subject Credential Program, EDUC 308, EDUC 309, EDUC 428, EDUC 429, EDUC 431 and concurrently taking the first quarter of student teaching, EDUC 432 and EDUC 454.

#### **EDUC 456 Multiple Subject Student Teaching II (12) (CR/NC)**

Second field assignment involving observation, teaching, professional growth and related activities in public K-8 classrooms. Credit/No Credit grading only. Taken concurrently with EDUC 457. Prerequisite: Successful completion of EDUC 454 and EDUC 455, and EDUC 428, EDUC 429, EDUC 431, EDUC 432 and LS 461.

#### **EDUC 457 Multiple Subject Student Teaching Seminar II (2)**

Issues related to teaching, moral responsibilities of the profession, setting professional goals, parent conferencing, self-assessment, implementation of formal and standardized assessments, interviews, completion of materials for a job search, and beginning the first year as a teacher. 2 seminars. Taken concurrently with EDUC 456. Prerequisites: Successful completion of EDUC 454 and EDUC 455, and EDUC 428, EDUC 429, EDUC 431 and EDUC 432.

#### **EDUC 458 Summer Quarter Field Experiences: General and Special Education (4) (CR/NC)**

Participation in public schools in activities representing different teaching roles in general and special education. Assumption of a teacher's responsibility for individual and small groups. May include student teaching in special education. Minimum 20 hours per week. Total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: EDUC 304 and acceptance into Education Specialist Credential program. Must be taken concurrently with EDUC 459.

#### **EDUC 459 Summer Quarter Special Education Seminar (4) (CR/NC)**

Provides support and understanding of field experiences and the role of general and special education. Total credit limited to 8 units. 4 seminars. Credit/No Credit grading only. Prerequisite: EDUC 304 and acceptance into Level I Special Education Credential Program. Must be taken concurrently with EDUC 458.

#### **EDUC 460 Curriculum and Instruction for Democratic Secondary Schools (3)**

Introduction to traditional academic, student-centered, and democratic approaches to curriculum design and methods of teaching. 2 seminars, 1 activity. Prerequisite: Admission to post-baccalaureate Single Subject Credential Program, junior standing or consent of instructor.

#### **EDUC 461 Field Experiences for Curriculum and Instruction for Democratic Schools (1) (CR/NC)**

Field experience for EDUC 460. Observation of teaching in 6-12 classroom. Analysis of curriculum in subject area. 1 activity. Credit/No Credit grading only. Prerequisite: EDUC 300 or equivalent and junior standing or consent of instructor.

#### **EDUC 462 Organization and Management of Instructional Environments for Diverse Learners in the Secondary School (3)**

Principles, methods and practices of organizing and managing secondary classrooms including multiple models of classroom discipline and the management of cooperative learning. Issues of law as they relate to teacher's responsibilities in the classroom. 2 seminars, 1 activity. Prerequisite: Admission to post-baccalaureate Single Subject Credential program, junior standing or consent of instructor.

#### **EDUC 463 Field Experience for Organization and Management of Instructional Environments (1) (CR/NC)**

Field experience for EDUC 462, development of management strategies for 6-12 classroom including the management of cooperative groups. Credit/No Credit grading only. 1 activity. Prerequisite: EDUC 300 or equivalent and junior standing or consent of instructor.

#### **EDUC 464 Literacy in the Content Areas (3)**

Principles and strategies for using literacy for learning in the content areas; the role various forms of literacy play in content area, learning, influence of linguistic, social and cultural factors on student literacy learning; strategies for working with diverse student populations. 2 seminars, 1 activity. Prerequisite: Admission to post-baccalaureate Single Subject Credential program, junior standing or consent of instructor.

#### **EDUC 465 Field Experience for Literacy in the Content Area (1) (CR/NC)**

Field experience for EDUC 464. Demonstration of small group literacy assessment and instruction in 6-12 classrooms. Credit/No Credit grading only. 1 activity. Prerequisite: EDUC 300 or equivalent.

#### **EDUC 466 Learners, Learning and Assessment in Secondary Schools (3)**

Introduction to constructivist theories of learning and characteristics of adolescents as learners. Focus on forms of assessment, such as text construction, portfolio and performance design, and other alternative forms. 3 seminars. Taken concurrently with EDUC 468 and EDUC 469. Prerequisite: EDUC 427, EDUC 460, EDUC 462, EDUC 464.

#### **EDUC 467 Field Experience for Learners, Learning and Assessment in Secondary Schools (1)**

Field experience for EDUC 466. Creating and using forms of assessment in 6-12 classrooms. Analyzing student learning through observations. 1 activity. Taken concurrently with EDUC 466, EDUC 468, and EDUC 469 (except for AGED students who are not required to take EDUC 466). Prerequisite: EDUC 460, EDUC 461, EDUC 462, EDUC 463, EDUC 464, EDUC 465.

**EDUC 468 Teaching in Heterogeneous Classrooms for Secondary Schools (4)**

Multicultural education in American society and schools; introductory knowledge of cultural concepts. Preparation for successful teaching of diverse learners. Critical examination of traditional practices that hinder students' equal access to education. 3 seminars, 1 activity. Taken concurrently with EDUC 466 and EDUC 469. Prerequisite: EDUC 427, EDUC 460, EDUC 462, EDUC 464.

**EDUC 469 Part-Time Student Teaching (6) (CR/NC)**

Part-time assignment in a classroom (Single Subject only). 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 begin student teaching and approval of campus screening committee for credential candidates. Taken concurrently with EDUC 466, EDUC 467, EDUC 468.

**EDUC 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.

**EDUC 479 Student Teaching (12) (CR/NC)**

Full-time assignment in a classroom (Single Subject only). 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 480 Computer Based Curriculum (3)**

Computer assisted instruction and computer based technology. Lesson planning and integration of technology into the K-12 curriculum. Familiarization with available educational courseware and software. Emphasis on classroom application. 2 seminars, 1 activity. Prerequisite: Computer literacy, CSC 488 or CSC 416, or equivalent.

**EDUC 481 Community Based Technology Integration (2)**

Creation of materials and procedures to meet requirements for Level II technology, as defined by the CCTC, in a community based learning environment. Application of technology in a K-12 classroom. 1 seminar, 1 activity. Prerequisite: EDUC 480 or test equivalent.

**EDUC 500 Individual Study (1-4)**

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 advisor, 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 (4)**

Language arts curriculum: objectives, methods, content, materials, evaluation, current trends, research and field work activities. 3 seminars. 1 activity. 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. 3 seminars, 1 activity. Prerequisite: Graduate standing.

**EDUC 505 Seminar in Social Studies Curriculum and Methods (4)**

In-depth study of the social studies curriculum: objectives, methods, content, materials, evaluation, current trends and field work activities. 3 seminars, 1 activity. 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. 2 seminars, 1 activity. Prerequisite: Graduate standing.

**EDUC 510 Educational Finance and Resource Allocation (4)**

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, 1 activity. Prerequisite: Graduate standing and consent of instructor.

**EDUC 511 Educational Law and Governance (4)**

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, 1 activity. Prerequisite: Graduate standing and 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 and consent of instructor.

**EDUC 513 Educational Planning and Decision Making (4)**

Concepts of planning and decision making in educational administration that utilize a wide range of data gathering and analysis procedures. 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 and consent of instructor.

**EDUC 515 Educational Program Management and Evaluation (4)**

Supervision, management, and evaluation of educational curriculum and educational programs. Current trends in program management including mapping, monitoring, alignment. 3 seminars, 1 activity. Prerequisite: Graduate standing and 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 and 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: admission to MA Education program.

**EDUC 518 Administrative Services Fieldwork (3) (CR/NC)**

Supervised fieldwork in school administration for supervision at the elementary and secondary level. Assignments must encompass three of the four academic quarters 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 and consent of instructor.

**EDUC 525 Literacy and 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 Diagnostic Procedures in Literacy and Reading (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. 2 seminars, 2 activities. Prerequisite: Graduate standing.

**EDUC 530 Secondary, College, and Adult Literacy Practices (4)**

Principles, procedures, and materials for improving literacy and 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 533 Internship (3) CR/NC**

Supervised experience as an employed professional. Supervision conducted cooperatively with university and employer. Setting must be approved in advance. Limited to candidates in approved internship programs. Total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: EDUC 440, graduate standing.

**EDUC 542 Administration of Special Programs and Services (4)**

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, 1 activity. Prerequisite: Graduate standing and consent of instructor.

**EDUC 543 Advanced Studies in Assessment, Behavioral Support, Curriculum for Transition in Special Education (4)**

Advancement of Level II candidate's knowledge and skills in assessment driven decision making for pupils with disabilities, supporting pupils with serious emotional or behavioral problems, and preparing pupils with disabilities for major life cycle school transitions. Analyzing assessment data to determine how to modify academic instruction, provide behavioral support, social skills training, career and vocational preparation. 3 seminars, 1 activity. Prerequisite: Admission into the Professional Level II Special Education Credential Program, EDUC 441.

**EDUC 544 Advanced Collaboration, Consultation, and Instructional Techniques for Teachers of Pupils with Mild/Moderate Disabilities (4)**

Advanced studies and skills in assessment, adaptation and modification of curriculum to meet the needs of individual pupils with mild/moderate disabilities. Emphasis on the collaborative and consultative role of the special educator with a wide range of individuals including school personnel, parents, community members and paraprofessionals. 3 seminars, 1 activity. Prerequisite: Admission into the Professional Level II Special Education Credential Program, EDUC 441.

**EDUC 545 Characteristics and Instruction of Pupils with Mild/Moderate Disabilities (4)**

Characteristics of, and instructional strategies for students with mild/moderate disabilities. 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: Acceptance into Level I Special Education Credential Program, EDUC 304, EDUC 440.

**EDUC 547 Atypical Learning Patterns and Curricular Adaptations (4)**

Theoretical considerations of learning patterns deviating from normal development. Educational implications of current theories of cognitive development and brain function as applied to individuals with disabilities. Development and application of a remedial therapy with appropriate individual(s). 3 seminars, 1 activity. Prerequisite: Acceptance into Level II Special Education Credential Program or masters degree program.

**EDUC 548 Advanced Collaboration, Consultation and Instructional Techniques for Teachers of Pupils with Moderate/Severe Disabilities (4)**

Advanced studies in assessment, adaptation and modification of curriculum, and instructional techniques for teachers of pupils with moderate/severe disabilities. Emphasis on the collaborative, consultative, and management roles of the special educator, focus on interactions with school staff, parents, and outside agencies. 3 seminars, 1 activity. Prerequisite: Admission into the Professional Level II Special Education Credential Program, EDUC 441.

**EDUC 550 Assessment Strategies for Special Education (4)**

Using norm referenced, criterion referenced, and curriculum based testing for assessing academic, behavioral, and physical status of individuals with exceptional needs for referral purposes. Instructional and evaluation decisions regarding exceptional students in school settings. 3 seminars, 1 activity. Prerequisite: Acceptance into Level I Special Education Credential Program, EDUC 440, EDUC 446, EDUC 545, EDUC 551.

**EDUC 551 Characteristics and Instruction of Pupils with Moderate/Severe Disabilities (4)**

Definition and social behavioral characteristics of students with moderate to severe disabilities. Instructional strategies emphasizing law, assessment, educational settings, and the collaborative strategies necessary for facilitating the inclusion of students with moderate/severe disabilities in general education settings. Emphasis on the communication, social skills, movement, mobility, sensory and specialized health care issues of students with moderate to severe disabilities. 3 seminars, 1 activity. Prerequisite: Acceptance into Level I Special Education Credential Program, EDUC 304, EDUC 440.

**EDUC 553 Current Issues, Emerging Research and Practices in Special Education (4)**

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. 4 seminars. Prerequisite: Admission to Level I Special Education Credential Program or masters degree program.

**EDUC 555 Counseling and Communication (4)**

Overview of the counseling profession, history, philosophy, theory and ethics. Emphasis on developing interviewing, assessment and communication skills. Required practicum. 3 seminars, 1 activity. Prerequisite: Admission to MA Education program.

**EDUC 556 Ethnic Counseling (4)**

Socio-psychological and psycho-historical analysis of the visible ethnic and ethnic experience. Effects of poverty, history and the significance of oppression. Counseling techniques, assessment, community relations and required activities. 3 seminars, 1 activity. Prerequisite: Admission to MA Education program.

**EDUC 557 Career Development (4)**

Counselor role in career decision making to include career choice theory, appraisal instruments, community referral resources, occupational information, computerized retrieval systems, and personal and social data and required activities. 3 seminars, 1 activity. Prerequisite: EDUC 555 and admission to MA Education program.

**EDUC 558 Academic Counseling in Elementary Schools (4)**

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.

**EDUC 559 Academic Counseling in Secondary Schools (4)**

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.

**EDUC 560 Counseling Theories and Assessment (4)**

Counseling theories and concepts applied to individuals. Develop skills in interviewing, assessment intervention selection, termination and crisis intervention. Ethics and law included. 3 seminars, 1 activity. Prerequisite: EDUC 555 and admission to MA Education program.

**EDUC 561 Group Counseling (3)**

Theory and practice of group counseling, client selection, group structure, process and termination, and application of theories to specific developmental groups. Communication and facilitation skills emphasized with relevant ethics and law. 2 seminars, 1 activity. Prerequisite: EDUC/PSY 555, EDUC 560 or consent of instructor.

**EDUC 562 Student Development—Higher Education (4)**

Exploration of the roles and competencies of the student development specialist in higher education. Review of relevant developmental theory with emphasis on practical implementation. Explore current issues and trends in higher education, and organizational framework. 4 seminars. Prerequisite: Admission to MA Education program.

**EDUC 563 Counseling At-Risk Students (3)**

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: Admission to MA Education program.

**EDUC 573 Field Experience, Counseling (1–12) (CR/NC)**

Practical application of guidance services and counseling in public schools, colleges and community settings. Seminars with university staff included. Total credit limited to 24 units. Credit/No Credit grading only. Maximum of 6 units may be applied toward MA Education. Prerequisite: EDUC/PSY 555, EDUC 560 and Advancement to Candidacy.

**EDUC 581 Graduate Seminar in Education (1–3)**

Contemporary problems in education. Trends, developments, and issues. Total credit limited to 9 units. Prerequisite: Graduate standing.

**EDUC 586 Introduction to Inquiry in Education (3)**

Introduction to professional literature search techniques and to professional organizations as a basis for educational inquiry. Explanation

of social construction of knowledge, and the philosophical basis of quantitative and qualitative research. 2 seminars, 1 activity. Prerequisite: Admission to UCTE master's program.

**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 Educational Research Methods (3)**

Introduction to research methodologies, application of inferential and descriptive statistics, critical analysis of research designs and data collection techniques. 2 seminars, 1 activity. Prerequisite: EDUC 586.

**EDUC 590 Research Applications in Education (3)**

Application of social science research techniques to problems in education and human services. Capstone experience for the UCTE master's inquiry course sequence. Completion of an inquiry project required. 1 seminar, 2 activities. Prerequisite: EDUC 586 and EDUC 589.

**EDUC 591 Induction Planning and Assessment (1–6) (CR/NC)**

In year one, development and monitoring an induction and assessment plan designed to meet the candidate's needs and goals. In year two, completion of induction plan and implementation of a collaborative action research project. Total credit limited to 6 units. Credit/No Credit grading only. Prerequisite: acceptance into the Professional Administrative Services Credential program.

**EDUC 592 Principles of Administrative Practice (1) (CR/NC)**

Thematic application of a set of five principles of administrative practice that are integrated into coursework modules. Theory and practical application of leadership modules and skills specific to the needs of new administrators. *Class Schedule* will list number of modules offered each quarter. Total credit limited to 18 units. Credit/No Credit grading only. Prerequisite: acceptance into the Professional Administrative Services Credential program.

**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 111 Introduction to Electrical Engineering (1)**

A general overview of the field of electrical engineering. Preparation for successful completion of the Electrical Engineering (EE) program at Cal Poly. 1 lecture. Concurrent: EE 151.

**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. Concurrent or prerequisite: PHYS 133.

**EE 129 Digital Design (3) (Also listed as CPE 129)**

Number systems, Boolean algebra, Boolean functions, and minimization. Analysis and design of combinational logic circuits. Feedback circuits. Analysis and design of sequential logic circuits. Applying Hardware Description Language (HDL) to synthesize digital logic circuits in Programmable Logic Devices (PLDs). 3 lectures. Prerequisite: An orientation course in student's major (EE 111/151 for EE students, CPE/CSC 101 for CPE students), CPE/CSC 101. Concurrent: EE 169.

**EE 151 Introduction to Electrical Engineering Laboratory (1)**

A variety of hands-on experiments and demonstrations in electrical engineering, providing background and motivation for successful completion of the Electrical Engineering (EE) program at Cal Poly. 1 laboratory. Concurrent: EE 111.

**EE 169 Digital Design Laboratory (1) (Also listed as CPE 169)**

Experiments to analyze and design combinational and sequential logic circuits with discrete ICs and PLDs. Introduction to laboratory equipment such as the logic state analyzer for testing circuits. Introduction to a hardware description language for logic simulation and design. 1 laboratory. Prerequisite: An orientation course in student's major (EE 111/151 for EE students, CPE/CSC 101 for CPE students), CPE/CSC 101. Concurrent: EE 129.

**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. Not for electrical engineering majors. 3 lectures. Prerequisite: MATH 244, PHYS 133.

**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 213 Basic Circuit Analysis (4)**

Introduction to basic circuit analysis. Resistive circuits, voltage and current sources, analysis methods, network theorems. Operational amplifiers, capacitor and inductors, first-order circuits, and second-order circuits. 4 lectures. Prerequisite: PHYS 133. Concurrent: MATH 244, EE 253. Suggested: CHEM 124, EE 111/151, IME 156, ENGL 134.

**EE 214 Steady-State Circuit Analysis (4)**

Steady-state sinusoidal analysis, AC power, three-phase circuits, mutual inductance, frequency response, series and parallel resonance, Bode plots, and two-port networks. 4 lectures. Prerequisite: EE 213/253, MATH 244. Concurrent: EE 254.

**EE 228 Continuous-Time Signals and Systems (4)**

Continuous-time systems analysis, with emphasis on linear time-invariant (LTI) systems. Classification of continuous-time systems. Convolution and its application to LTI systems. The Laplace transform, Fourier transform, and Fourier series, and their application to the analysis of LTI systems. 4 lectures. Prerequisite: EE 214/254. Suggested: MATH 241.

**EE 229 Computer Design and Assembly Language Programming (3) (Also listed as CPE 229)**

Design and implementation of digital computer circuits via CAD tools for programmable logic devices (PLDs). Basic computer design with its data path components and control unit. Introduction to assembly language programming of an off-the-shelf RISC-based microcontroller. 3 lectures. Prerequisite: EE 129/169. Concurrent: EE 269.

**EE 241 Electric Circuit Analysis Laboratory II (1)**

Use of electrical and electronic test equipment. Experimental verification of circuit analysis concepts including Kirchhoff's Laws, Thevenin's Theorem, maximum power transfer and superposition. 1 laboratory. Concurrent: EE 211, ENGL 133 or ENGL 134.

**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 251 Electric Circuits Laboratory (1)**

Techniques of measurement of DC and steady-state AC circuit parameters. Equivalent circuits, nonlinear elements, resonance. 1 laboratory. Concurrent: EE 201.

**EE 253 Basic Circuit Analysis Laboratory (1)**

Use of electrical and electronic test equipment. Experimental verification of circuit analysis concepts including Kirchhoff's Laws, Thevenin's Theorem, maximum power transfer, superposition, and RLC circuit transient behavior. 1 laboratory. Prerequisite: PHYS 133. Concurrent: MATH 244, EE 213. Suggested: CHEM 124, EE 111/151, IME 156, ENGL 134.

**EE 254 Steady-State Circuit Analysis Laboratory (1)**

Observation of transient and steady-state phenomena, phase-shift circuits, resonance, mutual inductance, and two-port networks. Use of phasor diagrams. 1 laboratory. Prerequisite: EE 213/253, MATH 244. Concurrent: EE 214.

**EE 255 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, and AC induction and synchronous machines. Stepper motors. 3 lectures. Prerequisite: EE 214/254 or EE 201/251. Concurrent: EE 295.

**EE 269 Computer Design and Assembly Language Programming Laboratory (1) (Also listed as CPE 269)**

Experiments to design and test digital computer circuits and systems with programmable logic devices (PLDs). Design projects to implement a basic computer with data path components and control. Assembly language programming projects for an off-the-shelf RISC-based microcontroller. 1 laboratory. Prerequisite: EE 129/169. Concurrent: EE 229.

**EE 295 Energy Conversion Electromagnetics Laboratory (1)**

Single-phase and three-phase transformers. Starting of rotating machines, evaluation of characteristics of rotating machines. Stepper motor. 1 laboratory. Prerequisite: EE 214/254 or EE 201/251. Concurrent: EE 255.

**EE 302 Classical Control Systems (3)**

Introduction to feedback control systems. System modeling. Transfer functions. Graphical system representation. System time response, stability. Root Locus. Frequency response. Compensation. 3 lectures. Prerequisite: EE 228, EE 255/295. Concurrent: EE 342. Suggested: EE 468.

**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 228.

**EE 306 Semiconductor Device Electronics (3)**

Internal operation, semiconductor physics, terminal characteristics, models and application of diodes (LEDs, solar cells, and photo-diodes) and transistors (field-effect and bipolar). 3 lectures. Prerequisite: CHEM 124, EE 214/254, IME 156, PHYS 211. Concurrent: EE 346.

**EE 307 Digital Electronics and Integrated Circuits (3)**

Analysis, design, application and interfacing of integrated logic circuits, including NMOS, CMOS, TTL, ECL, and other logic families. 3 lectures. Prerequisite: EE 229/269, EE 306/346. Concurrent: EE 347.

**EE 308 Analog Electronics and Integrated Circuits (3)**

Analysis and design of integrated circuits for use in analog applications. Gain, frequency response, and feedback of linear small-signal amplifiers. 3 lectures. Prerequisite: EE 302/342, EE 307/347. Concurrent: EE 348.

**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 228. Concurrent: EE 353.

**EE 314 Introduction to Communication Systems (3)**

Analog modulation, including: double-sideband modulation, amplitude modulation, single-sideband modulation, frequency modulation, phase modulation. Performances of such systems in the presence of white Gaussian noise. Implementations of transmitters and receivers. 3 lectures. Prerequisite: STAT 350.

**EE 321 Electronics (3)**

Semiconductor devices and circuits. Instrumentation amplifiers, power control rectifiers, feedback, pulse circuits, digital logic circuits. Not for Electrical Engineering majors. 3 lectures. Prerequisite: EE 201.

**EE 328 Discrete Time Signals and Systems (3)**

Discrete-time systems and analysis, with emphasis on linear time-invariant (LTI) systems. Sampling theorem. Classification of discrete-time systems. Convolution and its application to LTI systems. The  $z$  transform, discrete-time Fourier transform, and discrete Fourier transform. Introduction to digital filters. 3 lectures. Prerequisite: EE 228. Concurrent: EE 368.

**EE 329 Programmable Logic and Microprocessor-Based Systems Design (4) (Also listed as CPE 329)**

Design, implementation and testing of programmable logic microprocessor-based systems. Hardware/software tradeoffs (such as timing analysis and power considerations), system economics of programmable logic and microprocessor-based system design. Interfacing hardware components (such as ADCs/DACs, sensors, transducers). 3 lectures, 1 laboratory. Prerequisite: EE 307/347.

**EE 334 Electromagnetic Fields I (3)**

Advanced treatment of static electric and magnetic fields and their sources. Poisson's and Laplace's equations, and boundary value problems. Maxwell's equations and time-varying electromagnetic fields. Plane wave propagation in free space and in materials. 3 lectures. Prerequisite: PHYS 133, STAT 350.

**EE 335 Electromagnetic Fields and Transmission (4)**

Maxwell's equations. Plane wave propagation in free space. Static electric and magnetic fields. Distributed-circuit concepts and transmission line parameters. Reflections and standing waves. The Smith chart and its applications. Transmission line measurements and impedance matching techniques. 4 lectures. Prerequisite: MATH 241, EE 214/254.

**EE 336 Microprocessor System Design (4) (Also listed as CPE 336)**

Introduction to microcontrollers and integrated microprocessor systems. Emphasis on the Intel 8051 and Motorola 68HC11 families and derivatives. Hardware/software trade-offs, system economics, and functional configurations. Interface design, real-time clocks, interrupts, A/D conversion, serial and parallel communications, watch-dog timers, low power operation, and assembly language programming techniques. Architecture and design of sampled data and digital control systems. Case studies of representative applications. 3 lectures, 1 laboratory. Prerequisite: EE 129/169.

**EE 342 Classical Control Systems Laboratory (1)**

Laboratory work pertaining to classical control systems, including servo control, transient and frequency responses, stability, and computer-aided analysis of control systems. 1 laboratory. Prerequisite: EE 228, EE 255/295. Concurrent: EE 302. Suggested: EE 368.

**EE 346 Semiconductor Device Electronics Laboratory (1)**

Experimental determination of device characteristics and models. 1 laboratory. Prerequisite: CHEM 124, EE 214/254, IME 156, PHYS 211. Concurrent: EE 306.

**EE 347 Semiconductor Device Electronics Laboratory (1)**

Computer simulation and experimental investigation of the characteristics, applications and interfacing of different logic families. 1 laboratory. Prerequisite: EE 229/269, EE 306/346. Concurrent: EE 307.

**EE 348 Analog Electronics and Integrated Circuits Laboratory (1)**

Design, simulation, construction and testing of solid state amplifiers and sub-circuits to meet stated specifications. 1 laboratory. Prerequisite: EE 302/342, EE 307/347. Concurrent: EE 308.

**EE 353 Signal Transmission Laboratory (1)**

Transmission and reflection measurements. Impedance matching techniques. 1 laboratory. Prerequisite: EE 368. Concurrent: EE 313.

**EE 361 Electronics Laboratory (1)**

Instrumentation amplifiers, feedback, rectifiers and power control, pulse and digital logic circuits. 1 laboratory. Prerequisite: EE 251. Concurrent: EE 321.

**EE 368 Signals and Systems Laboratory (1)**

Laboratory work pertaining to linear systems, including Fourier analysis, time and frequency responses, and system transfer function. 1 laboratory. Prerequisite: EE 228. Concurrent: EE 328.

**EE 400 Special Problems for Advanced Undergraduates (1-5)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 5 units. Prerequisite: Consent of department chair.

**EE 401 Electromagnetic Fields II (3)**

Reflection and transmission of normal incidence plane waves at planar boundaries between two and multiple media. Reflection and refraction of oblique incidence plane waves at a planar boundary between two different media. Wave guides. Antennas. 3 lectures. Prerequisite: EE 334.

**EE 402 Electromagnetic Waves (4)**

Maxwell's equations and plane wave propagation in materials. Reflection and transmission of normal and oblique incidence plane waves at planar boundaries between different media. Wave guides. Antennas. 4 lectures. Prerequisite: EE 335. Concurrent: EE 442.

**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 telecommunications and local area networks (LANs). 3 lectures. Prerequisite: EE 335 or PHYS 323.

**EE 405 High-frequency Amplifier Design (3)**

Design of modern electronic amplifiers and amplifier systems with advanced techniques. UHF and microwave small signal amplifier design utilizing microstrip transmission lines,  $S$  parameters of GaAs FET, and bipolar transistors. Low noise, broadband, and power amplifier designs. Oscillator designs. 3 lectures. Prerequisite: EE 308/348, EE 335. Concurrent: EE 445.

**EE 406 Power Systems Analysis I (4)**

Introduction to electric power systems. Representation of power systems and its components including transmission lines, synchronous machines, transformers and loads. One line diagrams and per unit calculations. Symmetrical faults. Load flow analysis. 4 lectures. Prerequisite: EE 335, EE 255/295.

**EE 407 Power Systems Analysis II (4)**

Symmetrical components, unbalanced faults, power system stability, system protection, relays and relay systems, power system instrumentation and measurement techniques, economic operation. 4 lectures. Prerequisite: EE 406.

**EE 409 Electronic Design (3)**

Design of electronic systems and subsystems using analog and digital integrated circuits. Design principles and techniques. 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 308/348, EE 328/368, EE 329. Concurrent: EE 449.

#### **EE 410 Power Electronics I (4)**

Introduction to power electronics and power semiconductor devices. Analysis, performance characterization, and design of power electronics converters such as: rectifiers, DC choppers, AC voltage controllers, and single-phase inverters. Operation of DC motor drives. Use of commercially available software. 3 lectures, 1 laboratory. Prerequisite: EE 409/449 (or concurrent) and EE 255/295, or EE 321 and consent of instructor.

#### **EE 411 Power Electronics II (4)**

Switching losses. Analysis, performance characterization, and design of snubber circuits and resonant converters. Operation of DC transmission lines, flexible AC transmission system (FACTS) controllers, three-phase inverters, and AC motor drives. Use of commercially available software. 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 409/449, EE 314.

#### **EE 413 Advanced Electronic Design (4)**

Advanced design of electronic circuits and subsystems. Design as a process. Implementation of specific design projects. Automated test using GPIB instruments. 3 lectures, 1 laboratory. Prerequisite: CSC 101, EE 409/449.

#### **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 409/449, EE 314.

#### **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: quantization, multiplexing and multiple access, spread spectrum techniques, coding, synchronization. 3 lectures. Prerequisite: EE 314, EE 328.

#### **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 255/295.

#### **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. 3 lectures. Prerequisite: EE 335 or PHYS 323.

#### **EE 419 Digital Signal Processing (3)**

Review of Z-transform, convolution and discrete Fourier Transform. Digital filter design. Fast Fourier Transform. Theory and applications of digital signal processors. 3 lectures. Prerequisite: CSC 101, EE 328/368. Concurrent: EE 459.

#### **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: EE 307.

#### **EE 422 Polymer Electronics Laboratory (1)**

Experimental procedures in polymer electronics. Investigation of the characteristics of a polymer electronic device. 1 laboratory. Prerequisite: EE 347 or MATE 345.

#### **EE 425 Analog Filter Design (3)**

Approximation Theory. All pole filters. Frequency transformations. Elements of passive synthesis. Time delay filters. Theory and design of active filters. Sensitivity analysis. 3 lectures. Prerequisite: EE 409/449. Concurrent: EE 455.

#### **EE 427 Digital Computer Subsystems (3) (Also listed as CPE 427)**

Design of components and subsystems in digital computers. Use of modern techniques and devices (CPLDs and FPGAs) in implementation. Consideration given to cost/speed tradeoffs. Implementation of a basic digital computer using pre-designed subsystems. 3 lectures. Prerequisite: EE 307/347. Concurrent: EE 467.

#### **EE 431 Computer-Aided Design of VLSI Devices (4)**

Design of VLSI circuits, design of subsystems using static CMOS, transmission gates, and other methods. Variety of CAD tools for design, verification, test, and simulation. Several design projects. 3 lectures, 1 laboratory. Prerequisite: EE 307/347, EE 308/348 or consent of instructor.

#### **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 302/342, EE 328/368. Concurrent: EE 472.

#### **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 255/295, EE 335.

#### **EE 438 Digital Computer Systems (3) (Also listed as CPE 438)**

Design of computer ALUs, microprogram controllers, memory systems, and I/O controllers. Use of LSI components in CPU design. Microprogram and nanoprogram development. 3 lectures. Prerequisite: EE 427 or consent of instructor.

#### **EE 439 Computer Peripheral Interfacing (3) (Also listed as CPE 439)**

Design of the more common computer peripherals 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: EE 329, or consent of instructor.

#### **EE 442 Signal Transmission Laboratory (1)**

Transmission line characterization. Load determination and standing wave patterns using the slotted line technique. Application of the Smith Chart in transmission line characterization and impedance matching techniques. Time domain response to voltage pulses. 1 laboratory. Prerequisite: EE 335. Concurrent: EE 402.

#### **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. Concurrent or prerequisite: 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 406.

**EE 445 High Frequency Amplifier Design Laboratory (1)**

Experimental investigation employing advanced techniques. Design of high-frequency electronic amplifiers utilizing S-parameters of bipolar transistors, network analyzers, and computer simulation techniques. 1 laboratory. Prerequisite: EE 308/348, EE 335. Concurrent or prerequisite: EE 405.

**EE 449 Electronic Design Laboratory (1)**

Design of electronic systems and subsystems using integrated circuits. 1 laboratory. Prerequisite: EE 308/348, EE 328/368, EE 329. Concurrent: EE 409.

**EE 455 Analog Filter Design 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 409/449. Concurrent: EE 425.

**EE 456 Communication Systems Laboratory (1)**

Methods of analog and digital modulation and demodulation. Emphasis on spectral analysis, bandwidth requirements and other practical considerations of modulation and demodulation. 1 laboratory. Prerequisite: EE 328/368, EE 314.

**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: CSC 101, EE 328/368. Concurrent: EE 419.

**EE 460 Senior Project Preparation (1)**

Methods for project planning including Gantt Chart, critical paths, time and cost estimates. Experience in subsystem definition. Case studies and examples. Ethical code of conduct in the engineering profession. Definition and planning of senior project. 1 lecture. Prerequisite: EE 314, EE 335. Prerequisite or concurrent: EE 409/449.

**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 409/449, EE 460.

**EE 463, 464 Senior Project Design Laboratory (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. EE 463: 3 laboratories; prerequisite: EE 409/449, EE 460. EE 464: 2 laboratories; prerequisite: EE 463. Note: although EE 463, 464 substitute for EE 461, 462, students may not use repeat credit for the purpose of increasing GPA.

**EE 467 Digital Computer Subsystems Laboratory (1)**  
(Also listed as CPE 467)

Introduction to industrial grade CAD tools. Design and implementation of digital computer subsystems using SPLDs, CPLDs, and FPGAs. 1 laboratory. Prerequisite: EE 307/347. Concurrent: EE 427.

**EE 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: Consent of instructor.

**EE 471 Selected Advanced Laboratory (1–4)**

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 8 units. 1–4 laboratories. Prerequisite: Consent of instructor.

**EE 472 Digital Control Systems Laboratory (1)**

Design and programming of microprocessor-based digital controls for electro-mechanical plants. Topics include digital control laws, translation of transfer functions into algorithms, assembly language programming, real-time software design, sample rate selection, finite word-length considerations. 1 laboratory. Prerequisite: EE 302/342, EE 328/368. Concurrent: EE 432.

**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 advisor, and supervising faculty member. Total credit limit at discretion of graduate advisor, not to exceed 9 units.

**EE 502 Microwave Engineering (4)**

Application of Maxwell's equations and boundary value problems to waveguide structures. Striplines and microstrip lines. S-parameters. Microwave equivalent circuit theorem. Passive microwave devices. Charge and field interactions in oscillators and amplifiers. Transferred electron devices, avalanche transit-time devices, and microwave transistors. Circuits associated with oscillators and reflection type amplifiers. 4 seminars. Prerequisite: EE 402 or equivalent.

**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 255 or equivalent, and 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, and graduate standing or consent of instructor.

**EE 514 Advanced Topics in Automatic Control (4)**

Summary course covering five selected graduate-level topics in automatic control theory and practice; implementation issues in digital control, nonlinear control theory and design, LQ and time optimal control, variable structure control, and fuzzy logic/model-free control. 4 seminars.

Prerequisite: EE 513 or equivalent, EE 328 or similar course on discrete-time linear systems.

#### **EE 515 Discrete Time Filters (4)**

Advanced topics in filter design and implementation. Emphasis placed on current applications and on the processing of real signals. Topics may include signal analysis via spectral estimation, short time Fourier transforms, and spectrograms. Effects of coefficient quantization, and limits of practical filters. State space realization. Optimal and adaptive filters for signal prediction, system identification, and noise cancellation. Techniques implemented in programming assignments. 4 seminars. Prerequisite: EE 314 or equivalent, and 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 314 or equivalent, EE 525, and 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, and 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, and 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 437 or equivalent, 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 329 or equivalent, 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 307 or equivalent, and 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, and 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: STAT 350 or equivalent, and 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 314 or equivalent, EE 525, and graduate standing or consent of instructor.

#### **EE 527 Advanced Topics in Power Electronics (4)**

Static variable speed AC and DC drives. Phase-controlled rectifiers and choppers in DC motor control. PWM in three-phase inverters, sinusoidal modulation techniques, control strategies for AC three-phase variable speed motor control using voltage source inverters, current source inverters and speed control of AC motors. Torque and speed pulsations. HVDC converters and DC transmission. 4 seminars. Prerequisite: EE 410 or equivalent, EE 411 or equivalent, and graduate standing or consent of instructor.

#### **EE 528 Digital Image Processing (4)**

Processing and interpretation of images by computer. Emphasis on current applications with real images used in programming assignments. Topics may include histogram equalization, 2-D convolution, correlation, frequency-domain processing, median filtering, compression, Hough transform, segmentation and region growing, morphological operations, texture description, shape description, Bayes classifier. 4 seminars. Prerequisite: EE 314 or equivalent, EE 525, and 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 402 or equivalent, PHYS 412 or equivalent, and graduate standing or consent of instructor.

#### **EE 530 Photonic 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 402 or equivalent, EE 314 or equivalent, and graduate standing or consent of instructor.

#### **EE 533 Antennas (4)**

Principles of antenna theory. Antenna parameters, radiation integrals. Duality and reciprocity theorems. Wire antennas. Antenna arrays. Traveling wave antennas. Broadband and frequency independent antennas. Aperture and reflector antennas. Microstrip antennas. Antenna design. 4 seminars. Prerequisite: EE 402 or equivalent.

#### **EE 541 Advanced Microwave Laboratory (2)**

Experimental measurement in waveguide and microstrip circuits employing the advanced Network Analyzer. Design of both passive and active microwave circuits using microstrip. Graphical and analytical design techniques as well as the use of computer-aided design codes. 2 laboratories. Prerequisite: EE 402 or equivalent. Concurrent or prerequisite: EE 502, and graduate standing or consent of instructor.

#### **EE 544 Solid-state Electronics Laboratory (1)**

Experimental procedures in solid-state electronics. Investigation and improvement of the characteristics of a solid-state electronic device. 1 laboratory. Prerequisite: Graduate standing or consent of instructor. Concurrent: EE 524, and graduate standing or consent of instructor.

**EE 563 Graduate Seminar (1) (CR/NC)**

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. Credit/No Credit grading only. Total credit limited to 3 units. 1 seminar.

**EE 570 Selected Advanced Topics (1-4)**

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 8 units. 1-4 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 and consent of instructor.

## **EHS-ENVIRONMENTAL HORTICULTURAL SCIENCE**

**EHS 121 Fundamentals of Environmental Horticulture I (4)**

Introduction to environmental horticulture. Plant processes, climate and the effect of the environment on plants. Controlling the plant's environment, soil and media, mineral nutrition. Field trip required. 3 lectures, 1 laboratory.

**EHS 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. 2 lectures, 2 laboratories. Prerequisite: HCS 110, EHS 121.

**EHS 123 Landscape Installation and Maintenance (4)**

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. Speakers from industry. 3 lectures, 1 laboratory. Prerequisite: HCS 110, EHS 121.

**EHS 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: HCS 110, EHS 121, and BOT 121.

**EHS 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. 1 lecture, 2 laboratories.

**EHS 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.

**EHS 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: HCS 110, EHS 121, EHS 124.

**EHS 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. 1 lecture, 2 laboratories. Prerequisite: EHS 125.

**EHS 230 Environmental Horticulture (4)**

Technical information and recommendations for the residential horticulturist. Propagation, pruning, planting, media, fertilizers, pest and weed control, landscaping, maintenance, identification and care of ornamental plants. Being a wise horticultural consumer. For non-horticulture majors. 3 lectures, 1 laboratory.

**EHS 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. EHS 231 prerequisite for EHS 232.

**EHS 301 Principles of Landscape Design (4)**

Introduction to basic principles and elements of single-family residential landscape design, design theory, plant composition; creative problem solving, functional and aesthetic uses of landscape materials, client and maintenance criteria, xeriscape concepts, and perspective drawing. Expansion of EHS 122 drafting and CADD skills. 2 lectures, 2 laboratories. Prerequisite: EHS 122, EHS 123, EHS 126, EHS 231 and one computer literacy course.

**EHS 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 EHS 210 and EHS 310 limited to four units. Credit/No Credit grading only. Prerequisite: EHS 210 or consent of instructor.

**EHS 315 Plant Materials Research and Presentation Techniques (4)**

Researching information about horticultural plants and presenting it verbally, in writing, and photographically. Systematic learning and identification of a selected group of horticultural plants. Field trip required. 4 lectures. Prerequisite: EHS 232.

**EHS 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. 2 lectures, 2 laboratories. Prerequisite: Computer literacy course; EHS 122.

**EHS 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. 2 lectures, 2 laboratories. Prerequisite: EHS 231, EHS 232, EHS 301. Recommended: EHS 320, EHS 381, BRAE 237.

**EHS 324 Foliage Plant Culture (4)**

Identification, propagation, production, marketing, utilization and maintenance of plants intended for interior landscaping. 3 lectures, 1 laboratory. Prerequisite: EHS 121, EHS 124, SS 121.

**EHS 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 activity, 2 laboratories. Prerequisite: EHS 121, or consent of instructor.

**EHS 327 Abiotic Plant Problems (3)**

Diagnosis of physiological disorders associated with environmental and nutritional factors. Particular emphasis on the systematic inquiry process. Case histories, multimedia use. 2 lectures, 1 laboratory. Prerequisite: EHS 122, EHS 123, EHS 124, EHS 231, EHS 232, BOT 121, CHEM 111, SS 121.

**EHS 331 Landscape Contracting (4)**

Practices in supervising personnel and applying standard techniques in landscape construction. Cost finding and estimating for landscape trades. 3 lectures, 1 laboratory. Prerequisite: EHS 122, EHS 126, EHS 301.

**EHS 332 Landscape Contracting (4)**

Practices in supervising personnel and applying standard techniques in landscape construction cost finding and estimating for landscape trades. Rules, regulations, and licensing laws, set forth by the State of California, governing landscape contractors. 3 lectures, 1 laboratory. Prerequisite: EHS 331.

**EHS 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.

**EHS 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: EHS 121, or consent of instructor.

**EHS 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. 3 lectures, 1 laboratory. Prerequisite: EHS 340 or consent of instructor.

**EHS 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: EHS 340 or consent of instructor.

**EHS 343 Turfgrass Management (4)**

Turfgrass species and uses. Principles of turfgrass physiology and communities under different environments. Overview of procedures and equipment for propagation, mowing, irrigation, fertilization, aerification, and pest control. 3 lectures, 1 laboratory. Prerequisite: EHS 123, SS 221.

**EHS 381 Native Plants for California Landscapes (4)**

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 trips required. 3 lectures, 1 laboratory. Prerequisite: BOT 121, junior standing or consent of instructor.

**EHS 382 Restoration Horticulture (4)**

Role of horticulture in the successful implementation of restoration projects, including mitigation, revegetation, and erosion control. Practical application of restoration methods and guidelines for specific California plant communities including site-specific plant production. 3 lectures, 1 laboratory. Prerequisite: EHS 124, EHS 381, SS 121.

**EHS 401 Field Studies in Ornamental Horticulture (1)**

Field trip to see environmental horticulture in the field. Private and public sector facilities visited. Itinerary varies. Total credit limited to 2 units. 1 activity. Prerequisite: EHS 121.

**EHS 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: EHS 121, EHS 122, ECON 201, junior standing or consent of instructor. Recommended: BUS 271.

**EHS 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: EHS 123, EHS 231, EHS 232, or consent of instructor.

**EHS 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. 2 activities. Prerequisite: EHS 421 or consent of instructor.

**EHS 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. 3 lectures, 1 laboratory. Prerequisite: EHS 124, EHS 327, SS 221, senior standing or consent of instructor.

**EHS 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. 2 lectures, 1 laboratory. Prerequisite: EHS 124 and BIO 435 or CRSC 410.

**EHS 433 Advanced Turfgrass Operations (4)**

Advanced maintenance and operation of turfgrass facilities. Systems of management, maintenance, business and finance. 3 lectures, 1 laboratory. Prerequisite: EHS 343.

**EHS 434 Landscape Management (4)**

Maintenance procedures and operations. Operating a landscape management business. Estimating, scheduling, recordkeeping and implementation of landscape maintenance projects. Interior landscape maintenance. 3 lectures, 1 laboratory. Prerequisite: EHS 123, EHS 126, or permission of instructor.

**EHS 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: EHS 301 and EHS 324 or consent of instructor.

**EHS 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: EHS 342 or consent of instructor.

**EHS 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 EHS majors. Repeatable for credit up to 9 units. 3 seminars.

**EHS 599 Thesis in Environmental Horticultural Science (1-9)**

Systematic research of a significant problem in environmental horticulture. 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.

**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. Not for baccalaureate credit. 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. Not for baccalaureate credit. Credit/No Credit grading only. Repeatable. 4 lectures.

**ENGL 103 Writing Laboratory (1) (CR/NC)**

Directed practice in writing in a laboratory environment. Required of all students scoring below 151 on the English Placement Test (EPT). Students scoring below 146 must take an additional remedial course before registering for ENGL 103. Not for baccalaureate credit. Credit/No Credit grading only. To be taken concurrently with ENGL 134. 1 laboratory.

**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 a student's own pace. Preparation for freshman composition. Not for baccalaureate credit. 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. Not for baccalaureate credit. 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. Not for baccalaureate credit. 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. Not for baccalaureate credit. Credit/No Credit grading only. 4 lectures. Prerequisite: ENGL 111 or ENGL 112, or consent of instructor.

**ENGL 115 Graduation Writing Requirement Preparation (4) (CR/NC)**

Writing practice of extemporaneous expository and argumentative essays under time pressure. Discussion and application of rhetorical and grammatical principles through critical reading of student and professional essays. Satisfactory completion of the course fulfills the Graduate Writing Requirement. Not for baccalaureate credit. Credit/No Credit grading only. 4 lectures. Prerequisite: At least two unsuccessful attempts at the GWR.

**ENGL 133 Writing: Exposition for ESL (4) GE A1**

Writing and stylistic analysis of expository papers. Study and application of techniques of exposition. Critical reading of model essays. Special emphasis on grammar and writing issues appropriate for English as a Second Language students. 4 lectures. Prerequisite: ENGL 111, 112, or 113 or consent of instructor.

**ENGL 134 Writing: Exposition (4) GE A1  
(formerly ENGL 114)**

Writing and stylistic analysis of expository papers. Study and application of techniques of exposition. Critical reading of models of effective writing. 4 lectures. Prerequisite: Satisfactory score on the English Placement Test.

**ENGL 145 Reasoning, Argumentation, and Writing (4) GE A3  
(Also listed as HNRS/SCOM 145)  
(formerly ENGL 215)**

The principles of reasoning in argumentation. Examination of rhetorical principles and responsible rhetorical behavior. Application of these principles to written and oral communications. Effective use of research methods and sources. 4 lectures. Prerequisite: Completion of GE Area A1 and A2.

**ENGL 148 Reasoning, Argumentation and Professional Writing (4) GE A3  
(Also listed as HNRS 148)  
(Replacement for ENGL 218)**

The principles of reasoning in professional writing. Discussion and application of rhetorical principles, both oral and written, in professional environments. Study of methods, resources and common formats used in corporate or research writing. 4 lectures. Prerequisite: Completion of GE Areas A1 and A2.

**ENGL 149 Technical Writing for Engineers(4) GE A3  
(Also listed as HNRS 149)  
(Engineering replacement for ENGL 218)**

The principles of technical writing. Discussion and application of rhetorical principles in technical environments. Study of methods, resources and common formats used in corporate or research writing. 4 lectures. Prerequisite: Completion of GE Areas A1 and A2. For Engineering students and students who have already met the CSU GE critical thinking requirement.

**ENGL 203 Core I: Old English/Medieval (4)**

Representative canonical and non-canonical readings in the literature of the period. Selections may include readings such as *Beowulf*, Dante, the Pearl Poet, Chaucer, Medieval theater, and others, as chosen by the instructor. 4 lectures. Prerequisite: Completion of GE Area A, and ENGL 251; for English majors only.

**ENGL 204 Core II: Renaissance (4)**

Representative canonical and non-canonical readings in the literature of the period. Selections may include such readings as Shakespeare, Spenser, Milton, Donne, Jonson, and others, as chosen by the instructor. 4 lectures. Prerequisite or concurrent: ENGL 203; for English majors only.

**ENGL 205 Core III: 1660-1798 (4)**

Representative canonical and non-canonical readings in the literature of the period. Selections may include such readings as Pope, Swift, Austen, representative American Colonial writers, one playwright, and others, as chosen by the instructor. 4 lectures. Prerequisite or concurrent: ENGL 204; for English majors only.

**ENGL 225 Introduction to Creative Writing (4)**

Creative process employed by poets, fiction writers, playwrights, and essayists. Reading model works, and writing in each of the genres. Creative process in other arts and in science. 4 lectures. Prerequisite: Completion of GE Area A.

**ENGL 230 Masterworks of British Literature through the Eighteenth Century (4) GE C1**

Covers a thousand years of British literature, from the eighth to the eighteenth century and may include such readings as *Beowulf*, *The Canterbury Tales*, *Utopia*, *Othello*, *Paradise Lost*, *Oroonoko* and *Gulliver's Travels*. 4 lectures. Prerequisite: Completion of GE Area A.

**ENGL 231 Masterworks of British Literature from the Late 18<sup>th</sup> Century to the Present (4) GE C1**

Broadly surveys Romantic, Victorian, Modern, and Contemporary British literature in an historical-cultural context. Investigates works from several genres and a variety of national and cultural voices. May include such writers as Wordsworth, Wollstonecraft, Dickens, G. Eliot, Wilde, Woolf, Yeats, and Gordimer. 4 lectures. Prerequisite: Completion of GE Area A.

**ENGL 240 The American Tradition in Literature (4) GE C1**

A broadly based survey of American literature, exploring the impact of various world cultures on the evolving definition of the American

experience. Literary expression of movements that shape the American character over time, such as Puritanism, Transcendentalism, and Naturalism. 4 lectures. Prerequisite: Completion of GE Area A.

**ENGL 251 Great Books I: Introduction to Classical Literature (4)**  
(Also listed as HNRS 251) **GE C1**

Examination of the ancient epics and classical literature of Mesopotamia, Greece, and Rome. May include such readings as "The Epic of Gilgamesh," the "Iliad," the "Odyssey," "Genesis," "Exodus," "Antigone," the "Symposium," the "Aeneid," and Marcus Aurelius's "Meditations." 4 lectures. Prerequisite: Completion of GE Area A.

**ENGL 252 Great Books II: Medieval to Enlightenment Literature (4)** **GE C1**

Examination of key works marking the transition from Mediterranean Classicism (c. 500 CE) to an emergent European tradition (c. 1800 CE). May include such readings as Augustine's "Confessions," "Song of Roland," "Egil's Saga," the "Consolation of Philosophy," "The Romance of Tristan," the "Inferno," Cellini's "Autobiography," "Utopia," "Princess of Cleves," "Candide," "Discourse on Method," and Rousseau's "Confessions." 4 lectures. Prerequisite: Completion of GE Area A.

**ENGL 253 Great Books III: Romanticism to Modernism Literature (4)** **GE C1**

Examination of key works marking the Romantic Revolution and the realist and modernist movements that followed in its wake. May include such readings as the poetry of Blake, Wordsworth, Eliot, Rimbaud, Plath, Ginsberg, and Stein; "Notes from Underground," "The Death of Ivan Ilich," "The Metamorphosis" and/or "The Hunger Artist," "Heart of Darkness," "Sonny's Blues," and Virginia Woolf's short fiction and essays. 4 lectures. Prerequisite: Completion of GE Area A.

**ENGL 260 Children's Literature (4)**

Analysis and evaluation of traditional literature, fantasy, realistic fiction, historical fiction, informational books, picture books, and poetry for children in multiple subject classroom grades K–6. Emphasis on multicultural texts. 4 lectures. Prerequisite: Completion of GE Area A.

**ENGL 290 Introduction to Linguistics (4)**

Introduction to the nature of language; concepts and methods of linguistic science. 4 lectures. Prerequisite: Completion of GE Area A.

**ENGL 301 Advanced Composition – ESL (4)**

Writing and critical analysis of expository and argumentative papers. Emphasis on rhetorical, stylistic, and grammatical problems specific to non-native speakers. Critical reading of essays and/or fiction. Practice in revision and editing of papers. Journal writing to promote fluency. 4 lectures. Prerequisite: Completion of GE Area A.

**ENGL 302 Writing: Advanced Composition (4)**

Writing and analysis of expository and argumentative papers at an advanced level. Special attention paid to issues of style and voice. Critical reading of models of effective writing. 4 lectures. Prerequisite: Completion of GE Area A.

**ENGL 303 Core IV: 1798–1865 (4)**

Representative canonical and non-canonical readings in the literature of the period. May include such authors as Wordsworth, Coleridge, Keats, Emerson, Hawthorne, and others, as chosen by the instructor. 4 lectures. Prerequisite or concurrent: ENGL 205; for English majors only.

**ENGL 304 Core V: 1865–1914 (4)**

Representative canonical and non-canonical readings in the literature of the period. May include such authors as Dickinson, Whitman, Arnold, James, Hardy, and others, as chosen by the instructor. 4 lectures. Prerequisite or concurrent: ENGL 303; for English majors only.

**ENGL 305 Core VI: 1914–Present (4)**

Representative canonical and non-canonical readings in the literature of the period. May include such authors as Yeats, Joyce, Woolf, Eliot, Faulkner, and others, as chosen by the instructor. 4 lectures. Prerequisite or concurrent: ENGL 304; for English majors only.

**ENGL 310 Corporate Communication (4)**

Instruction and practice in forms of communication characteristic of business and industry. 4 lectures. Prerequisite: Completion of GE Area A.

**ENGL 317 Technical Editing (4)**

Instruction and practice in editing skills commonly used in workplace settings. Includes practical instruction in copyediting, sentence level editing, and substantive editing for accuracy and consistency. Editing documents, illustrations, web pages for consistency and use. Application of grammar and punctuation. 4 lectures. Prerequisite: Completion of GE Area A.

**ENGL 318 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 148 or ENGL 149.

**ENGL 319 Document Design for Technical Communicators (4)**

Instruction and hands-on practice in producing well-designed professional documents. Focus on history, terminology, typography, design principles, graphics generation, text/graphics integration, project management, and relevant software applications. 4 lectures. Prerequisite: ENGL 148 and consent of instructor.

**ENGL 326 Literary Theory (4)**

Theory and practice from the various perspectives common in current criticism covering fundamental issues about literature and its contexts, including the nature of literary "truth," the autonomy of texts, relationships between literature and history and the role of ideology, among others. 4 lectures. Prerequisite: Completion of GE Area A.

**ENGL 330 British Literature in the Age of Belief: to 1485 (4)** **GE C4**

The historical development of medieval English literature through selected canonical and non-canonical works of various genres. Medieval authorship and textual practice; the relationship between gender and writing; and the forging of a national poetic identity. Interdisciplinary support material (artwork and music) illustrating key themes. 4 lectures. Prerequisite: Completion of GE Areas A and C1. English majors will not receive GE C4 credit.

**ENGL 331 British Literature in the Age of the Renaissance: 1485–1660 (4)** **GE C4**

The literary, historical, political, religious and scientific concerns of the Age of the Renaissance. May include such readings as More's *Utopia*, Spenser's *Faerie Queene*, Shakespeare's *Othello*, Donne's *Songs and Sonnets*, Milton's *Paradise Lost*. 4 lectures. Prerequisite: Completion of GE Areas A and C1. English majors will not receive GE C4 credit.

**ENGL 332 British Literature in the Age of Enlightenment: 1660–1798 (4)** **GE C4**

In-depth exploration of the dominant themes and preoccupations of the Age of Enlightenment. Historical and cultural contexts of canonical and non-canonical literature emphasized to illustrate 18<sup>th</sup> century Britons' views of themselves and their changing world. May include such writers as Dryden, Behn, Defoe, Swift, Pope, and Johnson. 4 lectures. Prerequisite: Completion of GE Areas A and C1. English majors will not receive GE C4 credit.

**ENGL 333 British Literature in the Age of Romanticism: 1798–1832 (4)** **GE C4**

In-depth exploration of the literature of the British Romantic period. Cultural, historical, and philosophic contexts will also be examined in both canonical and non-canonical works. May include such writers as Blake, Wordsworth, Keats, and Wollstonecraft. 4 lectures. Prerequisite: Completion of GE Areas A and C1. English majors will not receive GE C4 credit.

**ENGL 334 British Literature in the Age of Industrialism:****1832-1914 (4)****GE C4**

In-depth study of historical, philosophical, and literary reaction to the rise of the modern industrial state. Special focus on the literary response to the following: industry, democracy, class, art, and culture. 4 lectures.

Prerequisite: Completion of GE Areas A and C1. English majors will not receive GE C4 credit.

**ENGL 335 British Literature in the Age of Modernism:****1914-Present (4)****GE C4**

In-depth exploration of the dominant concerns and achievements of British literature from Modernism through Postmodernism. Historical and cultural contexts of canonical and non-canonical literature explored to illustrate 20<sup>th</sup> century Britain's reactions to the breakdown of traditional beliefs, the World Wars, the legacy of colonialism, the changing politics and problems of a multicultural nation. May include such writers as Conrad, Joyce, Woolf, Yeats, Heaney, Ishiguro, Walcott. 4 lectures. Prerequisite: Completion of GE Areas A and C1. English majors will not receive GE C4 credit.

**ENGL 338 Introduction to Shakespeare-London Study (4)****GE C4**

Shakespeare's works as texts, productions, and major historical, aesthetic and cultural touchstones. The author's intellectual and social influences on four centuries of theatre and his subsequent impact on literature and other arts in London. 3 lectures, 1 activity. Prerequisite: Completion of GE Areas A and C1. English majors will not receive GE C4 credit.

**ENGL 339 Introduction to Shakespeare (4)****GE C4**

Shakespeare's works as texts, productions and major historical, aesthetic and cultural touchstones. The author's intellectual and social influences on four centuries of theatre and his subsequent impact on literature and other arts. 4 lectures. Prerequisite: Completion of GE Areas A and C1. English majors will not receive GE C4 credit.

**ENGL 340 The Literary Sources of the American Character:****1600-1865 (4)****GE C4**

The literature of the United States from its sources in the accounts of the early British and Spanish explorers to the works of the American Renaissance. The relationship between mainstream and marginalized voices in the American character. 4 lectures. Prerequisite: Completion of GE Areas A and C1. English majors will not receive GE C4 credit.

**ENGL 341 The Literary Sources of the American Character:****1865-1914 (4)****GE C4**

Analysis of literary Realism and Naturalism in their cultural and historical contexts. May include such writers as Whitman, Dickinson, Twain, Chopin, James, Wharton, Dreiser, Norris, and Crane seen to accommodate the sense of danger, doubt, and disorder of the time. 4 lectures. Prerequisite: Completion of GE Areas A and C1. English majors will not receive GE C4 credit.

**ENGL 342 The Literary Sources of the American Character:****1914-1956 (4)****GE C4**

The writers of the modern period and those of the early post-modern age, including writers marked by stylistic innovation and a willingness to challenge traditionally accepted standards. May include such writers as Hemingway, Fitzgerald, Stein, Hughes. 4 lectures. Prerequisite: Completion of GE Areas A and C1. English majors will not receive GE C4 credit.

**ENGL 343 Multiple Voices of Contemporary American Literature:****1956-Present (4)****GE C4**

In-depth study of American fiction, poetry, and drama written since 1956. How contemporary literature examines enduring American themes and breaks new ground with the inclusion of diverse voices. 4 lectures. Prerequisite: Completion of GE Areas A and C1. English majors will not receive GE C4 credit.

**ENGL 345 Women Writers of the Twentieth****Century (4)****GE C4 USCP**

In-depth exploration of works of 20<sup>th</sup> century women authors within their historical and cultural contexts. Analysis of canonical and non-canonical writing by women of differing classes, races, ethnicities, and sexual preferences. Literary techniques through which texts reflect or challenge such cultural constructs as gender, identity, sexuality, motherhood, etc. The emergence of a female literary tradition. May include such writers as Woolf, Rich, Kingston, Yamamoto, Morrison, Cervantes. 4 lectures. Prerequisite: Completion of GE Areas A and C1. English majors will not receive GE C4 credit.

**ENGL 346 Ethnic American Literature (4)****GE C4 USCP**

Investigation of the primary issues, themes, and tropes of literature written in English by African-American, Asian-American, Native American, Hispanic and Jewish writers. Cultural and historical contexts explored to consider effects of marginalization on this literature, and its subsequent relation to the American canon. 4 lectures. Prerequisite: Completion of GE Areas A and C1. English majors will not receive GE C4 credit.

**ENGL 347 African American Literature (4)****GE C4 USCP**

The writings of African Americans from the end of the eighteenth century to the present. Individual works and literary trends among African Americans of various periods and contexts: intellectual, political, and cultural. 4 lectures. Prerequisite: Completion of GE Areas A and C1. English majors will not receive GE C4 credit.

**ENGL 349 Gender in Twentieth Century****Literature (4)****GE C4 USCP**

In-depth study of issues related to male and female identity and the relations between men and women as depicted in twentieth-century fiction, poetry, non-fiction, and/or drama. How gender issues are created and viewed from different perspectives, such as social/economic class, ethnicity, and sexual orientation. 4 lectures. Prerequisite: Completion of GE Areas A and C1. English majors will not receive GE C4 credit.

**ENGL 350 The Modern Novel (4)****GE C4**

Readings in the modern novel in its historical and cultural context. 4 lectures. Prerequisite: Completion of GE Areas A and C1. English majors will not receive GE C4 credit.

**ENGL 351 Modern Poetry (4)****GE C4**

The poetry of Modernism, considered in its historical and cultural context. The rise of experimental styles designed to reflect the disorder of the twentieth century – fragmentation, alienation, dislocation, and the absence of connections. 4 lectures. Prerequisite: Completion of GE Areas A and C1. English majors will not receive GE C4 credit.

**ENGL 352 Modern Drama (4)****GE C4**

Reading and analysis of world drama of the last 150 years, thereby enhancing student awareness of modern culture, history, ethics, politics, and the human condition. Design work, multi-media forms, art, music, and cinema as components or informing elements of the works under consideration. 4 lectures. Prerequisite: Completion of GE Areas A and C1. English majors will not receive GE C4 credit.

**ENGL 353 Drama in London (4)****GE C4**

Reading in drama of the Twentieth Century and/or earlier periods, exclusive of Shakespeare, with special emphasis on form and ideas. Attendance at play performances required. 3 lectures, 1 activity. Prerequisite: Completion of GE Areas A and C1. English majors will not receive GE C4 credit.

**ENGL 354 The Bible as Literature and in Literature and the Arts (4) (formerly ENGL 355)****GE C4**

The most important and representative books of the Bible. Exposure to works based on the Bible in literature, painting, sculpture, architecture, music, and film. 4 lectures. Prerequisite: Completion of GE Areas A and C1. English majors will not receive GE C4 credit.

**ENGL 360 Literature for Adolescents (4)**

Analysis and evaluation of young adult literature appropriate for classroom instruction in grades 6–12 with special attention to the relationship of young adult literature to popular culture and themes relevant to adolescents. Pedagogical approaches also explored. 4 lectures. Prerequisite: One of the following: ENGL 230, 231, 240, 251, 252, or 253.

**ENGL 370 World Cinema (4)****GE C4**

Major works of international cinema with emphasis on critical interpretation, on the ways film communicates visually and aurally, and on the historical and cultural contexts in which films are created. 3 lectures, 1 laboratory. Prerequisite: Completion of GE Areas A and C1. Recommended: completion of Area C3. English majors will not receive GE C4 credit.

**ENGL 371 Film Styles and Genres (4)****GE C4**

Major films within a particular cinematic genre or style, with emphasis on critical interpretation, aesthetic appreciation, and the films' historical and cultural contexts. *Class Schedule* will list topic selected. Total credit limited to 12 units. 3 lectures, 1 laboratory. Prerequisite: Completion of GE Areas A and C1. Recommended: Completion of Area C3. English majors will not receive GE C4 credit.

**ENGL 372 Film Directors (4)****GE C4**

Films of one or more major film directors, with emphasis on critical interpretation, aesthetic appreciation, and the films' historical and cultural contexts. *Class Schedule* will list topic selected. Total credit limited to 12 units. 3 lectures, 1 laboratory. Prerequisite: Completion of GE Areas A and C1. Recommended: Completion of Area C3. English majors will not receive GE C4 credit.

**ENGL 380 Literary Themes (4)****GE C4**

Literature selected according to a particular theme. Emphasis on critical interpretation, aesthetic appreciation, and historical and cultural contexts. *Class Schedule* will list topic selected. Total credit limited to 12 units. 4 lectures. Prerequisite: Completion of GE Areas A and C1. English majors will not receive GE C4 credit.

**ENGL 381 Diversity in Twentieth-Century American Literature (4)****GE C4 USCP**

Literature selected according to a particular theme, with a focus on issues of ethnicity and gender. Emphasis on critical interpretation, aesthetic appreciation, and historical and cultural contexts. *Class Schedule* will list topic selected. Total credit limited to 12 units. 4 lectures. Prerequisite: Completion of GE Areas A and C1. English majors will not receive GE C4 credit.

**ENGL 386 Creative Nonfiction (4)****GE C4**

Writing creative nonfiction (the memoir, the nature essay, the personal narrative, cultural criticism, literary journalism) by adding composition skills of fictional and poetic techniques. A publication workshop. Total credit limited to 8 units. 4 lectures. Prerequisite: Completion of GE Area A and one course from Area C. English majors will not receive GE C4 credit.

**ENGL 387 Fiction Writing (4)**  
(formerly ENGL 327)**GE C4**

How to write and read fiction. Exploring and understanding the elements of fiction writing, employing models by established writers. Total credit limited to 8 units. 4 lectures. Prerequisite: Completion of GE Area A and one course from Area C. English majors will not receive GE C4 credit.

**ENGL 388 Poetry Writing (4)**  
(formerly ENGL 328)**GE C4**

How to write and read poetry. Exploring a variety of formal options, employing model poems by established writers, and identifying and enhancing what is best in poetry written in class. Total credit limited to 8 units. 4 lectures. Prerequisite: Completion of GE Area A and one course from Area C. English majors will not receive GE C4 credit.

**ENGL 389 Creative Writing: Drama (4)**

(formerly ENGL 329)

Instruction and practice in writing, revising, and evaluating drama. Total credit limited to 8 units. 4 lectures. Prerequisite: Completion of GE Area A.

**ENGL 390 The Linguistic Structure of Modern English (4)**

Linguistic analysis of the English language, including phonology, morphology, syntax, and style and dialect variation. 4 lectures. Prerequisite: Completion of GE Area A.

**ENGL 391 Topics in Applied Linguistics (4)**

Topics in applied linguistics including sociolinguistics, first and second language acquisition, literacy, bilingualism, and dialectology. Applications to teaching the English language. *Class Schedule* will list topic selected. Total credit limited to 8 units. 4 lectures. Prerequisite: Completion of GE Area A.

**ENGL 395 History of the English Language (4)**

Linguistic approach to the history of the English language: evolution of phonology, morphology, lexicon, syntax, and semantics within the changing cultural context of the last 2000 years. 4 lectures. Prerequisite: Completion of GE Area A.

**ENGL 399 Tutor Training (2) (CR/NC)**

Studies of approaches to 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. Credit/No Credit grading only. 1 lecture, 1 laboratory. Prerequisite: Completion of GE Area A and ENGL 302.

**ENGL 400 Special Problems for Advanced Undergraduates (1–4)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units. Prerequisite: consent of the department chair.

**ENGL 408 Internship (2–12) CR/NC**

Advanced study and part-time work experience; current innovation, practices, and problems in administration, supervision, and organization. Must be able to do independent work in career field. Weekly reports and evaluation by work supervisor required. Total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: Consent of instructor.

**ENGL 411 Writing Interactive Documents (4)**

Computer-based writing in theory and practice: hypertext, e-mail, online documentation, multimedia, networked group editing; compound electronic documents, interdocument linking. Technical, business, scholarly, pedagogical and creative applications. Total credit limited to 8 units. 4 lectures. Prerequisite: advanced skills in writing and/or graphics, and/or computer programming; upper-division standing, and consent of instructor.

**ENGL 416 New Media Study (4)**

Theoretical, critical, or applied study of new electronic communication media. *Class Schedule* will list topic selected. Total credit limited to 8 units. 4 seminars. Prerequisite: HUM 250 or equivalent; upper division standing.

**ENGL 418 Technical Communication Practicum (2–4) (CR/NC)**

Supervised work experience in government, corporate, or volunteer setting, as approved by department chair. 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 and two technical writing courses.

**ENGL 419 Multimedia Projects (2) (CR/NC)**

Supervised independent projects creating computer-based multimedia documents for academic, professional, or popular audiences. Students are paired with teachers, business people, service organizations, or others who need multimedia, web, or hypertext documents designed for specific uses.

Total credit limited to 8 units. Credit/No Credit grading only. Prerequisite: ENGL 411 or ENGL 519 and consent of instructor.

**ENGL 424 Teaching English in Secondary Schools (5)**

Methods of teaching English in secondary schools, with emphasis on practical approaches to teaching grammar/mechanics and the writing process in a literature-based classroom. Attention to lesson and unit planning and integration of technology in the classroom. 5 lectures. Prerequisite: Completion of GE Area A, admission to the teacher education program, or consent of instructor.

**ENGL 430 Chaucer (4)**

Selected readings from *Canterbury Tales* and Chaucer's other major poems. 4 seminars. Prerequisite: ENGL 203 and a 300-level literature course, or consent of instructor.

**ENGL 431 Shakespeare (4)**

Representative comedies, tragedies, and histories. 4 seminars. Prerequisite: One of the following: ENGL 204 and a 300-level literature course, or consent of instructor.

**ENGL 432 Milton (4)**

*Paradise Lost*, *Paradise Regained*, and *Samson Agonistes*, with some attention to the minor poems. 4 seminars. Prerequisite: ENGL 204 and one of the following: ENGL 204 and a 300-level literature course, or consent of instructor.

**ENGL 439 Significant British Writers (4)**

Selected British writers, as individual writers or in groups. *Class Schedule* will list topics selected. Total credit limited to 12 units. 4 seminars. Prerequisite: The MAJOR CORE literature class in the relevant period and a 300-level literature course, or consent of instructor.

**ENGL 449 Significant American Writers (4)**

Selected American writers, as individual writers or in groups. *Class Schedule* will list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: The MAJOR CORE literature class in the relevant period and a 300-level literature course, or consent of instructor.

**ENGL 459 Significant World Writers (4)**

Selected world writers, as individual writers or in groups. *Class Schedule* will list topics selected. Total credit limited to 12 units. 4 seminars. Prerequisite: ENGL 203 and a 300-level literature course, or consent of instructor.

**ENGL 461 Senior Project (1)**

One-unit adjunct course which must be taken concurrently with a department-approved English 400-level course during the last two quarters of the student's undergraduate career. English majors only.

**ENGL 465 Computer Resources for English Teachers (4)**

Computer as problem-solving, teaching, research, communication, and administrative tool in English education. Lesson planning and integration of technology into the secondary English classroom, including networked communication, the World-Wide Web, educational software and appropriate hardware. Attention to ethical, rhetorical, and phenomenological implications of the use of technology in English education. 3 seminars, 1 laboratory. Prerequisite: Computer literacy.

**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 486 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 487 Advanced Creative Writing: Fiction (4)**  
(formerly ENGL 427)

Instruction and practice in advanced writing, revising and evaluating of fiction. Total credit limited to 8 units. 4 lectures. Prerequisite: ENGL 387 or consent of instructor.

**ENGL 488 Advanced Creative Writing: Poetry (4)**  
(formerly ENGL 428)

Instruction and practice in advanced writing, revising and evaluating of poetry. Total credit limited to 8 units. 4 lectures. Prerequisite: ENGL 328 or consent of instructor.

**ENGL 489 Advanced Creative Writing: Drama (4)**  
(formerly ENGL 429)

Instruction and practice in advanced writing, revising and evaluating of drama. Total credit limited to 8 units. 4 lectures. Prerequisite: ENGL 329 or consent of instructor.

**ENGL 495 Topics in Applied Language Study (4)**

Application of linguistics to human communications, human relations, and language policy and planning, or literature. *Class Schedule* will list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: ENGL 290, ENGL 390 or 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 courses or consent of instructor.

**ENGL 498 Approaches to Teaching English as a Second Language/Dialect (4)**

Approaches to teaching English as a second language. Attention to materials development and testing. 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 classroom under supervision of a cooperating teacher. Teaching materials development and curriculum design. Credit/No Credit grading only. 1 seminar, 1 supervision. Prerequisite: ENGL 497 and ENGL 498.

**ENGL 501 Techniques of Literary Research (4)**

Purposes and methods of literary research in literature. Acquaintance with printed and on-line materials of research and practical experience in collecting material, weighing evidence, reaching conclusions, and writing scholarly articles. Analysis of dissemination of scholarly information. Discussion of ethics of scholarship. 4 seminars. Prerequisite: Graduate standing in English.

**ENGL 502 Seminar in Critical Analysis (4)**

Basic approaches used by critics. Multiple points of view. Application to literary works. *Class Schedule* will list topic selected. Total credit limited to 8 units. 4 seminars. Prerequisite: Graduate standing in English.

**ENGL 503 Graduate Introduction to Linguistics (4)**

Introduction to linguistics for graduate students. Phonology, morphology, lexicon, syntax, and variation within language; application of linguistics to real-world issues. 4 seminars. Prerequisite: Graduate standing in English.

**ENGL 504 Seminar in English Linguistics (4)**

Examination of varying theoretical approaches to the structure of English, or applications of linguistic methods in the study of literature, dialectology, language acquisition, literacy, bilingualism, or discourse analysis. *Class Schedule* will list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: Graduate standing in English and one of the following: ENGL 290, ENGL 390, or ENGL 503, or consent of instructor.

**ENGL 505 Seminar in Composition Theory (4)**

Special problems in composition. Direct application of composition and rhetorical theory to composition instruction. 4 seminars. Prerequisite: Graduate standing in English, or consent of instructor.

**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 classroom organization and management. Discussion of research into the nature and resolution of student writing problems. Required of all new teaching assistants in English. Credit/No Credit grading only. 4 seminars. Prerequisite: Graduate standing in English and ENGL 505, or consent of instructor.

**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 16 units. 4 seminars. Prerequisite: Graduate standing in English. ENGL 501 strongly advised.

**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 20 units. 4 seminars. Prerequisite: Graduate standing in English. ENGL 501 strongly advised.

**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 20 units. 4 seminars. Prerequisite: Graduate standing in English. ENGL 501 strongly advised.

**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 16 units. 4 seminars. Prerequisite: Graduate standing in English. ENGL 501 strongly advised.

**ENGL 515 Apprenticeship in Teaching Literature, Composition, or Linguistics at College Level (2) (CR/NC)**

Supervised experience in planning, teaching, and evaluating a 100-, 200- or 300-level linguistics, composition, 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. Total credit limited to 8 units. Prerequisite: Graduate standing in English and 8 units of successful graduate work.

**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: Graduate standing in English and ENGL 318, or consent of instructor.

**ENGL 519 Web Authoring (4)**

Writing and publishing for the World Wide Web and/or other network based communication media. Rhetorical theory of computer-based communication and hypertext. Review of HTML and network delivery. Advanced supplementary technologies. Integration of text, graphics, multimedia, interactivity. Site construction, maintenance, and management. Total credit limited to 8 units. 4 seminars. Prerequisite: HUM 250 or equivalent; graduate standing or consent of instructor.

**ENGL 587 Graduate Seminar in Creative Writing: Fiction (4) (formerly ENGL 527)**

Graduate instruction in writing, revising, and evaluating fiction. Total credit limited to 8 units. 4 seminars. Prerequisite: Graduate standing in English and ENGL 487, or consent of instructor.

**ENGL 588 Graduate Seminar in Creative Writing: Poetry (4) (formerly ENGL 528)**

Graduate instruction in writing, revising, and evaluating poetry. Total credit limited to 8 units. 4 seminars. Prerequisite: Graduate standing in English and ENGL 488, or consent of instructor.

**ENGL 590 Directed Study (1-4)**

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 and the permission of the graduate advisor.

**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 MESA 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 MESA Engineering Program. Credit/No Credit grading only. 1 lecture, 1 activity.

**ENGR 210 Technical Group Study Training (2) (CR/NC)**

Approaches to facilitated small group study. Practice facilitating under supervision in the MEP Technical Study Center. Review academic and interactive group communication skills. Minimum two hour facilitated group lab. CRLA International Tutor Program Certification. Total credit limited to 6 units. Credit/No Credit grading only. 1 lecture, 1 laboratory. Prerequisite: Grade of B or better at Cal Poly in course student will be facilitating.

**ENGR 213 Bioengineering Fundamentals (2) (Also listed as BRAE 213)****GE B2**

Treatment of the engineering applications of biology. Genetic engineering and the industrial application of microbiology. Systems physiology with engineering applications. Structure and function relationships in biological systems. The impact of life on its environment. 2 lectures. For engineering students only. Prerequisite: MATH 142, CHEM 124. Co-requisite: BIO 213.

**ENGR 240 Additional Engineering Laboratory (2)**

Special assignments undertaken by students who need or wish to acquire abilities supplementary to their standard pattern of courses. Assignments must be primarily shop or laboratory in nature. Work is done by the student with faculty supervision. Total credit limited to 4 units. 2 laboratories. Prerequisite: Consent of department head.

**ENGR 302 Transportation and Manufacturing in the Twenty-First Century (4)****GE Area F**

Role of transportation and manufacturing technology in the twenty-first century. Effects of technological change upon society, and the principles

associated with the advancement of transportation and manufacturing technologies in the automotive industry and the industrial-military complex. Case studies of systems to compare alternative approaches to problem solving. Not open to students in engineering or computer science. 4 lectures. Prerequisite: Completion of GE Area B, 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 350 The Global Environment (4) GE Area F (Also listed as AG/BUS/EDES/HUM/SCM 350)**

Interdisciplinary investigation of how human activities impact the Earth's environment on a global scale. Examination of population, resource use, climate change, and biodiversity from scientific/technical and social/economic/historical/political perspectives. Use of remote sensing maps. Sustainable solutions. Not open to students in engineering or computer science. 3 lectures, 1 activity. Prerequisite: Completion of GE Areas A and B and junior standing.

### **ENGR 400 Special Problems for Advanced Undergraduates (2-4)**

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units. Prerequisite: ME 212 or consent of department head.

### **ENGR 450 Special Topics in Bioengineering (4)**

Current topics in bioengineering, including medical applications and industrial applications. Total credit limited to 8 units, with a maximum of 4 units per quarter. See *Class Schedule* for topic selected. 3 lectures, 1 activity. Prerequisite: MATH 242, ME 313 or consent of instructor.

### **ENGR 462 Senior Project (4)**

Selection and completion of project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results presented in a formal report. Minimum commitment of 150 hours. Prerequisite: ME 212, junior standing, and consent of instructor.

### **ENGR 481, 482 Senior Project Design Laboratory I, II (2) (2)**

Selection, development, and completion of project by individuals or team which is typical of problems graduates must solve in their fields of employment or applied research. Project may involve, but is not limited to, physical modeling and testing of integrated design projects, costs, planning scheduling and research and may involve students from several disciplines. Formulation of outline, literature review, and project schedule. 2 laboratories. **ENGR 481** prerequisite: MATH 244, IME 314, ME 302 or consent of instructor. **ENGR 482** prerequisite: ENGR 481 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 500 Individual Study (2-4)**

Advanced study planned and completed under the direction of faculty. Open to graduate students who have demonstrated the ability to do independent work. Total credit limited to 8 units. Prerequisite: Graduate standing and consent of Program Director.

### **ENGR 550 Advanced Topics in Bioengineering (4)**

Current topic in bioengineering research/application in detail, including medical applications and industrial applications. Takes advantage of capabilities of resident or visiting faculty. 3 lectures, 1 activity. Prerequisite: ENGR 450 or consent of instructor.

### **ENGR 581 Biochemical Engineering I (4)**

Fundamentals of Biotechnology. Types of organisms and their structure. Unstructured and structured models for microbial growth. Theory of microbial competition. Stoichiometric and thermodynamic principles. Material and energy balances for aerobic and anaerobic growth. Kinetics of enzyme catalyzed reactions. 3 seminars, 1 laboratory. Prerequisite: MCRO 221 and CHEM 371, or consent of instructor.

### **ENGR 582 Biochemical Engineering II (4)**

Kinetics of growth, product formation and cell death. Continuous culture. Cell recycle and immobilization. Air sterilization. Transport processes in bioreactors. Scale-up of bioprocesses. Biochemical processes. Biocatalysis. Recombinant DNA and non-microbial processes. 3 seminars, 1 laboratory. Prerequisite: ENGR 581 or consent of instructor.

### **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 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 111 Introduction to the Environmental Engineering Profession (1) (CR/NC)**

Overview of environmental engineering solutions to water pollution, air pollution, solid waste, and hazardous waste problems. Remediation of contaminated soil and groundwater. Environmental regulations. Careers in environmental engineering. Licensing and professional registration, professional code of ethics, professional engineering societies. Credit/No Credit grading only. 1 lecture.

### **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 chair.

### **ENVE 304 Thermodynamics of Processes (3)**

Material and energy balances, liquids and mixtures, vapor-liquid equilibria, solubility and absorption, equilibrium in chemical reactions. 3 lectures. Prerequisite: ME 302, CHEM 125; prerequisite or co-requisite: ENVE 331.

**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 114, MATH 241, PHYS 133, and CSC 234 or CSC 231.

**ENVE 324 Introduction to Air Pollution (4)****GE Area F**

Causes and effects of air pollution on the individual, the community and industry. Legal and economic aspects. For non-majors. Not open to students in engineering or computer science. 4 lectures. Prerequisite: Completion of GE Area B and 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 (4)**

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. 4 lectures. Prerequisite: Completion of GE Area B and junior standing.

**ENVE 331 Introduction to Environmental Engineering (4)**

Description and quantification of water and air quality characteristics important for water and wastewater treatment and air pollution control. Fundamentals of kinetics, reactor configurations, toxicity and dose-response relationship. Regulations governing ambient pollutant levels and discharges. Introduction to the modeling of pollutant fate and transport. Overview of solid waste management and global environmental issues. 4 lectures. Prerequisite: CHEM 125, MATH 242 or MATH 244 (or concurrent).

**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 chair.

**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 304, ME 341 ENVE 325, and ENVE 331.

**ENVE 416 Environmental Process Modeling (4)**

Introduction to automatic control instrumentation. Methods of analysis of control systems. Analytical determination of control response. Modeling of pollution control and natural systems. 4 lectures. Prerequisite: ME 341; ENVE 331.

**ENVE 421 Mass Transfer Operations (3)**

Theory and practices related to using mass transfer principles to solve environmental problems. Design principles dealing with air and water pollution control and hazardous waste management. 3 lectures. Prerequisite: ENVE 304, ENVE 325, ENVE 331, and 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 212/312, ME 341, STAT 312, and ENGL 149.

**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 212/312, and ENVE 330 or ENVE 331. FNR majors should consult instructor regarding this prerequisite.

**ENVE 436 Introduction to Hazardous Waste Management (3)**

Overview of industrial processes that 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 and ENVE 331, or equivalent.

**ENVE 437 Industrial and Hazardous Waste Treatment (4)**

Theory and case studies of innovative industrial and hazardous waste treatment and waste minimization through process design and principles of pollution prevention. Life cycle assessment and economics of waste reduction. 3 lectures, 1 laboratory. Prerequisite: ENVE 331.

**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 and ME 341.

**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. 3 lectures. Prerequisite: ENVE 330 or ENVE 331, and senior standing.

**ENVE 443 Bioenvironmental Engineering I (4)**

State-of-the-art bioremediation technologies for soil, groundwater and contaminated air stream remediation and pollution prevention. Introduction to engineering design combining biogenetics, reactor configuration, and basic biological and engineering principles. Various in-situ and ex-situ technologies. 3 lectures, 1 laboratory. Prerequisite: ENVE 331.

**ENVE 450 Industrial Pollution Prevention (4)**

Theory and case studies of innovative industrial and hazardous waste treatment and waste minimization through principles of pollution prevention. 3 lectures, 1 laboratory. Prerequisite: ENVE 331.

**ENVE 455 Environmental Health and Safety (4)**

Physical, chemical and biological hazards associated with industrial processes. Toxicology. Safety analysis and design. Causes and prevention of occupational and environmental hazards. Development and implementation of industrial hygiene programs. 4 lectures. Prerequisite: ENVE 331.

**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 466 Senior Project Design Laboratory I (2)**

Selection and initial work on a project by individuals or team which is typical of problems graduates must solve in their fields of employment. Project involves, but is not limited to, physical modeling, testing and design. The project may include students/elements from other disciplines. Formulation of outline, literature review, project schedule, initial analyses and interim report. 2 laboratories. Prerequisite: Senior standing and consent of instructor. Note: although ENVE 466 substitutes for ENVE 461, students may not use repeat credit for the purpose of increasing GPA.

**ENVE 467 Senior Project Design Laboratory II (2)**

Continuation of CE 466. Continuation of research methodology: problem statement, method, results, analysis, synthesis, project design, construction (when feasible), and evaluation/conclusions. Project results are presented in formal written reports for reference library and formal oral reports. 2 laboratories. Prerequisite: ENVE 466. Note: although ENVE 467 substitutes for ENVE 462, students may not use repeat credit for the purpose of increasing GPA.

**ENVE 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.

**ENVE 471 Selected Advanced Laboratory (1-4)**

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 8 units. 1 to 4 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 chair.

**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 or consent of instructor.

**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 or consent of instructor.

**ENVE 537 Decentralized Wastewater Management (4)**

Design and management of decentralized wastewater treatment systems. Description of wastewater characteristics, process analysis, and wastewater pretreatment. Design of treatment processes for septic tank effluent. Effluent disposal, septage management, and the management of decentralized systems. 4 lectures. Prerequisite: ENVE 438.

**ENVE 541 Resource and Energy Recovery (3)**

In-depth evaluation of physical and biological processes for the recovery of resources and energy from solid waste. Preparation of an engineering design report. Use of computer models for process engineering and cost

estimation of resource recovery facilities. 2 lectures, 1 laboratory. Prerequisite: Graduate standing 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 or consent of instructor.

**ENVE 570 Selected Advanced Topics (1-4)**

Directed group study of selected topics for advanced students. Open to graduate students. *Class Schedule* will list topic selected. Total credit limited to 8 units. 1-4 seminars. Prerequisite: Graduate standing or consent of instructor.

**ENVE 571 Selected Advanced Laboratory (1-4)**

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 8 units. 1-4 laboratories. Prerequisite: Consent of instructor.

**ENVE 599 Design Project (Thesis) (2) (2) (5)**

Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis. Prerequisite: Graduate standing.

**ERSC-EARTH SCIENCES****ERSC 110 Orientation in Soil Science (1) (CR/NC)**  
(Also listed as SS 110)

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.

**ERSC 202 Soil Erosion and Water Conservation (4)**  
(Also listed as SS 202)

Development of an erosion and sediment control plan using climate, topography, soils and land use in relation to soil and water quality. Evaluation of soil and water conservation plans and best management practices for agriculture, urban, riparian, and rangelands. 3 lectures, 1 activity. Prerequisite: SS 121 or consent of instructor.

**ERSC 223 Rocks and Minerals (4)**  
(Also listed as SS 223)

Origin, composition, identification and weathering of rocks, minerals, and clays important in the development of soils. Parent materials as related to the nature and properties of soils. 3 lectures, 1 laboratory. Prerequisite: SS 121, CHEM 111 or CHEM 128.

**ERSC 250 Physical Geography (4)**  
(Also listed as GEOG 250)

Addresses the origins and patterns of the earth's diverse assemblage of climates, landforms, biota and soils. A major focus on relationship between human cultures and these earthly environments. 4 lectures.

**ERSC 321 Soil Morphology (4)**  
(Also listed as SS 321)

Identification of soil morphological and site properties. Correlation of soil physical and chemical properties with soil taxonomy and land use. Techniques of interpretations for agriculture, forest lands, range lands and urban development. 3 lectures, 1 laboratory. Prerequisite: SS 121.

**ERSC 325 Climate and Humanity (4) (Also listed as GEOG 325)**

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. 4 lectures. Prerequisite: Junior standing or consent of instructor.

**ERSC 333 Human Impact on the Earth (4)**  
(Also listed as GEOG 333)

Global assessment of the impact of humans on the earth's vegetation, animals, soil, water and atmosphere. Emphasis on problems stemming from the interactions of human attitudes, technologies, and population with natural resources. 4 lectures.

**ERSC 401 Field-Geology Methods (4)**  
(Also listed as GEOL 401)

Collecting and interpreting field-geologic data. Description of sedimentary rocks and construction of stratigraphic columns. Mapping geologic structures in the field. Surficial geologic stratigraphy and surficial geologic mapping. Understanding geologic processes through field study. Communicating results of field study. 1 lecture, 3 activities. Prerequisite: GEOL 102 or GEOL 201, GEOL 241, SS 223, SS 323.

**ERSC 402 Geologic Mapping (4)**  
(Also listed as GEOL 402)

Bedrock geologic mapping on topographic maps and aerial photos. Surficial geologic mapping on topographic maps and aerial photos. Correlating and defining surficial geologic map units on the basis of soil development. Understanding landscape evolution using soil development 4 activities. Prerequisite: GEOL 102 or GEOL 201, GEOL 241, SS 223, SS 323, ERSC/GEOL 401.

**ERSC 414 Climatology (4) (Also listed as GEOG 414)**

The earth's pattern of climates and the physical processes that account for them. Focus on interrelationships between climate and the physical/biological and cultural environments. Special emphasis on modern climate changes and their consequences. 3 lectures, 1 laboratory. Prerequisite: GEOG 250 or consent of instructor.

**ERSC 461 Senior Project (1)**  
(Also listed as SS 461)

Senior project topic selection and contract development with project advisor. Statement of problems, subproblems, assumptions, objectives, hypothesis, methods of analysis and statistical design. Development of literature review and budget of time and finances. Proper format and presentation of tabular and graphic information. 1 activity. Prerequisite: MATH 118 or MATH 131, STAT 211 or STAT 321 or CRSC 411.

**ERSC 462 Senior Project (3)**  
(Also listed as SS 462)

Implementation of materials and methods. Collection, analysis and interpretation of data. Completion of formal written report under advisor supervision. Minimum 90 hours. Prerequisite: ERSC 461.

## ES-ETHNIC STUDIES

**ES 112 Race, Culture and Politics in the United States (4) (Also listed as HNRS 112)** **GE D1 USCP**

Introductory and interdisciplinary study of the ways that race and ethnicity are created by both historical processes and American institutional formation – specifically social, political, economic, legal and cultural institutions. Special attention paid to the interlocking systems of race, class, gender and sexuality. 4 lectures.

**ES 114 Race in American Culture (4)** **USCP**

The social practices, cultural representations, and public policies that construct race and racism in the development of American institutions, and their effect upon ethnic groups and women. The cultural discourses that reinforce racist ideology and pseudo-scientific conceptions of race. 4 lectures.

**ES 200 Special Problems for Undergraduates (1-2)**

Supervised investigation, including a written report, of a topic chosen with prior approval of instructor. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

**ES 212 Global Origins of United States Cultures (4)**  
(Also listed as HNRS 212) **GE D3 USCP**

How the global dispersal of Europeans, Asians, and Africans, the hemispheric dispersal of Latin Americans, and the forced internal migration of Native Americans have contributed to American cultural heritage and the struggles for ethnic, class and gender equality, and justice. 4 lectures.

**ES 215 Planning for and with Multiple Publics (4)**  
(Also listed as CRP 215) **USCP**

How the social/spatial relationships among racial/ethnic and gender groups are expressed in terms of human settlement patterns, civic involvement and everyday negotiations. Ways in which segregation and marginalization are expressed in western and non-western contexts. 3 lectures, 1 activity. Prerequisite: Completion of GE Area D1.

**ES 240 Latino Metropolis (4)** **USCP**

Focus on strategic roles emerging Latino majorities play in such major urban centers as Los Angeles, New York, or Chicago, by exploring how Latinos establish and maintain distinctive social and cultural identities in the nation's cities. 4 lectures.

**ES 300 Chicano/a Non-Fiction Literature (4)** **GE C4 USCP**

Overview of contemporary Chicano/a literature since 1848. Thematic concerns, literary criticism, literary techniques, historical and socio-cultural factors influencing non-fiction Chicano/a literary genres. Instructor reserves option to select non-fiction genres to be studied. 4 lectures. Prerequisite: Completion of GE Area A and ENGL 240.

**ES 308 Fire and Society (4)** **GE D5**  
(Also listed as FNR 308)

Prehistorical and historical record of human use of and attitude toward fire. Mythology and religion of fire. Traditional, cultural and ethnic variations and their influence on modern U.S. institutions involved in managing fire. 3 lectures, 1 activity. Prerequisite: Completion of GE Areas D1 and D3.

**ES 320 African American Cultural Images (4)** **GE D5 USCP**

Comparative study of stereotypical and archetypal impressions, images, and projections of American cultural/ethnic minority/majority groups in American popular culture, opinion, and consciousness. 4 lectures. Prerequisite: Completion of GE Area A and two courses from Areas D1, D2, D3, D4 (Recommended: ES 112 or ES 212).

**ES 321 Native American Cultural Images (4)** **GE C4 USCP**

Stereotypical and archetypal images and projections of American Indians in American popular consciousness. Portrayals in the mass media, films, and literature. The social cultural impact of such representations and how American Indians see themselves and shape their own images. 4 lectures. Prerequisite: Completion of GE Area A and one course from Area C1; Recommended: ES 112 (D1) or ES 212 (D3).

**ES 322 Asian American Cultural Images (4)** **GE D5 USCP**

Comparative study of stereotypical and archetypal impressions, images, and projections of Asian Americans in American popular opinion and consciousness. 4 lectures. Prerequisite: Completion of GE Area A and two courses from Areas D1, D2, D3, D4 (Recommended: ES 112 or ES 212).

**ES 323 Mexican American Cultural Images (4)** **GE D5 USCP**

Comparative study of the cultural representations (racializing images and discourses) of, and counter-representations by, American cultural/ethnic groups in American popular opinion and consciousness, with particular emphasis on Mexican Americans/Latinos. 4 lectures. Prerequisite: Completion of GE Area A and two courses from Areas D1, D2, D3, D4 (Recommended: ES 112 or ES 212).

**ES 325 African American Women's Experiences (4)** **USCP**

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 occupy the center of inquiry,

with the following themes in mind: economics, gender roles, race and socio-political movements. 4 lectures. Prerequisite: ES 110 or ES 112.

**ES 330 The Chinese American Experience (4) GE D5 USCP**

History and current status of Chinese Americans, with emphasis on the international contexts, organizations and institutions of Chinese America, and on Chinese Americans' demographic compositions, spatial patterns, and cultural, socioeconomic, and political adaptation experiences. 4 lectures. Prerequisite: Completion of GE Area A and two courses from Areas D1, D2, D3, D4 (Recommended: ES 112 or ES 212).

**ES 350 Asian American and African American Environments (3) USCP**

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 134, POLS 112, HIST 207, junior standing.

**ES 360 Ethnicity and the Land (4) GE C4 USCP (Also listed as FNR 360)**

A comparative study of the ethnic, cultural and gender influences that shape people's perceptions, attitudes and behavior toward terrestrial and aquatic resource values and uses. 4 lectures. Prerequisite: Completion of GE Area A and one course from Area C1, C2, or C3. Junior standing. Recommended: one lower division Ethnic Studies course and an introductory natural resources course.

**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.

## **FNR-FORESTRY AND NATURAL RESOURCES**

**FNR 101 Natural Resources Management and Society (3)**

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 them 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 Introduction to Forest Ecosystem Management (3)**

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)**

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) (Also listed as REC 203)**

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 (3)**

Fire control techniques used on various wildland fuels. Elementary fire physics, fuels, weather, fire behavior, tactics and fire suppression techniques, line construction, "mop-up", fire line safety, air operations and fire organization. Meets basic wildland fire fighter certification requirements for the USDA Forest Service. Partially meets California Department of Forestry Firefighter I requirements. 2 lectures, 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. 2 lectures, 2 laboratories. Prerequisite: BOT 121 or BIO 152.

**FNR 215 Land and Resource Measurements (1)**

Introduction to land and resource measurement technology and methods -- field instruments, property description, map and photograph reconciliation, data accuracy and precision. Course may be offered at Swanton Pacific Ranch during week prior to beginning of fall quarter, or weekend field trips. 1 laboratory.

**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 247 Forest Surveying (2) (Also listed as BRAE 247)**

Use and care of tapes, staff compass, abney levels, theodolites, and GPS receivers. Keeping field notes, measurements by tape. Closed and open traverse by compass and theodolite. Turning angles and determining directions of lines. Map reading and public land description. GPS measurements. Weekend field trips required. 1 lecture, 1 laboratory. Prerequisite: MATH 119, FNR 215 or consent of instructor.

**FNR 260 Forest Practices and Environmental Protection (4)**

Relationships between forest ecosystem management, harvesting methods, timber harvest planning, components of forest harvesting, harvesting effects; cost analysis of harvesting methods; safety management; value-added forest utilization; and road location. Overnight or weekend field trips required. 3 lectures, 1 laboratory. Prerequisite: FNR 247.

**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) (Also listed as REC 300)**

Resource management applications of microcomputers. Software programs include forest and natural resource management planning, forecasting, analysis of systems, and resource data base management for multiple use objectives. Forestry and natural resource examples will be used. 1 lecture, 1 laboratory. Prerequisite: Consent of instructor.

**FNR 306 Natural Resource Ecology and Habitat Management (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 307 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. 2 lectures, 1 laboratory. Prerequisite: FNR 306 or ecology course, and FNR 204 or consent of instructor.

### **FNR 308 Fire and Society (4)** (Also listed as ES 308)

**GE D5**

Prehistorical and historical record of human use of and attitude toward fire. Mythology and religion of fire. Traditional, cultural and ethnic variations and their influence on modern U.S. institutions involved in managing fire. 3 lectures, 1 activity. Prerequisite: Completion of GE Areas A, D1 and D3.

### **FNR 311 Environmental Interpretation (4) (Also listed as REC 311)**

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: SCOM 101 or SCOM 102.

### **FNR 312 Technology of Wildland Fire Management (4) GE Area F**

Models and technology to solve complex land management problems. Historic, current and future perspectives of wildland fire in California. Sustainability and ecosystem health. Assumptions and limitations of fire behavior and suppression models. 3 lectures, 1 activity. Prerequisite: Completion of GE Area B, and junior standing. Forestry and Natural Resources majors will not receive GE Area F credit.

### **FNR 315 Measurements and Sampling in Forested Environments (4)**

Principles and methods of sampling and measurement for forest and natural resource quantities and qualities. Modeling and estimation for tree volumes, stand structure and composition, and related forest vegetation. Applications in sampling, statistical and inventory techniques. 2 lectures, 2 laboratories. Overnight, weekend field laboratories required. Prerequisite: MATH 120, STAT 218, BRAE/FNR 247.

### **FNR 317 The World of Spatial Data and Geographic Information Technology (4)** (Also listed as BIO/GEOG/LA 317)

**GE Area F**

Basic foundation for understanding the world through geographic information and tools available to utilize spatial data. Application of Geographic Information Systems (GIS) and related technologies, including their scientific basis of operation. 3 lectures, 1 activity. Prerequisite: A course in computer science, completion of Area B, and junior standing. Earth Sciences, Forestry and Natural Resources, Landscape Architecture, and Social Sciences (Geography concentration) majors will not receive GE Area F credit.

### **FNR 318 Applications in GIS (3) (Also listed as GEOG/LA 318)**

ARC/INFO and ArcView Geographic Information System (GIS) computer software to explore natural resources, social and business issues, using spatial data. Develop data base, use software and apply with relevant natural systems. 1 lecture, 2 laboratories. Prerequisite: Junior standing, computer literacy or consent of instructor.

### **FNR 319 Natural Resource Ecology, Theories and Applications (4)**

**GE B5**

Scope and nature of "ecology" in modern society, including resource terminology and classifications systems; dynamics of natural systems (energy exchange and cycles); man's role as a principle agent of change; environmental impacts; historical perspective including people (ethnicity); and the future environment. 3 lectures, 1 laboratory. Prerequisite: Completion of GE Area B2.

### **FNR 321 Water Systems Technology, Issues and Impacts (4)**

**GE Area F**

Sustainable strategies and technologies to enhance freshwater supplies and marine habitats. Systems treated include artificial wetlands, stormwater, drinking water, agricultural and industrial waste water. 3 lectures, 1 activity. Prerequisite: Completion of GE Area B, and junior standing. Forestry and Natural Resources majors will not receive GE Area F credit.

### **FNR 323 Human Dimensions in Natural Resources Management (4)**

**GE D5**

Social, economic, political and ecological conditions and institutions that influence decisions affecting the environment; examination of human-caused environmental impacts and how they in turn influence social institutions. 4 lectures. Prerequisite: Completion of GE Area A and two courses from Areas D1, D2, D3. Forestry and Natural Resources majors will not receive GE Area D5 credit.

### **FNR 326 Natural Resources Economics and Valuation (4)**

Principles of efficient use of renewable and nonrenewable natural resources, including methods for attaching value to marketable and non-market natural resources. Key resource sectors treated in detail: timber, water resources, wildlife/fisheries, and wildland recreation. 3 lectures, 1 laboratory. Prerequisite: MATH 118, GE Area D2 (ECON 201 recommended), AGB 212 or consent of instructor.

### **FNR 335 Conflict Management in Natural Resources (4)**

Application of behavioral science principles and techniques in the management of natural resource systems. Management of internal and external human resource issues and concerns in natural resources organizations is emphasized. 3 lectures, 1 laboratory. Prerequisite: PSY 201 or PSY 202 recommended.

### **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 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. Full-day field trips may be required. 2 lectures, 1 laboratory. Prerequisite: FNR 208.

### **FNR 355 Hardwood and Woodlot Management (4)**

Regeneration, management and improvement of farm and urban interface forest holdings. Design and production of wood biomass for wood fiber, fuel and Christmas trees, etc. Emphasis on hardwood/oak woodland management, biodiversity, and land ethics. Integration with range, wildlife and recreation values. Weekend or full-day field trips required. 3 lectures, 1 laboratory. Prerequisite: FNR 201, FNR 208, FNR 315.

### **FNR 360 Ethnicity and the Land (4)** (Also listed as ES 360)

**GE C4 USCP**

A comparative study of the ethnic, cultural and gender influences that shape people's perceptions, attitudes and behavior toward terrestrial and aquatic resource values and uses. 4 lectures. Prerequisite: Completion of GE Area A and one course from Area C1, C2, or C3. Junior standing..

Recommended: one lower division Ethnic Studies course and an introductory natural resources course.

**FNR 362 Survey and Management of Mediterranean Ecosystems (4)**

Woody vegetation found in worldwide Mediterranean ecosystems. Distribution, historical development and uses of these ecosystems. Emphasis on chaparral management techniques and effects of management on fire, water production, biomass potential. 3 lectures, 1 laboratory. Prerequisite: FNR 306 or equivalent.

**FNR 365 Silviculture and Vegetation Management (4)**

Applied forest ecology and prescriptions for achieving forest ecosystem management; dynamic relations among trees, biological communities, environmental factors, and land use. Vegetation manipulation and reforestation methods. Overnight and/or weekend field trips required. 3 lectures, 1 laboratory. Prerequisite: FNR 208, FNR 306, FNR 315.

**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 402 Forest Health (4)**

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. Course offered at Swanton Pacific ranch contingent on facilities. 3 lectures, 1 laboratory. Prerequisite: FNR 208, FNR 306 and department head approval.

**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, or consent of instructor.

**FNR 408 Water Resource Law and Policy (3)**

(Also listed as CRP 408)

Detailed examination of the various legal systems of water use, regulation and management in California and the United States. Discussion on the key concepts and principles of state, federal and interstate water quantity and quality control; focusing on issues and problems, why conflicts occur and how solutions evolve. 3 lectures. Prerequisite: FNR 306 or equivalent or instructor approval, senior standing.

**FNR 410 Resource Recreation Management (4)**

(Also listed as REC 410)

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 412 Forest and Natural Resources Senior Assessment Project (4)**

Principles and practices of integrated sampling and inventory of natural resource values in terrestrial ecosystems, culminating in a student project report. Course offered at Swanton Pacific ranch contingent on facilities. 2 lectures, 2 laboratories. Prerequisite: FNR 306 or equivalent and FNR 326, and department head approval.

**FNR 414 Sustainable Forest Management (4)**

Physical, biological, economic, social and political influences on optimal forest management for purposes of providing sustained yields of goods and services. Growth and yield modeling; forest investment analysis; sustainable forest production; harvest schedule modeling. 3 lectures, 1 laboratory. Prerequisite: FNR 326, FNR 365.

**FNR 416 Environmental Impact Analysis and Management (4)**

National Environmental Policy and California Environmental Quality Acts as applied to natural resource management processes. Intent, purpose and history of the laws; differences between laws identified. Request for

proposals and preparation of environmental documents covered. 3 lectures, 1 laboratory. Prerequisite: FNR 306 or equivalent.

**FNR 417 Resource Recreation Planning (3) (Also listed as REC 417)**

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 419 Watershed Management and Restoration (4)**

Hydrologic cycle concepts and measurement. Analysis and measurement of watershed processes. Watershed management and protection including rehabilitation, erosion, sedimentation, cumulative watershed effects, stream habitat assessment. Saturday and weekend field trip required. 3 lectures, 1 laboratory. Prerequisite: SS 121, FNR 306, FNR 318.

**FNR 420 Advanced Watershed Hydrology (4)**

Sources of streamflow and processes by which watersheds undergo change from natural and anthropogenic processes. Fluvial processes, sediment transport and channel restoration techniques. Influences of forest and range management on water resources including water quality and analytical techniques. Weekend field trips required. 3 lectures, 1 laboratory. Prerequisite: FNR 419.

**FNR 421 Wetlands (4)**

(Also listed as BIO/SS 421)

The formation, characteristics, and functions of wetlands. Genesis of hydric soils. Plant adaptations to saturated soils. Wetlands as wildlife habitat. Policies and social issues associated with wetlands. The procedures of wetland delineations. 3 lectures, 1 laboratory. Prerequisite: CHEM 128, BOT 223, SS 321.

**FNR 425 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. 3 lectures, 1 laboratory. Prerequisite: FNR 416 or senior standing.

**FNR 434 Wood Properties and Products (4)**

Principles of wood properties and efficient use of renewable wood resources including methods for using wood as an energy source. Weekend or full-day field trips required. 3 lectures, 1 laboratory. Prerequisite: FNR 201 and FNR 260 or consent of instructor.

**FNR 435 Natural Resources Policy Analysis (4)**

Policy process approach to understanding the efforts to resolve natural resource problems in the public and private sector. Principles and techniques used to analyze the effects of policy changes on natural resources management. 3 lectures, 1 laboratory. Prerequisite: FNR 326, FNR 335.

**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 455 Urban-Wildland Interface Fire Protection (3)**

Social, economic, political, and technological issues affecting fire management in urbanized landscapes where fire continues its ecological role. Fire risk analysis; needs assessment, legislative codes, standards and policies; liability issues; evacuation; incident response planning. 2 lectures, 1 laboratory. Prerequisite: FNR 204 or FNR 307, FNR 318.

**FNR 460 Advanced Applications of GIS (2)**

Acquisition, organization and analysis of geographic data from diverse sources to develop coverages using Geographic Information System (GIS)

software. Advanced GIS modeling applications and validation techniques. 2 laboratories. Prerequisite: FNR/LA 318.

#### **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 464 Advanced GIS Practicum (1)**

Advanced GIS applications and modeling strategies used in projects developed in FNR 460. 1 laboratory. Prerequisite: FNR 460.

#### **FNR 465 Ecosystem Management (4)**

Applied integration of forestry and natural resources management knowledge. Principles, concepts and techniques designed to utilize resources while sustaining forest health and habitat within acceptable limits of change. Ecosystem management planning project. 3 lectures, 1 laboratory. Prerequisite: FNR 326, FNR 365, and FNR 416.

#### **FNR 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: Consent of instructor.

#### **FNR 471 Selected Advanced Laboratory (1-4)**

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 8 units. 1-4 laboratories. Prerequisite: Consent of instructor.

#### **FNR 472 Leadership Practice (1) (Also listed as REC 472)**

Leadership styles used in the natural resources management and recreation administration professions. Study and practice in setting goals and objectives; developing, evaluating and implementing an entrepreneurial project plan; decision making and problem-solving. Total credit limited to 4 units. 1 laboratory. Prerequisite: Junior standing or 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 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 530 Social Systems in Forest Resources Management (3)**

Theories and methods for incorporating community in the management of forest resources. Approaches to conflict resolution between resource owners and community stakeholders using tools such as GIS. 2 lectures, 1 laboratory. Prerequisite: Graduate standing and consent of instructor.

#### **FNR 532 Forestry Applications in Biometrics and Econometrics (4)**

Quantitative methods in modeling biological and economic processes associated with managing forested ecosystems. Biometric modeling of stand growth and inventory. Econometric modeling of market and non-market natural resource values. 3 lectures, 1 laboratory. Prerequisite: Graduate standing, and consent of instructor.

#### **FNR 534 Forest Ecosystem Management and Modeling (3)**

Methods and modeling approaches used in quantifying ecological processes and conditions associated with forested ecosystems, such as fire behavior, hydrologic processes, terrestrial and aquatic habitat condition using GIS and other models. 2 lectures, 1 laboratory. Prerequisite: Graduate standing, and consent of instructor.

#### **FNR 539 Graduate Internship in Forest Resources(1-9)**

Application of theory to the solution of problems of forest resources 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 advisor before the internship commences. Degree credit limited to 6 units. Prerequisite: Consent of internship instructor.

#### **FNR 570 Selected Topics in Forest Resources (1-4)**

Directed group study of selected topics for advanced students. *Class Schedule* will list topic selected. Total credit limited to 12 units. 1-4 seminars. Prerequisite: Graduate standing or consent of instructor.

#### **FNR 571 Selected Topics in Forest Resources Laboratory (1-4)**

Directed group laboratory of selected topics for advanced students. *Class Schedule* will list topic selected. Total credit limited to 12 units. 1-4 laboratories. Prerequisite: Graduate standing and consent of instructor.

#### **FNR 575 Applications in Advanced Watershed Hydrology (2)**

Techniques and applications in watershed hydrology to real-world projects. Projects could include water quality or quantity assessments, water quality or channel morphology monitoring, and structural and non-structural enhancements for channel and upland watersheds, culminating in a final report and presentation. 2 laboratories. Prerequisite: FNR 420 and graduate standing, or 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. Degree credit limited to 9 units. 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 121, 122 Intermediate Foreign Language (4) (4)**

Review of grammar in a foreign language. Practice in writing, speaking and listening and oral expression within a cultural context. To be taken in numerical sequence. 3 lectures, 1 activity. Prerequisite: FORL 103 or consent of instructor.

**FORL 200 Special Problems for Undergraduates (1)**

Individual investigation, research, studies, or surveys of selected problems at the lower division level. *Class Schedule* will list topic selected. Total credit limited to 8 units per quarter. Prerequisite: Consent of instructor.

**FORL 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units. Prerequisite: Consent of department head.

**FORL 460 Senior Project (4)**

Selection and completion of a project under faculty mentorship. Projects represent individual, well-defined problems and potential solutions that reflect pertinent scholarly activity in the field of modern languages and literatures, with special emphasis on one of the languages/cultures taught in the department. Total credit limited to 4 units. Prerequisite: SPAN 210, advanced composition in primary and/or secondary language, senior status and consent of instructor.

**FORL 470 Selected Advanced Topics (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. 4 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 121, 122 Intermediate French (4) (4)**

Review of French grammar and practice in writing and oral expression within a cultural context. To be taken in numerical sequence. 3 lectures, 1 activity. Prerequisite: FR 103 or consent of instructor.

**FR 233 Critical Reading in French Literature (4) GE C1**

Selected readings in French from major Francophone authors that illustrate the French literary tradition from the Middle Ages to the present in both France and other French-speaking countries. 4 lectures. Prerequisite: Completion of GE Area A, and FR 122.

**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: Consent of instructor.

**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: Consent of instructor.

**FR 305 Significant Writers in French (4) GE C4**

Critical analysis and oral discussion of poetry, essays, novels, and plays by selected French and Francophone writers. *Class Schedule* will list topic

selected. Total credit limited to 12 units. 4 lectures. Prerequisite: Completion of GE Area A, and FR 233. Modern Languages and Literatures majors will not receive GE C4 credit.

**FR 322 French Food in French (4)  
(Also listed as FSN 322)**

Blend of French language, culture, food preparation techniques, and basic food chemistry and nutrition. Total immersion in language and cooking: preparation of French food while interacting in French with classmates and instructors, in lectures, discussion, and laboratory. 3 lectures, 1 laboratory. Prerequisite: FR 103 or consent of instructor.

**FR 350 French Literature in English Translation (4) GE C4**

Selected works to be read by students in English translation. Critical analysis, interpretation, and comparison of works by significant French and/or Francophone writers. Lecture in English. *Class Schedule* will list topics selected. Total credit limited to 8 units. 4 lectures. Prerequisite: Completion of GE Area A and one course in Area C1. Modern Languages and Literatures majors will not receive GE C4 credit.

**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. 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 (2-4) (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. 1 lecture, variable practicum. Prerequisite: HCS 110, or consent of instructor.

**FRSC 210 Viticultural Practices (2)**

Propagation, layout and planting of a new vineyard, including irrigation and trellis system installations and pest control. Total credit limited to 4 units. 2 activities.

**FRSC 220 Viticulture/Enology Seminar (1) (CR/NC)**

Guest speakers series on selected viticulture and enology topics. Repeatable for a maximum of 2 units. 1 seminar.

**FRSC 230 California Fruit Growing (4)**

Interrelationship of climate and cultural techniques on orchard productivity. California's place in the international production-marketing scheme. Field trip required. 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. Field trip required. 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. 3 lectures, 1 laboratory. Prerequisite: FRSC 131 or FRSC 230, or consent of instructor.

**FRSC 402 Enterprise Project Management (2-4) (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. 1 lecture, variable practicum. Prerequisite: FRSC 202, and consent of instructor.

**FRSC 422 Tropical and Subtropical Crop and Fruit Production (4)  
(Also listed as CRSC 422)**

Production, distribution and utilization of major agronomic, vegetable, fruit and nut crops of economic importance in tropical and subtropical areas. Weather systems, climates, soils, and cropping systems of tropical and subtropical areas. Field trip required. 3 lectures, 1 laboratory. Prerequisite: 100/200-level plant production 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.

**FRSC 599 Thesis in Fruit Science (1-9)**

Systematic research of a significant problem in Fruit Science. 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.

**FSN-FOOD SCIENCE AND NUTRITION****FSN 101 Orientation to Nutrition (1) (CR/NC)**

Understanding the depth and breadth of the Nutrition program. Emphasis on curriculum and career planning. Nutrition 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. 3 lectures, 1 laboratory.

**FSN 125 Introduction to Food Science (5)**

Basic principles of food science. Chemical, physical, and microbiological properties of foods. Ingredient properties, preservation, and processing. Overview of the commercial food processing industry at state and national levels. 4 lectures, 1 laboratory.

**FSN 154 Basic Calculations in Food Processing (4)**

Introduction to basic calculations needed for food plant operations. Calculations dealing with units, material balance, heat balance, steam heating, psychrometry, vacuum and pressure. Field trip may be required. 3 lectures, 1 laboratory. Prerequisite: Minimum of intermediate algebra or appropriate score on ELM.

**FSN 200 Special Problems for Undergraduates (1-3) (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 instructor.

**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 125, or FSN 230 and consent of instructor.

**FSN 204 Food Processing Operations (4)**

Applied food manufacturing and processing technology emphasizing unit operations. Water removal in foods (dehydration, spray drying, vacuum concentration), heat removal (refrigeration, freezing), and osmotic preservation. Students produce processed foods in a pilot plant. 3 lectures, 1 laboratory. Prerequisite: FSN 125 or FSN 230, and FSN 154.

**FSN 210 Nutrition (4)****GE B5**

Introduction to the science of human nutrition. Nutrient structure, metabolism, and function in body systems. Application of nutrition science principles to promote optimal health. 4 lectures.

**FSN 230 Elements of Food Processing (4)**

Principles of food processing operations covering thermal processing, freezing, dehydration, fermentation and raw material handling. Overview of food technology, food quality, spoilage, packaging and label requirements. For non-Food Science majors only. Field trip may be required. 3 lectures, 1 laboratory.

**FSN 244 Cereal and Bakery Science (4)**

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. Optimization and management of manufacturing line operations. Comparative nutritional evaluation of flours, grains, and finished products. Product development concepts. 3 lectures, 1 laboratory. Prerequisite: FSN 125 or FSN 230.

**FSN 250 Food and Nutrition: Customs and Culture (4) GE D4 USCP**

Anthropological perspective of traditional and contemporary food customs and culture. Major emphasis on U.S. cultures including Native American, Hispanic American, African American, and Asian American. Past and future developments in organic foods, junk foods and industrial foods. 4 lectures.

**FSN 263 Professional Practice in Applied Nutrition (2)**

Understanding professional roles in applied nutrition settings, including dietetics and community nutrition. Discussion of relevant nutrition-related laws, regulations, and codes, including ethics. Development of professional portfolios. 2 seminars. Prerequisite: FSN 101, FSN 210, and sophomore standing.

**FSN 264 Survey of Food Chemistry (4)**

Basic application of chemistry to food products. Role of chemical components of food and beverage formulations with focus on grape, wine, fermented and distilled products as well as fruit, vegetable and cereal products. 4 lectures. Prerequisite: CHEM 111 or equivalent.

**FSN 270 Food and Wine Plant Sanitation (4)**

Operational management of a food and wine plant sanitation program. Chemical and physical control of insects, rodents, and birds. Microbial sanitation operations. Government and legal issues affecting operations. Chemistry of detergents, surfactants and sanitizers. Design and construction of plants. Certified organic USDA requirements. 4 lectures. Prerequisite: FSN 125 or FSN 230, or consent of instructor.

**FSN 275 Principles of Food Safety and Hazard Analysis (4)**

Chemical, microbiological, and physical aspects of food safety are addressed especially with regard to establishment of safety programs for the food industry. In-depth coverage of hazard analysis and critical control points (HACCP). 3 lectures, 1 activity. Prerequisite: FSN 125 or FSN 230, or consent of instructor.

**FSN 285 Certified Organic Food Processing Operations (2)**

Certification and legal requirements for the processing of fruit, vegetable, wine, beer and distilled spirits as well as muscle foods. Basic principles of certified organic handling and process operations. 2 lectures. Prerequisite: FSN 125, FSN 230 or consent of instructor.

**FSN 304 Advanced Culinary Principles and Practice (4)**

Chemistry of starch, fat and proteins and its impact on texture, taste, flavor and appearance of food. Effects of microorganisms on changes of food during preparation and storage. Strong emphasis on baking technology. 3 lectures, 1 laboratory. Prerequisite: FSN 121, CHEM 111, or consent of instructor.

**FSN 310 Maternal and Child Nutrition (4)**

Nutritional needs and issues during pregnancy and lactation. Role of nutrition in normal development, from conception through adolescence. Current nutrition issues in maternal and child nutrition. 4 lectures. Prerequisite: FSN 210; sophomore standing.

**FSN 315 Nutrition in Aging (4)**

Nutrition issues in the middle and later years. Changes in organ systems, nutrient needs, functional status, and food preferences as adults age. Nutrition and chronic disease. Nutritional assessment and screening. Nutrition-related health care and social services. 4 lectures. Prerequisite: FSN 210; sophomore standing.

**FSN 319 Food Technology for the Consumer (4) GE Area F**

Overview of the science and technology used to produce the foods consumed on a daily basis. Food science, biotechnology, food law, processing, preservation, ingredient functionality, package label information, and food safety information. 3 lectures, 1 activity. Prerequisite: Completion of GE Area B, and junior standing. Food Science and Nutrition majors will not receive GE Area F credit.

**FSN 321 Culinary Management: Principles and Practice (4)**

Principles involved in the choice, purchase, and preparation of foods in a variety of settings. Application of culinary management principles in the use of time, energy and money. Planning, preparing, and serving meals with emphasis on nutritional, aesthetic, economic and cultural aspects of food. 3 lectures, 1 laboratory. Prerequisite: FSN 121, FSN 210.

**FSN 322 French Food in French (4)**

(Also listed as FR 322)

Blend of French language, culture, food preparation techniques, and basic food chemistry and nutrition. Total immersion in language and cooking: preparation of French food while interacting in French with classmates and instructors in lectures, discussion, and laboratory. 3 lectures, 1 laboratory. Prerequisite: FR 103 or consent of instructor.

**FSN 323 Statistical Quality Control (3)**

Application of statistical methods in quality control programs and evaluation of design and production in the food industry. Emphasis on role of statistical quality control in total quality management. Computer software will be utilized in statistical quality control processes. 3 lectures. Prerequisite: STAT 218 for Food Science majors and FSN 230 for non-majors.

**FSN 328 Advanced Nutrition I (4)**

Metabolism of carbohydrates, fats and proteins as it applies to human nutrition. Integration of metabolic pathways. 4 lectures. Prerequisite: FSN 210, CHEM 313/371, BIO 111/151.

**FSN 329 Advanced Nutrition II (4)**

Continuation of FSN 328. Biochemical and physiological functions of vitamins and minerals and their interaction with other nutrients. Quantitative analysis of nutrients in foods and assay of nutrients and other constituents in body fluids. 3 lectures, 1 laboratory. Prerequisite: FSN 328.

**FSN 334 Food Packaging (3)**

Function of food packaging in food processing and preservation. Packaging materials and forms. Regulations and testing of food packaging material. Oral presentation required. 3 lectures. Prerequisite: FSN 125 and FSN 204.

**FSN 335 Food Quality Assurance (4)**

Chemical, microbiological, and physical methods of analyses of foods used in food quality assurance and product development laboratories. Organization and management of quality assurance and control programs. Development of food production standards and interpretation of specifications. Packaging and container evaluation. 3 lectures, 1 laboratory. Prerequisite: FSN 125 or FSN 230, junior standing or 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, distilled beverages, dairy foods, 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 sanitation and safety. 2 lectures, 1 laboratory. Prerequisite: FSN 121 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 321, FSN 343.

**FSN 354 Packaging Function in Food Processing (3)**

Basic food spoilage and preservation mechanisms. The role of food packaging in food processing. Package and food compatibility. For non-Food Science majors. 3 lectures. Prerequisite: Junior standing.

**FSN 364 Food Chemistry (4)**

Chemical and biochemical properties of food components. Basic principles of food enzymology and the chemical and biochemical changes occurring in food systems as a function of different food processing conditions. Mechanisms of reactions affecting food quality and nutritional value. Laboratory focus on assessment of food chemical systems. 3 lectures, 1 laboratory. Prerequisite: FSN 125 or FSN 230, CHEM 313.

**FSN 368 Food Analysis (4)**

Principles of chemical and biochemical methods and techniques for measuring food protein, carbohydrates, lipids, water, vitamins, minerals and other components of foods, wine analysis. Application of AOAC approved methods for determining nutrients as they relate to nutritional labeling legal requirements. 3 lectures, 1 laboratory. Prerequisite: FSN 364.

**FSN 374 Food Laws and Regulations (4)**

Federal, state, and local laws and regulations affecting the production, processing, packaging, marketing, and distribution of food. Emphasis on FDA, USDA and California codes. 4 lectures. Prerequisite: FSN 125; FSN 230 for non-Food Science majors.

**FSN 400 Special Problems for Advanced Undergraduates (1-4) (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 instructor.

**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 408 Food Composition Science and Product Development (4)**

Chemical and physical properties of food ingredients. Functionality of water, carbohydrates, proteins, lipids, additives and other food ingredients used in the formulation, development, and processing of foods. Product development processes from idea generation to marketing. 3 lectures, 1 laboratory. Prerequisite: FSN 364, CHEM 313, senior standing or consent of instructor.

**FSN 410 Nutritional Implications of Food Industry Practices (4)**

Methods for assessing nutritional quality of foods/diets. Nutrient databases for raw and processed foods. Effects of food industry practices (e.g., processing, fortification, new product development, biotechnology) on nutritional quality of foods/diets. Evolution of public policy. 4 seminars. Prerequisite: FSN 210; FSN 230 or one course in food processing; senior standing; or consent of instructor.

**FSN 411 Sensory Evaluation of Food (3)**

Designed to help the food scientist solve typical sensory problems occurring in the food industry by using simple difference and scaling test designs; select appropriate panelists for specific sensory tests; and conduct such tests, analyze, interpret the results and write a report. 2 lectures, 1 laboratory. Prerequisite: STAT 218; FSN 230 for non-majors.

**FSN 415 Nutrition Education and Communications (4)**

Application of appropriate behavior and learning theories to bring about positive health outcomes in population groups. Use of effective techniques and materials. Computer-based technology to augment learning activities. 3 lectures, 1 laboratory. Prerequisite: FSN 328 and senior standing, or consent of instructor.

**FSN 416 Community Nutrition (4)**

Federal, state and local nutrition assessment activities and program services for at-risk populations. Emphasis on health promotion and disease prevention concepts. Develop skills in assessing community nutrition problems and planning service interventions. 4 lectures. Prerequisite: FSN 329 and senior standing, or consent of instructor. Recommended: FSN 310, FSN 315.

**FSN 417 Nutrition Counseling (4)**

Communication, behavioral, and counseling theories as they relate to nutrition counseling. Emphasis on development of skills to promote healthy eating behaviors. Examination of eating disorders and obesity, including preventative and therapeutic interventions. 4 lectures. Prerequisite: FSN 415, PSY 201/202.

**FSN 420 Critical Evaluation of Nutrition Research (2)**

Nutrition research terminology and methods, including the strengths and weaknesses of *in vitro*, animal, human observational, and human intervention studies. Critical evaluation and interpretation of nutrition research. Case studies of research supporting or refuting diet/health links. 2 seminars. Prerequisite: FSN 329, STAT 218, and senior standing.

**FSN 426 Food Systems Management (3)**

Principles of successful organization and management with their application to the effective operation of food service. Administrative responsibilities of the food service manager. 3 lectures. Prerequisite: FSN 344, or consent of instructor.

**FSN 429 Clinical Nutrition I (4)**

Application of the nutritional care process to organic, functional, and metabolic disorders which may alter nutritional requirements or require dietary modifications. Nutritional assessment. GI disorders, diabetes mellitus, and inborn errors of metabolism. 3 lectures, 1 laboratory. Prerequisite: FSN 328, ZOO 331, 332 (*transfer equivalent ZOO 240, 241*) and senior standing.

**FSN 430 Clinical Nutrition II (4)**

Application of the nutritional care process to organic, functional, and metabolic disorders which may alter nutritional requirements or require dietary modifications. Atherosclerosis, hyperlipidemias, metabolic stress, liver disease, cancer, renal disease, AIDS, and parenteral and enteral nutrition. 3 lectures, 1 laboratory. Prerequisite: FSN 429.

**FSN 440 Internship (1-12)**

Career experience with private or public agencies. For Nutrition 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 444 Engineering Concepts in Food Processing (4)**

Engineering concepts relevant to food processing. Heat transfer, evaporation, dehydration and refrigeration calculation principles. 4 lectures. Prerequisite: FSN 154, FSN 204; FSN 230 for non-Food Science majors.

**FSN 461, 462 Senior Project (2-3) (2-3)**

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 120 hours required (Nutrition majors) or 180 hours (Food Science majors). Prerequisite: GE Area A courses (Food Science majors) or ENGL 148 (Nutrition majors), and senior standing.

**FSN 463 Undergraduate Seminar (1) (CR/NC)**

Exploration of students' career opportunities and factors to be considered in career decisions. Credit/No Credit grading only. 1 seminar. Prerequisite: Junior standing.

**FSN 464 Wine Chemistry and Analysis (4)**

Chemical and biochemical analysis of wines using certified methods. Comparative analysis for alcohol, ash, reducing sugars, volatile acidity, color, anthocyanin, tannins, sulfur dioxide by spectrophotometric, gas chromatography and titration methods. 3 lectures, 1 laboratory. Prerequisite: FSN 264 for non-Food Science majors; FSN 364 for Food Science majors; or consent of instructor.

**FSN 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: Senior standing.

**FSN 471 Selected Advanced Laboratory (1-4)**

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 8 units. 1-4 laboratories. Prerequisite: Senior standing.

**FSN 474 Advanced Food Processing (4)**

Advanced topics in processing operations with emphasis on thermal processing. Non-traditional processing technology such as microwave, ionizing radiation, and Pascalization. Oral presentation required. 3 lectures, 1 laboratory. Prerequisite: FSN 154 and FSN 204; FSN 230 for non-Food Science majors.

**FSN 485 Cooperative Education Experience in Food Science and Nutrition (6) (CR/NC)**

Part-time work experience with an approved Food Science or Nutrition firm engaged in production or related business, industry or governmental agency. 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. Degree credit limited to 6 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

#### **FSN 494 Food Engineering (4)**

Engineering concepts and unit operations used in the food industry. Materials balance and heat balance, heat transfer, steam heat, fluid flow, water removal and refrigeration. 3 lectures, 1 laboratory. Prerequisite: PHYS 104, MATH 131, MATH 132.

#### **FSN 495 Cooperative Education Experience in Food Science and Nutrition (12) (CR/NC)**

Full time work experience with an approved Food Science or Nutrition firm engaged in production or related business, industry or governmental agency. 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. Degree credit limited to 6 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

#### **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 advisor.

#### **FSN 501 Lipid Metabolism and Nutrition (3)**

Digestion, absorption and metabolism of lipids with emphasis on lipoprotein metabolism, regulation of lipid metabolism, essential fatty acid requirements and functions. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

#### **FSN 570 Selected Topics in Food Science and Nutrition (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 12 units. 1 to 4 seminars. Prerequisite: Graduate standing or consent of instructor.

#### **FSN 571 Selected Advanced Laboratory in Food Science and Nutrition (1-4)**

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 8 units. 1-4 laboratories. Prerequisite: 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 Introduction to Cultural Geography (4) GE D3**

The interplay of cultures, places, and environments, with emphasis on the diversity, interrelationships, and spatial features of global cultures. Topics include characteristics and patterns of population, ethnicity, agriculture, geopolitics, language, religion, urbanization, industry, and folk and popular culture. 4 lectures.

#### **GEOG 250 Physical Geography (4) (Also listed as ERSC 250)**

Addresses the origins and patterns of the earth's diverse assemblage of climates, landforms, biota and soils. A major focus on relationship between human cultures and these earthly environments. 4 lectures.

#### **GEOG 300 Geography of the United States (4) GE D5**

The population (including origin, ethnicity, migration, and distributions), land utilization, and economic development viewed against the background of the physical environment. Topically and regionally organized. Pervading themes include landscape evolution and alteration, regional cultural distinctiveness, and current problems. 4 lectures. Prerequisite: Completion of GE Areas A, D1 and D3. Social Sciences majors will not receive GE Area D5 credit.

#### **GEOG 301 Geography of Resource Utilization (4) GE D5**

A multicultural, world view of the interconnections of the following resource systems: food, energy, water, and non-fuel minerals. A pervading theme is the sustainability of these systems. 4 lectures. Prerequisite: Completion of GE Areas A, D2 and D3. Social Sciences majors will not receive GE Area D5 credit.

#### **GEOG 308 Global Geography (4) GE D5**

A regional examination of the interrelationships of global human cultures with their biophysical environments and with each other. Emphasis is placed on the origins of contemporary cultural landscapes and on their utility for the understanding of international differences, interactions, and current events. 4 lectures. Prerequisite: Completion of GE Area A and two courses from Areas D1, D2, D3, D4. Social Sciences majors will not receive GE Area D5 credit.

#### **GEOG 317 The World of Spatial Data and Geographic Information Technology (4) GE Area F (Also listed as BIO/FNR/LA 317)**

Basic foundation for understanding the world through geographic information and the tools available to utilize spatial data. Application of Geographic Information Systems (GIS) and related technologies, including their scientific basis of operation. 3 lectures, 1 activity. Prerequisite: A course in computer science, completion of Area B, and junior standing. Earth Sciences, Forestry and Natural Resources, Landscape Architecture and Social Sciences (Environmental Geography concentration) majors will not receive GE Area D5 credit.

#### **GEOG 318 Applications in GIS (3) (Also listed as LA/FNR 318)**

ARC/INFO and ArcView Geographic Information System (GIS) computer software to explore natural resources, social and business issues, using spatial data. Develop data base, use software and apply with relevant natural systems. 1 lecture, 2 laboratories. Prerequisite: Junior standing, computer literacy or consent of instructor.

#### **GEOG 325 Climate and Humanity (4) (Also listed as ERSC 325)**

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. 4 lectures. Prerequisite: Junior standing or consent of instructor.

#### **GEOG 333 Human Impact on the Earth (4) (Also listed as ERSC 333)**

Global assessment of the impact of humans on the earth's vegetation, animals, soil, water and atmosphere. Emphasis on problems stemming from the interactions of human attitudes, technologies, and population with natural resources. 4 lectures.

#### **GEOG 340 Geography of California (4)**

Physical environment of California; patterns of settlement and historic development; current problems. 4 lectures. Prerequisite: Junior standing.

#### **GEOG 360 Geography of Europe (4)**

The population, land utilization, and economic development viewed against the background of the physical environment. Topically and regionally organized. Pervading themes include landscape evolution and alteration, regional cultural distinctiveness, and current problems. Emphasis on Western Europe. 4 lectures. Prerequisite: Junior standing.

**GEOG 370 Geography of Latin America (4)**

Geographic analysis of Mexico, Central America, and South America. The patterns of physical environment, culture, economy, and development. The issues (local, regional, and global) that shape Latin America. 4 lectures. Prerequisite: Junior standing or consent of instructor.

**GEOG 401 Area Geography (4)**

Directed study of geographic characteristics of a selected world area. *Class Schedule* will list topic descriptive of the particular world area to be studied. Total credit limited to 12 units. 4 lectures. Prerequisite: Junior standing.

**GEOG 414 Climatology (4) (Also listed as ERSC 414)**

The earth's pattern of climates and the physical processes that account for them. Focus on interrelationships between climate and the physical/biological and cultural environments. Special emphasis on modern climate changes and their consequences. 3 lectures, 1 laboratory. Prerequisite: GEOG 250 or consent of instructor.

**GEOG 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 12 units. 1-4 lectures. Prerequisite: Consent of instructor.

**GEOL-GEOLOGY****GEOL 102 Introduction to Geology (4)****GE B3**

Processes responsible for the Earth's minerals, rocks, and structure surface features. Volcanism; mountain building; plate tectonics; weathering. Erosion and deposition by streams, glaciers, wind and waves. Geological resources, earth hazards, and interaction of man with global processes. 4 lectures.

**GEOL 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. Prerequisites: Consent of department chair.

**GEOL 201 Physical Geology (3)**

Processes responsible for the Earth's rocks, structural surface features, geologic hazards, and natural resources, with emphasis on interactions with human activities. 3 lectures. Prerequisite: MATH 119 or equivalent.

**GEOL 203 Fossils and the History of Life (4)****GE B5**

Fossil record. Geologic time scale. Evolution and the fossil record. Evolution – creation controversy. Early earth and early life. Features, lifestyles, origins, and histories of major invertebrate, vertebrate, and plant groups. Mass extinctions. 3 lectures, 1 recitation.

**GEOL 204 Geologic History of California (3)**

Development of California through geologic time. Where and why the rocks appeared. Movement on faults, and mountain building. Geologic processes at work today and yesterday. Relationship of California geology to the rest of the world. 3 lectures. Recommended prerequisite: GEOL 102 or GEOL 201.

**GEOL 205 Earthquakes (4)****GE B3**

World-wide seismicity and plate tectonics. Seismic waves and their recording. Earth structure and composition. Intensity, magnitude, and energy. Major California faults and earthquakes. Paleoseismology, forecasting and prediction. Acceleration, resonance, and effects of ground shaking on structures. Earthquake safety. Tsunamis. 3 lectures, 1 recitation.

**GEOL 206 Geologic Excursions (1) (CR/NC)**

Field trips to places of geologic interest. *Class Schedule* will indicate destinations. Students must provide their own transportation, food, and camping equipment. May be repeated for a maximum of 3 units provided field trips are taken to different locations. Credit/No Credit grading only.

1 laboratory. Recommended prerequisite or concurrent: GEOL 102 or GEOL 201, or GEOL 204.

**GEOL 207 Geology of the National Parks (3)**

Development through time of the rocks, structures, and landforms that are the major scenic elements of our national parks. Emphasis on national parks of the western states. 3 lectures. Recommended prerequisite: GEOL 102 or GEOL 201.

**GEOL 241 Physical Geology Laboratory (1)**

Properties and identification of minerals and rocks. Topographic maps and landform analysis. Geologic maps and interpretation of rock structure. 1 laboratory. Prerequisite or concurrent: GEOL 102 or GEOL 201.

**GEOL 305 Fundamentals of Seismology (4)****GE B6**

Theory of plate tectonics. Elastic waves in layered media. Principle of the seismometer. Seismic properties, structure and composition throughout the Earth. Intensity, magnitude, and seismic moment and energy calculations. Major California faults and earthquakes. Paleoseismology, forecasting and prediction. Analysis of ground motion. Resonance. Effects of ground shaking on structures and bodies of water. Earthquake safety. 3 lectures, 1 recitation. Prerequisite: PHYS 132.

**GEOL 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.

**GEOL 401 Field-Geology Methods (4)****(Also listed as ERSC 401)**

Collecting and interpreting field-geologic data. Description of sedimentary rocks and construction of stratigraphic columns. Mapping geologic structures in the field. Surficial geologic stratigraphy and surficial geologic mapping. Understanding geologic processes through field study. Communicating results of field study. 1 lecture, 3 activities. Prerequisite: GEOL 102 or GEOL 201, GEOL 241, SS 223, SS 323.

**GEOL 402 Geologic Mapping (4)****(Also listed as ERSC 402)**

Bedrock geologic mapping on topographic maps and aerial photos. Surficial geologic mapping on topographic maps and aerial photos. Correlating and defining surficial geologic map units on the basis of soil development. Understanding landscape evolution using soil development. 4 activities. Prerequisite: GEOL 102 or GEOL 201, GEOL 241, SS 223, SS 323, ERSC/GEOL 401.

**GER-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 121, 122 Intermediate German (4) (4)**

Review of German grammar and practice in writing and oral expression within a cultural context. To be taken in numerical sequence. 3 lectures, 1 activity. Prerequisite: GER 103 or consent of instructor.

**GER 233 Critical Reading in German Literature (4)****GE C1**

Selected readings from major German authors that show the German literary tradition from the Middle Ages to the present in Germany, Austria, Switzerland, and or foreign writers in Germany. 4 lectures. Prerequisite: Completion of GE Area A, and GER 122.

**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: Consent of instructor.

**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: Consent of instructor.

**GER 305 Significant Writers in German (4)****GE C4**

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: Completion of GE Area A, and GER 233. Modern Languages and Literatures majors will not receive GE C4 credit.

**GER 350 German Literature in English Translation (4)****GE C4**

Selected works to be read by students in English translation. Critical analysis, interpretation, and comparison of individual works by outstanding German, Austrian and Swiss writers. Lecture in English. *Class Schedule* will list topics selected. Total credit limited to 8 units. 4 lectures. Prerequisite: Completion of GE Area A, and one course in Area C1. Modern Languages and Literatures majors will not receive GE C4 credit.

**GER 470 Selected Advanced Topics (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 8 units. 4 lectures. Prerequisite: Consent of instructor.

**GRC—GRAPHIC COMMUNICATION****GRC 101 Introduction to Graphic Communication (3)**

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 and digitally-imaged products and services. 3 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 instructor.

**GRC 201 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. 2 lectures, 1 laboratory.

**GRC 202 Image Capture and Manipulation (3)**

Optical and digital methods of image capture and image manipulation for the graphic arts. Photographic materials and equipment for the graphic arts. Densitometry, light sources, pin register, film assembly, exposure and development control. Contact frame, camera, and scanner theory and practice. 2 lectures, 1 laboratory. Prerequisite: GRC 101 and either GRC 201 or GRC 377.

**GRC 203 Electronic Prepress (3)**

Terminology, materials, equipment, facilities and methods used in electronic prepress. File formats, fonts, imposition, trapping, screen angling. Preflight, PostScript output, imagesetters, proofing, and platemaking. 2 lectures, 1 laboratory. Prerequisite: GRC 202.

**GRC 204 Introduction to Printing Management (3)**

Printing industry structure and business practices. Small business startup. Functional activities of a printing business. Applied organizational and management theory. 3 lectures. Prerequisite: GRC 101.

**GRC 211 Substrates, Inks and Toners (4)**

Technical aspects of paper, other substrates, inks and toners used in the printing industry. Manufacture, application and interaction of these

materials are examined in relation to particular processes and end use requirements. Hands-on use of computerized densitometers, spectrophotometers and performance testing equipment. 3 lectures, 1 laboratory. Prerequisite: GRC 101.

**GRC 212 Substrates, Inks and Toners: Theory (3)**

Technical aspects of paper, other substrates, inks and toners used in the printing industry. Manufacture, application, and interaction of these materials are examined in relation to particular processes and end use requirements. Credit not allowed for GRC majors. 3 lectures. Prerequisite: GRC 101.

**GRC 218 Digital Typography and Electronic Copy Preparation (4)**

History, development and application of typography in electronic text and display applications for cross media publishing. Type and electronic art preparation for offset, flexography, gravure, screen printing, digital and electronic means of publishing communication. 3 lectures, 1 laboratory. Prerequisite: GRC 101 and either GRC 201 or GRC 377.

**GRC 260 Introduction to Research Methods in Graphic Communication (3)**

Introduction to research methods for preparing scholarly and defensible papers and projects, and in conducting qualitative and quantitative evaluations, testing and research in graphic communication. Methods covered include the Scientific Method, historical and descriptive research, questionnaires, Elite and Specialized Interviewing, content analysis, and sampling. Design of research projects for each method taught. 2 lectures, 1 activity. Prerequisite: GRC 101

**GRC 302 Digital Printing and Emerging Technologies in Graphic Communication (3)**

New graphic communication technologies that are impacting the methods and procedures of producing and distributing print media. Application of digital printing and related technologies, including digital data exchange. Technological transitions and how to manage technological change. 3 lectures. Prerequisite: GRC 201.

**GRC 315 Sheetfed Printing Technology (5)**

Theory, practice and application of sheetfed technology to commercial, book, advertising, catalog, packaging and reprographic segments of the printing industry. Computerized press controls, workflow, color measurement and press department management. 4 lectures, 1 laboratory. Prerequisite: GRC 211.

**GRC 316 Web Printing Technology (5)**

Analysis of web printing technology for lithography, flexography and gravure. Applications for newspapers, packaging, magazines, books, catalogs and commercial products. Applications of computers to the management and technical function of web printing technology. 4 lectures, 1 laboratory. Prerequisite: GRC 315.

**GRC 320 Implementing Quality Management in the Graphic Arts (4)**

Theory and practices of quality management and productivity in the graphic arts industry. Quantifying customer needs and expectations, the development of specifications, standard operating procedures, statistical process control tools, capability studies, process improvement techniques, and employee empowerment will be examined. 3 lectures, 1 laboratory. Prerequisite: GRC 315 and STAT 217.

**GRC 322 Advanced Digital Typography (3)**

Typographic principles relating to print and electronic media. Electronic composition and font management with consideration for multimedia requirements. Technical problem solving related to browser and multiple viewing platforms. 2 lectures, 1 laboratory. Prerequisite: GRC 218 and GRC 338.

**GRC 324 Binding, Finishing, and Distribution 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. Fulfillment and mailing operations. Applications of computers to the

management and technical function of binding; finishing and distribution. 2 lectures, 1 laboratory. Prerequisite: GRC 101.

### **GRC 325 Binding and Finishing Processes: Theory (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. Fulfillment and mailing operations. Applications of computers to the management and technical function of binding; finishing and distribution. 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 201.

### **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. 2 lectures, 1 laboratory. Prerequisite: GRC 101 and GRC 201.

### **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. Credit not allowed for GRC majors. 2 lectures, 1 laboratory. Prerequisite: GRC 101.

### **GRC 330 Print Reproduction Processes (4)**

The functions of press departments in the print production of books, advertising materials, catalogs, newspapers, business forms, magazines, packaging and quick printing. Standard contract language, press checks, quality assurance systems, pressroom management, color management procedures, digital presses and automated press controls. Credit not allowed for GRC majors. 4 lectures. Prerequisite: GRC 212.

### **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 202 and PSC 101.

### **GRC 337 Consumer Packaging (3)**

Problem-solving strategies for package printing that integrate concepts from management, design and technology. Package manufacturing, function, quality, visual appeal, and economics are addressed. Consumer packaging industry. 2 lectures, 1 laboratory. Prerequisite: Junior standing or consent of instructor.

### **GRC 338 Digital Content Management for Publishing (4)**

Advanced application of type arrangement, digital illustration, image manipulation and page composition. Digital content management strategies: database principles, archiving, document formats, variable data, workflow analysis and repurposing. Technical and creative problem-solving for content production, printing, online publishing and dissemination. 3 lectures, 1 laboratory. Prerequisite: GRC 203.

### **GRC 339 Digital Design and Production for Multiple Media (3)**

In-depth understanding of design and production as it relates to print and on-line digital media. Advanced production techniques in image editing and multimedia applications. Preparation and evaluation of computer-generated images. 2 lectures, 1 laboratory. Prerequisite: GRC 338.

### **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. 1 lecture, 1 laboratory. Prerequisite: GRC 101.

### **GRC 361 Marketing and Sales for Print and Digital Media (4)**

Marketing and sales management for print and digitally-imaged products and services. Graphic communication market determination, market strategy, and implementation. Strategic sales management, personal selling, forecasting and planning. 3 lectures, 1 laboratory. Prerequisite: GRC 101.

### **GRC 377 Web and Print Publishing (4)**

#### **GE Area F**

Web and print publishing technology and its impact on society. The technologies of scanning, typography, graphics, layout, and design for print and World Wide Web publishing. Decision-making considerations. The application of scientific and mathematical principles to web and print publishing technologies. 3 lectures, 1 laboratory. Prerequisite: Completion of Area B and junior standing. Graphic Communication majors will not receive GE Area F credit.

### **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 instructor.

### **GRC 403 Estimating for Print and Digital Media (4)**

Estimating the cost of various kinds of print and digitally-imaged products and services. Development of budgeted hour costs and production standards. Cost estimating methods for prepress, sheetfed press and finishing operations. Paper estimating for flat sheet and bookwork production. Analysis of material, labor and other cost factors. Overview of computer estimating methods. 3 lectures, 1 laboratory. Prerequisite: GRC 315.

### **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 316.

### **GRC 411 Pricing, Costing and Web Estimating (4)**

Coordination of customer service, sales and estimating functions to printing industry market trends. Marketing and pricing strategies for printers. Cost estimating for web processes. Evaluating printing company profitability using ratio analysis. Cost-effective techniques for printers including data collection systems, management information systems, and innovative management practices. 3 lectures, 1 activity. Prerequisite: GRC 316 and consent of instructor.

### **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 316.

### **GRC 421 Production Management for Print and Digital Media (4)**

Production planning, scheduling, and control for print and digitally-imaged products. Equipment and inventory planning, resource optimization, and the application of quality management principles to the printing industry. 3 lectures, 1 activity. Prerequisite: GRC 315, and MATH 117, MATH 118, or MATH 120.

### **GRC 422 Supervision and Personnel Issues for Print and Digital Media (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 or corequisite: GRC 460 or consent of instructor.

**GRC 429 Digital Media (3)**

Current digital media and electronic publishing systems, including CD ROM and Internet publishing. Industry standards such as XML, HTML, PostScript, and PDF. Multimedia authoring; current issues in digital media production and distribution. 2 lectures, 1 laboratory. Prerequisite: GRC 338.

**GRC 431 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: GRC 421.

**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 338.

**GRC 439 Book Design Technology (4)**

Advanced creative problem-solving strategies associated with the technologies used in book design and production. Advanced techniques in page layout, design, typography, type specification and image manipulation as they relate to output technology. Content, format and distribution of print and electronic books. 3 lectures, 1 laboratory. Prerequisite: GRC 338.

**GRC 440 Magazine and Newspaper Design Technology (4)**

Concept development of magazine and newspaper design technology. Design and technical considerations as they relate to output and rendering technology. Application of organizational structures such as grids, formatting and sequential design. Advanced techniques in digital information and image manipulation. Content, format and distribution of print and electronic magazines and newspapers. 3 lectures, 1 laboratory. Prerequisite: GRC 338.

**GRC 460 Research Methods in Graphic Communication (2)**

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, 1 activity. Prerequisite: Senior standing and STAT 217.

**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: GRC 460.

**GRC 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: Consent of instructor.

**GRC 472 Applied Graphic Communication Practices (2)**

Application of theories and practices to University Graphic Systems as they apply to commercial printing, publication printing, digital media and newspaper industries. Major credit limited to 4 units; total credit limited to 18 units. 2 lectures. Prerequisite: GRC 101.

**GRC 473 Applied Graphic Communication Management Practices (2)**

Management theories and practices in the graphic communication industry. Application of theories and practices to University Graphic Systems as they apply to commercial printing, publication printing, digital media and newspaper industries. Major credit limited to 4 units; total credit limited to 18 units. 2 lectures. Prerequisite: GRC 472 and consent of instructor.

**GRC 485 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.

**GRC 495 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.

**GSB-GRADUATE STUDIES-BUSINESS****GSB 500 Independent Study (1-4)**

Advanced study planned and completed under the direction of the Director of Graduate Management Programs. Open only to graduate students who have demonstrated ability to do independent work. Prerequisite: Formal petition with approval.

**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 510 The General Manager I (12)**

The core business knowledge and skills required by all managers. Functional areas covered are: Accounting, economics, finance, government and society, information systems, international business, marketing, organization behavior, production/operations management, and strategy. The course sequence (GSB 510, 520, 530, 540) includes components that focus on integration of functional areas, business strategy, and integration at an enterprise level. 12 seminars. Prerequisite: Graduate standing.

**GSB 511 Financial Accounting (4)**

Financial accounting model and accounting systems concepts. Principles and concepts used in preparing published financial statements. Interrelationships among those statements. Analysis and interpretation of their content. 4 seminars.

**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 515 Staffing (4)**

Processes by which individuals and organizations become matched to form the employment relationship. Specific issues related to human resources planning, internal and external recruitment and selection. 4 seminars. Prerequisite: GSB 583 or equivalent.

**GSB 520 The General Manager II (12)**

Continuation of studies begun in GSB 510. 12 seminars. Prerequisite: GSB 510 and GSB 512.

**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 Advanced Management Information Systems I (4)**

Combines database systems, data analysis and modeling of business applications, and information systems architecture. Provides a basic understanding of data models, including relational, post-relational and object-oriented. Diagramming techniques, including entity-relationship and data flow diagrams through the use of case tools. Information systems architecture and development. Systems analysis methods. Data, processes, network, and object modeling. Web-based database systems. 3 lectures, 1 activity. Prerequisite: CSC 101, CSC 102, BUS 390 and GSB 530.

**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 530 The General Manager III (8)**

Continuation of studies in GSB 510 and GSB 520. 5 seminars, 3 activities. Prerequisite: GSB 520.

**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 Advanced Management Information Systems II (4)**

Interface of system analysis to the system design construction, implementation, and evaluation procedures. User interface design, including event-driven, input, output, and web-based platforms. Prototyping and Rapid Application Development (RAD). Software design, quality, and testing. Transition from process design to process simulation and improvement. Cost estimation techniques. 3 lectures, 1 activity. Prerequisite: GSB 522.

**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 540 The General Manager IV (8)**

Continuation of studies in GSB 510, GSB 520 and GSB 530. 3 seminars, 5 activities. Prerequisite: GSB 520, GSB 530 (or permission), and second year standing.

**GSB 555 Negotiation for Managers (4)**

Negotiation concepts and practice in two-party and multiple-party situations faced by practicing managers. 4 seminars. Prerequisite: GSB 530.

**GSB 561 Seminar in Joint Ventures and Alliances (4)**

Joint ventures and alliances between organizations, using cross cultural, interdisciplinary perspective. Alliance motives, types, and traits. Processes for partner selection, negotiation, structure, operation, and performance assessment of international and cross cultural alliances. 4 seminars. Prerequisite: Second year standing, or consent of instructor.

**GSB 562 Seminar in General Management and Strategy (4)**

Application of interdisciplinary skills to business and corporate strategy formulation and implementation. Analysis of interdependence between external environments and internal systems. Focus on responsibilities, tasks, and skills of general managers. Case studies, group problem solving. Integrating course of MBA core curriculum. Course satisfies comprehensive examination requirement. 4 seminars. Prerequisite: Must be taken within last 24 units prior to graduation and after completion of all MBA first-year required GSB courses or equivalent.

**GSB 565 Services Marketing (4)**

Distinctive approaches required for marketing strategies unique to service organizations and other business entities which define themselves from a services perspective. 4 seminars. Prerequisite: GSB 524.

**GSB 566 Product Management (4)**

Issues that confront brand/product managers; including new product development and brand/product management. 4 seminars. Prerequisite: GSB 524.

**GSB 567 Advanced Seminar in International Business Management (4)**

Integration of management concepts within complex multinational organizations. Interdisciplinary approach to identifying and assessing multinational and global competitive environments and strategies; structuring and managing interdependent multinational operations; addressing conflicts between domestic and international policies and practices in multinational enterprises. Case studies, simulations, group analysis and problem solving. 4 seminars. Prerequisite: Completion of first year MBA core courses or consent of instructor.

**GSB 569 Managing Technology in the International Legal Environment (4)**

Practical legal decisions required to conduct business for or with high technology companies. Methods to protect high technology developments in international markets, including copyrights, patents, trade secrets, trademarks and contracts. 4 seminars. Prerequisite: GSB 514 or equivalent.

**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 and Management (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: GSB 513.

**GSB 573 Market Research and Planning (4)**

Problem and/or opportunity analysis. Secondary and primary research techniques, including survey research and experimental design, data analysis, and reporting. 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 International Business Management (4)**

Managerial concepts and techniques appropriate for analysis and decision making within international businesses. Environmental and organizational factors influencing multinational operations. Assessing international market opportunities and entry modes. Complexities of multinational management strategy, structure and systems. Case studies and simulations. 4 seminars. Prerequisite: Second-year standing or consent of instructor.

**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 Business Marketing (4)**

Identification and development of solutions for customers in business markets. Building alliances and managing relationships with suppliers and customers. 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)**

Human-centered product development, product diffusion and adoption cycles in high-tech markets, and the marketing strategies that are consistent with each phase of the high-tech diffusion cycle. Marketing capabilities enabled by the Internet. 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 advisor.

**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 Designing and Managing Sociotechnical Systems (4)**

Designing organizations as sociotechnical systems. 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 advisor.

**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 Managing Change (4)**

Managing planned change within complex organizations. Managing change and 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 advisor.

**GSB 599 Individual Research (1-4)**

Advanced individual research planned and completed under the direction of a member of the college 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.

## HCS-HORTICULTURE AND CROP SCIENCE

**HCS 110 Orientation to Horticulture and Crop Science (2) (CR/NC)**

Understanding the depth and breadth of horticultural and field crops, and plant protection. Examination of curricula within the department, including potential career opportunities. Introduction to both student and professional organizations and affiliations. Agricultural equipment and chemical safety. Required of all Horticulture and Crop Science students. Credit/No Credit grading only. 2 activities.

**HCS 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. Report required. Prerequisite: Consent of department head.

**HCS 339 Internship in Horticulture and Crop Science (1-12) (CR/NC)**

Selected Horticulture and Crop Science 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. Degree credit limited to 6 units. Credit/No Credit grading only. Prerequisite: Consent of internship instructor.

**HCS 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. Report required. Prerequisite: Junior status or consent of department head.

**HCS 421 Postharvest Technology of Horticultural Crops (3)**

Respiration, ethylene, ripening and senescence; survey of postharvest techniques to maximize commodity shelf-life. 3 lectures. Prerequisite: One production class in fruits, vegetables or ornamentals, or consent of instructor. Concurrent enrollment in HCS 425 required for Crop, Fruit and Environmental Horticultural Science majors only.

**HCS 425 Postharvest Technology of Horticultural Crops Lab (1)**

Determining maturity; measurement of respiration, ethylene, humidity; packaging effects on commodity shelf-life; half-cooling time; chilling injury; maintaining quality of floral crops. Field trip to commercial postharvest facility required. 1 laboratory. Prerequisite: Concurrent enrollment in HCS 421.

**HCS 461 Senior Project (2)**

Selection of a project under faculty advisor 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 HCS 462. Contract drawn up with approval of advisor. Minimum 60 hours. Prerequisite: All 100-200 level courses in curriculum; 135 units; ENGL 134, completion of GE Area A.

**HCS 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 advisor supervision. Minimum 60 hours. Prerequisite: Completion of HCS 461 with a grade of C or better.

**HCS 463 Senior Seminar (1)**

Oral presentations by students and guest speakers on current topics in horticulture and crop science. 1 seminar. Prerequisite: HCS 461.

**HCS 470 Selected Advanced Topics (1-4)**

Directed group study of selected topics for advanced students. *Class Schedule* will list topic selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

**HCS 471 Selected Advanced Laboratory (1-4)**

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 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

**HCS 500 Individual Study in Horticulture and Crop Science (1-3)**

Advanced independent study planned and completed under the direction of a member of the Horticulture and Crop Science faculty. Total credit limited to 6 units; may be in same term. Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

**HCS 539 Graduate Internship in Horticulture and Crop Science (1-9)**

Application of theory to the solution of problems of agricultural production or related business in the fields of horticulture and crop science. Analyze specific management problems and perform general management assignments detailed in a contract between the student, the firm or organization, and the faculty advisor before the internship commences. Degree credit limited to 6 units. Prerequisite: Consent of internship instructor.

**HCS 570 Selected Topics in Horticulture and Crop Science (1-4)**

Directed group study of selected topics for advanced students. *Class Schedule* will list topic selected. Total credit limited to 12 units; may be in same term. 1-4 seminars. Prerequisite: Graduate standing or consent of instructor.

**HCS 571 Selected Topics Laboratory in Horticulture and Crop Science (1-4)**

Directed group laboratory of selected topics for advanced students. *Class Schedule* will list topic selected. Total credit limited to 12 units; may be in same term. 1-4 laboratories. Prerequisite: Graduate standing or consent of instructor.

**HIST-HISTORY****HIST 110 Western Civilization: Ancient to Renaissance (4)**

Beginnings of western civilization from the river valley societies of the Middle East, circa 3,000 BCE to the Renaissance in Western Europe to 1550 CE. Political, economic, social, intellectual, and artistic development of that period. 4 lectures.

**HIST 111 Western Civilization: Reformation to Twentieth Century (5)**

Development of western civilization from 1550 CE to 1900 CE. Comparison of liberal modernization of the West with the retarded, conservative modernization in Central, East and Southeast Europe. Political, economic, social, intellectual, and artistic developments of that period. Particular attention to understanding dynamics that produce pluralistic mass societies in the West and authoritarian mass societies elsewhere. 5 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 chair.

**HIST 206 American Cultures (4) GE D1 USCP**

The social, cultural, constitutional, and political history of African American, Asian American, Native American, European American, and Latino/a men and women. 4 lectures.

**HIST 207 Freedom and Equality in American History (4) GE D1 USCP**

The multiple and conflicting ways in which various Americans (defined in terms of race, class and gender) have struggled to formulate and promote their own understandings of freedom and equality, from the pre-conquest era to the present. 4 lectures.

**HIST 213 Modern Political Economy (4) GE D2**

The relationship between states and economies in the modern period. Themes of modernization, industrialization, and colonial expansion. The major theories of political economy, especially liberalism and socialism. 4 lectures.

**HIST 214 Political Economy of Latin America and the Middle East (4) GE D2**

Comparative examination of socio-economic structures of the Middle East and Latin America in the framework of global economy. Analysis of the historical context of integration of these two regions in the international

economic system and the local reactions to the effects of global forces on national structures. 4 lectures.

**HIST 215 Comparative World History (4) GE D3 (Also listed as HNRS 215)**

Interaction of selected traditional and modernizing non-Western cultures with Western industrial imperialism and its attendant economic, political, and cultural 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. 4 lectures.

**HIST 303 Research and Writing Seminar in History (5)**

Designed to develop student's ability to research and write an interpretive paper on a specific topic. Seminar participants practice the skills of library research, historical and historiographical analysis, and writing and revising. Paper in lieu of final examination. *Class Schedule* will list topic selected. 4 lectures and research project. Prerequisite: Completion of GE Areas A1 and A3, and junior standing or consent of instructor.

**HIST 304 Historiography (4)**

Theories of history: past and present. 3 seminar meetings and research project. Prerequisite: HIST 303.

**HIST 305 History of American Agriculture (4)**

Agricultural development with emphasis upon economic, political and social implications. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

**HIST 306 The Witch-Hunt in Europe, 1400-1800 (4) GE D5**

A history of the development of witchcraft ideas, persecutions, and skepticism in the western world from 1400 to 1800, focusing on the legal, economic, social, and intellectual currents that produced, fired, and eventually ended the phenomenon. 4 lectures. Prerequisite: Completion of GE Area A and two courses from Areas D1, D2, D3, D4. History majors will not receive GE Area D5 credit.

**HIST 307 European Thought, 1800-2000 (4) GE D5**

Intellectual and cultural history of Europe from the nineteenth century to the present. Liberalism, radical thought, feminism, evolutionary theory, psycho-analysis, structuralism, existentialism, and postmodernism. 4 lectures. Prerequisite: Completion of GE Area A and two courses from Areas D1, D2, D3, D4. History majors will not receive GE Area D5 credit.

**HIST 308 The Trans-Atlantic Slave Trade (4) GE D5**

The African, Islam and Euro-American dimensions of the trans-Atlantic slave trade, with focus on its varying roots, organization and impact on cross-cultural and global levels. 4 lectures. Prerequisite: Completion of GE Area A and two courses from Areas D1, D2, D3. History majors will not receive GE Area D5 credit.

**HIST 309 Cultures of West Africa and the African Diaspora (4) GE D5**

The cultures of West African and the African Diaspora, with special attention to the intersection of Animist, Islamic and Western cultures, and the survival of African cultures in the Americas as manifested in the artistic, religious, literary, and other humanistic legacies of the African Diaspora. 4 lectures. Prerequisite: Completion of GE Areas A, D1 and D3. History majors will not receive GE Area D5 credit.

**HIST 310 East Asian Culture and Civilization (4) GE D5**

The pre-modern and modern histories of China and Japan. Focus on the traditional era, the transition to modernity, cultural uniqueness within East Asian civilization, and western images of Asia. 4 lectures. Prerequisite: Completion of GE Area A and two courses from Areas D1, D2, D3, D4. History majors will not receive GE Area D5 credit.

**HIST 311 Early Britain (4)**

History of the British Isles from the reconstruction of Celtic history to the end of the Medieval epoch. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

**HIST 312 Early Modern Britain (4)**

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 and research project. Prerequisite: Junior standing or consent of instructor.

**HIST 313 Modern Britain: Industry, Empire and War (4)**

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 and research project. Prerequisite: Junior standing or consent of instructor.

**HIST 314 The Middle East (4)**

Political, social, and economic development of the Middle Eastern countries in the context of regional history and international politics since the birth of Islam. Particular attention to the resurgence of religious movements and their connection with nationalism and anti-colonialism in the region. 3 lectures and research project. Prerequisite: Junior standing.

**HIST 320 Colonial and Revolutionary America (4) GE D5**

Settlement and evolution of British America, background to the imperial dispute, events leading to the Revolution, Articles of Confederation, Constitution, the national economy, roles of and impact on African-Americans, women, Native Americans and Loyalists. 4 lectures. Prerequisite: Completion of GE Area D1 and completion of Area D2, Area D3, or Area D4. History majors will not receive GE Area D5 credit.

**HIST 321 Civil War America (4) GE D5**

The experiences of nineteenth-century Americans. Focus on industrialization, antebellum reform, slavery, the Civil War battlefield and homefront, Reconstruction, and the creation of a New South. 4 lectures. Prerequisite: Completion of GE Area D1 and completion of Area D2, Area D3, or Area D4. History majors will not receive GE Area D5 credit.

**HIST 322 Modern America (4) GE D5**

American history since 1900. Focus on domestic and foreign policy interactions, struggle of disenfranchised groups for social and political equality, and changes in culture and identity. 4 lectures. Prerequisite: Completion of GE Area D1 and completion of Area D2, Area D3, or Area D4. History majors will not receive GE Area D5 credit.

**HIST 325 Comparative History of American Minorities (3) USCP**

Political, economic and social status of various racial and ethnic groups in the United States, with focus 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. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 328 American Indian History (3) USCP**

Historical examination of Native American cultures; topics of cultural conflict, changing roles of women, and contributions emphasized. Contemporary race, class and gender issues. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 329 American Indian Thought (3) USCP**

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, gender and cultural separatism. 3 lectures. Prerequisite: Junior standing.

**HIST 332 African-American History to 1865 (4)**

History of African Americans from the colonial period to the Civil War, roughly 1619-1865. The slave trade, slavery in the colonies, plantation slavery, the Black West, and free Black culture and institutions. 3 lectures and research project. Prerequisite: HIST 206 or HIST 207; junior standing or consent of instructor.

**HIST 333 African-American History from 1865 (4) USCP**

History of African-Americans from the Civil War to the present. Reconstruction, racial segregation, the Harlem Resistance, the Great

Migration, the Civil Rights Movement, Black Feminism and Black Power. 3 lectures and research project. Prerequisite: HIST 206 or HIST 207; junior standing or consent of instructor.

**HIST 339 History of Colonial Latin America (4)**

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 and research project. Prerequisite: Junior standing.

**HIST 340 History of Modern Latin America (4)**

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 and research project. Prerequisite: Junior standing.

**HIST 341 History of Modern Central America (4)**

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 and research project. Prerequisite: Junior standing or consent of instructor.

**HIST 343 Ancient Greece and Rome (4)**

Foundations of western civilization through study of the origins of the sociopolitical institutions, philosophy, art, science, and technology that shaped the modern world, from the perspective of the two ancient cultures of the Mediterranean. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

**HIST 346 Medieval Europe (4)**

Medieval Europe from the fall of Rome to the plague (400-1350 CE), with topics including the Barbarian Kingdoms, the early Church, Charlemagne, medieval art and Gothic architecture, Church fathers and Scholasticism, medieval philosophy, agricultural and commercial revolutions, and the Great Plague. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

**HIST 347 Renaissance and Reformation Europe (4)**

Europe from 1348 to 1620 CE, with topics including the urban milieu, Renaissance philosophy and artistic expression, the new prince, the educational revolution, the Renaissance Church, Martin Luther, Jean Calvin, and the monumental economic, social, and political changes of the sixteenth century. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

**HIST 348 Religious Wars and Absolutism (4)**

Europe from 1559 to 1715 CE, focusing on the Catholic-Protestant conflict, the rise of the Absolutist state (especially Louis XIV), the "Crisis of the Seventeenth Century," the Thirty Years War, the English Civil War and Cromwell, and the Newtonian Paradigm. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

**HIST 349 The Age of Revolution and Napoleon (4)**

Europe from the death of Louis XIV (1715) to the settlements of the Congress of Vienna (1815). International politics, continental and global warfare, the Enlightenment, "Enlightened Absolutism," the French and Industrial Revolutions, and Napoleon. Political, intellectual, economic, and social developments in the eighteenth century. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

**HIST 351 Europe in the Age of Reaction and Revolution, 1815-1871 (4)**

Reaction to the French Revolution. Industrialization. Liberal socialist and nationalist revolts against the conservative order of 1815. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

**HIST 352 Europe in the Age of Imperialism and War, 1871-1919 (4)**

Maturation of industrialization, socialism and nationalism. Imperialist competition of nation states for world hegemony. Explosion of the First World War. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

**HIST 353 Europe in the Age of Fascism (4)**

Democracy in crisis and the fascist alternatives. Second World War and the recovery of Europe in a bipolar world to the fall of the Berlin Wall, German reunification and the disintegration of Yugoslavia. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

**HIST 354 History of Network Technology (4)****GE Area F**

History of computer network technology from the Cold War to the present. Origins of the Internet, development of TCP/IP, growth of network democracy, encryption, race and gender in cyberspace, Usenet and hypertext. 4 lectures. Prerequisite: Completion of GE Area B and junior standing. History majors will not receive GE Area F credit.

**HIST 358 Cloning (4)****GE Area F**

An integrative and multidisciplinary approach to the study of cloning, to better understand its history, scientific techniques, and their applications. The ethical, social, legal and other issues raised by cloning will also be discussed. 4 lectures. Prerequisite: Completion of GE Area B and junior standing. History majors will not receive GE Area F credit.

**HIST 359 Living in a Material World (4)****GE Area F****(Also listed as MATE 359)**

Evolution of materials (ceramics, metals, polymers, composites, semiconductors) in the context of history. Traces the link between historical and technological developments enabled by materials from the Stone Age to the Electronic Age. 4 lectures. Prerequisite: Completion of GE Area B and junior standing.

**HIST 381 Precolonial African History (4)**

Survey of African history from earliest times. Ancient African civilizations, Moslem penetration, the rise of indigenous kingdoms and the continuous impact of Atlantic slave trade. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

**HIST 382 Modern African History (4)**

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 and research project. Prerequisite: Junior standing or consent of instructor.

**HIST 383 History of American Thought (4)**

Thought and culture in America since the Puritans. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

**HIST 385 Topics in California History (4)**

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 and research project. Prerequisite: Junior standing or consent of instructor.

**HIST 387 History of United States Foreign Relations (4)**

History of American foreign policy from 1900 to the present. Emergence of the United States as a world power early in the century, the retreat following the Great War, Franklin Roosevelt's diplomacy leading to and through the Second World War, atomic diplomacy and the Cold War, four decades of Containment and the search for a new post-Cold War strategy. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

**HIST 390 American Presidency (4)**

Examination of the American presidency with emphasis on its role in American society since the beginning of the twentieth century. From the era of congressional government through the Imperial Presidency of the post-World War II period, and beyond, using presidential biography as a historical source. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

**HIST 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

**HIST 401 Early America (4)**

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 and research project. Prerequisite: Junior standing or consent of instructor.

**HIST 402 American Revolution and the New Nation (4)**

Background to the imperial dispute, events leading to the Revolution, Articles of Confederation, Constitution, impact on the national economy, women, African-Americans, Loyalists, Native Americans. *Class Schedule* will list topic selected. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

**HIST 404 The Era of Civil War and Reconstruction (4)**

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 and research project. 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 408 The Age of Roosevelt: Depression and World War, 1929-50 (4)**

Principle forces affecting the nation's political, social and economic life during the Age of Franklin Roosevelt. Included are the politics of the New Deal, government regulation of the economy and response to the Depression, the rise of the modern presidency, racial and ethnic conflict, the politics of class and gender, the home front at war and post-war tension. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

**HIST 409 Vietnam War at Home and Abroad (4)**

Interaction of revolutionary Vietnamese nationalism with U.S. foreign policy. Analysis of the conduct of the war. Assessment of the impact of the war on U.S. society. 3 lectures and research project. Prerequisite: Junior standing.

**HIST 410 Recent America Since 1950: Shattering of the American Consensus (4)**

Political, social and economic forces that have shaped American life since 1950. Subjects included are the Red Scare, suburbanization, the civil rights movement, the Great Society, the politics and culture of protest, recasting the welfare state, and de-industrialization. Emphasis on racial, ethnic and gender issues in the collapse of the American Consensus. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

**HIST 414 The Fall of Imperial China (4)**

History of China's last dynasty, the Qing (1644-1912). Origins of Manchus, High Qing era of expansion and prosperity, creation of uniquely Manchu dynasty, new contact with Western imperialism, internal rebellions, modern reform policies, and revolution. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

**HIST 416 Modern Japan (4)**

Japan's development as a modern state (1800-2000 CE). Themes include Japan's engagement with modernity and nationalism, the emperor system, Japanese imperialist expansion, and postwar reconstruction of Japanese society. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

**HIST 417 Modern China (4)**

Chinese history in the twentieth century: the fall of the Qing Dynasty and founding of Republic of China in 1912, problems of imperialism and modernity, Chinese Communist Party and People's Republic of China

since 1949. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

#### **HIST 418 Chinese Film and History (4)**

Examination of 20<sup>th</sup> century Chinese history through the use of Chinese feature films. Films (with English subtitles) serve as main texts for understanding the tremendous changes in modern Chinese history, and the evolving relationships between film and Chinese society. 4 lectures. Prerequisite: Junior standing or consent of instructor.

#### **HIST 424 Organizing and Teaching History (3)**

Organization, selection, presentation, application, and interpretation of subject matter in history in secondary schools. 3 seminars. Prerequisite: Admission to teacher education program or valid teaching credential.

#### **HIST 426 Imperial Russia (4)**

Political, social, intellectual and economic roots of Russian Absolutism. Emergence of Russia as an imperial power, reform, reaction and revolution - 1689-1914. 3 lectures and research project. Prerequisite: Junior standing.

#### **HIST 427 Soviet Russia (4)**

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; Civil War; the "experimental" 20s; forced collectivization and industrialization; the Purges; "engineering" a new Soviet Woman and Man for a new communist world; War: Second and Cold. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

#### **HIST 431 South Africa to 1900 (4)**

History of South Africa prior to white rule including the African societies populating the area, their history prior to European contact, the nature of early white settlement, and the impact of mineral discoveries in the 19<sup>th</sup> century. 3 lectures and research project. Prerequisite: One of the following: HIST 315, HIST 381, HIST 382, or consent of instructor.

#### **HIST 432 Twentieth Century South Africa (4)**

History of South Africa in the 20<sup>th</sup> century focusing on the rise and fall of the apartheid state and including Afrikaner nationalism, apartheid legislation, industrial development, and the growth of effective African resistance leading to full democracy. 3 lectures and research project. Prerequisite: One of the following: HIST 315, HIST 381, HIST 382, HIST 431 or consent of instructor.

#### **HIST 434 American Women's History to 1870 (4)**

(Also listed as WS 434)

Female ideology and experience from the colonial period through the American Civil War. Use of a variety of sources, including women's own writing, in order to understand the history of women as it both reflects and shapes American culture and society. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

#### **HIST 435 American Women's History from 1870 (4)**

(Also listed as WS 435)

USCP

The female past in the 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 lectures and research project. Prerequisite: Junior standing or consent of instructor.

#### **HIST 437 Nazi Germany (4)**

Background of German Romantic Nationalism; national unification and defeat in World War I; the failure of Weimar Democracy and political radicalization; the Nazi political, economic, and social revolution 1933-1939. 3 lectures and 1 activity. Prerequisite: Junior standing.

#### **HIST 440 Topics and Issues in the History of the United States (4)**

Selected topics and issues in United States history. Descriptive subtitles assigned to each course. *Class Schedule* will list topic selected. May be repeated to 8 units. 3 lectures and a research project. Prerequisite: Junior standing or consent of instructor.

#### **HIST 441 Topics and Issues in European History (4)**

Selected topics and issues in European history. Descriptive subtitles assigned to each course. *Class Schedule* will list topic selected. May be repeated to 8 units. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

#### **HIST 442 Topics and Issues in Latin American History (4)**

Selected topics and issues in Latin American history. Descriptive subtitles will be assigned to each course. *Class Schedule* will list topic selected. May be repeated to 8 units. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

#### **HIST 443 Topics and Issues in Asian History (4)**

Selected topics and issues in Asian history. Descriptive subtitles will be assigned to each course. *Class Schedule* will list topic selected. May be repeated to 8 units. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

#### **HIST 444 Topics and Issues in African History (4)**

Selected topics and issues in African history. Descriptive subtitles will be assigned to each course. *Class Schedule* will list topic selected. May be repeated to 8 units. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

#### **HIST 445 Topics and Issues in Comparative History (4)**

Selected topics and issues in comparative history. Descriptive subtitles will be assigned to each course. *Class Schedule* will list topic selected. May be repeated to 8 units. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

#### **HIST 450 History Internship (6-12) (CR/NC)**

Supervised work experience using skills of the discipline of history in a public agency ranging from 18 to 36 hours per week. Interns work directly under the supervision of an employee of the agency and are subject to the professional responsibilities typical of the state. Credit/No Credit grading only. Prerequisite: Junior standing. Completion of HIST 303 with grade of B or better and consent of internship coordinator.

#### **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 303, HIST 304, History major.

#### **HIST 463 Undergraduate Seminar (2)**

Historical analysis of selected problems and topics for undergraduates. 2 seminars. Prerequisite: HIST 303, HIST 304.

#### **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. Recommended preparation: Western Civilization Survey, U.S. and California History, History of Art.

#### **HIST 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: 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.

## **HNRS--HONORS**

### **HNRS 100 Orientation to the University Honors Program (2)** (CR/NC)

Introduction to the Honors Program and overview of the University. Topics include the role of higher education, development of academic skills, career advising, and guest speakers from the Cal Poly community. For University Honors Program students only. Credit/No Credit grading only. 1 lecture, 1 activity.

### **HNRS 101 Public Speaking (4)** **GE A2** (Also listed as SCOM 101)

Introduction to the principles of public speaking. Practical experience in the development, presentation, and critical analysis of speeches to inform, to persuade, and to actuate. Not open to students with credit in SCOM 102. 4 lectures.

### **HNRS 112 Race, Culture and Politics in the United States (4)** (Also listed as ES 112) **GE D1 USCP**

Introductory and interdisciplinary study of the ways that race and ethnicity are created by both historical processes and American institutional formation – specifically social, political, economic, legal and cultural institutions. Special attention paid to the interlocking systems of race, class, gender and sexuality. 4 lectures.

### **HNRS 131 General Physics (4)** **GE B3 & B4** (Also listed as PHYS 131)

Fundamental principles of mechanics. Vectors, particle kinematics. 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 141 with grade C- or better, MATH 142 or MATH 182 (or concurrent enrollment), and consent of Honors Program. Recommended: high school physics.

### **HNRS 132 General Physics (4)** **GE B3 & B4** (Also listed as PHYS 132)

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 or HNRS 131.

### **HNRS 141, 142, 143 Calculus I, II, III (4) (4) (4)** **GE B1** (Also listed as MATH 141, 142, 143)

Limits, continuity, differentiation, integration. Techniques of integration, applications to physics, transcendental functions. Infinite sequences and series, vector algebra, curves. 4 lectures. 141 prerequisite: ELM requirement and passing score on Mathematics Placement Examination, or MATH 118 and MATH 119 or equivalent; and consent of Honors Program. 142 prerequisite: HNRS/MATH 141 with a grade of C- or better or consent of instructor; and consent of Honors Program.

### **HNRS 145 Reasoning, Argumentation, and Writing (4)** **GE A3** (Also listed as ENGL/SCOM 145) (formerly HNRS 215)

The principles of reasoning in argumentation. Examination of rhetorical principles and responsible rhetorical behavior. Application of these principles to written and oral communications. Effective use of research methods and sources. 4 lectures. Prerequisite: Completion of GE Areas A1 and A2, and consent of Honors Program.

### **HNRS 148 Reasoning, Argumentation and Professional Writing (4)** **GE A3** (Also listed as ENGL 148)

The principles of reasoning in technical writing. Discussion and application of rhetorical principles, both oral and written, in technical environments. Study of methods, resources and common formats used in corporate or research writing. 4 lectures. Prerequisite: Completion of GE Areas A1 and A2, and consent of Honors Program.

### **HNRS 149 Technical Writing for Engineers (4)** **GE A3** (Also listed as ENGL 149)

The principles of technical writing. Discussion and application of rhetorical principles in technical environments. Study of methods, resources and common formats used in corporate or research writing. 4 lectures. Prerequisite: Completion of GE Areas A1 and A2, and consent of Honors Program. For Engineering students only.

### **HNRS 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 and Honors Program.

### **HNRS 201 Survey of Economics (4)** **GE D2** (Also listed as ECON 201)

Basic principles of microeconomics and macroeconomics. Emphasis on applications to current national and global economic issues. For majors requiring one quarter of economics. Not open to students having previous credit in ECON 222 or equivalent. 4 lectures.

### **HNRS 212 Global Origins of United States Cultures (4)** **GE D3 USCP** (Also listed as ES 212)

How the global dispersal of Europeans, Asians, and Africans, the hemispheric dispersal of Latin Americans, and the forced internal migration of Native Americans have contributed to American cultural heritage and the struggles for ethnic, class and gender equality, and justice. 4 lectures.

### **HNRS 215 Comparative World History (4)** **GE D3** (Also listed as HIST 215)

Interaction of selected traditional and modernizing non-Western cultures with Western industrial imperialism and its attendant economic, political, and cultural 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. 4 lectures.

### **HNRS 251 Great Books I: The Ancient and Classical World—From Myth to Reason (4)** (Also listed as ENGL 251) **GE C1**

Examination of the ancient epics and classical literature of Mesopotamia, Greece, and Rome. Representative readings include "The Epic of Gilgamesh," "The Illiad," "The Odyssey," "Genesis," "Exodus," "Antigone," "The Symposium," "The Aeneid," and Marcus Aurelius's "Meditations." 4 lectures. Prerequisite: Completion of GE Area A and consent of Honors Program.

### **HNRS 303 Economics of Poverty, Discrimination and Immigration (4)** (Also listed as ECON 303) **GE D5 USCP**

Economic analysis of the cause, extent and impact of poverty, discrimination and immigration and of the policies designed to address these socioeconomic issues. Emphasis on the experience of African-Americans, Latinos, and women in the United States. 4 lectures. Prerequisite: Completion of GE Areas A, D1, and ECON 201 or 222.

### **HNRS 304 Values and Technology (4)** **GE C4** (Also listed as HUM 303)

Humanistic investigation into the theoretical and practical applications of technology with specific reference to the social effects of technological change. For all majors. Non-technical. 4 lectures. Prerequisite: Completion of GE Area A and one course from Area C.

**HNRS 310 Air and Space (4)**  
(Also listed as AERO 310)

**GE Area F**

Technological innovations that have led to modern aircraft and spacecraft as viewed from an historical perspective. Development of aerodynamics, propulsion systems, light-weight structures, and control systems. How aviation has affected, and been affected by, history. Impact of aviation on society, including civil and military aircraft/spacecraft. Federal regulation of aviation, including air traffic control and airlines. Future developments in air and space technology. 4 lectures. Prerequisite: Completion of GE Area B, junior standing and consent of Honors Program.

**HNRS 320 Values, Media, and Culture (4)**  
(Also listed as HUM 320)

**GE C4**

Contemporary popular culture and its relationship to the great art and literature of the past. Discussion of television, films, advertising, best sellers, popular magazines, children's stories, comics, and the great tradition of literature. 4 lectures. Prerequisite: Completion of GE Area A and one course from Area C.

**HNRS 375 Technology and the Environment: A Seminar on Contemporary Issues (4) (Also listed as CRP 375)**

Interdisciplinary exploration of significant environmental issues (local, regional, national, or global) where technology is a major cause and/or offers a possible solution. 4 seminars. Prerequisite: Completion of GE Area A and two courses from Areas D1, D2, D3. Honors Program membership or nomination by CRP department head.

**HNRS 490 President's Seminar: Science, Society and the University (4) (Also listed as HUM 490)**

Development of higher education in the United States; the role of science and research in the University; and the response of higher education to changing economic, political and social demands. 4 seminars. Prerequisite: Senior standing, GPA of at least 3.0, or consent of instructor.

## HUM—HUMANITIES

**HUM 250 Computer Applications in the Liberal Arts (4)**

The computer as a problem-solving tool in Liberal Arts research, teaching, data management, scholarship, writing, and other forms of electronic communication. An introduction to microcomputers, networked computer systems, appropriate software, and Internet and WWW resources. The ethical and phenomenological implications of the burgeoning use of technology in the humanities. 3 seminars, 1 laboratory. Prerequisite: ENGL 134.

**HUM 302 Human Values in Agriculture (4)**

**GE Area F**

Technical aspects of controversial agricultural issues. Identification of value conflicts, comparison of potential impacts, and use of relevant ethical principles. Weighing risks and benefits to resolve the issue. Extensive participation and interaction making oral presentations, role playing, and arguing in public forums. 3 lectures, 1 activity. Prerequisite: Completion of GE Area B and junior standing.

**HUM 303 Values and Technology (4)**  
(Also listed as HNRS 304)

**GE C4**

Humanistic investigation into the theoretical and practical applications of technology with specific reference to the social effects of technological change. For all majors. Non-technical. 4 lectures. Prerequisite: Completion of GE Area A and one course from Area C.

**HUM 310 Humanities in World Cultures (4)**

**GE C4**

Interdisciplinary examination of the humanities in a selected culture. Special focus on the arts, literature, philosophy and language in that culture. *Class Schedule* will list topic selected. Repeatable to 12 units with different course titles. 4 lectures. Prerequisite: Completion of GE Area A and one course from Area C.

**HUM 312 Humanities in Chicano/a Culture (4)**

**GE C4 USCP**

Interdisciplinary examination of humanities in Chicano culture. Special focus on the arts, literature, social situations, and the monolingual and

bilingual language aspects in Chicano culture. 4 lectures. Prerequisite: Completion of GE Area A and one course from Area C.

**HUM 316 London: From Roman Colony to World Capitol (4)**

**GE D5**

Selective examination of the historical and cultural legacy of London within the development of Western civilization as well as its influence on the submission and eventual emergence of the non-Western world in the twentieth century. An analytical and interpretive study of how London shaped the social, economic, political and legal institutions of Western society. 4 lectures. Prerequisite: Enrollment in London Study; completion of GE Area A; completion of two courses in GE Area D/E; junior standing or consent of instructor. Co-requisite: Enrollment in HUM 319.

**HUM 319 London Activities (2) (CR/NC)**

Analytical and interpretive survey of the principal center of the English speaking world. The development of London from Roman administrative capital to modern cultural, financial and political colossus. Credit/No Credit grading only. 2 activities. Prerequisite: Limited to London Study students.

**HUM 320 Values, Media, and Culture (4)**  
(Also listed as HNRS 320)

**GE C4**

Contemporary popular culture and its relationship to the great art and literature of the past. Discussion of television, films, advertising, best sellers, popular magazines, children's stories, comics, and the great tradition of literature. 4 lectures. Prerequisite: Completion of GE Area A and one course from Area C.

**HUM 330 Cal Poly Land: Nature, Technology and Society (4)**

**GE Area F**

Scientific investigation of the natural features of the Cal Poly landscape and their transformations by land management technology. Analysis of the environmental, economic, social, and political effects of agricultural, resource extraction and construction technology on that landscape. Emphasis on the educational, land-use and long term planning issues of technology presented by this case study. 4 lectures. Prerequisite: Completion of GE Areas A and B, and junior standing.

**HUM 340 The Content of Our Character (4)**

**GE C4**

Some of the major heroes of Western literature; Homer's Achilles, Sophocle's Antigone, Socrates, King David, Job, Jesus, Hemingway's Lt. Frederick Henry. How the choices they made reflected the moral beliefs of their day. 4 lectures. Prerequisite: Completion of GE Area A and one course in Area C1 or Area C2.

**HUM 350 The Global Environment (4)**

**GE Area F**

(Also listed as AG/BUS/EDES/ENGR/SCM 350)

Interdisciplinary investigation of how human activities impact the Earth's environment on a global scale. Examination of population, resource use, climate change, and biodiversity from scientific/technical and social/economic/historical/political perspectives. Use of remote sensing maps. Sustainable solutions. 3 lectures, 1 activity. Prerequisite: Completion of GE Areas A and B and junior standing.

**HUM 361 Modernism (4)**

**GE C4**

Interdisciplinary survey of the eighteenth, nineteenth and twentieth-century concepts and cultural movements known as modernism throughout Europe, North America and Latin America. Disciplines may include architecture, art, drama, literature, music, philosophy, and photography. 4 lectures. Prerequisite: Completion of GE Area A and one class from Area C.

**HUM 362 Postmodernism (4)**

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: Completion of GE Area A.

**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 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: Completion of GE Area A and junior standing.

**HUM 490 President's Seminar: Science, Society and the University (4) (Also listed as HNRS 490)**

Development of higher education in the United States; the role of science and research in the University; and the response of higher education to changing economic, political and social demands. 4 seminars. Prerequisite: Senior standing, GPA of at least 3.0, or consent of instructor.

**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. Survey of engineering techniques and areas of application in manufacturing and service systems. Career opportunities review. 1 laboratory.

**IME 130 Technical Foundations (2) (CR/NC)**

Introduction to visualization, sketching, and drafting. Basic hand-tools, shop practices, and materials. Clearances and fits, threads and fasteners. Safety. Open to all majors. Credit/No Credit grading only. 1 lecture, 1 laboratory.

**IME 140 CAD and Modeling (2)**

CAD/CAM on UNIX workstations using parameter-driven, surface-bounded solid modeling with total bi-directional associativity between design, drafting, and manufacturing tools. Introduction to Computer-Aided Engineering (CAE) as driven by the CAD solid model. 1 lecture, 1 laboratory. Prerequisite: IME 130 or high school drafting.

**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. 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. 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. Open to all majors. 1 lecture, 1 laboratory.

**IME 144 Introduction to Design and Manufacturing (4)**

CAD/CAM on Unix workstations using parameter-driven, surface-bounded solid modeling with integration between design, drafting, and manufacturing tools. Introduction to conventional machining processes on lathes and mills, computer numerical control, cutting tool design, machining parameters, quality control, production methods, and design for manufacturing. Open to all majors. 2 lectures, 2 laboratories. Prerequisite: IME 130 or high school drafting.

**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. Open to all majors. 1 laboratory. Prerequisite: IME 143 or IME 144 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 156 Basic Electronics Manufacturing (2)**

Practical electronics manufacturing knowledge expanded through concepts such as CAD/CAM design, Design for Manufacture (DFM), documentation requirements, prototyping and production planning. Hands-on techniques learned for project planning, soldering, automation, hand tool usage and production methods. 1 lecture, 1 laboratory.

**IME 157 Electronics Manufacturing (4)**

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. Open to all majors. 2 lectures, 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 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. Recommended: IME 101.

**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 Manufacturing Process Design I (4)**

Economic and engineering analysis of manufacturing processes. Cost estimation for production planning, analysis, and control. Analysis of machining process inputs and mechanisms as an example process. Test report writing, documentation, and inspection methods. Field trips to manufacturing centers. 3 lectures, 1 laboratory. Prerequisite: IME 143 or IME 144, PHYS 131.

**IME 251 Introduction to Manufacturing Engineering Analysis (4)**

State of the art methods and processes in mechanical and electronic manufacturing. Selection of materials for manufacturing. Product design and manufacturability. Specifications and metrology in manufacturing. Continuous improvement strategies, such as automation, group technology, value analysis, and flexible system design. 2 lectures, 2 laboratories. Prerequisite: IME 143 or IME 144, PHYS 131, CHEM 124.

**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 244.

### **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 305 Operations Research II (4)**

Queuing models, dynamic programming and inventory models, Markovian processes, simulation modeling, computer programming in solution of problems. 4 lectures. Prerequisite: IME 301, STAT 312 or STAT 321.

### **IME 312 Data Management and System Design (4)**

Design and management of industrial databases and reporting systems. Relationships of financial accounting databases and production systems. Efficient data entry and reports, queries, macro function, and Internet based database applications. 3 lectures, 1 laboratory. Prerequisite: IME 314, CSC 111 or CSC 234.

### **IME 313 Introduction to Information Systems Engineering (4)**

Practical approach to use of new and existing data communications technologies related to industrial and manufacturing engineering. Use of hardware, operating systems, networks and application software, covered in both theory and practice. 3 lectures, 1 laboratory. Prerequisite: IME 312.

### **IME 314 Engineering Economics (3)**

Economic analysis of engineering decisions. Determining rates of return on investments. Effects of inflation, depreciation and income taxes. Sensitivity, uncertainty, and risk analysis. Application of basic principles and tools of analysis using case studies. 3 lectures. Prerequisite: 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 or consent of instructor, and junior standing.

### **IME 320 Human Factors and Technology (4)**

#### **GE Area F**

Analysis of cognitive, sensory and physical limitations and capabilities of operators and users of technology, both hardware and software, in working and living environments. Analysis of pertinent databases for a proactive approach to designing user-centered industrial products /systems, consumer products, and work environment. Not open to students in engineering or computer science. 4 lectures. Prerequisite: Junior standing and completion of GE Area B requirements.

### **IME 326 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: STAT 312 or STAT 321.

### **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 144, IME 251.

### **IME 335 Computer-Aided Manufacturing I (4)**

Wire-frame, surface, and solid model generation. Benefits, limitations, and selection of CAD and CAM systems. CAD as an input to CAM. Manual, language-based, and graphics-based NC programming. Configuration of CAD/CAM software; post-processor generation. 3 lectures, 1 laboratory. Prerequisite: CSC 234 or CSC 111.

### **IME 336 Computer-Aided Manufacturing II (4)**

Automated production of parts: computerized part programming, post-processor generation and use, and CNC machining center operation. Introduction to flexible manufacturing systems and robotics. 3 lectures, 1 laboratory. Prerequisite: IME 335 or consent of instructor.

### **IME 341 Tool Engineering (4)**

Design and engineering of jigs, fixtures, molds, and dies; material selection. Field trips to manufacturing centers. 3 lectures, 1 laboratory. Prerequisite: IME 241, CE 204, MATH 244, PHYS 133, MATE 210.

### **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, MATH 241. Recommended: STAT 312 or STAT 321.

### **IME 351 Advanced Material Removal Process Design (4)**

Advanced turning and milling processes; grinding and non-traditional processes. Thread and gear manufacturing, producibility, machinability, part and tool materials, cutting fluids, and tool life testing. Finishes and measurement of surface roughness. Process design projects. 2 lectures, 2 laboratories. Prerequisite: IME 352.

### **IME 352 Manufacturing Process Design II (4)**

Advanced engineering analysis of material shaping processes, surface processing and assembly operations with emphasis on optimizing process parameters, equipment, and operational sequence. Process design projects. 2 lectures, 2 laboratories. Prerequisite: IME 141, IME 142, IME 241, MATE 210/215, CE 204.

### **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: EE 321.

### **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 or IME 251, EE 321.

### **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 234 or CSC 231.

**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 239, IME 305, IME 314.

**IME 410 Inventory Control Systems (4)**

Inventory planning and control systems. Implementation of manufacturing resource planning (MRP II) including demand forecasting, production planning, master scheduling, bill-of-material, and inventory master file. Capacity requirements planning and shop floor control. JIT approach to inventory control through pull production system. 3 lectures, 1 laboratory. Prerequisite: IME 305 or IME 342, IME 312.

**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)**

Structure of flexible manufacturing systems. Planning and control for FMS. Tool management and operations control. Application of techniques related to production scheduling decisions. Cellular manufacturing and production flow analysis. Case studies of flexible manufacturing systems. Computer applications. 3 lectures. Prerequisite: IME 301. Recommended: STAT 312 or STAT 321.

**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 or equivalent.

**IME 417 Supply Chain and Logistics Management (4)**

Overview of key logistics and supply chain management concepts. Models and solution methods for the design, control, operation, and management of supply chains. Techniques that are used to analyze supply chains. Team projects in partnership with industry sponsors. 4 lectures. Prerequisite: IME 410 or consent of instructor.

**IME 418 Product-Process Design (4)**

Strategic engineering management of product design and manufacturing competitiveness; concurrent engineering. Study of manufacturability constraints in terms of prototyping, designing, testing, pre-production support, processing, quality, delivery, and customer satisfaction. Industrial design projects. Field trip to manufacturing centers. 3 lectures, 1 laboratory. Prerequisite: IME 314, IME 341, IME 356. Recommended: IME 342 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 305, IME 312.

**IME 421 Manufacturing Organizations (3)**

Theory and principles for manufacturing organizations. Competitive advantage. Strategic planning and operations management for organizations and teams in a rapidly changing environment. Engineering management concepts and practices. Team-based projects and cases. 3 seminars. Prerequisite: IME 314, PSY 201/PSY 202.

**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 341, IME 426. Recommended: IME 342.

**IME 427 Process Optimization through Designed Experiments (4)**

Experiments for optimization of industrial processes: process variables, response, measurements, analysis and interpretations. Statistical principles in design. Design approaches: conventional methods, response surface methodology, and Taguchi methods. Type of experiments: factorial, fractional factorial, mixture, and orthogonal arrays. Design projects using real world problems. 3 lectures, 1 laboratory. Prerequisite: IME 426 and IME 241 or IME 251 or consent of instructor.

**IME 428 Engineering Metrology (4)**

Measurement of attributes and variables; standards, accuracy and precision; mechanical, electronic and optical/laser measurement systems. Contact and non-contact measurement; straightness, flatness and squareness; GDT (Geometric Dimensioning and Tolerancing); CMM (Coordinate Measurement Machines); surface roughness; metrology for electronic products. 3 lectures, 1 laboratory. Prerequisite: IME 335 or consent of instructor.

**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, design of experiments 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. Specifications and standards. 4 lectures. Prerequisite: IME 326 or equivalent.

**IME 431 Supplier Quality Engineering (4)**

Customer-supplier partnership. Functions of Supplier Quality Engineering. Supplier selection, development, process qualification, concurrent engineering, value engineering. Process characterization, repeatability, consistency, process control. Quality system standards. Supplier survey, audit, rating, measurement of quality, delivery performance and certification. Customer service, corrective action approaches. 3 lectures, 1 laboratory. Prerequisite: IME 430.

**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 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 426.

**IME 437 Advanced Human Factors Engineering (3)**

Team-based approach to human factors assessment of consumer and industrial products, systems, and information technology. Team building principles and techniques; performance measurements and monitoring. Usability analysis and ergonomics auditing through experimental methods. 2 lectures, 1 laboratory. Prerequisite: IME 319, IME 426 or equivalent.

**IME 440 Quality Process Management (4)**

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. 4 lectures. Prerequisite: Junior standing or consent of instructor.

**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 334 or IME 335, and senior standing. Recommended: concurrent enrollment in IME 421.

**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 144, IME 223, IME 305 or IME 342, IME 314, or equivalent. Recommended: IME 319, IME 420.

**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. Recommended 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. 461: 2 laboratories, 462: 3 laboratories. Prerequisite: Senior standing (within 3 quarters of graduation), IME 314, IME 443, or IME 418.

**IME 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: Consent of instructor.

**IME 471 Selected Advanced Laboratory (1-4)**

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 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

**IME 481 Senior Project Design Laboratory I (2)**

Selection and completion of a project by individuals or team which is typical of problems which IE or MfgE graduates must solve in their fields of employment, which is representative of those encountered in professional practice. Project typically involves system design, modeling, analysis and testing. Project method includes costs, planning, scheduling, and appropriate research methodology. Formulation of project outline, literature review, project activity scheduling and regular progress reviews by instructor are required. 2 laboratories. Prerequisite: Senior standing in major and consent of instructor. Note: although IME 481 substitutes for IME 461 students may not use repeat credit for the purpose of increasing GPA.

**IME 482 Senior Project Design Laboratory II (3)**

Continuation of IME 481. Involves research methodology: problem statement, method, results, analysis, synthesis, project design, construction (when feasible), and evaluation/conclusions. Project results are presented in formal written reports suitable for reference library and formal oral reports. 3 laboratories. Prerequisite: IME 481. Note: although IME 482 substitutes for IME 462, students may not use repeat credit for the purpose of increasing GPA.

**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 advisor and supervising faculty member.

**IME 501 Graduate Survey I (4)**

Survey of traditional industrial engineering applications in industrial systems, work method, measurements and analysis. Facilities design, automation and logistics of industrial operations. Human factors and cost estimation of industrial applications. 4 lectures. Prerequisite: Graduate standing.

**IME 502 Graduate Survey II (4)**

Survey of current issues in data analysis and mathematical modeling of industrial systems, Queuing theory, Markov Chains quality control and supply chain issues. 4 lectures. Prerequisite: Graduate standing with approval of instructor.

**IME 503 Applied Statistical Methods in Industrial Engineering (4)**

Application of hypothesis testing, regression models, and ANOVA models to forecasting, process optimization, cost estimation, work measurement, inventory control, scheduling, and ergonomics. Probability distributions of process outputs in industries and service systems such as Normal, exponential, Uniform, Hypergeometric, Binomial, and Poisson. Applications in queuing, reliability, Markov chains. Expectations of random variables. Measures of central tendency and variation. Population and a random sample. Central limit theorem and its application in simulation of processes. 3 lectures, 1 laboratory. Prerequisite: STAT 312 or STAT 321 or equivalent.

**IME 516 Mechatronics Systems Analysis (4)**

Overview of smart products and intelligent manufacturing systems. Tools and technologies utilized in the design, manufacturing, and operations of such products and systems. Artificial Intelligence Technologies and Fuzzy Logic. Design of smart products and intelligent systems. Case studies. Team projects and formal presentations. 3 seminars, 1 laboratory. Prerequisite: IME 416 or ME 405 or equivalent.

**IME 520 Advanced Information Systems for Operations (4)**

Advanced information systems (IS) applications in manufacturing and service operations. Introduction of common IS applications, such as manufacturing execution systems; reporting systems; capacity planning

systems; scheduling systems; and customer inquiry systems. Industry-specific analysis of IS requirements and availability. 4 seminars. Prerequisite: IME 410 or consent of instructor.

#### **IME 526 Advanced Topics in Manufacturing System Design (4)**

Modeling and analysis of manufacturing systems. Advanced topics in manufacturing system design to support development of complex systems: Virtual Reality, discrete event simulation, system architectures, systems integration, scheduling and control of manufacturing systems. Total credit limited to 12 units. 3 seminars, 1 laboratory. Prerequisite: IME 410 or equivalent.

#### **IME 541 Advanced Operations Research (4)**

Operations Research approach to model building. Linear programming and sensitivity analysis. Network flow models. Integer programming, large scale linear programming. Goal programming and multi-attribute decision making. Dynamic programming. Nonlinear programming and search methods. Applications in model building and computer solutions in planning, resource allocation, scheduling, and other industrial and service operations. 3 lectures, 1 laboratory. Prerequisite: Graduate standing and consent of instructor.

#### **IME 542 Reliability Engineering II (4)**

Reliability engineering terminology and definitions. Reliability mathematics; probability plotting; load-strength interference and safety margin. Failure distributions and failure rate models. Weibull analysis; bath tub curve; reliability of parts. Reliability of systems; redundancy; reliability allocation. Maintainability and availability. Failure modes and effects analysis. Fault tree analysis. Failure data analysis; reliability testing; reliability growth testing. Electronic system, mechanical and software reliability. Safety and human reliability; reliability management. 3 lectures, 1 laboratory. Prerequisite: IME 503.

#### **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 (4)**

Review of interest calculations and comparison of economic alternatives. Replacement analysis. Capital planning and budgeting. Mathematical programming and capital budgeting. Utility theory. Decision making under risk and uncertainty. Application of simulation in risk modeling. Benefit-cost analysis. Multi-attribute decision making. Analytic hierarchy process. 3 lectures, 1 activity. Prerequisite: Undergraduate course in engineering economy.

#### **IME 545 Advanced Topics in Simulation (4)**

Validation of simulation models. Statistical techniques for variance reduction. Experimental design and optimization. Comparison of attributes of simulation languages. Review of current manufacturing and service industry applications. Case studies. 3 lectures, 1 laboratory. Prerequisite: IME 420 and graduate standing.

#### **IME 548 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 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 and managing change in organizations. 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)**

Assessing likely future technological environments, speed of change in competitive environments, relationship to business, strategic, and technology plans of firms. Past, present and technological evolution and operational changes. Technological and competitive impact assessment and business/technology strategy development. Use of case studies and company experiences. 4 seminars. Prerequisite: IME 503 or equivalent, and graduate standing.

#### **IME 558 Executive Seminars (4)**

Culminating overview of major issues facing organizations as they meet the challenge to sustain a competitive advantage in a business environment characterized by rapid and pervasive change. Topics include project management, virtual organizations, the service sector, manufacturing futures, and information technology. Total credit limited to 8 units. 2 seminars, 2 supervision. Prerequisite: Advanced graduate program status or consent of instructor.

#### **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)**

Integrated total quality system engineering for manufacturing and service firms. Classical and modern quality philosophies and quality assurance and improvement methods. Statistical methods. Designing for quality, continuous quality improvement, and total quality system integration. Case studies. 4 seminars. Prerequisite: IME 421, IME 430, or equivalent.

#### **IME 570 Selected Advanced Topics (1-4)**

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. 1-4 seminars. Prerequisite: Graduate standing and/or consent of instructor.

#### **IME 575 Critical Technologies (4)**

Scientific, engineering and strategic overview of numerous critical emerging technologies. Topics include: technologies critical for different engineering disciplines, critical to numerous industries, and/or critical to the national interest. Focus on each technology to include: understanding key scientific fundamentals, evaluating commercialization potential to industry, and identifying conditions and outlook for future technological breakthroughs. 3 seminars, 1 laboratory. Prerequisite: Engineering graduate student or consent of instructor.

#### **IME 580 Manufacturing Systems (4)**

Modern approaches in production and inventory planning and control to support large-scale manufacturing systems, material requirements planning (MRP I), manufacturing resource planning (MRP II), and just-in-time (JIT) manufacturing systems. Information requirements, operational issues, and policy matters. 4 seminars. Prerequisite: IME 410 or equivalent.

#### **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 591, 592 Integrated Product Development I, II (4) (4)**

Team taught course addressing: product opportunity identification, customer needs analysis, concept definition, requirements definition, product-process analysis, product specification, design/process description, prototyping, project management, packaging, product promotion/introduction, and manufacturing ramp-up. Team projects in partnership with industry sponsors, field-trips and formal presentations. 3 seminars, 1 laboratory for each. Prerequisite: second year MS/MBA.

#### **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 596 Team Project/Internship (4) (6)**

Integrative learning experience through internship and team project with industrial organization. Requires advanced study and focuses on industrial unstructured problem or opportunity requiring integration across disciplines. Team project involves student, faculty, and sponsoring firm representative(s) in a collaborative learning environment, and culminates in comprehensive written report. Total credit limited to 10 units. Prerequisite: Advanced graduate standing, completion of, or concurrent enrollment in, engineering courses in specialization, and consent of participating faculty.

#### **IME 599 Design Project (Thesis) (1-9)**

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 137 Electronic Systems (4)**

Introduction to electronics and electric circuit fundamentals. Essential information for technical managers regarding the universal law, theory, principles, application and troubleshooting of AC, DC, circuits and devices. Familiarity with concepts used extensively in most areas of manufacturing and production as well as the countless electronic products produced. Understanding of inductance, capacitance, resistance, integrated circuit components and the relationship they have with each other. Extensive strategic decision and problem solving skills developed using electronics as the environment. 3 lectures, 1 laboratory.

#### **IT 150 Mechanical Systems (4)**

Introduction to the systems that supply energy, convert energy to power and transmit energy and power, including fossil, atomic and solar resources. Conversion by current power technology systems including reactors, internal and external combustion and direct conversion. Power transmission systems including electrical, refrigeration, pneumatic and hydraulic systems. 4 lectures.

#### **IT 260 Manufacturing Processes (4)**

Application of manufacturing processes and testing using metals and ceramics including base material preparation, forming, fastening and finishing processes. Emphasis on current methods of manufacturing, equipment use, safety and material standards. 2 lectures, 2 activities.

#### **IT 300 Symposium Organization (2) (CR/NC)**

Managing the development of a technical information symposium from concept through symposium presentation. Organization of facilities, speakers, dinner meeting, professional meetings, industrial displays, food services, personnel, finances, and advertising. Credit/No Credit grading

only. Total credit limited to 6 units. 2 seminars. Prerequisite: Completion of Area A or equivalent.

#### **IT 301 Technological Issues: Metals Manufacturing and Society (4)**

Survey of metals manufacturing technology and its impact on the quality of life in the United States and the world. History, risks, benefits, health, safety, environments, equipment, materials, processes, strategies of metals and their implications. 2 lectures, 2 activities. Prerequisite: Completion of GE Area B and junior standing.

#### **IT 303 Industrial Quality Assurance (4)**

Principles and techniques of quality assurance as applied to organizations. Emphasis on competitive implications with the integration of fundamental quality assurance techniques and new quality techniques. Technologies focused on continuous organizational improvement. 4 lectures. Prerequisite: STAT 217 or STAT 218.

#### **IT 326 Product Evaluation (4)**

Practical application of value engineering. Systematic application of recognized techniques which identify the function of a product or service, establish the monetary value for that function, and provide the necessary function reliably at the lowest overall cost. 3 lectures, 1 activity. Prerequisite: IT 150 and junior standing.

#### **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. 3 lectures, 1 laboratory. Prerequisite: CHEM 110 or CHEM 111 or equivalent.

#### **IT 329 Industrial Materials (4)**

Structure, properties, applications and limitations of select industrial materials to include ferrous and nonferrous metals, ceramics, glasses, composites, and organic materials. Materials testing and material selection. 3 lectures, 1 activity. Prerequisite: CHEM 110 or CHEM 111 or equivalent.

#### **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 and international 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 Electrical Power Systems (4)**

Industrial operational facility management of electrical power systems providing a broad overview of production, distribution, control, conversion and measurement of electrical power. Specific strategies including advantages and disadvantages of economics, safety, conservation, design and maintenance. Familiarity with electronic devices and industrial motor controls. Electrical power system technology including generators, transformers, motors, inductive loads, conductors, distribution systems and power generation. Use of design and analysis software packages for strategic management decisions. 3 lectures, 1 laboratory. Prerequisite: IT 137, MATH 141 or MATH 221, PHYS 122.

#### **IT 333 Introduction to CAD and MIS (4)**

Computer aided decision making and problem solving in industry utilizing CAD and other computer and communication applications software. Introduction to the essentials of management information systems, grounding in the fundamentals of organizational information systems and their effect on the industrial organization and its employees. 2 lectures, 2 laboratories. Prerequisite: CSC 119 or consent of instructor.

#### **IT 336 Textile Technology (4)**

Physical and chemical characteristics of natural and manufactured fibers. Production of synthetic polymers. Technology of fabric production and finishes. Industrial and consumer applications. Textiles as a global

#### **GE Area F**

industry. Legislation. Laboratory identification of fibers and evaluation of performance properties of fabrics. 3 lectures, 1 laboratory. Prerequisite: Junior standing, completion of Area A and one laboratory science course, or consent of instructor.

#### **IT 341 Plastic Processes and Applications (4)**

#### **GE Area F**

Cultural, social and economic implications of plastics in a worldwide environment. Study of materials, costs, processes, resource management, recycling, safety, laws and regulations. Applied experiences include molding, i.e., injection, blow, rotational and compression; extrusion, casting and plastics fabrication. 3 lectures, 1 laboratory. Prerequisite: Junior standing, completion of GE Area B or consent of instructor. Industrial Technology majors will not receive GE Area F credit.

#### **IT 350 Electrical and Mechanical Controls (4)**

A systems approach to the control of electrical and mechanical equipment and industrial process instrumentation. Topics covered include: Open-loop and closed loop systems, block diagrams, transfer functions, classifications, microprocessor-based control, relays, sensors, actuators, PLCs and feedback control principles. 2 lectures, 2 laboratories. Prerequisite: IT 137, IT 150, PHYS 121 and PHYS 122.

#### **IT 375 Packaging Material and Product Testing (4)**

Survey of tests and procedures for packaging materials and packaging products following ASTM, TAPPI, and ISTA standards. The testing procedures will include tests for shock, vibration, drop, impact, tensile, shear, edge-wise crush, mullen, and incline plane as prescribed for shipment by truck, rail, sea, and air. 2 lectures, 2 activities. Prerequisite: IT 330.

#### **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 Presentations (4)**

Methods, techniques and evaluation of presenting technical information to groups. Individual and group presentations using self-produced aids including computer presentation and visual aid generation, video tape, transparencies, slides, charts, and other media. Computer and other media development techniques and video tape editing. 2 lectures, 2 activities. Prerequisite: Junior standing, SCOM 101 or SCOM 102.

#### **IT 403 Product Quality Control (4)**

Develop a quality program plan for a specific manufacturing or service company incorporating vendor controls, test and inspection requirements, calibration, corrective action, audits and statistical process control techniques which are compatible with the latest standards designed for and by that industry. 4 lectures. Prerequisite: IT 303.

#### **IT 406 Industrial Sales (4)**

Development and implementation of a base of competencies to succeed in industrial sales. Refinement of technical knowledge and selling skills in an industrial setting. Team-taught by Industrial Technology and Marketing faculty. 3 lectures, 1 activity. Prerequisite: BUS 346 and either BUS 371 or IT 407.

#### **IT 407 Applied Industrial Operations (4)**

Implementation of product/project design and operation procedures within an integrated national and international manufacturing environment. Students are required to design/develop, manufacture, assemble and market a product while working in a simulated "real world" environment. The course builds upon and solidifies foundational concepts introduced in the business core program. 2 lectures, 2 laboratories. Prerequisite: A grade of C- or better in both: BUS 346 and IT 301.

#### **IT 408 Corrugated Protective Packaging (4)**

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. International packaging standards and hazmat requirements. 2 lectures, 2 activities. Prerequisite: IT 330, PHYS 121, CHEM 110 or CHEM 111, or consent of instructor.

#### **IT 409 Machinery For Packaging (4)**

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. Material handling and distribution equipment and systems, and storage and retrieval systems. Required field trips to packaging operations. 3 lectures, 1 activity. Prerequisite: IT 330, PHYS 104 or PHYS 121, or consent of instructor.

#### **IT 410 Industrial Planning (4)**

Production planning and control. Linking production planning systems and manufacturing technologies in a global economy. 3 lectures, 1 activity. Prerequisite: IT 333, or consent of instructor.

#### **IT 411 Industrial Safety and Health (4)**

Industrial safety and health: 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: Completion of Area A or consent of instructor.

#### **IT 419 Cooperative Education/Internship (2-12) (CR/NC)**

Work experience in business, industry, government and other areas of student career interest. Periodic written progress reports, final report, and evaluation by work supervisor required. Credit/No Credit grading. Total credit limited to 16 units. Prerequisite: Approval of area chair, sophomore standing, and a CPSLO cumulative GPA of at least 2.5 without being on academic probation.

#### **IT 422 Computer Process Simulation of Operational Systems (4)**

Focus on management of business process flows, utilizing computer process simulation software. Transformation of inputs into outputs by means of capital and labor resources. Models, modeling tools, solution approaches and methodologies for process improvement, including product development within both service and manufacturing organizations. 2 lectures, 2 laboratories. Prerequisite: IT 407.

#### **IT 428 Industrial Strategies (4)**

International and strategic dimensions of concepts as they relate to industrial work forces, resources and industrial leadership, knowledge, skills and methods. Investigate systems and practices, ethics, industrial decision making tools and concepts, and analysis through the use of case studies and individual and team projects. 4 lectures. Prerequisite: IT 410 or consent of instructor.

#### **IT 435 Packaging Development (4)**

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 domestic and international package/product successes and failures. Class project for analysis and solution. 3 lectures, 1 activity. Prerequisite: IT 330.

#### **IT 445 Computerized Manufacturing Processes (4)**

The utilization of computer aided design; computer aided machining and materials processing; robotic control in production, planning and control; flexible manufacturing; concurrent design and production quality. Conceptual foundation providing an integrated production orientation. 2 lectures, 2 activities. Prerequisite: IT 333, IT 407.

#### **IT 446 Textile Product Design and Development (4)**

Organization/structure of the textile and apparel industries. Creating and developing a textile product line; sourcing, pre-production; and

production processes; costing. Markets, distribution channels, store and non-store retailing. Quick response. Quality assurance. Trade associations and professional organizations. 4 lectures. Prerequisite: IT 336.

#### **IT 451 Facility Equipment and Systems (4)**

Develop an understanding of how major mechanical equipment and systems are incorporated in the utility and production support systems of a modern industrial facility. Includes field trips to industrial/commercial facilities. 4 lectures. Prerequisite: IT 150 or consent of instructor.

#### **IT 454 Facilities Development (4)**

Construction and maintenance of physical facilities and equipment as related to plant layout/design, regulatory and environmental compliance, safety/security, energy conservation, and process improvement. 4 lectures. Prerequisite: IT 451 or consent of instructor.

#### **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 (1-4)**

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.

#### **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 advisor and supervising faculty member.

#### **IT 510 Impact of Science and Technology (4)**

Comprehensive study of innovation – ideas implemented successfully in practice. Theories, strategies, and information for directing cutting-edge technological trends in a variety of industries but not limited to: materials, telecommunications, biotechnology, environmental, packaging, transportation, food technology, and facilities. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

#### **IT 512 Improving Productivity Through Technology (4)**

Current and emerging automation technologies, from a technology perspective, and how they are used in manufacturing to provide firms with a competitive advantage. Problems raised and opportunities made available by modern manufacturing automation technologies. Issues concerning technology selection, justification, implementation, technology consistency, and restructuring. 4 lectures. Prerequisite: Graduate standing or consent of instructor.

#### **IT 514 Commercializing Technological Development (4)**

The process utilized in developing technologies for customers. Emphasis on new technology/product development process, including idea generation, concept development, industrial market niche, product research and development, manufacturing, product launch and evaluation. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

#### **IT 520 Leadership of Technology (4)**

The role of technology and importance of technology in corporate production environments. Different approaches to manufacturing leadership, organization and planning, in terms of their impact on decision-making, product development and innovation. 4 lectures. Prerequisite: Graduate standing.

#### **IT 521 Training in Industrial and Technical Systems (4)**

Developing technological training in industry. Integration of people, technology, philosophy, corporate visions, missions, goals, objectives, resources, populations, facilities, budgets and evaluation in the

development of industrial training curriculum and instruction. 4 lectures. Prerequisite: Graduate standing or consent of instructor.

#### **IT 522 Facility Planning (4)**

Methods and techniques for prospective planners of the modern industrial facility, including but not limited to: site selection, layout, materials handling, utilities, color and lighting, sound, air, safety standards, and current trends. 4 lectures. Prerequisite: Graduate standing.

#### **IT 527 Trends and Issues in Technology (4)**

In-depth study of key current trends and issues relative to the American workforce. Variable topics include teams, team building, and managing diversity in today's workforce. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

#### **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 (4)**

Survey of historical influences in the development of today's journalism. Contributions of women and minorities to American mass media. Rise of technology in the communication industry. 4 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 134.

#### **JOUR 205 Agricultural Communications (4)**

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. Writing on agriculture-related issues. 3 lectures, 1 activity.

#### **JOUR 218 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 233 Copy Editing (4)**

Introduction to the techniques of newspaper, magazine, and on-line copy desk work. Rewriting and editing copy and headlines for news, feature stories, and on-line material. Headline, caption, and display copy writing. Ethical issues in copy editing. Selecting, cropping, and writing captions. Art/photography selection, sizing, and cropping. Basic editing functions of Photoshop and Quark. Practical laboratory experience in editing. 3 lectures, 1 laboratory. Prerequisite: JOUR 203 or equivalent.

#### **JOUR 290 Multicultural Journalism (4)**

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. Emerging minority groups from developing countries and their media. 4 lectures.

**USCP**

**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, news directors. 4 lectures. Prerequisite: JOUR 203.

**JOUR 304 Reporting Contemporary Issues (4)**

Experience leading to advanced skills in reporting and writing stories about contemporary issues, government and courts. Field and laboratory assignments focusing on beat reporting, coverage of speeches and meetings, investigative techniques and interpretive reporting. 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 320 Telecommunications and Broadcasting (4)**

Introduction to telecommunications, broadcast and electronic media. Examination of the structure of media organizations, the technologies involved and programming content. Analysis and understanding of that content in terms of perceived target audiences. 4 lectures. Prerequisite: ENGL 134 and SCOM 101 or SCOM 102.

**JOUR 331 Contemporary Advertising (4)**

Principles of advertising, copy, layout, and production for print and broadcast media. Economic, political, and social function of advertising in a free market society. Advertising ethics. Social responsibility of advertising in a multicultural environment. Emerging advertising technologies. Advertising on the Internet. 4 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 335 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 333.

**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 and Production (4)**

Broadcast skills including writing, announcing, editing, and production. Editing and production of news wraps, promos, public service announcements, commercials and interviews. 3 lectures, 1 activity. Prerequisite: JOUR 333.

**JOUR 351 Advanced Radio Reporting: KCPR (2)**

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. 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 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; non-majors: consent of instructor.

**JOUR 385 Mass Media Criticism (4)**

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: SCOM 101 or SCOM 102, and junior standing.

**JOUR 390 Visual Communication for the Mass Media (4)**

Theory and application of visual communication in today's print, broadcast and public relations media. Extensive experience in visual and text manipulation for effective information communication. 3 lectures, 1 laboratory. Prerequisite: JOUR 233 and JOUR 304.

**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 Journalism Ethics (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: Junior standing, JOUR 218.

**JOUR 407 Feature Writing (4)**

Practice in researching, interviewing, writing and marketing nonfiction articles for print media, and analysis of similar work in current distribution. 4 lectures. Prerequisite: JOUR 203 or consent of instructor.

**JOUR 410 Computer Assisted Reporting (4)**

Exploration of the uses of computers for newsgathering and reporting. Focus on information gathering from mass media, governmental and corporate data bases and contextual manipulation using personal computers and mainframe computers. Commercial online and Internet tools (such as the World Wide Web) and database tools used for day-to-day and project oriented reporting. 3 lectures, 1 laboratory. Prerequisite: 200-level Statistics course, JOUR 351/352/353 and JOUR 390.

**JOUR 412 Applied Public Relations (4)**

Production of public relations materials for actual clients, internal and external. Needs of clients, including departmental and college units. Creation of print, broadcast and web products that serve actual public relations needs. 3 lectures and 1 activity. Prerequisite: JOUR 342 and JOUR 390.

**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 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.

## **JPNS-JAPANESE**

#### **JPNS 101, 102, 103 Elementary Japanese (4) (4) (4)**

Beginning Japanese class practice in pronunciation, sentence structure, reading, writing, basic conversation, and introduction to Japanese culture. Activity drill required. To be taken in numerical sequence. 3 lectures, 1 activity.

## **KINE-KINESIOLOGY**

(See also PE-Physical Education)

### **PROFESSIONAL ACTIVITIES**

Priority for enrollment given to those students pursuing a major in Kinesiology. Kinesiology majors may apply a maximum of 24 units of credit earned in PE 101-199 or KINE 206-239 toward the bachelor's degree. When applicable, course selection should be determined by the student after consultation with his/her advisor. 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.

- KINE 206 Gymnastics (2)
- KINE 208 Golf (1)
- KINE 210 Tennis (1)
- KINE 211 Softball-Baseball (1)
- KINE 212 Handball/Racquetball (1)
- KINE 213 Basketball (1)
- KINE 214 Volleyball (1)
- KINE 216 Wrestling (1)
- KINE 217 Flag Football/Football (1)
- KINE 218 Aquatics (2)
- KINE 219 Progressive Strength Training (1)
- KINE 220 Group Fitness Activities (2)
- KINE 221 Combatives/Self Defense (1)
- KINE 222 Archery (1)
- KINE 223 Cross Country and Track Events (1)
- KINE 224 Field Events (1)
- KINE 225 Team Handball (1)
- KINE 226 Soccer (1)
- KINE 227 Aerobic Dance Exercise (2)
- KINE 228 Cooperative Games and Activities (1)
- KINE 229 Badminton (1)

### **ACADEMIC COURSES**

Professional courses designed primarily for the student majoring in kinesiology.

#### **KINE 241 Understanding Fitness and Training (1)**

Introduction to physiological principles and factors which provide the basis for the development and maintenance of optional physical fitness. 1 lecture. Prerequisite: Concurrent enrollment in PE 110, PE 116, PE 125, PE 131, PE 145, PE 146, PE 147, PE 154 or PE 156.

#### **KINE 243 Lifeguard Training (3) (CR/NC)**

Lifeguarding skills and knowledge needed to prevent and respond to aquatic emergencies. Successful completion of this course will result in American Red Cross certifications in Lifeguard Training, First Aid, and CPR for the Professional Rescuer. Credit/No Credit grading only. 2 lectures, 1 activity.

#### **KINE 250 Healthy Living (4)**

**GE D4**

Personal health and promoting health behavior change. Drug education, psychosocial health, nutrition, infectious and noninfectious diseases, violence and abuse, healthy relationships and sexuality, early childhood and adolescent health. Not open to students with credit in KINE 255. 3 lectures, 1 recitation.

#### **KINE 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: GE B1b.

#### **KINE 255 Personal Health: A Multicultural Approach (4)**

**GE D4 USCP**

Introduction to personal health with special emphasis on multicultural practices. Not open to students with credit in KINE 250. 3 lectures, 1 recitation.

#### **KINE 270 Orientation to Kinesiology (2)**

Designed to acquaint the student with the concept of kinesiology as a profession and to orient the student to the Cal Poly program. 2 lectures.

#### **KINE 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.

#### **KINE 276 Athletic Coaching Theory (3)**

Basic concepts, methods, practices, strategies and philosophies as they apply to competitive athletics. 3 lectures.

#### **KINE 277 Coaching Practicum (2-6)**

Practical experience through the actual coaching of a competitive sports team. 2-6 activities; minimum of 2 hours per week per unit. Total credit limited to 6 units. Prerequisite: KINE 276 and consent of advisor.

#### **KINE 280 Responding to Emergencies: First Aid/CPR (3)**

An American Red Cross certification course, more comprehensive than a Standard First Aid course. Skills and knowledge necessary in the treatment of life-threatening emergencies and other injuries and sudden illnesses. Red Cross First Aid/CPR certifications issued upon successful completion of certification requirements. 2 lectures, 1 activity.

#### **KINE 300 Planning Techniques in Physical Education (5)**

History and philosophy of physical education in educational settings. Practical skills and techniques of teaching physical education in schools. Unit and lesson planning, class management, teaching aids, implementation and evaluation of a lesson in a laboratory setting. 3 lectures, 2 activities. Prerequisite: 2 professional activities or equivalent.

#### **KINE 301 Muscle Anatomy (1)**

Functional organization of the human muscular system. All major muscle groups, with emphasis on segmental motion. 1 laboratory. Prerequisite: ZOO 331 or concurrent enrollment.

#### **KINE 302 Biomechanics (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 331 (*transfer equivalent ZOO 240*) and KINE 301.

#### **KINE 303 Physiology of Exercise (4)**

Application of the knowledge of human physiology to exercise situations. 3 lectures, 1 laboratory. Prerequisite: ZOO 331, 332 (*transfer equivalent ZOO 240, 241*). Recommended: FSN 210.

#### **KINE 305 Drug Education (2)**

Instruction on the nature and effect of the use of tobacco, alcohol, narcotics and restricted dangerous drugs. 2 lectures. Prerequisite: KINE 250.

**KINE 307 Adapted Physical Activity (4)**

Major categories of disabling conditions with implications for the development of physical activity programs for specific disabilities. 3 lectures, 1 laboratory. Prerequisite: GE Area B2 and B3, sophomore standing. Recommended: ZOO 331, 332 (*transfer equivalent ZOO 240, 241*).

**KINE 309 Creative and Nontraditional Games (3)**

Introduction of preparatory teachers to non-traditional and multicultural games and activities which address the State Framework and the National Standards. Students present the activities in a manner which demonstrates effective models of instruction, including maximum participation. 1 lecture, 2 activities. Prerequisite: KINE 300.

**KINE 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: GE D4 (See page 79 for GE requirements.)

**KINE 315 Field Sports (3)**

Basic skill development and instructional strategies related to the following sports: soccer, speedball, ultimate frisbee, speed-a-way, field hockey, and lacrosse. 1 lecture, 2 activities. Prerequisite: KINE 300.

**KINE 317 Computer Applications in Kinesiology (2)**

Experiences focusing on applications of computers, data processing and information technology as they relate to understanding and solving specific problems in the field of kinesiology. Total credit limited to 4 units. 2 activities. Prerequisite: GE Area F or consent of instructor.

**KINE 319 Measurement and Evaluation in Kinesiology (4)**

Principles of test selection and administration, measurement and evaluation of data characteristics, and data analysis related to motor behavior and the performance of physical skills. How the personal computer and various software can be used to enhance the entire process. 3 lectures, 1 activity. Prerequisite: KINE 317 and STAT 217 or STAT 218.

**KINE 322 Sport and Popular Culture: Film (4)**

Identifying and analyzing various social themes and messages present in sport films. Exploration of meaning, role and place of sport films in American society and culture. 4 lectures. Prerequisite: Completion of GE Areas A, D1 and D3.

**KINE 323 Sport and Gender (4)****GE D5 USCP**

Intersections between sport and gender in American society. Identification and discussion of the historical, sociological and psychological issues that affect the sport experiences of males and females, especially as they relate to class, race/ethnicity, sexuality, and political movements. 4 lectures. Prerequisite: Completion of GE Areas A, D1 and either D3 or D4. Kinesiology majors will not receive GE Area D5 credit.

**KINE 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: KINE 250 or KINE 255.

**KINE 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: KINE 206 and KINE 300, or consent of instructor.

**KINE 384 Water Safety Instructor (4)**

Analysis of swimming strokes and techniques with emphasis on teaching methods for beginners through advanced swimmers. Those students who complete the course requirements are eligible for American Red Cross

Water Safety Instructor certification. 2 lectures, 2 activities. Prerequisite: Demonstrate proficiency in swimming or instructor permission.

**KINE 385 Lifeguard Instructor (3)**

Analyzing lifeguarding, CPR and First Aid skills with emphasis on techniques and methods for teaching rescue skills. Upon successful completion of this course, American Red Cross certifications Lifeguard Instructor, CPR for the Professional Rescuer Instructor, and community First Aid and Safety Instructor will be issued. 2 lectures, 1 activity. Prerequisite: KINE 243 or equivalent certifications.

**KINE 396 Outdoor Education (3)**

Planning and implementation of outdoor education activities appropriate for K-12<sup>th</sup> grade physical education programs. Includes but is not limited to Project Adventure, orienteering, backpacking, ropes course, and a water sport. 1 lecture, 2 activities. Prerequisite: KINE 300, and KINE 384 or equivalent.

**KINE 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.

**KINE 401 Managing Kinesiology Programs (3)**

Planning, organizing and controlling programs in public, commercial, private and clinical physical activity settings. Emphasis on legal, ethical and budgetary considerations. 3 lectures. Prerequisite: KINE 319.

**KINE 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: Computer literacy and KINE 317, or consent of instructor.

**KINE 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.

**KINE 405 Community Health Promotion (4)**

Application of methods to educate and empower communities toward actions that resolve health issues and problems. Sociological, historical, educational, environmental and biological influences on health status. 3 lectures, 1 activity. Prerequisite: KINE 250 or KINE 255, junior standing. Recommended KINE 443.

**KINE 406 Neuroanatomy (4)**

Structure and function of the human nervous system. Afferent and efferent pathways involved in perception and action. Behavioral aspects of motor control and related neurological dysfunction and pathologies. Designed for allied health professions students. 4 lectures. Prerequisite: ZOO 331, ZOO 332, and KINE 301.

**KINE 408 Exercise and Health Promotion for Senior Adults (4)**

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, 1 activity. Prerequisite: KINE 250, senior standing or consent of instructor.

**KINE 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 and junior standing.

**KINE 411 Psycho/Social Aspects of Physical Activity (3)**

Psychological and sociological effects of physical activity on individuals and groups in American society. 3 lectures. Prerequisite: Completion of GE Areas A and D3, PSY 201 or PSY 202, and junior standing.

**KINE 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. 3 lectures. Prerequisite: Upper division standing and consent of instructor for non-KINE/REC majors.

**KINE 419 Physical Education Program Content in the Elementary School (3)**

Cognitive and psychomotor competencies required to design a developmental physical education program for elementary aged school children. 2 lectures, 1 activity. Prerequisite: KINE 300. Recommended: PSY 210/202, KINE 206.

**KINE 420 Aquatic Facility Management and Operation (4)**

Principles of aquatic facility management; swimming pool purification and filtration systems. Aquatic facility safety; instructional programming. Successful completion of this course and attainment of appropriate scores on written tests will result in two national certifications: Certified Aquatic Manager and Pool Operator on Location. 4 lectures. Prerequisite: KINE 384 or consent of instructor.

**KINE 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: KINE 300, KINE 419, and 2 activity classes.

**KINE 422 Teaching Elementary School 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: KINE 300, KINE 419, and KINE 421.

**KINE 423 Teaching Middle School Physical Education (3)**

Techniques for teaching physical education in middle school. Emphasis on class organization, lesson plan development and evaluation, class management and control, and understanding the middle school setting. 1 seminar, 2 laboratories. Prerequisite: KINE 206, KINE 422.

**KINE 424 Organization and Implementation of a K-12 Physical Education Program (3)**

Organization, selection, presentation, strategy, application, and interpretation of K-12 subject matter in physical education. 3 seminars. Prerequisite: KINE 300, KINE 419, KINE 422 and KINE 423.

**KINE 425 Teaching High School Physical Education (3)**

Techniques for teaching physical education in high schools. Emphasis on teaching strategies, organization, lesson plan development, self-evaluation, class management, and behavior management. 1 seminar, 2 laboratories. Prerequisite: KINE 300, KINE 421, KINE 422, KINE 423, and one 300-level activity class.

**KINE 426 Senior Seminar for Teaching Concentration (2)**

Capstone course which engages students in activities that integrate the sub-disciplines of kinesiology, facilitates the development of a personal portfolio, and prepares the student to apply to a credential program. 2 seminars. Prerequisite: KINE 300, KINE 421, KINE 422, KINE 423, and KINE 425. One of these classes may be taken concurrently.

**KINE 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: KINE 241 and KINE 252 for non-KINE majors; KINE 252 and senior standing for KINE majors.

**KINE 434 Planning Health Promotion Programs: Theory and Practice (4)**

Theory and methods to facilitate individual and group behavior change to promote health and prevent premature disease, disability, and death. Concepts in the behavioral sciences affecting health behavior, motivation,

and decision making. Development of planning and evaluation skills. 3 lectures, 1 activity. Prerequisite: KINE 250 or KINE 255 and junior standing.

**KINE 436 Community Health Education Fieldwork (2-6) (CR/NC)**

Practical work experience in community health education/promotion at approved sites under the direct supervision of qualified on-site supervisor. Total credit limited to 6 units. Credit/No Credit grading only. Minimum of 20 contact hours per unit. Prerequisite: KINE 405.

**KINE 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 advisor.

**KINE 438 Adapted Physical Activity Fieldwork (1-3) (CR/NC)**

Practical experience in adapted physical activity programming. Students plan and conduct physical activity programs for subjects who are disabled. Total credit limited to 6 units. Credit/No Credit grading only. Prerequisite: KINE 307, and consent of instructor.

**KINE 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: KINE 423 or consent of instructor.

**KINE 443 Comprehensive School Health Education (4)**

Course content includes the health status of children K-12, and the recommendations of the California Health Framework. 4 lectures. Prerequisite: KINE 250 or KINE 255 and KINE 354 (Health concentration students) or KINE 300 (Teaching concentration students).

**KINE 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: KINE 303, or consent of instructor.

**KINE 446 Echocardiography (4)**

Basic principles of echocardiography, including practical skills of the echocardiographer. Recognition of normal echocardiographic patterns and abnormalities, including those caused by pathology and exercise conditioning. 2 lectures, 2 laboratories. Prerequisite: KINE 445.

**KINE 450 Worksite Health Promotion Programs (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: SCOM 301, KINE 250 or KINE 255, and KINE 434.

**KINE 451 Nutrition for Fitness and Sport (5)**

Application of nutritional and metabolic facts to selected aspects of physical training, degenerative disease, obesity and weight control, diet manipulation and modification in sport, nutritional supplementation and special dietary considerations for the young and old, male and female athletes. 5 lectures. Prerequisite: KINE 250 or KINE 255, KINE 303. Recommended: CHEM 313.

**KINE 452 Testing and Exercise Prescription for Fitness Specialists (4)**

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. 2 lectures, 2 laboratories. Prerequisite: FSN 210, KINE 303, KINE 445 or consent of instructor.

**KINE 461 Senior Project (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Prerequisite: KINE 302, KINE 303, KINE 319, KINE 402 and junior level writing course.

**KINE 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. Minimum 30 hours total time. Prerequisite: KINE 461 and consent of advisor.

**KINE 463 Clinical and Worksite Health Promotion Field Work (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 KINE 463.

**KINE 470 Selected Advanced Topics (1-4)**

Directed group study of selected topics for advanced students. *Class Schedule* will list topic selected. Total credit limited to 8 units. 1-4 lectures. Prerequisite: Consent of instructor.

**KINE 471 Selected Advanced Laboratory (1-4)**

Directed group laboratory study of selected topics for advanced students. *Class Schedule* will list topic selected. Total credit limited to 8 units. 1-4 laboratories. Prerequisite: Consent of instructor.

**KINE 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.

**KINE 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.

**KINE 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: KINE 517 and consent of department head, graduate advisor, and supervising faculty member.

**KINE 502 Current Trends and Issues in Physical Education and Sport (3)**

Practical problems in physical education and sport and their solution in terms of desired objectives in these fields. 3 seminars. Prerequisite: Graduate standing.

**KINE 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: KINE 250 or KINE 255 and graduate standing or consent of instructor.

**KINE 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 332 (*transfer equivalent* ZOO 241), KINE 303.

**KINE 510 Communication and Health Behavior Change (3)**

Contemporary theory and research related to promoting healthy behavior. Health problems from biological, ecological, and psycho-social perspectives. Behavioral change strategies integrated into activities and programs for the purpose of acquiring and maintaining behaviors which enhance health status and overall well-being. 3 seminars. Prerequisite: KINE 250 or KINE 255, KINE 411 or KINE 434.

**KINE 511 Administration of Athletics (3)**

Principles and techniques of administration of athletics at all levels, i.e., elementary school through college. 3 seminars. Prerequisite: Graduate standing.

**KINE 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: KINE 250 or KINE 255, KINE 411 or KINE 434, and KINE 510.

**KINE 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: KINE 250, KINE 401 or consent of instructor.

**KINE 516 Managing Clinical/Worksite Health Promotion Programs (3)**

Application and development of principles, procedures and concepts for managing and facilitating promotion in various health and fitness settings. 3 seminars. Prerequisite: KINE 450.

**KINE 517 Research Methods in Kinesiology (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: KINE 319 or consent of instructor.

**KINE 519 Evaluation of Current Studies (3)**

Analysis and evaluation of published studies in physical education, health education and recreation. 3 seminars. Prerequisite: KINE 517.

**KINE 522 Advanced Biomechanics (3)**

Advanced biomechanical concepts applied to human movement, examination of research, and biomechanical analyses of movement activities. 2 seminars, 1 laboratory. Prerequisite: KINE 302 or equivalent.

**KINE 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.

**KINE 526 Sport in American Society (3)**

Understanding the role of physical education and sport in American society as viewed from sociological perspectives. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**KINE 530 Advanced Physiology of Exercise (4)**

Physiological determinants of physical work capacity and sports performance. 3 seminars, 1 laboratory. Prerequisite: KINE 303.

**KINE 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: KINE 445 or equivalent.

**KINE 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 Kinesiology. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor. Student must be advanced to candidacy.

**KINE 539 Observation and Analysis of Teaching Physical Education and Coaching Sports (3)**

Observation and analysis of teaching physical and sport education with special emphasis in pedagogical systems. 2 seminars, 1 activity. Prerequisite: KINE 421 or equivalent.

**KINE 581 Graduate Seminar in Kinesiology (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.

**KINE 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.

**KINE 599 Thesis or Project (3) (3)**

Completion of a thesis or project pertinent to the field of kinesiology. Independent research under the guidance of the faculty. Prerequisite: KINE 519, consent of graduate committee and supervising faculty member.

## LA–LANDSCAPE ARCHITECTURE

**LA 109 Visual Literacy and Design Communication in Landscape Architecture (4)**

A special course recommended for students transferring from the community colleges. The basics of visual literacy and design communication in landscape architecture. Topics also include plans, sections, oblique drawings and perspective views. 4 laboratories.

**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. 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)**

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 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 221 Native Plants for Landscape Architects (3)  
(Also listed as BOT 221)**

Introduction to the horticultural characteristics and landscape design potential of California native plants. Includes experiences in field identification, basic planting design, installation and maintenance techniques. Required field trips. 2 lectures, 1 laboratory. Prerequisite: BIO 114 or BOT 121 or consent of instructor.

**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. 3 laboratories. Concurrent: LA 252. Prerequisite: LA 114, BRAE 237, MATH 118/119.

**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. 4 laboratories. Prerequisite: LA 110, LA 111, LA 114, or consent of instructor.

**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. 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 in Landscape Architecture.

**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: Computer literacy elective or consent of instructor.

#### **LA 311 History of Landscape Architecture (4)**

Historical investigation of human activity and how it shaped environments. Consequences are examined for entire continents or as isolated statements in individual gardens. The metaphor of “garden” provides understanding for agrarian regions, urban spaces, and vernacular landscapes of the world. 4 lectures. Prerequisite: Consent of instructor.

#### **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. 2 lectures, 1 laboratory. Prerequisite: Upper division standing in ARCH, LA, CRP or related discipline.

#### **LA 317 The World of Spatial Data and Geographic Information Technology (4) GE Area F (Also listed as BIO/FNR/GEOG 317)**

Basic foundation for understanding the world through geographic information and the tools available to utilize spatial data. Application of Geographic Information Systems (GIS) and related technologies, including their scientific basis of operation. 3 lectures, 1 activity. Prerequisite: A course in computer science, completion of Area B, and junior standing. Earth Sciences, Forestry and Natural Resources, Landscape Architecture and Social Sciences (Environmental Geography concentration) majors will not receive GE Area D5 credit.

#### **LA 318 Applications in GIS (3) (Also listed as FNR/GEOG 318)**

ARC/INFO and ArcView Geographic Information System (GIS) computer software to explore natural resources, social and business issues, using spatial data. Develop data base, use software and apply with relevant natural systems. 1 lecture, 2 laboratories. Prerequisite: Junior standing, computer literacy 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, or consent of instructor.

#### **LA 321 Concepts in Environmental Decision Making (3)**

Investigation of theoretical and attitudinal bases of environmentally concerned disciplines. Ecology, perception, behavior and design studies as organizational principles and theories in developing understanding of interface between built and natural environments. 3 lectures. Prerequisite: Consent of instructor.

#### **LA 323 History of Twentieth Century Landscape Architecture (4)**

Philosophies and ethics of important personalities in the environmental design disciplines of the twentieth century. Design theories supporting these individuals' projects and the nature of their practice, combined with the great influential events in industry, the arts and sciences, politics, and society of this century. 4 lectures. Prerequisite: At least one course in either architecture, landscape architecture or planning history.

#### **LA 344 Form and Materials (4)**

Introduction to wide range of materials attendant to landscape architectural concerns and their use in contemporary professional practice.

Issues attendant to the properties of diverse materials and their inherent qualities. Utilization of numerous tools and working process in the exploration of form generation. 2 lectures, 2 activities. Prerequisite: Third-year standing in Landscape Architecture.

#### **LA 349 Advanced Planting Design (3)**

Advanced examination of the theories and applied principles of planting design. Emphasis on connections between art and science in the design of parks, gardens and other landscapes. Case studies and field trips. 2 lectures, 1 activity. Prerequisite: EHS 231, EHS 232 and EHS 381 or LA 221.

#### **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. 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. 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. Prerequisite: Consent of instructor.

#### **LA 401 Research Project (1) (CR/NC)**

Research methods in landscape architecture and proposal writing techniques. Students prepare proposal and strategy for fifth year study in area of concentration. Credit/No Credit grading only. 1 seminar. Prerequisite: LA 451 and LA 452.

#### **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. 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: LA 351.

#### **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. 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. 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. 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 in Landscape Architecture.

**LA 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: Consent of instructor.

**LA 471 Selected Advanced Laboratory (1–4)**

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 8 units. 1–4 laboratories. Prerequisite: Consent of instructor.

**LA 474 Collaborative Studio: Rendering, Animation and Modeling (4) (Also listed as ARCH 474/ART 474)**

A collaborative visualization and design studio focusing on rendering, animation and modeling. Modeling and animation software for design conceptualization and expression. Collaboration in teams with students from the College of Architecture and Environmental Design and the Art and Design Department. Total credit limited to 8 units. 2 lectures, 2 activities. Prerequisite: ART 335 or ARCH 350 or LA 310, ARCH 460 or 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 standing or graduate standing, or consent of instructor.

**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. Total credit limited to 36 units. 1–12 activities. Prerequisite: Fourth or fifth year standing, or consent of instructor.

**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: Junior 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: Junior 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: 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 302 Library Resources and Literature Searches (1–4)**

Sources of information and search strategies in major subject fields. Reference materials, bibliographic aids, indexing and abstracting tools, and Internet sources. Evaluation of sources. *Class Schedule* will list major subject area covered. Total credit limited to 4 units. 1–4 lectures. Prerequisite: ENGL 134, junior standing or consent of instructor.

**LIB 402 Library Resources and Literature Searches (1-4)**

Sources of information and search strategies in major subject fields. Reference materials, bibliographic aids, indexing and abstracting tools, and Internet sources. Evaluation of sources. *Class Schedule* will list major subject area covered. Total credit limited to 12 units. 1-4 lectures. Prerequisite: ENGL 134, junior standing or consent of instructor.

**LIB 502 Library Resources and Literature Searches (1-4)**

Courses of information and search strategies in major subject fields. Reference materials, bibliographic aids, indexing and abstracting tools, and Internet sources. Evaluation of sources. Literature review process for a master's thesis. *Class Schedule* will list major subject area covered. Total credit limited to 12 units. 1-4 lectures. Prerequisite: Graduate standing.

**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 211 The American Enterprise: The Birth of a Nation to the 1876 Centennial (4)**

The first Americans. The Americas "discovered." Colonial America The American Revolution—birth of a nation. The Constitution. A nation expands—the Louisiana Purchase, the Oregon trail and the California gold rush. A family struggles—the Civil War. Reconstruction. 3 lectures, 1 activity. Prerequisite: ENGL 134.

**LS 212 The American Enterprise: The 1876 Centennial to the 21<sup>st</sup> Century (4)**

Manifest Destiny. Evolution of our government institutions—parallels between the past and present. Immigration in the 20th Century. The Nation steps into a larger world—World Wars. Civil Rights—equity for all. 3 lectures, 1 activity. Prerequisite: ENGL 134.

**LS 230 Community-Based Field Experience (1-3)**

Community service such as tutoring and aiding in a school setting or volunteering to work for a public service or non-profit group. Explore careers while putting academic experience to work. Offered in conjunction with Cal Poly Community Service Center. Total credit limited to 5 units.

**LS 310 Storytelling: The Oral Tradition (4)  
(Also listed as SCOM 310)**

Techniques for performing traditional folktales and myths in primary and secondary teaching situations. Selection, preparation and presentation of folklore for an audience; lectures on function of folk literature and mythology in modern society. 4 lectures. Prerequisite: SCOM 101 or SCOM 102.

**LS 311 Visual Arts in the Elementary Classroom (4)**

Theory and philosophy of visual arts, through multi-strategies, as related to child development and visual arts processes for the elementary classroom. 4 lectures. Prerequisite: LS 101 or consent of instructor.

**LS 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.

**LS 461 Senior Project (3)**

Selection and completion of an individual report or group project and report. For those planning careers as teachers project will involve field experience and inquiry project focused on content area selected for emphasis area. 1 seminar, 2 activities. Prerequisite: Senior standing and Elementary Education Concentration.

**LS 462 Senior Project (3)**

Selection and completion of a project or report under faculty supervision. Topic must be chosen with departmental approval. Results must be in a formal, written report. Prerequisite: Senior standing and Individualized Study Concentration.

**MATE-MATERIALS ENGINEERING****MATE 110 Introduction to Materials Engineering (1)**

A lecture series involving materials engineers from industry as well as Cal Poly faculty. 1 lecture.

**MATE 120 Introduction to Materials Engineering Practice (1)**

Introduction to various topics in materials engineering with emphasis on industrial and laboratory practices. 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 210 Materials Engineering (3)**

Structure of matter. Physical and mechanical properties of materials including metals, polymers, ceramics, composites, and electronic materials. Equilibrium diagrams. Heat treatments, materials selection and corrosion phenomena. 3 lectures. Prerequisite: CHEM 111, CHEM 124 or CHEM 127.

**MATE 215 Materials Engineering Laboratory (1)**

Laboratory experiments on the heat treatment and resulting properties of metals. Effects of cold deformation of metals. Brittle-ductile fracture behavior, equilibrium phase relationships, corrosion. Mechanical behavior of polymers. Properties of semiconductor devices. 1 laboratory. Prerequisite or concurrent: MATE 210.

**MATE 220 Structure of Materials (3)**

Foundations of material structure: crystalline structure and symmetry, major crystal structures, noncrystalline structure, crystal defects (vacancies, dislocations, grain boundaries). Processing—structure—properties relationships in materials. 3 lectures. Prerequisite: MATE 210. Concurrent: MATE 225.

**MATE 225 Structure of Materials Laboratory (1)**

Relationship of atomic bonding to material properties. Building of crystals with physical models and by computer. Characterization of materials by x-ray diffraction (XRD) for phase identification, crystal structure determination and lattice constant measurements. Microstructural analysis by qualitative and quantitative metallography. 1 laboratory. Prerequisite: MATE 210. Concurrent: MATE 220.

**MATE 230 Physical Metallurgy (4)**

Physical metallurgy of major ferrous and nonferrous alloy systems. Mineral resources and economics of metal production. Introduction to equilibrium diagrams, phase transformations and heat treatment. Casting, working and joining of metals. 4 lectures. Prerequisite: MATE 210, MATE 220 and MATE 225. Concurrent: MATE 235.

**MATE 235 Physical Metallurgy Laboratory (1)**

Interpretation of microstructures in metals and alloys and laboratory methods for revealing and documenting such microstructures. Casting and heat treating of metals. 1 laboratory. Prerequisite: MATE 225; MATE 230 should be taken concurrently.

**MATE 240 Additional Materials Laboratory (1) (CR/NC)**

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. Credit/No Credit grading only. 1 laboratory. Prerequisite: Consent of department head.

**MATE 310 Polymers (4)**

Molecular structures of polymers and polymer systems. Synthesis, processing techniques, properties and fabrication methods of polymeric materials. 4 lectures. Prerequisite: MATE 210.

**MATE 320 Ceramics (4)**

Development, utilization, and control of properties in ceramic materials (inorganic-nonmetallic solids). Structure of crystalline ceramics and of glasses. Mechanical, thermal, optical, magnetic, and electrical properties. Physical chemistry of ceramics. 4 lectures. Prerequisite: MATE 210, CHEM 305.

**MATE 330 Composites (4)**

Fundamentals of polymer-matrix, ceramic-fiber composites from materials engineering and applied mechanics viewpoints. Materials (matrices, fibers) and manufacturing methods treated in detail. Beginning applied mechanics of continuous and discontinuous fiber-reinforced composites covered including properties of an orthotropic lamina; behavior of laminated plates. 4 lectures. Prerequisite: MATE 210, MATE 350, CE 204 or consent of instructor.

**MATE 340 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 210, PHYS 133.

**MATE 345 Electronic Properties of Materials Laboratory (1)**

Exploration of electrical, optical and magnetic properties of materials. Optical absorption, electrical conductivity, ferromagnetism, superconductivity. 1 laboratory. Concurrent or prerequisite: MATE 340.

**MATE 350 Mechanical Behavior of Materials (3)**

Fundamental behavior, emphasis on the relationship between microstructure and mechanical properties. Continuum mechanics—stress, strain, elasticity, anelasticity, plasticity. Detailed treatment of the mechanical behavior of (1) crystalline materials (metals, ceramics)—dislocation dynamics, slip, strengthening mechanisms; (2) non-crystalline materials (polymers). 3 lectures. Prerequisites: MATE 210, CE 204; MATE 355 should be taken concurrently.

**MATE 355 Mechanical Behavior of Materials Laboratory (2)**

Additional meaning to major concepts in MATE 350. Mechanical properties of materials. Major concepts in stress, strain, elasticity, and plasticity in a range of engineering materials. Multiple session laboratories. Significant component of technical writing. Prerequisite: MATE 210, CE 204. Concurrent: MATE 350.

**MATE 359 Living in a Material World (4)  
(Also listed as HIST 359)****GE Area F**

Evolution of materials (ceramics, metals, polymers, composites, semiconductors) in the context of history. Traces the link between historical and technological developments enabled by materials from the Stone Age to the Electronic Age. Not open to students in engineering or computer science. 4 lectures. Prerequisite: Completion of GE Area B, and junior standing.

**MATE 360 Thermodynamics of Materials (4)**

Mass and energy balances, thermochemistry of reactions, design of materials processes including evaluation of energy needs and input/output stream compositions. 4 lectures. Prerequisite: MATE 210, CHEM 305.

**MATE 370 Kinetics of Materials (4)**

Theories and applications of kinetics in materials: solid-state diffusion (steady-state and non-steady-state), nucleation and growth kinetics, solid state phase transformations. 4 lectures. Prerequisite: MATE 360. Concurrent: MATE 375.

**MATE 375 Thermodynamics and Kinetics of Materials Laboratory (1)**

Demonstrations and analyses of thermodynamic and kinetic theories: diffusion, phase transformations, annealing, and sintering. 1 laboratory. Prerequisite: MATE 360. Concurrent: MATE 370.

**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 Materials Characterization (3)**

Metallographic practices for metals and non-metals. Theory and application of quantitative microscopy and image analysis. Fundamental and advanced Scanning Electron Microscopy (SEM) and Energy Dispersive Spectroscopy (EDS) analysis of metals, ceramics, and polymers. Introduction to Differential Scanning Calorimetry (DSC). 3 lectures. Prerequisite: MATE 210, MATE 215, MATE 225, MATE 345. Co-requisite: MATE 406.

**MATE 406 Materials Characterization Laboratory (2)**

Interpretation of microstructures in metals and non-metals and laboratory methods for revealing and documenting such microstructures. Fundamental and advanced Scanning Electron Microscopy (SEM) and Energy Dispersive Spectroscopy (EDS) analysis of metals, ceramics, and polymers. Introduction to Differential Scanning Calorimetry (DSC). 2 laboratories. Prerequisite: MATE 210, MATE 215, MATE 225, MATE 345. Co-requisite: MATE 401.

**MATE 410 Materials Inspection (2)**

Special physical and mechanical techniques for non-destructive and destructive examination of materials, to determine their fitness for service. Topics include: statistical methods and control charts, hardness testing, quantitative metallography, grain size measurement and analysis, ultrasonics, liquid penetrant, magnetic particle, radiography, and eddy current. 2 lectures. Prerequisite: MATE 210; MATE 415 should be taken concurrently. *Materials analysis and characterization course.*

**MATE 415 Materials Inspection Laboratory (2)**

Special physical and mechanical techniques for non-destructive and destructive examination of materials, to determine their fitness for service. Laboratory topics include: hardness testing, quantitative metallography, grain size determination, and various NDT methods. 2 laboratories. Prerequisite: MATE 235, MATE 410 as corequisite. *Materials analysis and characterization course.*

**MATE 425 Corrosion Engineering (4)**

Forms of corrosion. Influences of environmental variables on corrosion. Methods of corrosion control. 3 lectures, 1 laboratory. Prerequisite: CHEM 125 or CHEM 128, MATE 210. *Materials analysis and characterization course or Special topics course.*

**MATE 430 Microelectronic Materials Processing (3)**

Integrated circuit fabrication, oxidation, diffusion, ion implantation, etching, chemical and physical vapor deposition, photolithography. 3 lectures. Prerequisite: MATE 210. Prerequisite or concurrent: MATE 360 or permission of instructor. *Materials processing course.*

**MATE 435 Microelectronics Processing Laboratory (2)**

Basic processes involved in integrated circuits; cleanroom protocol, oxidation, diffusion, photolithographic and etching processes, sputtering and evaporation, device testing. Each student will be part of a 4–6 person team that will fabricate an integrated circuit. 2 laboratories. Prerequisite or concurrent: MATE 430, STAT 312 or equivalent. *Materials processing course.*

**MATE 440 Welding Metallurgy and Joining of Advanced Materials (3)**

Principles, primary variables, and microstructural changes associated with the joining process. Physics of energy transfer. Heat and mass balances in joining, thermodynamic and kinetic justification of solidification and near

interface microstructures. Heterogeneous interfaces, adhesion, wetting. Relation between process selection, interface design, microstructure, and properties, weldability. 3 lectures. Prerequisite: MATE 210. *Materials processing course.*

#### **MATE 445 Joining of Advanced Materials Laboratory (2)**

Laboratory to accompany MATE 440. Illustration of principles, primary variables, and microstructural changes associated with the joining process. Physics of energy transfer. Heat and mass balances in joining, thermodynamic and kinetic justification of solidification and near interface microstructures. Heterogeneous interfaces, adhesion, wetting. Relation between process selection, interface design, microstructure, and properties, weldability. 2 laboratories. Prerequisite: MATE 210. *Materials processing course.*

#### **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 or consent of instructor. *Special topics course.*

#### **MATE 450 Failure Analysis (3)**

Procedures for analyzing failed materials. Actual failure analysis of a component by each student. Topics include fracture, fatigue, wear and overload failures, exposure to techniques of metallography, electron microscopy, energy dispersive x-ray spectroscopy, chemical analysis and heat treatment. 1 lecture, 2 laboratories. Prerequisite: MATE 220, MATE 230, MATE 350, MATE 410. Concurrent: MATE 415. *Materials analysis and characterization course.*

#### **MATE 460 Materials Selection in Mechanical Design (4)**

Materials-based approach to mechanical design. Using mechanical and physical properties of materials (performance indices) to select them for design needs (Materials Selection Charts). Detailed background of material properties – information from materials and mechanics. Numerous case studies highlight the concepts covered. 4 lectures. Prerequisite: MATE 210, CE 204, or consent of instructor. *Special topics course.*

#### **MATE 463 Undergraduate Seminar (1)**

Developments, policies, practices and procedures discussed through regular seminar. 1 seminar. Prerequisite: Senior standing.

#### **MATE 467, 468 Senior Project (1) (4)**

Capstone senior project design class. Involves research methodology, problem statement, method, results, analysis, synthesis, project design, construction (when necessary for project), materials testing and analysis, and evaluation/conclusions. MATE 467: 1 laboratory. MATE 468: 4 laboratories. Prerequisite: MATE 210. Note: although MATE 467, 468 substitute for MATE 461, 462, students may not use repeat credit for the purpose of increasing GPA.

#### **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 advisor, or supervising faculty member.

#### **MATE 520 X-Ray Diffraction (3)**

Theory and application of x-ray diffraction as applied to advanced materials problems such as crystal quality and identification, thin film applications and structural transformations at high and low temperatures. Course will cover techniques in sample preparation, operation of equipment and interpretation of diffraction data. 3 lectures. Prerequisite: Graduate status or instructor's permission. *Materials analysis and characterization or Special topics course.*

#### **MATE 522 Advanced Ceramics (5)**

Development, utilization, and control of properties in ceramic materials (inorganic-nonmetallic solids). Emphasis on application on processing to achieve structure and properties. Structure of crystalline ceramics and of glasses. Mechanical, thermal, optical, magnetic, and electrical properties. Application of ceramics in technology. Physical chemistry of ceramics. 4 lectures, 1 seminar. Prerequisite: Graduate standing or permission of instructor.

#### **MATE 525 X-Ray Diffraction Laboratory (2)**

X-ray diffraction laboratory experiments of advanced materials problems such as crystal quality and identification, thin film applications and structural transformations at high and low temperatures. Radiation safety training, techniques in sample preparation, operation of equipment and interpretation of diffraction data. 2 laboratories. Prerequisite: Graduate standing in engineering or science or instructor's permission. Concurrent: MATE 520. *Materials analysis and characterization or Special topics course.*

#### **MATE 530 Biomaterials (4)**

Structures of biological materials - plant/animal. Biomimetics. Structure-function relationships for materials in contact with biological systems. Interactions of materials implanted in the body. Histological and hematological considerations including foreign body responses, inflammation, carcinogenicity, thrombosis, hemolysis, immunogenic and toxic properties. Microbial interaction with material surfaces, degradation. 4 lectures. Prerequisite: ENGR 213, MATE 210 and graduate standing or permission of instructor. *Special topics course.*

#### **MATE 540 Tribology (4)**

Wear and degradation of engineering systems. Dry and lubricated wear modes, identification, and prevention. Materials selection. Friction, contact mechanics, and lubrication theory. Case studies of mechanical systems and failure analysis. Wear Modeling and testing. 4 lectures. Prerequisite: MATE 210, MATE 215.

#### **MATE 550 Numerical Methods for Materials Engineers (4)**

Numerical analysis techniques relevant to materials engineers. Topics include computer programming, data analysis and reduction methods, linear and non-linear regression; materials modeling methods such as finite differences; and finite elements. 3 lectures, 1 laboratory. Prerequisite: CSC 231/234, MATH 244, MATE 350, MATE 360 or consent of instructor. *Materials analysis and characterization or Special topics course.*

#### **MATE 560 Thin-Film Processing (3)**

Thin film science and technology: deposition techniques, surface crystal notation, energy and kinetic processes, epitaxy. Schottky barriers and surface states, stress analysis, characterization techniques, electronics devices incorporating thin films. *Class Schedule* will list topics for selection. Total credit limited to 6 units. 3 lectures. Prerequisite: Graduate standing or permission of instructor. *Materials processing course.*

#### **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. *Special topics course.*

**MATE 565 Thin-Film Processing Laboratory (2)**

Thin film processing and analytical techniques: direct current and radio frequency magnetron sputtering, reactive sputtering, co-evaporation, epitaxy, grazing incidence x-ray diffraction, magnetic force imaging. *Class Schedule* will list topics for selection. Total credit limited to 6 units. 2 laboratories. Concurrent: MATE 560 or consent of instructor. *Materials processing course*.

**MATE 570 Advanced Engineering Materials (4)**

An advanced treatment of the structure of matter. Physical and mechanical properties of materials including metals, alloys, ceramics, insulating materials, semiconductors, super semiconductors, polymers and composites based on detailed theoretical understanding of material microstructures. Discussions of Equilibrium diagrams, processing approaches, material selection based on thermodynamic and kinetic arguments. Degradation and failure, fitness for purpose. 4 lectures. Prerequisite: Graduate standing or permission of instructor. *Special topics course*.

**MATE 580 Fracture and Fracture Mechanics of Materials (4)**

Fracture modes and mechanisms in engineering materials, fracture mechanics fundamentals (stress analysis of cracks, energy analysis of fracture process). Use of fracture mechanics in design. Laboratory gives concentrated exposure to fracture development in materials, fracture surface evaluation, fracture toughness testing. 3 lectures, 1 laboratory. Prerequisite: MATE 350, MATE 355, or graduate standing. *Special topics course*.

**MATE 590 Solidification and Densification (4)**

Thermodynamics, kinetics and morphologies of solid-liquid interfaces. Heat flow in castings, crystal growth. Solidification mechanics, solute redistribution. Production, characterization and testing of metal powders. Compacting of powder. Sintering with/without liquid phase. Hot pressing, properties of sinterings as a function of processing conditions. Application of theory to the production of useful materials. 4 lectures. Prerequisite: Graduate standing or permission of instructor. *Materials processing or Special topics course*.

**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 110 Beginning Algebra Laboratory (1) (CR/NC)**

Facilitated study and discussion of the theory, problems, and applications of beginning algebra. Not for baccalaureate credit. Credit/No Credit grading only. 1 laboratory. Corequisite: Concurrent enrollment in the associated section of MATH 100.

**MATH 112 The Nature of Modern Mathematics (4) GE B1**

Topics from contemporary mathematics, their development, applications, and role in society. Some typical topics, to be chosen by the instructor: graph theory, critical path analysis, statistical inference, coding, game

theory, and symmetry. 4 lectures. Prerequisite: Appropriate score on ELM examination or an ELM exemption or credit in MATH 104.

**MATH 114 Intermediate Algebra Laboratory (1) (CR/NC)**

Facilitated study and discussion of the theory, problems, and applications of intermediate algebra. Not for baccalaureate credit. Credit/No Credit grading only. 1 laboratory. Corequisite: Concurrent enrollment in the associated section of MATH 104.

**<sup>1</sup> MATH 116, 117 Pre-Calculus Algebra I, II (3) (3)**

**For MATH 116 and 117: GE B1**

Pre-calculus college algebra without trigonometry. Special products and factoring, exponents and radicals. Fractional and polynomial equations. Matrices, determinants, and systems of equations. Polynomial, rational, exponential, and logarithmic functions. Graphing, inequalities, absolute value, and complex numbers. MATH 116 and MATH 117 are equivalent to MATH 118, but are taught at a slower pace. Upon completion of MATH 116 and MATH 117, a student will receive 4 units of GE credit for Area B1. Not open to students with credit in MATH 118 or MATH 120. 3 lectures. **MATH 116** prerequisite: Appropriate score on ELM examination, or an ELM exemption, or credit in MATH 104. **MATH 117** prerequisite: MATH 116 with a grade of C- or better or consent of instructor.

**MATH 118 Pre-Calculus Algebra (4)**

**GE B1**

Pre-calculus algebra without trigonometry. Special products and factoring, exponents and radicals. Fractional and polynomial equations. Matrices, determinants, and systems of equations. Polynomial, rational, exponential, and logarithmic functions. Graphing, inequalities, absolute value, and 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 appropriate ELM exemption.

**MATH 119 Pre-Calculus Trigonometry (4)**

**GE B1**

Rectangular and polar coordinates. Trigonometric functions, fundamental identities. Inverse trigonometric functions and relations. Vectors, complex numbers, conic sections, and analytic geometry. Not open to students with credit in MATH 120. 4 lectures. Prerequisite: Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination, or MATH 117, or MATH 118 or equivalent.

**MATH 120 Pre-Calculus Algebra and Trigonometry (5) GE B1**

An integrated review course in pre-calculus algebra and trigonometry covering function concepts and symbols, rectangular coordinates, linear, quadratic, polynomial, and rational functions, inequalities, trigonometric functions, inverse trigonometric functions, exponential and logarithmic functions, systems of equations, complex numbers, and analytic geometry. 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: Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination and high school trigonometry or equivalent.

**MATH 126 Pre-Calculus Algebra I Laboratory (1) (CR/NC)**

Facilitated study and discussion of the theory, problems, and applications of pre-calculus algebra. Credit/No Credit grading only. 1 laboratory. Corequisite: Concurrent enrollment in the associated section of MATH 116.

**MATH 127 Pre-Calculus Algebra II Laboratory (1) (CR/NC)**

Facilitated study and discussion of the theory, problems, and applications of pre-calculus algebra. Credit/No Credit grading only. 1 laboratory. Corequisite: Concurrent enrollment in the associated section of MATH 117.

**MATH 128 Pre-Calculus Algebra Laboratory (1) (CR/NC)**

Facilitated study and discussion of the theory, problems, and applications of pre-calculus algebra. Credit/No Credit grading only. 1 laboratory. Corequisite: Concurrent enrollment in the associated section of MATH 118.

<sup>1</sup> Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.

**MATH 129 Pre-Calculus Trigonometry Laboratory (1) (CR/NC)**

Facilitated study and discussion of the theory, problems, and applications of pre-calculus trigonometry. Credit/No Credit grading only. 1 laboratory. Corequisite: Concurrent enrollment in the associated section of MATH 119.

**<sup>1</sup> MATH 131, 132, 133 Technical Calculus (4) (4) (4)**

Functions, their graphs and limits; techniques and applications of differential and integral calculus; introduction to applied differential equations. Designed principally for technology students and others interested in an applied three-quarter calculus sequence. Not open to students with credit in MATH 142, MATH 143, MATH 318 (respectively) or equivalents. 4 lectures. Prerequisite: ELM requirement, and passing score on Mathematics Placement Examination, or MATH 118 and MATH 119, or equivalent.

**<sup>1</sup> MATH 141, 142, 143 Calculus I, II, III (4) (4) (4) GE B1**  
(Also listed as HNRS 141, 142, 143)

Limits, continuity, differentiation, integration. Techniques of integration, applications to physics, transcendental functions. Infinite sequences and series, vector algebra, curves. 4 lectures. **MATH 141** prerequisite: Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination, or MATH 118 and MATH 119 or equivalent. **MATH 142** prerequisite: MATH 141 with a grade of C- or better or consent of instructor. **MATH 143** prerequisite: MATH 142.

**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. Corequisite: Concurrent enrollment in the associated section of MATH 141, MATH 142, or MATH 143.

**MATH 161, 162 Calculus for the Life Sciences I, II (4) (4) GE B1**

Review of exponential, logarithmic, and trigonometric functions. Differential and integral calculus with applications to the biological sciences. Introduction to differential equations and mathematical modeling. Examples, exercises and applications to emphasize problems in life sciences. Not open to students with credit in MATH 141, 142 respectively. 4 lectures. Prerequisite: Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination, or MATH 118 or equivalent.

**MATH 182 Calculus for Architecture and Construction Management (4) GE B1**

Integral calculus with applications to architecture and construction management. The algebra of vectors. Polar, cylindrical, and spherical coordinate systems. Not open to students with credit in MATH 142. 4 lectures. Prerequisite: MATH 141 or equivalent.

**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. Corequisite: Sophomore standing or consent of instructor.

**MATH 206 Linear Algebra I (4)**

Matrices, inverses, linear systems, determinants, eigenvalues, eigenvectors, vector spaces, linear transformations, applications. 4 lectures. Prerequisite: MATH 143 or consent of instructor.

**MATH 211, 212 Computational Mathematics I, II (4) (4)**

Fundamentals of procedural programming in C/C++ and selected applications to problems in integral and differential calculus, matrix analysis, geometry, and physics. 4 lectures. Prerequisite: MATH 141 or consent of instructor.

**MATH 221 Calculus for Business and Economics (4) GE B1**

Polynomial calculus for optimization and marginal analysis, and elementary integration. Not open to students with credit in MATH 142. 4 lectures. Prerequisite: Completion of ELM requirement and passing score

on appropriate Mathematics Placement Examination, or MATH 118 or equivalent.

**MATH 231 Calculus for Business and Economics Laboratory (1) (CR/NC)**

Facilitated study and discussion of the theory, problems, and applications of business calculus. Credit/No Credit grading only. 1 laboratory. Corequisite: Concurrent enrollment in the associated section of MATH 221.

**MATH 241 Calculus IV (4)**

Partial derivatives, multiple integrals, introduction to vector analysis. 4 lectures. Prerequisite: MATH 143.

**MATH 242 Differential Equations (4)**

Ordinary differential equations: introduction with selected applications; classification of equations and their analytic solutions; study of interrelationships between differential systems, graphs, and physical problems. Systems of ordinary differential equations. Not open to CENG students. 4 lectures. Prerequisite: MATH 241.

**MATH 244 Linear Analysis I (4)**

Separable and linear ordinary differential equations with selected applications; numerical and analytical solutions. Linear algebra: vectors in n-space, matrices, linear transformations, eigenvalues, eigenvectors, diagonalization; applications to the study of systems of linear differential equations. 4 lectures. Prerequisite: MATH 143 or consent of instructor.

**MATH 248 Methods of Proof in Mathematics (4)**

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 Technology in Mathematics Education (4)**

Examination of existing hardware and software designed for educational uses. Discussion of 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. 4 lectures. Prerequisite: MATH 141 or MATH 329, and a course in CSC or MATH 211, or consent of instructor.

**MATH 304 Vector Analysis (4) GE B6**

Algebra of free vectors with applications. Differential and integral calculus of vectors. Development of theory and application of vector operations. Green's Theorem, Stokes' Theorem, and the Divergence Theorem. 4 lectures. Prerequisite: MATH 241 or consent of instructor.

**MATH 306 Linear Algebra II (4)**

Inner product spaces, orthogonality, Fourier series and orthogonal bases, linear transformations and similarity, eigenvalues and diagonalization. 4 lectures. Prerequisite: MATH 206 and MATH 242, or MATH 241 and MATH 244, and a C- or better in MATH 248, or consent of instructor.

**<sup>1</sup> MATH 327, 328, 329 Mathematics for Elementary Teaching I, II, III (4) (4) (4)**

Introduction to set theory, number theory, real numbers, probability, statistics, and geometry. Computer applications. 2 lectures, 2 activities.

**MATH 327** prerequisite: Completion of ELM requirement, and passing score on appropriate Mathematics Placement Examination, or MATH 118 or equivalent. **MATH 328** prerequisite: MATH 327 with a grade of C- or better or consent of instructor. **MATH 329** prerequisite: MATH 328.

**MATH 331 Topics in Mathematics for Teachers (1-6) (CR/NC)**

Topics in mathematics for practicing credentialed teachers. Content will vary according to teaching level. *Class Schedule* will list topic selected. Total credit limited to 12 units. Credit/No Credit grading only. 1-6

<sup>1</sup> Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.

activities. Prerequisite: Multiple Subject or Single Subject teaching credential or consent of instructor.

### **MATH 333 Numerical Analysis I (4)**

Topics in interpolation and approximation methods, initial value problems, and boundary value problems of ordinary differential equations. 4 lectures. Prerequisite: MATH 242, or MATH 241 and MATH 244, or consent of instructor.

### **MATH 335 Graph Theory (4)**

Introduction to graph theory and its applications: isomorphism, paths and searching, connectedness, trees, tournaments, planarity, graph colorings, matching theory, network flow, adjacency and incidence matrices. Further topics to be selected from the theory of finite state machines, Ramsey theory, extremal theory, and graphical enumeration. 4 lectures. Prerequisite: Junior standing or consent of instructor.

### **MATH 336 Combinatorial Mathematics (4)**

Methods of enumerative combinatorics: sum, product, and division rules, bijective and recursive techniques, inclusion and exclusion, generating functions, and the finite difference calculus. Advanced topics to be selected from the theory of partitions, Polya theory, designs, and codes. 4 lectures. Prerequisite: Junior standing or consent of instructor.

### **MATH 341 Theory of Numbers (4)**

Properties of numbers. Euclid's Algorithm, greatest common divisors, diophantine equations, prime numbers, congruences, number theoretic functions, the quadratic reciprocity laws, primitive roots and indices. 4 lectures. Prerequisite: MATH 248 with a grade of C- or better or consent of instructor.

### **MATH 344 Linear Analysis II (4)**

**GE B6**

Linear methods applied to the solution of differential equations. Laplace transforms. Series solutions to ordinary differential equations. Orthogonality in  $n$ -space, Gram-Schmidt orthogonalization and least squares methods. Orthogonal bases in function spaces, Sturm-Liouville theory. Fourier series and transforms. Special functions of applied mathematics. 4 lectures. Prerequisite: MATH 206 and MATH 242, or MATH 241 and MATH 244, 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 372 Mathematical Community Service Projects (2) (CR/NC)**

Directed group mathematical research in support of volunteer community service projects. Total credit limited to 8 units. 2 seminars. Prerequisite: consent of instructor and consent of department chair.

### **MATH 400 Special Problems for Advanced Undergraduates (1-4)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 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 or MATH 244, and MATH 304, or consent of instructor.

### **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. 4 lectures. Prerequisite: MATH 306 or consent of instructor.

### **<sup>1</sup> MATH 408, 409 Complex Analysis I, II (4) (4) MATH 408: GE B6**

Elementary analytic functions and mappings. Cauchy's Integral Theorem; Poisson's Integral Formula. Taylor and Laurent series, theory of residues, and the evaluation of integrals. Harmonic functions, conformal mappings. 4 lectures. Prerequisite: MATH 242, or MATH 241 and MATH 244, or consent of instructor.

### **MATH 412 Introduction to Analysis 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 with a grade of C- or better or consent of instructor. Strongly recommended: successful completion of MATH 306, MATH 341, MATH 442, or MATH 481. Strongly recommended: Successful completion of MATH 306, MATH 341, MATH 442, or MATH 481.

### **<sup>1</sup> MATH 413, 414 Introduction to Analysis II, III (4) (4)**

A continuation of Introduction to Analysis 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 or MATH 244, 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, or MATH 241 and MATH 244, or consent of instructor.

### **MATH 418 Partial Differential Equations (4)**

Mathematical formulation of physical laws. Separation of variables. Orthogonal functions and generalized Fourier series. Bessel functions, Legendre polynomials. Sturm-Liouville problem. Boundary value problems; nonhomogeneous techniques. Applications to heat flow, potential theory, vibrating strings and membranes. 4 lectures. Prerequisite: MATH 344 or 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 with a grade of C- or better 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.

### **<sup>1</sup> MATH 431, 432 Mathematical Optimization I, II (4) (4)**

Classical optimization. Maximum/minimum of functions, linear and nonlinear optimization problems, duality, constrained optimization. Model building and applications to various fields. 4 lectures. Prerequisite: MATH 206 or MATH 244, and MATH 241, or consent of instructor.

<sup>1</sup> Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.

**MATH 433 Numerical Analysis II (4)**

Numerical techniques for solving partial differential equations of the parabolic, hyperbolic and elliptic type. 4 lectures. Prerequisite: MATH 333 or equivalent.

**MATH 437 Game Theory (4)**

Development of the mathematical concepts, techniques, and models used to investigate optimal strategies in competitive situations; games in extensive, normal, and characteristic form, Nash equilibrium points and Nash Bargaining Model. 4 lectures. Prerequisite: MATH 206 or MATH 244 or consent of instructor. Recommended: MATH 335 and MATH 431.

**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 with a grade of C- or better or consent of instructor.

**MATH 443 Modern Geometries (4)**

Non-Euclidean and projective geometries. Properties of parallels, biangles, Saccheri and Lambert quadrilaterals, angle-sum and area. Limiting curves, hyperbolic trigonometry, duality, perspectivity, quadrangles, fundamental theorems of projective geometry, conics. 4 lectures. Prerequisite: MATH 442.

**MATH 459 Undergraduate Seminar (4)**

Written and oral analysis and presentations by students on topics from mathematical modeling. 4 seminars. Prerequisite: Junior standing, MATH 206 and MATH 242, or MATH 241 and MATH 244, or consent of instructor.

**<sup>1</sup> MATH 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time. Prerequisite: MATH 459.

**MATH 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: Junior standing and consent of instructor.

**<sup>1</sup> MATH 481, 482 Abstract 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 with a grade of C- or better or consent of instructor. Strongly recommended: successful completion of MATH 306, MATH 341, MATH 412, or MATH 442. Strongly recommended: Successful completion of MATH 306, MATH 341, MATH 412, or MATH 442.

**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.

**<sup>1</sup> 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. MATH 501: Distance Learning Lab fee may be required—see *Class Schedule*. 4 lectures. Prerequisite: MATH 344 or equivalent, and graduate standing or consent of instructor.

**MATH 510 Survey of Modern Mathematics (4)**

Selected topics from the field of modern mathematics. Projective and synthetic geometry, topology, logic, matrices, vectors. Theory of games, probability, linear and modern algebra and convex sets. Boolean algebras, graph theory, lattice theory, geometry of complex numbers. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

**<sup>1</sup> 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: MATH 408, MATH 412, MATH 418 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.

**<sup>1</sup> 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: MATH 481, MATH 306 and graduate standing, or consent of 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, insolubility of the quintic. 4 lectures.

<sup>1</sup> Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.

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)**

Serious research endeavor devoted to the development, pedagogy or learning of mathematics. Course to be taken twice for a total of 6 units. Prerequisite: Graduate standing and consent of instructor.

## **MCRO–MICROBIOLOGY**

#### **MCRO 221 Microbiology (4)**

**GE B2 & B4**

Morphology, metabolism, classification and identification; bacteriology of air, soil, water and foods with applications to industry, agriculture, medicine, and public health. Not open to students with credit in MCRO 224; not for credit for Biology and Microbiology majors. 2 lectures, 2 laboratories. Prerequisite: One quarter of chemistry.

#### **MCRO 224 General Microbiology I (5)**

**GE B2 & B4**

Microbial cellular structure and function, nutrition and growth dynamics, control of microbial growth, metabolism, genetics and viruses. Both prokaryotic and eukaryotic microorganisms emphasized. 3 lectures, 2 laboratories. Prerequisite: BIO 151 and CHEM 128. Recommended: CHEM 129.

#### **MCRO 225 General Microbiology II (5)**

Microbial diversity, systematics, ecology, and symbiotic relationships. Introduction to host-microorganism interactions including pathogenesis, epidemiology, and immunology. 3 lectures, 2 laboratories. Prerequisite: MCRO 221 or MCRO 224.

#### **MCRO 320 Emerging Infectious Diseases (3)**

Recent outbreaks of human diseases, interrelationships between infectious disease agents, human biology, and the environment. Infectious agents and disease processes, surveillance methods to detect, investigate, and monitor emerging pathogens. Factors involved in the accelerating emergence of diseases and bioterrorist agents. 3 lectures. Prerequisite: MCRO 221 or MCRO 224 or BIO 151.

#### **MCRO 342 Sanitary Microbiology (4)**

Principles of disease prevention and control. Water-, food-, and air-borne microbial contaminations and epidemiology of ensuing diseases. Laboratory techniques in detection and control of wastes and disease-causing microorganisms. 2 lectures, 2 laboratories. Prerequisite: MCRO 221 or MCRO 224.

#### **MCRO 402 General Virology (5)**

Infective macromolecules (prions, viroids, and viruses) associated with microbes, plants, and animals. Epidemiology, immune responses, pathogenicity, pathogenesis, prevention, diagnoses and treatments. 5 lectures. Prerequisite: BIO 351 or CHEM 373.

#### **MCRO 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: MCRO 221 or MCRO 224. Recommended: CHEM 212/312.

#### **MCRO 423 Medical Microbiology (5)**

Microorganisms as agents of disease in humans. Epidemiology, host-parasite relationships, and chemotherapy. The compromised host and opportunistic disease. Laboratory safety. Procedures for laboratory diagnosis of human diseases. Rapid miniaturized methods of identification. 3 lectures, 2 laboratories. Prerequisite: MCRO 225. Recommended: Organic Chemistry.

#### **MCRO 424 Microbial Physiology (5)**

Cellular structure and life processes of bacteria; chemical composition, growth and metabolism. General biological and evolutionary considerations. 3 lectures, 2 laboratories. Prerequisite: MCRO 225 and CHEM 313.

#### **MCRO 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: MCRO 225 and MCRO 423.

#### **MCRO 433 Industrial Microbiology and Biotechnology (5)**

Principles and methods used for production of enzymes, pharmaceuticals, chemicals and food additives using micro-organisms. Topics include screening and strain improvement, regulation of metabolite production, genetic engineering, heterologous gene expression systems, large-scale production and intellectual property. 3 lectures, 2 laboratories. Prerequisite: MCRO 221 or MCRO 224, BIO 351 or equivalent, CHEM 212/312 or equivalent.

#### **MCRO 436 Microbial Diversity and Ecology (5)**

Ecology and interactions of prokaryotic and eukaryotic microorganisms in natural environments. Fundamentals of microbial ecology, microbial evolution, microbes and ecosystem function (bioremediation), practical aspects of microbial interactions, and microbial systematics. 3 lectures, 2 laboratories. Prerequisite: MCRO 221 or MCRO 224.

#### **MCRO 444 Dairy Microbiology (4)**

(Also listed as DSCI 444)

Microorganisms involved in the fermentation and ripening processes in the dairy industry, as well as those involved in spoilage of milk and dairy products, in the transmission of disease through these products, and indicator systems used to determine sanitary quality of these products. 2 lectures, 2 laboratories. Prerequisite: MCRO 221 or MCRO 224.

## **ME–MECHANICAL ENGINEERING**

#### **ME 134 Mechanical Systems (3)**

Introduction to mechanical engineering and its application in professional practice. Includes design, analysis, testing and dissection of mechanical devices, from simple machines to more complicated systems. 2 lectures, 1 laboratory.

#### **ME 151 Engineering Design Communication I (2)**

Communication of designs to manufacturing using basic definitions of points, lines and planes in space. Pictorials, orthographic projection, section views and auxiliary views. Techniques from geometry, vectors, analysis, and spatial definitions integrated to provide information to both the design and manufacturing processes. 1 lecture, 1 laboratory.

#### **ME 152 Engineering Design Communication II (2)**

Use of advanced communication principles to communicate project designs to manufacturing processes. Projects evaluated in terms of meeting design criteria. Techniques of advanced communication including weld symbols, threaded fasteners, dimensioning and tolerancing. Use of computers to enhance these processes. 1 lecture, 1 laboratory. Prerequisite: ME 151.

#### **ME 153 Introduction to Solid Modeling (1)**

Introduction to solid modeling, using current software and hardware. Creation of part models and assembly models; working drawings produced from the models. Introduction to finite element analysis using the chosen software. Relevancy of solid modeling to design and manufacturing. 1 laboratory. Prerequisite: ME 152 or equivalent.

#### **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 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 134, 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 of working fluids and fundamental relations for processes involving 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, convection, radiation, and combined modes. 3 lectures. Prerequisite: ME 341, ME 302 or CHEM 305, MATH 244, CSC 231 or CSC 234.

### **ME 318 Mechanical Vibrations (4)**

Free and forced vibration response of single and multiple degree of freedom systems. Experimental studies of the dynamic behavior of structures and machines. Instrumentation methods utilized in field and laboratory. 3 lectures, 1 laboratory. Prerequisite: MATH 344, ME 326, EE 201.

### **ME 321 Solar Energy (4)**

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. Not open to students in engineering or computer science. 4 lectures. Prerequisite: PHYS 131 or PHYS 123, completion of GE Area B and junior standing.

### **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. Dynamic simulation of mechanisms. 4 lectures. Prerequisite: MATH 242 (or concurrent), ME 212, CSC 231 or CSC 234.

### **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 205, ME 152, MATE 210, CSC 231 or CSC 234, 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, prime movers, 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 231 or equivalent.

### **ME 344 Thermal Engineering (4)**

Vapor and gas power cycles, refrigeration cycles, thermodynamic relations, psychrometrics, chemical reactions, and a thermal engineering design project. 4 lectures. Prerequisite: ME 236, 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 346 Thermal Science Laboratory (1)**

Heat transfer and thermodynamic experiments covering combined free convection and radiation, transient conduction, energy conversion, heat exchanger, polytropic blowdown, steam turbine, and refrigeration system. 1 laboratory. Prerequisite: ME 341, ME 344.

### **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 406 Mechatronics Design (4)**

Application of micro-controllers and programmable logic controllers in the design of mechatronic products and automation systems. Digital feedback motion and process control. Modern industrial mechatronics applications. 3 lectures, 1 laboratory. Prerequisite: ME 329 and ME 405 or consent of instructor.

### **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)**

Behavior of unidirectional fiber composites. Properties of short-fiber composites, and orthotropic lamina. Analysis of laminated composites. Strength and hygrothermal behavior of composite materials. Structural optimization. 3 lectures, 1 laboratory. Prerequisite: AERO 330 or ME 328.

### **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 418 Machinery Vibration and Rotordynamics (4)**

Vibrations relating to rotating machinery. Modeling of structural rotordynamic phenomena induced by shaft flexibility, bearings, and seals. Laboratory measurement of rotor system dynamic response and interpretation of machinery diagnostic information. 3 lectures, 1 laboratory. Prerequisite: ME 318.

**ME 422 Mechanical Control Systems (4)**

Modeling and control of physical systems. Design of mechanical, hydraulic and electrical systems using time response, frequency response, state space, and computer simulation. 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 231, MATE 210.

**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 149.

**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 and PVT properties of reservoir fluids. Introduction to flow in porous media, reserve calculations for different reservoirs 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, polymerflooding, 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 rod 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 441 Single Track Vehicle Design (4)**

Handling qualities of two-wheeled vehicles, and the application to vehicle design. Modeling of single-track vehicles begins with the complete free body diagram of the steerable section and the dynamics of the vehicle. Laboratory demonstrations of geometry changes to the control spring and control authority. Determination of vehicle geometry values of cg position, longitudinal radius of gyration, headtube angle, etc. as their effect on handling qualities. 3 lectures, 1 laboratory. Prerequisite: ME 318, ME 326, ME 422 or consent of instructor.

**ME 443 Turbomachinery (4)**

Performance characteristics of various types for liquids and for gases. Criteria for proper selection of type and main dimensions. Cavitation criteria. Gas turbine cycles and performance. Two-dimensional cascades. Axial flow turbines and compressors. Centrifugal compressors and radial-inflow turbines. 4 lectures. Prerequisite: ME 342, ME 344, MATH 318.

**ME 444 Combustion Engine Design (4)**

Application of design parameters to the various engine cycles. Aspects of the combustion processes. Emission regulation effects on engine design. 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 Ventilation Principles and Design (4)**

Individual and team project work (including computer simulation) in designing systems, selecting equipment, estimating energy consumption and operating costs for applications in industrial ventilation, exhaust and pollution control. 3 lectures, 1 laboratory. Prerequisite: ME 341, ME 344 or ENVE 304, EE 201.

**ME 457 Refrigeration Principles and Design (4)**

Basic engineering principles of refrigeration processes including: vapor compression cycles, multipressure systems, absorption systems, steam jet cooling, air cycles, and low temperature refrigeration. 3 lectures, 1 laboratory. Prerequisite: ME 313, ME 341, ME 344.

**ME 458 Air Conditioning Principles and Design (4)**

Individual and team projects in designing systems, using psychometrics and load calculations for selecting equipment, estimating energy

consumption and operating costs for air conditioning systems. 3 lectures, 1 laboratory. Prerequisite: ME 313, ME 341 and 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 interpretations 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 12 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

#### **ME 471 Selected Advanced Laboratory (1–4)**

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 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

#### **ME 481, 482 Senior Project Laboratory (2) (3)**

Selection, development and completion of an accepted project done under faculty supervision. An enhanced opportunity to work on senior projects in teams. **ME 481:** an option to ME 461; 2 laboratories; prerequisite: senior standing, ME 344, ME 329 (or concurrent). **ME 482:** an option to ME 462; 3 laboratories; prerequisite: ME 481 or equivalent.

#### **ME 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.

#### **ME 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.

#### **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 advisor and supervising faculty member.

#### **ME 502 Finite Element Analysis (4)**

Approximate methods of stress analysis with emphasis on the theory of the Finite Element Method. Rayleigh-Ritz approximate energy minimizations and methods of weighted residuals applied to one- and two-dimensional stress fields. 3 lectures, 1 laboratory. Prerequisite: ME 401, graduate standing or consent of instructor.

#### **ME 503 Inelastic Stress Analysis (4)**

Introduction to Cartesian tensors. Constitutive equations for linear viscoelastic, plastic, and viscoplastic materials. Material response at micro, meso, and macroscale. Dislocations, creep mechanisms and diffusion in metals. Tresca and Mises yield criteria. Slipline theory, the correspondence principle of linear viscoelasticity, boundary value

problems. Applications in beams, frames, rotating disks and metalworking. 4 lectures. Prerequisite: ME 401.

#### **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, 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 344 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 Conductive 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 563 Graduate Seminar (1)**

Current developments in mechanical engineering. Participation by graduate students, faculty and guests. 1 seminar. Prerequisite: Graduate standing in mechanical engineering program.

#### **ME 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.

#### **ME 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.

### **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.

## **MSL—MILITARY SCIENCE LEADERSHIP**

### **MSL 101 Foundations of Officership I (1)**

Introduction to issues and competencies of the Army officer profession. Emphasis on stereotypes about the military, the role of the Army officer, customs and traditions within the military, and personal and physical development. Open to all freshmen and sophomores. 1 lecture.

### **MSL 102 Foundations of Officership II (1)**

The role of leadership within a large organization. Emphasis on the definition of leadership, leadership framework, individual and organizational core values, and the moral responsibility of leadership. 1 lecture.

### **MSL 103 Basic Leadership (1)**

The foundation of basic leadership fundamentals such as problem solving, communications, briefings and effective writing, techniques for improving listening and speaking skills, and an introduction to counseling. 1 lecture.

### **MSL 111 Orienteering (2)**

Principles of orienteering, basic map reading and compass skills; course running techniques applied in field orienteering events. Open to all freshmen and sophomores. 1 lecture, 1 activity.

### **MSL 201 Individual Leadership Studies (2)**

Identification of successful leadership traits through observation of others and self through experiential learning exercises. Recording of observed traits in a dimensional leadership journal, and discussion of observations in small groups. Open to all students. 2 lectures.

### **MSL 202 Leadership and Teamwork (2)**

Application of leadership principles. Emphasis on understanding how to build teams, problem solving, building trust, and working with small groups. Identification of successful leadership traits through experiential learning exercises. Open to all students. 2 lectures.

### **MSL 203 Leadership Studies and Personal Development (2)**

Focus on building character. Emphasis on personal development (reasoning and problem solving), making self-assessments, improving communication skills, improving physical well being, and diversity training (values and ethics). Open to all students. 2 lectures.

### **MSL 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.

### **MSL 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. 2 activities.

### **MSL 301 Leadership and Problem Solving (3)**

Introduction to principles of physical fitness and a healthy lifestyle fundamental to a military professional. Application of the Leadership Development Program, a formalized interactive process used to evaluate leadership performance and provide developmental counseling feedback

in areas such as communication (verbal and nonverbal) and time management. Preparation, performance and evaluation of individual and small unit training. 3 lectures. Prerequisite: Completion of MSL 101, MSL 102, MSL 103, MSL 201, MSL 202, MSL 203, or completion of MSL 212, or consent of department head.

### **MSL 302 Leadership, Problem Solving, and Effective Communication (3)**

Study of reasoning skills and communication skills. Emphasis on the use of these skills and their specific application in the form of the Army's troop leading procedures. Detailed examination of officership and officership case studies. 3 lectures. Prerequisite: MSL 301 and consent of instructor.

### **MSL 303 Leadership and Ethics (3)**

Examination of the role communications, values, and ethics play in effective leadership. Topics include ethical decision-making, value of diversity, spirituality in the military, and examination of the Army leadership doctrine. Emphasis on improving oral and written communication. 3 lectures. Prerequisite: MSL 301, MSL 302, and consent of instructor.

### **MSL 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.

### **MSL 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.

### **MSL 401 Leadership and Management I (3)**

Developing proficiency in planning and executing complex operations, functioning as a member of a staff, and mentoring subordinates. Emphasis on training management, methods of effective staff collaboration, and developmental counseling techniques. 3 lectures. Prerequisite: MSL 301, MSL 302, MSL 303 and consent of instructor.

### **MSL 402 Leadership and Management II (3)**

Continuation of MSL 401 with a focus on communications and personal development. Study includes in-depth analysis of organizational culture and the dynamics of change, physical well-being, and practical exercises on establishing an ethical command climate. Series of leadership simulations. 3 lectures. Prerequisite: MSL 401 and consent of instructor.

### **MSL 403 Officership (3)**

Case study analysis of military law, and practical exercises on establishing an ethical command climate. Completion of a quarter-long senior leadership project that requires planning, organizing, collaboration, analysis and demonstration of leadership skills. 3 lectures. Prerequisite: MSL 401, MSL 402 and consent of instructor.

### **MSL 470 Selected Advanced Topics (1–4)**

Directed group study of selected topics for advanced students. *Class Schedule* will list topic selected. Total credit limited to 8 units. 1–4 lectures. Prerequisite: Consent of instructor.

## **MU—MUSIC**

### **MU 100 Music Fundamentals (4)**

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. 3 lectures, 1 activity.

**MU 101 Introduction to Music Theory (4)**

GE C3

Introduction to the elements of music and their use by composers and performers. Notation of pitch and rhythm, scales, key signatures, intervals and chords. 3 lectures, 1 activity.

**MU 103 Music Theory I (4)**

Structure of tonality, four-part writing of root position and inverted triads, cadences and melodic structure, harmonic progressions, harmonization of a melody and nonharmonic tones. Composition project. 4 lectures. Prerequisite: MU 101 or permission of instructor.

**MU 104 Musicianship I (2)**

Introductory sight-singing; rhythmic performance and dictation in simple meters; identification and performance of melodic and harmonic intervals and triads; dictation of major diatonic melodies. 2 activities. Prerequisite: Previous or current enrollment in MU 101; Music major or minor status.

**MU 106 Musicianship II (2)**

Sight-singing in all forms of the minor mode; rhythmic performance and dictation in compound meters and syncopation; identification of triad inversions and cadence formulas; dictation of minor diatonic melodies; interval identification in multiple timbres. 2 activities. Prerequisite: MU 104 or consent of instructor.

**MU 114 Introduction to Composing (4)**

Fundamental concepts in music composition. Creative projects. Compositional techniques, development, and structure. Analysis of examples from the literature. 3 lectures, 1 activity. Prerequisite: MU 101 or consent of instructor.

**MU 120 Music Appreciation (4)**

GE C3

Explores the world of music with emphasis on Western tradition. Language of music, the role of music in society. Historical context and major composers from the Middle Ages to the present. 3 lectures, 1 activity.

**MU 121 Introduction to Non-Western Musics (4)**

Survey of selected non-Western music cultures. Emphasis on listening and understanding the ensemble type, aesthetic principle, musical style, and performance practice of each. 3 lectures, 1 activity. Prerequisite: Music major, minor, or consent of instructor.

**MU 149 Applied Study/Technique (1)**

Individual instruction in performance with emphasis on the technical skills needed for the performance of repertoire. Total credit limited to 3 units. Specific areas of study are listed in the *Class Schedule*. Prerequisite: 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 6 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, sight-reading and facility. 1 lecture, 1 activity.

**MU 152 Elementary Class Piano (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 Intermediate Class Piano (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 (2)**

Beginning study of vocal and performance technique for the untrained singer. Includes the beginning study of the vocal mechanism and the fundamentals of notation. 1 lecture, 1 activity.

**MU 155 Beginning Guitar (1)**

Fundamentals of guitar technique and performance. Elements of classical, pop, and folk styles. Basics of staff and chord notations. No previous experience necessary. 1 activity.

**MU 161 Piano Skills I (1)**

Preparation for Piano Proficiency Examination. Study of piano repertoire, sight-reading, 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, sight-reading, 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, sight-reading, 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)**

Study and public performance of music written for big band jazz. Limited to those who have had considerable experience playing musical 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 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 Wind Orchestra (1)**

Study and public performance of music written for large wind bands (woodwinds, brass, and percussion). Limited to those students who have had experience with wind and percussion instruments. The band performs concerts on campus and makes at least one tour annually. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

**MU 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 175 Contemporary Music Ensemble (1)**

Open to all instrumentalists who are interested in performing recent classical literature. Limited to students who are proficient on their instrument. Total credit limited to 6 units. 1 activity. Prerequisite: By audition or consent of instructor.

**MU 176 Mustang Band (1)**

Public performance of music and specially-designed shows written for marching band (woodwinds, brass, percussion, and flag team auxiliary). Limited to those students who have had marching experience with wind and percussion instruments, or flag, rifle or dance lines. 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 PolyPhonics (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 specialized 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 185 University Singers (1)**

Study and public performance of music for large mixed chorus. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

**MU 187 Vocal Jazz Ensemble (1)**

Study and performance of vocal jazz, including ensemble performance as well as solo performance and improvisation. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

**MU 189 Vocal Practicum (1)**

Study and implementation of performing techniques used by vocalists in a recital or concert setting. Total credit limited to 6 units. 1 activity. Prerequisite: MU 150, MU 250, MU 350 or MU 450, or consent of instructor.

**MU 200 Special Problems for Undergraduates (1)**

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.

**MU 207 Music Theory II (4)**

Construction and resolution of seventh chords, secondary dominants, nondominant seventh chord, basic modulation, change of mode. Augmented sixth chord and Neapolitan sixth chord. Binary and ternary form. Composition project. 4 lectures. Prerequisite: MU 103.

**MU 208 Musicianship III (2)**

Sightsinging in all modes in two or more parts; rhythmic dictation in 2 parts; identification of triadic chord progressions and root position seventh chords; dictation of two-part melodies in all modes. 2 activities. 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 6<sup>th</sup> chords; and modulatory dictation in 2 parts. 1 activity. Prerequisite: MU 211 or consent of instructor.

**MU 221 Jazz Styles (4)****GE C3 USCP**

Survey of Jazz as a significant American art form from 1900 to the present; its historical background and development in the United States; key elements, leading performers, and significant compositions in each style. Emphasis on listening skills. 3 lectures, 1 activity.

**MU 229 Music of the 60s: War and Peace (4)****GE C3 USCP**

Explores wide spectrum of rock, folk and pop styles of the 60s. Relates music to social turmoil and historical trends, including Vietnam War, Civil Rights Movement, American Indian Movement, Chicano Movement, Free Speech Movement. 3 lectures, 1 activity.

**MU 249 Applied Study/Technique (1)**

Individual instruction in performance with emphasis on the technical skills needed for the performance of repertoire. Total credit limited to 3 units. Specific areas of study are listed in the *Class Schedule*. Prerequisite: Consent of instructor.

**MU 250 Applied Music (1)**

Individual instruction in performance with emphasis on repertoire, technical skills, style, and interpretation. Total credit limited to 6 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. *Class Schedule* will list topic elected. Total credit limited to 3 units. 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 Advanced Class Piano (1)**

Advanced 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 Intermediate Guitar (1)**

Develops intermediate guitar techniques and performance. Elements of classical, pop, and folk styles. Intermediate skills, reading notes and chord charts. 1 activity. Prerequisite: MU 155 or permission of instructor.

**MU 259 Beginning Jazz Improvisation (2)**

Development of fundamentals of jazz improvisation including scales, arpeggios, patterns, swing feel, expressiveness, and motifs through in-class performance of written materials and improvisations with play-along recordings. Total credit limited to 6 units. 2 activities. Prerequisite: Facility on a musical instrument or singing ability; MU 101 or consent of instructor.

**MU 260 Intermediate Jazz Improvisation (2)**

Further development of fundamentals of jazz improvisation including alternate scales, arpeggios, embellishments, expressiveness, and motifs through in-class performance of written materials and improvisations with play-along recordings. Total credit limited to 6 units. 2 activities. Prerequisite: Successful completion of MU 259 or 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 (4)**

Counterpoint as a compositional technique. Modal, tonal, and post-tonal practices. Creative project. 4 lectures. Prerequisite: MU 309.

**MU 308 Sound Design: Technologies (4)**

Fundamental tools of electroacoustic sound design. Concepts and application of music studio procedure, recording, synthesis, and MIDI. Studio projects. 3 lectures, 1 activity. Prerequisite: MU 101, MU 120 or consent of instructor.

**MU 309 Music Theory III (4)**

Compositional procedures employed by composers of the Classical and Romantic periods. Chromatic third-related harmony, ninth, eleventh and thirteenth chords. Chromatic and enharmonic modulation. Sonata and rondo form. Composition project. 4 lectures. Prerequisite: MU 207.

**MU 310 Sound Design: Recording (4)**

Exploring creative use of recording technology. Analog and digital equipment for recording music. Analysis and creative projects. 3 lectures, 1 activity. Prerequisite: MU 308 or permission of instructor.

**MU 315 Music Fundamentals in the Classroom (4)**

Music skills and concepts for non-musicians developed through "learn-by-doing" music education pedagogies. Methodologies and state standards for teaching classroom music, performance skills (singing, recorder, accompanying instruments, body percussion). 3 lectures, 1 activity. Prerequisite: Completion of GE Area A and consent of instructor.

**MU 320 Music Research and Writing (4)**

Methodology for researching, analyzing, and writing about music. Exploration of investigative tools including library resources, periodicals, bibliographic tools, computerized search methods. Computerized software for text and music notation. Formatting music for publication. Performance practice. 4 lectures. Prerequisite: MU 207 and ENGL 134. Recommended: MU 120; or permission of instructor.

**MU 324 Music and Society (4)**

GE C4

Exploration into the role of music historically and culturally. Emphasis on deeper understanding and appreciation of the context of music through topics of special interest. *Class Schedule* will list topics selected. Total credit limited to 12 units. 3 lectures, 1 activity. Prerequisite: Completion of GE Area A and a foundation course in Area C. Music majors will not receive GE C4 credit.

**MU 325 America's Music (4)**

USCP

Explorations of the many styles of America's music through lectures, readings, sound recordings, musical scores, and performance. Includes "Native American," "folk," "popular," and "fine art" traditions. How American music reflects the different cultural heritages, social contexts, and philosophies of its creators. 4 lectures. Prerequisite: MU 207. Recommended: MU 120.

**MU 326 Cultural Concepts and Structures in Music (4)**

Exploring the definition, concepts, and structures of music in terms of theory, performance practice, and compositional procedures of selected non-Western cultures. 3 lectures, 1 activity. Prerequisite: Junior standing or consent of instructor.

**MU 328 Women in Music (4)**

GE C4

Survey of women's contributions as composers and performers of western art and popular music; historical overview of the experiences and perception of women as musicians. 3 lectures, 1 activity. Prerequisite: Completion of GE Area A and a foundation course in Area C. Music majors will not receive GE C4 credit.

**MU 331 Music of the Middle Ages and Renaissance (4)**

Musical literature, styles, composers, theory, genres and notation of the Middle Ages and Renaissance. Relationship to historical trends. 4 lectures. Prerequisite: MU 320; Recommended: MU 120; or permission of instructor.

**MU 332 Music of the Baroque and Early Classic Eras (4)**

Survey of the history of western art music from 1600 to 1780. 4 lectures. Prerequisite: MU 320; Recommended: MU 120; or permission of instructor.

**MU 333 Music of the Classic and Romantic Eras (4)**

Survey of the history of western art music from 1780 to 1900. 4 lectures. Prerequisite: MU 320; Recommended: MU 120; or permission of instructor.

**MU 334 Music of the Modern Era (4)**

Composers, important works, and significant trends in the Western European and American classical tradition during the 20<sup>th</sup> and 21<sup>st</sup> Centuries. 4 lectures. Prerequisite: MU 320; Recommended: MU 120; or permission of instructor.

**MU 335 Survey of Keyboard Literature (4)**

Intensive survey of solo piano literature from early keyboard music through contemporary composers; emphasis upon composers' influences, stylistic characteristics, performance practices, and the development of the pianoforte. 4 lectures. Prerequisite: MU 207 or consent of instructor.

**MU 336 Jazz History and Theory (4)**

Survey of Jazz theoretical techniques. Emphasis upon historical context and development of Jazz through study and analysis of scores and historical performances. 4 lectures. Prerequisite: MU 207.

**MU 337 Survey of Vocal Literature (4)**

Comprehensive survey of vocal literature from early to contemporary composers. Emphasis upon composers' influences, style characteristics, and performance practices. 4 lectures. Prerequisite: MU 207 or consent of instructor.

**MU 340 Conducting: Fundamentals (2)**

Principles and techniques of conducting with experience in score reading. 2 activities. Prerequisite: MU 207 or consent of instructor.

**MU 341 Conducting: Choral (2)**

Continuation of MU 340. Emphasis on choral literature. Score reading, rehearsal techniques, and musical details associated with vocal music. 2 activities. Prerequisite: MU 340.

**MU 342 Conducting: Instrumental (2)**

Continuation of MU 340. Emphasis on band and orchestra literature. Score reading, rehearsal techniques, and musical details associated with instrumental music. 2 activities. Prerequisite: MU 340.

**MU 349 Applied Study/Technique (1)**

Individual instruction in performance with emphasis on the technical skills needed for the performance of repertoire. Total credit limited to 3 units. Specific areas of study are listed in the *Class Schedule*. Prerequisite: Consent of instructor.

**MU 350 Applied Music (1)**

Individual instruction in performance and composition. Total credit limited to 6 units. Specific areas of study are listed in the *Class Schedule*. Prerequisite: Consent of instructor.

**MU 351 Jazz and Popular Music Arranging (2)**

Arranging for small and large jazz ensembles. Score and part preparation. 2 activities. Prerequisite: MU 207.

**MU 352 Orchestration (4)**

Ranges, transposition, technical capabilities, and scoring of vocal ensembles, band, and orchestra instruments. Creative project. 3 lectures, 1 activity. Prerequisite: MU 207.

**MU 360 Music for Classroom Teachers (4)**

Development of skills for 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, 1 activity. Prerequisite: MU 100 or MU 101.

**MU 361 Instruments (1)**

Fundamentals of playing and teaching woodwind, brass, string, and percussion instruments. Separate sections in specific areas of study are 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 (4)**

Study and application of Orff, Dalcroze, Kodaly, Manhattanville, and Suzuki. Philosophy, objectives and methodologies for implementing an effective school music program. Includes fieldwork. 3 lectures, 1 activity. Prerequisite: MU 207; junior standing.

**MU 366 Piano Pedagogy (2)**

Survey of elementary, intermediate and advanced teaching methods and literature; private and group instruction; studio policies. 2 activities. Prerequisite: MU 207 or consent of instructor.

**MU 367 Vocal Pedagogy (2)**

Survey of elementary, intermediate and advanced teaching methods including a comprehensive study of the vocal mechanism. 2 activities. Prerequisite: MU 207 or consent of instructor.

**MU 370 University Jazz Band (1)**

Study and public performance of music written for big band jazz. Limited to those who have had considerable experience playing musical 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 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 Wind Orchestra (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 375 Contemporary Music Ensemble (1)**

Open to all instrumentalists who are interested in performing recent classical literature. Total credit limited to 6 units. 1 activity. Prerequisite: Junior standing; by audition or consent of instructor.

**MU 376 Mustang Band (1)**

Public performance of music and specially-designed shows written for marching band (woodwinds, brass, percussion, and flag team auxiliary). Limited to those students who have had marching experience with wind and percussion instruments, or flag, rifle or dance lines. 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 PolyPhonics (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 specialized 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 385 University Singers (1)**

Study and public performance of music for large mixed chorus. Total credit limited to 6 units. 1 laboratory. Prerequisite: Junior standing and consent of instructor.

**MU 387 Vocal Jazz Ensemble (1)**

Study and performance of vocal jazz, including ensemble performance as well as solo performance and improvisation. Total credit limited to 6 units. 1 laboratory. Prerequisite: Junior standing and consent of instructor.

**MU 389 Vocal Practicum (1)**

Study and implementation of performing techniques used by vocalists in a recital or concert setting. 1 activity. Prerequisite: MU 150, MU 250, MU 350 or MU 450, 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 (4)**

Examination of modern compositional practices including impressionism, polytonality, serialism, timbre and form, minimalism, and the new eclecticism. Analysis and creative projects. 4 lectures. Prerequisite: MU 309 or permission of instructor.

**MU 404 Composition (2)**

Independent creative projects. Exercises in compositional methods designed to increase technical facility. Total credit limited to 6 units. 2 activities. Prerequisite: MU 309 or permission of instructor.

**MU 411 Sound Design: Synthesis (4)**

Compositional application of sound synthesis techniques. Realization of computer music. Creative projects. 3 lectures, 1 activity. Prerequisite: MU 310.

**MU 412 Sound Design: Composition and Production (4)**

Production of electroacoustic music in media. Program analysis, technical planning, composition, and product development. 3 lectures, 1 activity. Prerequisite: MU 310.

**MU 420 Music History: Selected Topics (4)**

Intensive study of selected topics in music history through the use of readings, recordings, scores, and class presentations. *Class Schedule* will list topics selected. Total credit limited to 8 units. 3 lectures, 1 activity.

Prerequisite: MU 331, MU 332, MU 333, MU 334, or consent of instructor.

#### **MU 449 Applied Study/Technique (1)**

Individual instruction in performance with emphasis on the technical skills needed for the performance of repertoire. Total credit limited to 3 units. Specific areas of study are listed in the *Class Schedule*. Prerequisite: Consent of instructor.

#### **MU 450 Applied Music (1)**

Individual instruction in performance and composition. Total credit limited to 6 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 (4)**

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. 3 lectures, 1 activity. Prerequisite: MU 341, or consent of instructor.

#### **MU 466 Instrumental Literature and Rehearsal Techniques (4)**

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. 3 lectures, 1 activity. Prerequisite: MU 342, or consent of instructor.

## **PE—PHYSICAL EDUCATION**

(See also KINE—Kinesiology)

### **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 kinesiology 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 107 Billiards  
PE 108 Basketball  
PE 109 Bowling  
PE 110 Cycling  
PE 111 Fencing  
PE 112 Bowling, Int.

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 189 Soccer  
PEW 190 Softball  
PEW 191 Swimming  
PEW 192 Tennis  
PEW 193 Track and Field  
PEW 194 Volleyball

**PROFESSIONAL ACTIVITIES – See KINE—Kinesiology**

**ACADEMIC COURSES – See KINE—Kinesiology**

## **PHIL—PHILOSOPHY**

### **PHIL 126 Logic and Argumentative Writing (4)**

**GE A3**

Principles of argument analysis, evaluation and construction. Deductive and inductive reasoning, including analogical arguments, universal and statistical generalizations, and causal inferences. Principles of organizing and writing argumentative essays. Moral dimensions of rational discourse.

3 lectures, 1 library research project. Prerequisite: Completion of GE Areas A1 and A2.

**PHIL 225 Symbolic Logic (4)**

The nature of deductive logical systems. Methods of notation, translation and proof in the sentential, predicate and relational calculi including indirect and conditional methods of proof. 4 lectures. Prerequisite: Completion of GE Area A3.

**PHIL 230 Philosophical Classics: Metaphysics and Epistemology (4)**

**GE C2**

Study of several classic works from the history of philosophy on issues in metaphysics and epistemology. At least one will be from the Ancient period, and at least one from the Modern era. No more than one from the twentieth century. 4 lectures. Prerequisite: Completion of GE Area A.

**PHIL 231 Philosophical Classics: Social and Political Philosophy (4)**

**GE C2**

Readings from primary philosophical texts, from the ancient and modern periods, with focus on the identification and evaluation of the central ethical and political themes and arguments presented in them. 4 lectures. Prerequisite: Completion of GE Area A.

**PHIL 311 Greek Philosophy (4)**

**GE C4**

Beginnings of Western philosophy and science. The Presocratics, Socrates, Plato, and Aristotle. 4 lectures. Prerequisite: Completion of GE Area A, and PHIL 230 or PHIL 231. Philosophy majors will not receive GE C4 credit.

**PHIL 312 Medieval Philosophy (4)**

**GE C4**

Development of Western philosophy from Augustine to Ockham, including Anselm, Abelard, Roger Bacon, Bonaventure, Aquinas, and Duns Scotus. 4 lectures. Prerequisite: Completion of GE Area A, and PHIL 230 or PHIL 231. Philosophy majors will not receive GE C4 credit.

**PHIL 313 Continental Philosophy: Descartes to Leibniz (4)**

**GE C4**

Development of Western philosophy from the late Renaissance through Leibniz, with special emphasis upon the epistemology and metaphysics of the Continental Rationalists. 4 lectures. Prerequisite: Completion of GE Area A, and PHIL 230 or PHIL 231. Philosophy majors will not receive GE C4 credit.

**PHIL 314 British Philosophy: Bacon to Mill (4)**

**GE C4**

Development of Western philosophy from the Renaissance through Mill, with special emphasis on British Empiricism. 4 lectures. Prerequisite: Completion of GE Area A, and PHIL 230 or PHIL 231. Philosophy majors will not receive GE C4 credit.

**PHIL 315 German Philosophy: Kant to Nietzsche (4)**

**GE C4**

Primary issues and concepts found in German philosophy from 1780 to 1900, with emphasis on Kant, Hegel, and Nietzsche. 4 lectures. Prerequisite: Completion of GE Area A, and PHIL 230 or PHIL 231. Philosophy majors will not receive GE C4 credit.

**PHIL 316 Contemporary European Philosophy (4)**

**GE C4**

Recent movements within the Continental tradition, including French and German existentialism, phenomenology, and post-metaphysical philosophy. 4 lectures. Prerequisite: Completion of GE Area A, and PHIL 230 or PHIL 231. Philosophy majors will not receive GE C4 credit.

**PHIL 317 Contemporary British and American Philosophy (4)**

**GE C4**

Major developments within 20<sup>th</sup> century British and American philosophy, with focus chiefly around Analytic philosophy. Other schools, such as Pragmatism, may be included, as may some philosophers outside of Britain and America whose work was influential in those countries. 4 lectures. Prerequisite: Completion of GE Area A, and PHIL 230 or PHIL 231. Philosophy majors will not receive GE C4 credit.

**PHIL 320 Asian Philosophy (4)**

**GE C4**

Philosophies developed in India, South Asia, China and Japan, including the logical and epistemological presuppositions of the Six Schools of

Hindu metaphysics, Buddhist philosophy, Confucian moral philosophy, Taoist metaphysics and social ecology. 4 lectures. Prerequisite: Completion of GE Area A, and PHIL 230 or PHIL 231. Philosophy majors will not receive GE C4 credit.

**PHIL 321 Philosophy of Science (4)**

**GE C4**

The rational foundations of inquiry and explanation in the physical, biological and social sciences. Justification of scientific claims, the difference between science and pseudoscience, the relationship between science and other fields of investigation. 4 lectures. Prerequisite: Completion of GE Area A, and PHIL 230 or PHIL 231. Philosophy majors will not receive GE C4 credit.

**PHIL 331 Ethics (4)**

**GE C4**

Analyses of various traditional and contemporary positions on the difference between right and wrong, if there is one. Theories of metaethics and normative ethics including the divine command theory, relativism, intuitionism, noncognitivism, virtue ethics, egoism, utilitarianism and duty-based ethics. 4 lectures. Prerequisite: Completion of GE Area A, and PHIL 230 or PHIL 231. Philosophy majors will not receive GE C4 credit.

**PHIL 332 History of Ethics (4)**

**GE C4**

The history of moral thought from Homer and the Pre-Socratics to the 20<sup>th</sup> century, and focus on theories of moral goodness and rightness of action. Related issues and areas of thought, e.g. metaphysics, theology, science, politics, psychology freedom/determinism to be considered, where they shed light on moral thought. 4 lectures. Prerequisite: Completion of GE Area A, and PHIL 230 or PHIL 231. Philosophy majors will not receive GE C4 credit.

**PHIL 333 Political Philosophy (4)**

**GE C4**

Analyses of the philosophical foundations of political ideologies, including theories of political authority, legitimacy, obligation, and rights, and of the proper function of the state, and the relation of these theories to issues in metaphysics, theory of knowledge, and ethics. 4 lectures. Prerequisite: Completion of GE Area A, and PHIL 230 or PHIL 231. Philosophy majors will not receive GE C4 credit.

**PHIL 334 Philosophy of Law (4)**

**GE C4**

Normative and analytic questions about law. Nature of law and legal systems. Justification of law. Moral obligation to obey the law. Nature and justification of punishment. Guilt and legal responsibility. 4 lectures. Prerequisite: Completion of GE Area A, PHIL 230 or PHIL 231, and POLS 112. Philosophy majors will not receive GE C4 credit.

**PHIL 335 Social Ethics (4)**

**GE C4 USCP**

Examination of contemporary moral problems, solutions to these problems, and the arguments for these solutions, with emphasis on two or more of the following sample problem areas: abortion, suicide and euthanasia, capital punishment, family ethics, race relations, social justice, war, women's issues. 4 lectures. Prerequisite: Completion of GE Area A, and PHIL 230 or PHIL 231. Philosophy majors will not receive GE C4 credit.

**PHIL 337 Business Ethics (4)**

**GE C4**

Critical examination of ethical problems that arise in business. 4 lectures. Prerequisite: Completion of GE Area A, and PHIL 230 or PHIL 231. Philosophy majors will not receive GE C4 credit.

**PHIL 338 Ethics and Education (4)**

**GE C4**

Critical discussion of moral issues as a means to the educational goals of autonomy and freedom. Critical examination of major ethical theories. Examination of classroom approaches to discussions of ethical values and moral controversy in education. 4 lectures. Prerequisite: Completion of GE Area A, and PHIL 230 or PHIL 231. Philosophy majors will not receive GE C4 credit.

**PHIL 339 Biomedical Ethics (4)**

**GE C4**

Critical examination of problems in biomedical ethics, proposed solutions to these problems, and the arguments for such solutions. Emphasis on two or more of the following sample problem areas: concepts of health and disease, human experimentation, informed consent, behavior control,

genetic intervention, new birth technologies, euthanasia and physician-assisted dying. 4 lectures. Prerequisite: Completion of GE Area A, and PHIL 230 or PHIL 231. Philosophy majors will not receive GE C4 credit.

**PHIL 340 Environmental Ethics (4)** **GE C4**  
Analyses of various positions on the moral status of nonhuman entities and problems such as the treatment of animals, wilderness preservation, population, pollution and global warming. 4 lectures. Prerequisite: Completion of GE Area A, and PHIL 230 or PHIL 231. Philosophy majors will not receive GE C4 credit.

**PHIL 342 Philosophy of Religion (4)** **GE C4**  
Inquiry into the rational and nonrational bases of religious claims. Arguments for and against the existence of God. Discussion of miracles, revelation, the definition of God, the problem of evil, the relation of faith and reason, the nature of religious experience, the verification of religious claims. 4 lectures. Prerequisite: Completion of GE Area A, and PHIL 230 or PHIL 231. Philosophy majors will not receive GE C4 credit.

**PHIL 350 Aesthetics (4)** **GE C4**  
Critical examination of philosophical views of art from both a historical and contemporary perspective. Treatment of theories from Plato and Aristotle through those of the twentieth century. Discussion of the problems raised by modern art. The relation between aesthetic values and metaphysics, epistemology, ethics and politics. 4 lectures. Prerequisite: Completion of GE Area A, and PHIL 230 or PHIL 231. Philosophy majors will not receive GE C4 credit.

**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 (4)**  
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, research paper. Prerequisite: PHIL 230.

**PHIL 412 Epistemology (4)**  
Analysis of the concept of knowledge. Development of competing theories of epistemic justification and truth. Inquiry into relationship between knowledge, belief, justification and truth. Examination of skepticism. 3 lectures, research paper. Prerequisite: PHIL 230.

**PHIL 422 Philosophy of Mind (4)**  
Classic and current work in the problems and issues of the nature and unity of the self, consciousness, mental representations, and action, and of the relation of philosophy of mind to psychology, linguistics and computer science. 3 lectures, research paper. Prerequisite: PHIL 230 or PHIL 231.

**PHIL 429 Special Topics in the History of Philosophy (4)**  
Advanced discussion of selected topics in the history of philosophy. Examination and analysis of important philosophical movements (e.g., positivism, postmodernism) or alternatively, of particular philosophers or philosophical works of exceptional importance (e.g., David Hume; Kant's *Critique of Pure Reason*). *Class Schedule* will list topic selected. Total credit limited to 12 units. 3 lectures, research paper. Prerequisite: PHIL 230.

**PHIL 439 Selected Problems in Ethics and Political Philosophy (4)**  
Advanced discussion of selected topics in ethics and political philosophy. Examination and analysis of significant ethical or political theories (e.g., utilitarianism, contractarianism) or alternatively, of particular philosophers or philosophical works of exceptional importance (e.g., John Stuart Mill; John Rawls' *A Theory of Justice*). *Class Schedule* will list topic selected. Total credit limited to 8 units. 3 lectures, research paper. Prerequisite: PHIL 231 and PHIL 331 or PHIL 333.

## **PHIL 460, 461 Senior Project (2) (2)**

Selection, development and completion of a project under faculty supervision. Results presented in a formal thesis. Minimum of 60 hours per quarter. Requirements for PHIL 460 must be completed before student can enroll in PHIL 461. Prerequisite: Senior standing, consent of instructor.

## **PHIL 470 Selected Advanced Topics (1-4)**

Directed group study of selected topics for advanced students. *Class Schedule* will list topics selected. Total credit limited to 8 units. 1-4 lectures. Prerequisite: Consent of instructor.

# **PHYS-PHYSICS**

## **PHYS 104 Introductory Physics (4)** **GE B3**

Elementary introduction to mechanics, gases, liquids and solids, heat, vibrations and waves, light, electricity and magnetism. Intended to provide non-science students with an understanding of basic physical concepts. Not open to students who have credit in a college physics course. 4 lectures. Prerequisite: Appropriate ELM exemption or an appropriate score on the ELM examination or MATH 104.

## **PHYS 107 Introduction to Meteorology (4)** **GE B3**

Physics of Earth's atmosphere. Topics include the physical basis for temperature, wind generation, atmospheric circulation, humidity, adiabatic processes, cloud formation, cyclone development, precipitation, and storm growth. Other topics include the variety of storms and their effects, satellite imaging, and air pollution and its possible effect on global temperature change. 4 lectures. Prerequisite: Appropriate score on the ELM examination for MATH 116 eligibility, or an ELM exemption, or MATH 104.

## **PHYS 111 Modern Physics for Poets (4)** **GE B3**

Non-mathematical exploration of the key concepts of quantum mechanics and Einstein's special and general theories of relativity. Particle-wave duality, Heisenberg's uncertainty principle, Schrodinger's cat, warped spacetime, black holes. 4 lectures.

## **PHYS 121 College Physics (4)** **GE B3 & B4**

Introductory course in mechanics emphasizing motion, force, and energy. Not open to students having a grade of C- or better in PHYS 131. 3 lectures, 1 laboratory. Prerequisite: MATH 118 and high school trigonometry, or MATH 119 or MATH 120.

## **PHYS 122 College Physics (4)**

Continuation of PHYS 121. Topics include properties of materials, fluids, waves and vibrations, sound, heat, light and optics. Not open for credit to students having a grade of C- or better in PHYS 132. 3 lectures, 1 laboratory. Prerequisite: PHYS 121.

## **PHYS 123 College Physics (4)**

Continuation of PHYS 121 and 122. Electrostatics, electric current, magnetic fields and induction. Elements of modern physics. Not open for credit to students having a grade of C- or better in PHYS 133. 3 lectures, 1 laboratory. Prerequisite: PHYS 121. Recommended: PHYS 122.

## **PHYS 131 General Physics (4)** **GE B3 & B4** (Also listed as HNRS 131)

Fundamental principles of mechanics. Vectors, particle kinematics. 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 141 with grade C- or better and MATH 142 or MATH 182 (or concurrent enrollment). Recommended: high school physics.

## **PHYS 132 General Physics (4)** **GE B3 & B4** (Also listed as HNRS 132)

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 or HNRS 131.

**PHYS 133 General Physics (4) GE B3 & B4**

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 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 College 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 on the Computer (4)**

Introduction to computer algebra system for solving problems in physics: differential equations, matrix manipulations, simulations and numerical techniques, nonlinear dynamics. 4 lectures. Prerequisite: PHYS 133, MATH 241 or MATH 244 (preferred) and computer literacy.

**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, computer literacy, and concurrent enrollment in PHYS 256.

**PHYS 211 Modern Physics I (4)**

Special relativity, fundamental principles of quantum mechanics, emphasizing the modern description of atomic phenomena. Kinetic theory, wave particle duality, Bohr theory, Schrodinger equation, elementary atomic structure. 4 lectures. Prerequisite: PHYS 123, or PHYS 132 and PHYS 133, and MATH 241.

**PHYS 212 Modern Physics II (4)**

Applications of quantum physics to atoms, nuclei, and elementary particles. Quantum statistics, principles of the laser. Topics in solid state physics such as the free electron theory of metals, bonding in solids and energy bands. Nuclear structure and nuclear energy. 4 lectures. Prerequisite: PHYS 211.

**PHYS 215 Physics of Sound and Music (3)**

Wave nature of sound. Musical instruments and production of sound, overtones and tone quality, musical scales, decibels and noise hazards. Speech and hearing. Recording and reproduction of sound. Electronic instruments and synthesizers. Room acoustics. 3 lectures. Prerequisite: PHYS 104 or PHYS 122 or PHYS 132 or PSC 101 or consent of instructor.

**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)**

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)**

Vector analysis, laws of motion, kinematics and dynamics of a particle. Work and energy. Oscillatory motion (damped and forced oscillation). Center of mass. Linear and angular momentum. 3 lectures. Prerequisite: PHYS 131, MATH 244 or MATH 344 (preferred).

**PHYS 303 Analytical Mechanics II (3)**

Dynamics of a rigid body. Three-dimensional motion of a rigid body. Introduction to Lagrange's and Hamilton's equations. 3 lectures. Prerequisite: PHYS 302. Concurrent: MATH 344.

**PHYS 310 Physics of Energy (3)**

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 315 Introduction to Lasers and Laser Applications (3)**

Interaction of radiation with matter, theory of laser action, characteristics and modification of laser output, types of lasers. Holography and other applications. 3 lectures. Prerequisite: PHYS 133, or PHYS 123 and MATH 143.

**PHYS 317 Special Theory of Relativity (3)**

Fundamental experiments and basic postulates of special relativity. Simultaneity, length and time measurements. Lorentz transformations. Four-Vectors. Space-time diagrams. Relativistic mechanics and electromagnetism. 3 lectures. Prerequisite: PHYS 211.

**PHYS 323 Optics (5)**

Geometric optics, lens systems, aberration, physical optics and polarization. 4 lectures, 1 laboratory. Prerequisite: PHYS 133, MATH 241.

**PHYS 340 Quantum Physics Laboratory I (2)**

Experimental studies of the quantum properties of atoms and nuclei. Measurements of fundamental constants. Statistics and data analysis. 1 lecture, 1 laboratory. Prerequisite: PHYS 212 and PHYS 256.

**PHYS 341, 342 Quantum Physics Laboratory II, III (1) (2)**

Advanced experimental studies of quantum properties of atoms and nuclei. Interactions with radiation, particles and fields. Courses must be taken in numerical order. PHYS 341: 1 laboratory; PHYS 342: 2 laboratories. Prerequisite: PHYS 340.

**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)**

Advanced nuclear physics topics. The two-nucleon problem at low energy. The deuteron. Subnuclear particles and their structure. Elementary particles. Symmetries and conservation laws. Parity, charge conjugation

and time reversal invariance. Hadronic interactions. The weak interaction. 3 lectures. Prerequisite: PHYS 212 and PHYS 405.

#### **PHYS 405 Quantum Mechanics I (4)**

Wave nature of matter and the basic postulates of quantum mechanics. The wave function, operators, and their interpretation. Schrodinger's Equation and its solutions in one and more dimensions. The hydrogen atom and the periodic table. 4 lectures. Prerequisite: PHYS 211, MATH 244. Recommended: PHYS 212, MATH 344.

#### **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, radiation 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 244 or equivalent.

#### **PHYS 412 Solid State Physics (3)**

#### **GE B6 with PHYS 452**

Properties of solids including the structural, mechanical, thermal, and electronic properties, energy band theory and the properties of metals and semiconductors. 3 lectures. Prerequisite: PHYS 211 or MATE 340, MATH 244.

#### **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 417 Nonlinear Dynamical Systems (4)**

#### **GE B6**

Analysis of linear and nonlinear dynamical systems with emphasis on geometrical methods and visualization techniques. Fixed points, phase plane analysis, bifurcations and limit cycles. Laboratory component includes data acquisition and analysis using computers, numerical simulations of dynamical systems, and analysis of discrete systems. 3 lectures, 1 laboratory. Prerequisite: MATH 242 or MATH 244, and junior standing, or consent of instructor.

#### **PHYS 423 Advanced Optics (4)**

Lens aberrations, interference and diffraction, Fourier optics, quantum optics, image formation and holography, non-linear optics. 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 344.

#### **PHYS 452 Solid State Physics Laboratory (1)**

#### **GE B6 with PHYS 412**

Selected experiments on X-ray diffraction, Hall effect, optical absorption, thermo-electric effect, photovoltaic cells, diode characteristics, and superconductivity. 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. Prerequisite: Consent of instructor.

#### **PHYS 463, 464 Senior Project - Laboratory Research (2) (2)**

Selection and completion of a laboratory research project under faculty supervision. Projects typical of problems which graduates will encounter in industry or graduate school. Project results are presented in a formal report. Minimum 120 hours total time. 2 laboratories. Prerequisite: Consent of instructor.

#### **PHYS 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.

#### **PHYS 471 Selected Advanced Laboratory (1-4)**

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 8 units. 1 to 4 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 instructor.

#### **PM 225 Introduction to Poultry Management (4)**

Introduction to modern techniques in poultry production, processing, marketing and price discovery. Consumption trends, breeds and consumer grades. Laboratory application of management skills, health care, keeping of production and accounting records and processing techniques. 3 lectures, 1 laboratory.

#### **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 320 Egg and Poultry Meat Processing (4)**

Science, technology and merchandising of egg and poultry meat products. Quality assurance, product formulation and further processing. Practical experience formulating, manufacturing and evaluating selected products. 3 lectures, 1 laboratory. Prerequisite: PM 225 or ASCI 209 or ASCI 211.

**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 225.

**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 225.

**PM 345 Poultry Business Management (4)**

Organization and management of vertically integrated poultry operations. Personnel management, cash flow analysis, cash vs. accrual accounting, structuring of financial statements, projecting product outputs and cash flow needs, employee benefit programs and insurance needs for poultry companies. 3 lectures, 1 laboratory. Prerequisite: PM 225.

**PM 360 Poultry Industry Seminar (3)**

New trends, management techniques and governmental regulations, special problems and research developments related to the poultry industry. 3 seminars. Prerequisite: PM 225, PM 330 and PM 340.

**PM 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 instructor.

**PM 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: Consent of instructor.

**PM 490 Advanced Poultry Management Enterprise (2-4) (CR/NC)**

Intensified management of specialized poultry enterprises in all species areas. Application of applied research and progressive husbandry and processing practices employed. Industry contact and visitation encouraged. Total degree credit for 290/490 limited to 9 units. Credit/No Credit grading only. Prerequisite: Consent of instructor.

**PM 581 Graduate Seminar in Poultry (3)**

Current trends and characteristics of the poultry industry enterprise. Group discussion of skills, techniques and practices to improve teaching of vocational agriculture as it applies to poultry. 3 seminars.

**POLS-POLITICAL SCIENCE****POLS 111 California Constitution and Government (1)**

Basic aspects of California state government. Satisfies California state and local government requirement for students who have AP credit for American Government or have taken American Government without coverage of California government. 1 lecture.

**POLS 112 American and California Government (4) GE D1**

Study of governmental institutions, politics, issues and political behavior in the United States and California in constitutional, historical, social and cultural perspectives. Meets the U.S. government and California state/local government requirement. 4 lectures.

**POLS 180 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, the dynamics of political change and philosophy of science. 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 225 Introduction to International Relations (4)**

Introduction to the basic concepts, issues, and theories surrounding the study of international politics. Changes in the nature of conflict, power, and national interests in the post-Cold War era. Role of states, non-governmental actors, and international organizations in the global arena. 4 lectures.

**POLS 229 Introduction to Comparative Politics (4)**

Comparative study of the governments of selected Western and non-Western countries. Case studies. 4 lectures.

**POLS 230 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 112.

**POLS 285 Model United Nations (4)**

Introduction to the United Nations and major issues that confront it. Preparation for participation in collegiate Model United Nations conferences. Rules of procedure and debate, preparation of country position papers, and resolution writing. 4 lectures. Prerequisite: One course in POLS or consent of instructor.

**POLS 308 Collective Violence and Conflict Resolution (4)**

Causes, methods, and consequences of non-state groups that use violent means to pursue revolutionary, separatist, or ideological goals both domestically and internationally. Dynamics of ethnic conflict, terrorist movements, paramilitary groups, insurgencies, and narco-trafficking. Processes of conflict resolution in divided societies through military responses, negotiated settlements, democracy, and peacekeeping missions. 4 lectures. Prerequisite: POLS 112.

**POLS 310 Politics of Ethnicity and Gender (4) USCP**

Analysis of factors that affect the changing role of women and major ethnic groups in American politics. Involvement, organization and role of minority groups in the political process. 4 lectures. Prerequisite: POLS 112.

**POLS 315 The American Presidency (4)**

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. 4 lectures. Prerequisite: POLS 112.

**POLS 316 Political Parties and Interest Groups (4)**

Make-up 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. 4 lectures. Prerequisite: POLS 112.

**POLS 317 Campaigns and Elections (4)**

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. 4 lectures. Prerequisite: POLS 112.

**POLS 318 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 112.

**POLS 319 United States Congress (4)**

Theory and practice of representative government in the United States. Organization, procedures and consequences of the legislative process in Congress and state legislatures. 4 lectures. Prerequisite: POLS 112.

**POLS 320 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 225 or junior standing.

**POLS 324 International Relations Theory (4)**

Survey of theoretical approaches to the study of international political processes and problems. Foreign policies and politics in relations between states. Conflicts and adjustments. Analyses of selected problems to elucidate differences between realist, liberal, socialist, constructivist, and other theories. 4 lectures. Prerequisite: POLS 225.

**POLS 325 Global Political Issues (4)****GE D5**

Concepts, theories and contemporary global issues combined so as to better understand the complexities of our modern world. Application of principles of international relations to subjects which affect our lives. 4 lectures. Prerequisite: Completion of GE Area A, and one course from two of the three subfields of Area D1, Area D2, and/or Area D3. Political Sciences majors will not receive GE Area D5 credit.

**POLS 328 Politics of Developing Areas (4)**

Process of political development in the Third World with appropriate examples taken from particular areas and countries. 4 lectures. Prerequisite: POLS 225.

**POLS 330 Modern Political Thought (4)**

Theories of political participation and the relationship between the individual and the state as developed in the works of influential thinkers such as Locke, Rousseau, Mill and Marx. 4 lectures. Prerequisite: POLS 230.

**POLS 333 World Food Systems (4)****GE Area F**

Integrated, interdisciplinary study of the technologies of global food production, environmental and social issues related to the application of those technologies, and moral and ethical issues associated with global food production and distribution. Emphasis on the politics of change. 4 lectures. Prerequisite: Junior standing and completion of GE Area B. Political Science majors will not receive GE Area F credit.

**POLS 334 Jurisprudence (4)**

Normative and analytical problems concerning law. Nature of law and legal systems. Justification of law and the obligation to conform. Analysis of liberty and justice and their relevance to issues such as affirmative action, discrimination, and free speech. 3 lectures, 1 activity. Prerequisite: POLS 112 and POLS 230.

**POLS 337 American Political Thought (4)**

The central political ideas of America's leading thinkers from the Puritans to the present. 4 lectures. Prerequisite: POLS 112, POLS 230.

**POLS 338 Critical Issues in American Politics (4)****GE D5**

Examination of significant social, legal, economic and political issues that face the country and how the basic institutions of government—national, state, local—are responding to them; assessment of policies to correct these problems. 4 lectures. Prerequisite: Completion of GE Area A, one course from Area D1, and one course from either Area D2 or D3. Political Sciences majors will not receive GE Area D5 credit.

**POLS 339 Comparative Political Systems (4)****GE D5**

Use of different methodologies to help understand western and non-western settings. Particular attention paid to the political, economic and social institutions which create distinctive politics. 4 lectures. Prerequisite: Completion of GE Area A and one course from two of the three subfields of Area D1, D2, and/or D3. Political Sciences majors will not receive GE Area D5 credit.

**POLS 341 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 112.

**POLS 343 Civil Rights in America (4)****USCP**

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 112.

**POLS 344 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 112.

**POLS 345 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 112.

**POLS 346 Politics in Literature (4)**

Political concepts and values examined, based on literary sources. Recent topics include: power, justice, violence and social responsibility. Authors whose works have been examined include: Brecht, Camus, Dostoevsky, Miller, Vonnegut, and Dorfman. Both plays and novels are used. 4 lectures. Prerequisite: POLS 112 or consent of instructor.

**POLS 347 Politics and Popular Culture (4)**

Intersection of politics and mass media. How political actors use popular culture to establish issue agendas, convey political concepts, symbolism, rhetoric and values. 4 lectures. Prerequisite: POLS 112 or consent of instructor.

**POLS 351 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 112.

**POLS 360 Political Analysis (5)**

Introduction to methodology research design and quantitative methods used in survey research and political analysis. Multiple regression analysis, non-linear techniques, and diagnostics used to analyze political phenomena. SPSS statistical computer programs used to work on statistical application. 4 lectures, 1 activity. Prerequisite: POLS 180 and STAT 221 or STAT 217 or equivalent with minimum grade of C-.

**POLS 375 California Politics (4)**

Political culture, processes, behavior, institutions, public policy and distribution of power in California state and substate governments. 4 lectures. Prerequisite: POLS 112.

**POLS 384 Citizenship, Society and Self (4)****GE D5**

Development of the skills and competencies that form the basis for an informed, responsible, and active citizenry. The meaning of democracy, community, and civic responsibility, and self-identification and examination as active participants in the community. Fieldwork and field research based on service involvement in the community. 3 lectures, 1 activity. Prerequisite: Completion of GE Area A, one course in Area D1, and one course in Area D3. Political Sciences majors will not receive GE Area D5 credit.

**POLS 385 Advanced Model United Nations (2) (CR/NC)**

Preparation for participation in collegiate Model United Nations conferences. Rules of procedure and debate, preparation of country position papers, and resolution writing. Discussion of current issues of concern to the United Nations. Credit/No Credit grading only. Total credit limited to 6 units. 2 lectures. Prerequisite: POLS 285 or consent of instructor.

**POLS 386 Government Internship (2-12) (CR/NC)**

Supervised work experience in a government or related public agency. 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 388 Field Study (1) (CR/NC)**

Field study experience visiting government facilities, museums, and cultural places as part of the London Study Program or other off-site Cal Poly programs. May include films, discussions, and lecture by Cal Poly faculty. Credit/No Credit grading only. Total credit limited to 6 units. 1 activity. Prerequisite: POLS 112 or equivalent.

**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 419 Social Movements and Political Protest (4)**

Selected U.S. social movements, including abolitionism, feminism, civil rights, gay rights, the Christian right, and environmentalism. Political opportunities and constraints that impact collective political action, and effects of grassroots struggles for justice in U.S. politics and society. 4 lectures. Prerequisite: POLS 112 and junior standing.

**POLS 420 Contemporary U.S. Foreign Policy (4)**

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. 4 lectures. Prerequisite: POLS 225.

**POLS 426 International Organizations and Law (4)**

Transnational politics and strategies supporting and opposing different dimensions of globalization. Topics include international law and the use of force, challenges to the primacy of the nation-state, and movement toward a global culture as expressed in the development of human rights law. 4 lectures. Prerequisite: POLS 225 or POLS 324.

**POLS 427 Politics of the Global Economy (4)**

Political conflicts surrounding the trading, financial, and security structures of the international economy. Motivations, resources, and responses of states, international organizations, multinational corporations and other nonstate actors as they address economic, political, environmental, and security issues within these structures. Desirability and inevitability of globalization. 3 lectures and a research paper. Prerequisite: POLS 225, completion of GE D2, or consent of instructor.

**POLS 451 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. 3 lectures and a research paper. Prerequisite: POLS 112.

**POLS 456 Politics and Economic Policy (4)**

Goals of economic policy, based on efficiency, equity, and other values. Theories of market failure and government regulation. Influence of electoral calculations, bureaucracy, and interest group pressures on government approaches to address market failures. Government intervention in the marketplace, and intervention by economic interests into politics, and how this challenges democracy 3 lectures and a research paper. Prerequisite: POLS 112, completion of GE D2; or consent of instructor.

**POLS 457 The Politics of Reproductive Policy (4)**

History, development, implementation and the relative success of various reproductive policies. Critical evaluation of these policies using a feminist theoretical framework and political science perspective. 4 lectures. Prerequisite: POLS 112, completion of GE Area D, and junior standing; or consent of instructor.

**POLS 460 Intermediate Political Analysis (4)**

Intermediate social science methodology focusing on stochastic model specification and estimation. Enhancements and generalizations of the basic approaches with applications to multivariate, nonlinear and large

sample settings. Increased use of computer packages and data analysis. 3 lectures, 1 activity. Prerequisite: POLS 360.

**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 470 Selected Advanced Topics (1-4)**

Directed courses on timely issues and topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. 1-4 lectures. Prerequisite: POLS 112, junior standing.

**POLS 471 Urban Politics (4)**

Theoretical approaches, concepts, and politics associated with urban governments. Urban power structures, the relationship between urban society and politics, and inter-governmental relations. 3 lectures and a research paper. Prerequisite: POLS 112.

**POLS 481 Senior Project Seminar (4)**

Selection, preparation and completion of senior project, focusing on current developments in the field of political science, with primary attention to American politics, public policy, international relations, or public administration. Project results presented in a formal paper. 3 seminars and a research paper. Prerequisite: POLS 112 and POLS 360.

**POLS 484 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: Junior or senior standing.

**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 500 Independent Study (1-4)**

Individual research, studies, or surveys under the supervision of the faculty. Total credit limited to 4 units. Prerequisite: Graduate standing with minimum of 12 core units.

**POLS 515 Public Policy (4)**

Public policy making and contemporary policy issues, including markets; regulation; criminal justice; housing; environment; poverty; health care and education. 4 lectures. Prerequisite: Graduate standing and POLS 112 or equivalent.

**POLS 516 Public Finance (4)**

Economic and political factors affecting federal, state and local governments. Intergovernmental relations and policy considerations in finance, debt management and tax administration. 4 lectures. Prerequisite: POLS 515.

**POLS 517 Administrative Theory and Behavior (4)**

Theories, concepts and case studies related to organizations and to the individuals and groups that work in them. Case studies and applications of concepts to public and non-profit organizations. 4 lectures. Prerequisite: POLS 515.

**POLS 518 Public Policy Analysis (4) (Also listed as CRP 518)**

Analysis of the social, economic, environmental, political contexts of public policy decisions. Public policy issues and use of concepts and tools related to monitoring and assessment. 4 lectures. Prerequisite: CRP 501, POLS 360 or consent of instructor.

**POLS 519 Public Personnel Policy (4)**

Concepts, techniques, and issues related to human resource administration. Techniques and concepts for public and nonprofit organizations. 4 lectures. Prerequisite: POLS 515.

**POLS 550 Development Administration (4)**

Administration in developing areas of the world. Tools for sustainable development. 4 lectures. Prerequisite: Graduate standing.

**POLS 560 Quantitative Methods (5)**

Social science methodology focusing on research design and quantitative methods used in policy and political research: multi-regression, non-linear techniques, diagnostics and time series. Advanced computer packages used to analyze challenging data sets. 4 lectures, 1 activity. Prerequisite: POLS 360, STAT 322, or STAT 512.

**POLS 586 Policy Internship (4-8) (CR/NC)**

Supervised work experience in a government or related public agency. Intern will function as an employee engaged in comparable work. Credit/No Credit grading only. Total credit limited to 8 units. Prerequisite: Completion of 12 units of core courses in the Master of Public Policy Program.

**POLS 590 Graduate Seminar (4)**

Seminar designed as a culminating component to the Master of Public Policy Program. Individual research under the supervision of the faculty within a small discussion environment, leading to a graduate project or paper. Total credit limited to 8 units. 4 seminars. Prerequisite: POLS 560, advancement to candidacy, consent of academic program chair.

**PPSC-PLANT PROTECTION SCIENCE****PPSC 110 People, Pests and Plagues (4)****GE B2 & B4**

Introduction to the science of entomology, focusing on insect and small arthropod biology. Insects as the largest group of terrestrial lifeforms on the plant. Insect pest and beneficial species, and their role in shaping how we live, work and eat. Not open to students majoring in CRSC, FRSC, EHS nor PPSC. 3 lectures, 1 activity.

**PPSC 311 Agricultural Entomology (4)**

The science of entomology as it relates to pest management in agriculture. Focus on the biology, ecology and identification of insects and mites important to agricultural production systems. Identification of insects injurious to California horticultural, field, and vegetable crops. 3 lectures, 1 laboratory. Prerequisite: CHEM 110/111 and introductory courses in biology, botany or zoology or consent of instructor.

**PPSC 321 Weed Ecology (4)**

Weed ecology, biology, and implications for management. Identification of weedy and invasive plant species in annual agricultural, perennial semi-managed, range, aquatic, and forest ecosystems, to elucidate weaknesses and strengths in order to facilitate vegetation management. Organic, cultural, biological, mechanical, and chemical methods and their integrated (IPM) uses. 3 lectures, 1 laboratory. Prerequisite: BOT 121 or introductory course in botany or biology.

**PPSC 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. 3 lectures, 1 laboratory. Prerequisite: Junior standing.

**PPSC 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. 3 seminars, 1 laboratory. Prerequisite: PPSC 321 or consent of instructor.

**PPSC 414 Grape Pest Management (4)**

Comprehensive survey of major grape pests including diseases, insects, weeds, vertebrates, and nematodes. Identification and biology of grape pests and natural enemies, monitoring, and integrated pest management (IPM) strategies, including cultural, biological, and chemical controls. Guest lectures. Total credit limited to 8 units. 3 lectures, 1 activity. Prerequisite: PPSC 311, BOT 323, FRSC 231.

**PPSC 427 Disease and Pest Control Systems for Ornamental Plants (4)**

Recognition, prevention and control of diseases, insect/mite pests and weeds 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, pest and weed control procedures. 3 lectures, 1 laboratory. Prerequisite: EHS 121, CRSC 311, BOT 324 and senior standing.

**PPSC 431 Insect Pest Management (4)**

Principles of insect and mite pest management, including integrated pest management (IPM), applications of ecological theory to pest management, cultural, biological and chemical controls, pesticide resistance management, insect and mite monitoring, biotechnology applications, pesticide laws and regulations, pest control advisor and qualified applicator licensing and certification. One field trip required. 3 lectures, 1 laboratory. Prerequisite: PPSC 311 or consent of instructor.

**PPSC 441 Biological Control of Insects (4)**

Biological control of insects to include history of classical methods, biology, augmentation and inundative release of beneficial arthropods. Identification of beneficial arthropods to appropriate taxonomic level. Technology, laws and regulations governing use of biocontrol agents. Field trips to insectaries, quarantine facilities and/or crop production areas. 3 lectures, 1 laboratory. Prerequisite: PPSC 311 or consent of instructor.

**PSC-PHYSICAL SCIENCE****PSC 101 The Physical Environment: Matter and Energy (4)****GE B3 & B4**

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)**

Introduction to the basic principles of the atomic, molecular, and sub-atomic behavior of matter, and applications of these principles in modern society. Electricity and magnetism, electrical nature of matter, organic and inorganic chemistry, modern physics, the nucleus. 3 lectures, 1 activity. Prerequisite: PSC 101.

**PSC 103 The Physical Environment: Earth and the Universe (4)****GE B3**

Introduction to the basic principles of the Earth sciences and astronomy, and applications of these principles in modern society. Structure and formation of the Earth, earthquakes, weather, oceanography, Solar System, stars, and cosmology. 3 lectures, 1 activity. Prerequisite: PSC 101

**PSC 110 Energy for the Present and the Future (3)**

Detailed qualitative presentation of current and future energy sources along with the associated environmental problems. Energy production, energy consumption, efficient use of energy, fossil fuels, nuclear fission and alternative sources such as solar, geothermal and fusion energy. 3 lectures.

**PSC 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.

**PSC 201 Introduction to Physical Oceanography (4) GE B5**

Ocean origin, evolution, and sea floor features. Sediments; sea water; the ocean and our climate. Ocean surface and deep currents; waves and tides; coastal ocean. Marine life, food production, organisms, environments and lifestyles. Coastal development, pollution and food. Ocean resources and law. 4 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 305 Patterns of Change (4)**

Patterns of change in the formation and evolution of the Universe, the Earth, and life. Topics include the Big Bang, radiometric dating, plate tectonics, the fossil record, biogeography, and the biochemical evidence that supports evolution. 3 lectures, 1 activity. Prerequisite: PSC 101 or PSC 103 or consent of instructor.

**PSC 307 Nuclear Weapons in the Post-Soviet World (4) GE Area F**

Technology and basic science of fission/fusion weapons, uranium/plutonium, nuclear reactors, offensive/defensive missile systems, command/control, verification, weapon effects, nuclear testing. Historical context of Cold War and proliferation, recent events, global norms, arms control treaties. 3 lectures, 1 seminar. Prerequisite: Completion of GE Area B, and junior standing. Physical Science majors will not receive GE Area F credit.

**PSC 320 Energy and the Environment for the New Millennium (4)****GE Area F**

Science and technology of current and future energy sources along with associated environmental problems. Energy production, consumption, efficient usage, fossil fuels, nuclear, solar, other renewables. Risks, benefits, planning, economics. 3 lectures, 1 recitation. Prerequisite: Completion of GE Area B, and junior standing. Physical Science majors will not receive GE Area F credit.

**PSC 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.

**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 103 Pairing and Marriage (4)**

Functional approach to contemporary dating and pairing patterns with emphasis on developing communication during the early developmental stage of the paired relationships. 4 lectures.

**PSY 104 Effective Study Techniques (3) (CR/NC)**

Provides adequate instruction and practice in specific study skills such as note-taking, time-planning, memory, concentration, reading, test taking, self monitoring, and use of personal resources. Credit/No Credit grading only. 2 lectures, 1 activity.

**PSY 200 Special Problems for Undergraduates (1-4)**

Individual investigation, research, study or survey of selected problems in consultation and with prior approval of instructor. Written report required.

Total credit limited to 4 units. Prerequisite: PSY 201 or PSY 202 and consent of department head.

**PSY 201 General Psychology (4)****GE D4**

Introduction to the psychological study of human beings. Applications and research in area such as psychobiology, perception, learning, motivation, consciousness, memory and 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. 4 lectures.

**PSY 202 General Psychology (4)****GE D4**

Introduction to the psychological study of human beings. Applications and research in area such as psychobiology, perception, learning, motivation, consciousness, memory and 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, 1 recitation.

**PSY 204 Tutor Training and Certification (2) (CR/NC)**

Group study/tutorial certification program. Prepares students for certification with the College Reading and Learning Association (CRLA) tutor program. Emphasis on effective group study/tutorial strategies and techniques, communication skills, multicultural issues and disability awareness. Credit/No Credit grading only. 1 lecture, 1 activity.

**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 SCOM 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 understand diversity issues, 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, diversity, 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 infancy to old age. Basic research and concepts in understanding social, emotional, cognitive, contextual, and diversity influences on development. 4 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 301 Psychology of Personal Development (4)**

Application of developmental psychology to self awareness. Includes communication skills, self modification skills and examination of life goals and values. 4 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 302 Behavior in Organizations (4)**

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. 4 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 303 Family Interaction (4)**

Examination of the family ecosystem and how it creates reality. Emphasis on how the practitioner can recognize the cues present in patterned behavior in family interaction that produce a family's distinctive style or family type. Normal processes are studied in order to understand how dysfunctional patterns are introduced and reinforced. Focus on the internal dimension rather than the effect of external influences. 4 lectures. Prerequisite: PSY 201 or PSY 202, CD 203 or PSY 254.

**PSY 305 Personality (4)**

Personality theories and research. Assessment, dynamics, and development of personality. Trait, behavioral, social learning, cognitive, humanistic, psychoanalytic and biological approaches. 4 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 306 Adolescence (4) (Also listed as CD 306)**

Psychological analysis of the years from prepubescence to young adulthood. Current research on behavior and development during adolescence with emphasis on physical, affective, cognitive, sociocultural, historical, family, peer and school aspects of life during the post-child, pre-adult years. 4 lectures. Prerequisite: PSY 201 or PSY 202, junior standing.

**PSY 307 Memory and Cognition (4)**

Principles and theories of memory and cognition including processes; models of perception, attention and memory; concept formation; language; intelligence; problem-solving and decision making; creativity; applications to areas such as law, artificial intelligence, and education. 4 lectures. Prerequisite: PSY 201 or PSY 202, junior standing.

**PSY 309 Psychology of Consciousness (4)**

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. 4 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 310 Psychology of Death (4)**

Psychological aspects of death, loss and grief, including scientific findings, person-culture transactions and expressions in the arts and humanities. Personal exploration and interdisciplinary application of psychology to issues such as death anxiety, dying processes, funerals, immortality beliefs, suicide, and grieving. 4 lectures. Prerequisite: PSY 201 or PSY 202, or consent of instructor.

**PSY 311 Environmental Psychology (4)****GE D5**

Interrelationship between behavior and the built and natural environments. Evaluating and understanding environments, environmental stress, and the human aspects of environmental problems. 4 lectures. Prerequisite: Any two lower-division GE Area D courses; PSY 201 or PSY 202 recommended; completion of Area A. Psychology and Child Development majors will not receive GE Area D5 credit.

**PSY 314 Psychology of Women (4)**

The lives of women from a psychological perspective. Topics include gender similarities and differences; masculinity, femininity, and androgyny; women's mental and physical health; female sexuality; women's roles in the workplace and the home; and harassment and violence against women. 4 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 315 Psychology of Men (4)**

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. 4 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 317 Psychology of Stress (4)**

Examines the relationship between stress and psychological and physical well-being. Research on the psychological factors influencing stress as well as a description and critical evaluation of methods of stress reduction. 4 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 318 Psychology of Aging (4)****GE D5**

Psychological and physiological aging in the context of the culture. Theories and research relating to the issues of stability and both positive and negative changes in perception, learning, memory, intelligence, personality, identity, motivation, sexuality, family relationships, career. Disorders, institutionalization, death and bereavement. 4 lectures. Prerequisite: Any two lower-division GE Area D courses; PSY 201 or PSY 202 recommended; completion of Area A. Psychology and Child Development majors will not receive GE Area D5 credit.

**PSY 319 Motivation and Emotion (4)**

Examination of the mechanistic and cognitive-based theories of motivation and emotion. Practical applications of each theory covered in an attempt to understand certain personal and societal behaviors. Research evaluating each theory and diversity consideration. 4 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 323 The Helping Relationship (4)**

Basic skills and approaches common to helping relationships with children, adults, and families. Examines theoretical, empirical, and practical applications of helping. Differentiation between professional, paraprofessional, and nonprofessional helping relationships. 2 lectures, 2 activities. Prerequisite: Junior standing, cultural pluralism course, Psychology & Human Development majors only, or consent of instructor.

**PSY 329 Research Methods in Psychology (3)**

Introduction to research methods used in psychology and other behavioral sciences. Topics include the logic and ethics of research; experimental, correlational, and survey methodology; library search strategies; basic statistical procedures; and the format of the research report. 2 lectures, 1 activity. Prerequisite: PSY 201 or PSY 202, STAT 217 or STAT 211, or consent of instructor.

**PSY 330 Behavioral Effects of Psychoactive Drugs (4)**

Pharmacokinetic, pharmacodynamic and behavioral effects of psychoactive drugs. Social and psychological issues related to drug use and misuse. 4 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 333 Quantitative Research Methods for the Behavioral Sciences (3)**

Thorough introduction to the quantitative aspects of empirical research. Using SPSS statistical software, students will learn how to choose, conduct, and interpret analyses of research data from different behavioral science disciplines. 2 lectures, 1 activity. Prerequisite: PSY 329 or SOC 333, and STAT 217, or consent of instructor.

**PSY 339 Psychology of Religion (4)**

Major psychological perspectives on religion, faith, and religious experience. Objective and subjective approaches to the study of religion as related to prayer, meditation, social attitudes, behavior, mental health, mysticism, religious orientation, and personal development. 4 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 340 Biopsychology (4)****GE B5**

Relationship between physiological and behavioral processes such as learning and memory, language, sleep, and abnormal behavior. Information processing, biochemistry, and structural organization at the cellular and nervous system levels. 4 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 350 Teamwork (4)**

Group dynamics applied to teams. Topics include team development, basic team processes, conflict management, decision making, leadership,

problem solving, and the impacts of diversity and culture on teams. Focus on effective use of teams in the workplace. 4 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 or PSY 323.

#### **PSY 352 Conflict Resolution: Violent and Nonviolent (4) GE D5**

Psychological, situational, political, and cultural determinants of violence and nonviolence in interpersonal, intergroup, and international conflict. Self-assessment of conflict resolution attitudes, competencies, and behaviors. Negotiation, mediation, and other approaches to conflict management. Educational and structural approaches to violence prevention. 4 lectures. Prerequisite: PSY 201/202, completion of GE Area A, and one course from Area D3. Psychology and Child Development majors will not receive GE Area D5 credit.

#### **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 360 Applied Social Psychology (4)**

Applications of social psychology to education, business and industry, environmental problems, interpersonal and intergroup relations, health and welfare, mass communication, judicial systems, and politics. Analysis of social and organizational problems, methods of intervention, and program evaluation. 4 seminars. Prerequisite: PSY 252.

#### **PSY 366 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 370 Introduction to Clinical and Counseling Psychology (4)**

Introduction to the fields of clinical and counseling psychology. History, education and training, theories, assessment, diagnosis, and treatment. Introduction to diverse settings, ethical principles, legal guidelines, credentialing and employment opportunities. 4 lectures. Prerequisite: Any two Psychology courses.

#### **PSY 390 Career Planning (2) (CR/NC) (Also listed as CD 390)**

Individual career and graduate school planning. Current employment issues for college graduates such as career profiles, trends and work environments. Credit/No Credit grading only. 2 seminars. Prerequisite: Junior or senior standing or consent of instructor.

#### **PSY 400 Special Problems for Advanced Undergraduates (1-4)**

Individual investigation, research, study or survey of selected problems in consultation and with prior approval of instructor. Written report required. Total credit limited to 4 units. Prerequisite: PSY 201 or PSY 202.

#### **PSY 405 Abnormal Psychology (4)**

Normal and abnormal behavior in everyday life. Anxiety, somatoform, dissociative, mood, childhood, personality, psychotic, cognitive, eating, and substance use disorders and their treatment. 4 lectures. Prerequisite: PSY 201 or PSY 202.

#### **PSY 410 History and Systems of Psychology (4)**

Survey of the philosophical and scientific roots of modern psychology, pioneer laboratories, systems, and schools of psychology, the refining of experimental methods, and applications of psychology in testing and psychological services. Examination of contributions by women and

minorities in psychology. 4 seminars. Prerequisite: PSY 201 or PSY 202, PSY 305, PSY 458 or consent of instructor.

#### **PSY 413 Parent-Child Relationships (4)**

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. 4 lectures. Prerequisite: PSY 256 or CD 209, junior standing.

#### **PSY 419 Self and Identity (4)**

Concepts, theories, and research related to the development of the self across the lifespan. Examination of the influence of temperament, culture, individuation, self-esteem, self-awareness, roles and identity on maturity. 4 seminars. Prerequisite: PSY 201 or PSY 202 and PSY 256 or consent of instructor.

#### **PSY 420 Social and Emotional Development (4)**

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. 4 seminars. Prerequisite: PSY 256 or consent of instructor.

#### **PSY 421 Cognitive Development (4)**

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. 4 seminars. Prerequisite: PSY 201 or PSY 202, PSY 307.

#### **PSY 422 Lifespan Sexuality (4)**

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. 4 lectures. Prerequisite: PSY 201 or PSY 202, or PSY 205, and junior standing.

#### **PSY 430 Sensation and Perception (4)**

Principles of sensory systems, psychophysics, attention and the perception of color, shape, movement, space, and time. Survey of the development of perception through the lifespan. 4 lectures. Prerequisite: PSY 201 or PSY 202, and PSY 307.

#### **PSY 432 Psychological Testing (4)**

Theory and practice of psychological measurement and testing. Principles of test construction, administration, and interpretation. Survey of common testing domains such as intelligence, scholastic aptitude and achievement, and personality. 4 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 CD 209, and EDUC 440 or consent of instructor.

#### **PSY 449 Research Internship (5) (CR/NC)**

Faculty-supervised research experience on various topics in psychology. Student apprenticeship with a department faculty member to conduct research. Responsibilities include some or all of the following: collecting data, entering and/or analyzing data, electronic literature search, report writing. May be repeated; total credit for PSY 449 and PSY 453 limited to 10 units. Credit/No Credit grading only. Prerequisite: PSY 329, PSY 333, Psychology major, junior standing, and consent of instructor. Recommended: PSY 366.

#### **PSY 450 Family 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, or graduate standing.

**PSY 453 Supervised Fieldwork (5) (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 5 units per quarter. May be repeated; total credit for PSY 449 and PSY 453 limited to 10 units. Credit/No Credit grading only. Prerequisite: PSY 323, Psychology majors, junior standing, and consent of instructor.

**PSY 456 Behavioral Disorders in Children (4)**

Applications of psychological principles to childhood behavioral disorders. Aggression, delinquency, stress reactions, motivational, perceptual-attentional deficiencies, psychoses, anxiety disorders, biological dysfunctions, and retarded social and cognitive development. 4 seminars. Prerequisite: PSY 201 or PSY 202, junior standing.

**PSY 458 Learning (4)**

Theoretical and philosophical foundations of the experimental analysis of behavior. Principles of classical and operant conditioning including aversive control of behavior through punishment and avoidance learning and the theoretical basis for behavior therapy techniques and applications of learning principles in education and health settings. 4 lectures. Prerequisite: PSY 201 or PSY 202, junior standing.

**PSY 459 Lifespan Theories (4)**

Comparative study of theories that have been offered as explanations for lifespan development. Controversial issues, evaluations and applications of theories. Emphasis on biological, psychological, and social aspects of lifespan development. 4 seminars. Prerequisite: PSY 201 or PSY 202, junior standing.

**PSY 460 Child Abuse and Neglect (4)**

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. 4 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. Psychology majors only. 1 seminar. Prerequisite: PSY 329, PSY 453, Graduation Writing Requirement.

**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. Psychology majors only. Prerequisite: PSY 461.

**PSY 465 Cross-Cultural Issues in Psychology (4)**

Psychological, cultural, ecological and behavioral influences on human development in different cultural settings. Focuses on from one to three different cultures outside the U.S. in any given quarter. 4 seminars. Prerequisite: PSY 201 or PSY 202 and junior standing.

**PSY 470 Selected Advanced Topics (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. 4 seminars. Prerequisite: Consent of instructor.

**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 (4)**

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. 4 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 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 advisor and supervising faculty member.

**PSY 504 Psychopharmacology (4)**

Advanced course in brain-behavior relationships. Neuropathology of brain disorders including the neurochemical etiology and treatment of mental illness and chemical dependency. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

**PSY 555 Counseling and Communication (4)**

Overview of the counseling profession, history, philosophy, theory, and ethics. Emphasis on developing interviewing, assessment and communication skills. Required practicum. 3 seminars, 1 activity. Prerequisite: EDUC/PSY 560; graduate standing or consent of instructor.

**PSY 556 Ethnic Counseling (4)**

Socio-psychological and psycho-historical analysis of the visible ethnic and ethnic experience. Effects of poverty, history and the significance of oppression. Counseling techniques, assessment, community relations and required activities. 3 seminars, 1 activity. Prerequisite: Graduate standing.

**PSY 558 Career Counseling (4)**

Sources, methods and techniques for gathering, evaluating and disseminating occupational, technological and educational information through career counseling. 4 seminars. Prerequisite: Graduate standing.

**PSY 560 Individual Therapy: Theory and Application (4)**

Counseling theories and concepts applied to individuals. Develop skills in interviewing, assessment, intervention selection, termination and crisis intervention. Ethics and law included. 3 seminars, 1 activity. Prerequisite: PSY 305 or consent of instructor, graduate standing.

**PSY 561 Group Counseling (3)**

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: MF Therapy (4)**

Ethical, legal and case management issues related to individual, child, family and group therapy. Client rights and professional orientation to ethical standards and state regulation of clinical practice. 4 seminars. Prerequisite: EDUC/PSY 560, 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, or consent of instructor.

**PSY 566 Group Therapy: Theory and Application (4)**

Group therapy theory, leadership and research applied to client assessment, screening, treatment selection, evaluation and termination.

Ethics, law included. 2 seminars, 2 activity. Prerequisite: EDUC/PSY 560, 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 IV, physiological, crisis and ethnic concerns with a required practicum. 2 seminars, 1 activity. Prerequisite: EDUC/PSY 555, PSY 459, equivalent or consent of instructor.

**PSY 568 Advanced Psychotherapies (4)**

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 12 units. 4 seminars. Prerequisite: EDUC/PSY 560, PSY 565 or consent of instructor.

**PSY 569 Counseling Clinic Practicum (3) (CR/NC)**

Applied experience and instruction in assessment, diagnosis, treatment planning and treatment of individuals, couples, families and children under direct supervision of faculty in program clinic. Weekly meetings. Total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: EDUC/PSY 560, PSY 405, PSY 450, or consent of instructor.

**PSY 570 Selected Topics in Psychology and Human Development (4)**

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 8 units. 3 seminars, 1 activity. Prerequisite: Graduate standing or consent of instructor.

**PSY 571 Family Therapy: Theory and Application (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: Theory and Application (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, PSY 566, PSY 405, PSY 456 or consent of instructor.

**PSY 573 Field Experience: Counseling (6) (CR/NC)**

Practical application of guidance services and counseling in public schools, colleges and community settings. Weekly seminars with university staff included. Total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: PSY 569 and consent of M.S. program committee.

**PSY 574 Psychological Assessment (4)**

Administration, scoring and interpretation of psychological tests. Reliability and validity of psychological measures. Ethical and cultural issues in testing. 4 seminars. Prerequisite: Graduate standing.

**PSY 575 Gender, Couple and Sexual Dysfunction Therapy (4)**

Antecedents to sex-role identity, gender aware therapy, couple therapy, treatment of spousal abuse, assessment, diagnosis, treatment of sexual dysfunction. 4 seminars. Prerequisite: PSY 450 and PSY 560.

**PSY 576 Field Experience: Marital and Family Counseling (4) (CR/NC)**

Supervised experience in applied psychotherapeutic techniques, assessment, diagnosis and treatment of individual, marital, family and child relationship problems. Total credit limited to 16 units. Credit/No Credit grading only. Weekly seminar with on-site and university supervisors. Prerequisite: PSY 569 and consent of 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: Graduate standing 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. Qualitative research design and analysis, needs assessment and program evaluation. Emphasis on the design of data collection instruments, data collection and 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 (4)**

Completion of a thesis pertinent to the fields of psychology and human services. Supervision. Prerequisite: PSY 590.

## **REC-RECREATION, PARKS, and TOURISM ADMINISTRATION**

**REC 100 Leisure Education and Lifestyle Management (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, Parks and Tourism (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 110 Career Planning in Recreation, Parks and Tourism (1) (CR/NC)**

Development and application of philosophy, learning strategies, and problem solving for career planning in recreation, parks, and tourism. Credit/No Credit grading only. 1 activity. Prerequisite: Recreation, parks and tourism administration majors only.

**REC 127 Leisure Behavior (4)**

Sociological, psychological, and cultural aspects of leisure behavior. Needs, motivations, constraints, values and benefits explored. 4 lectures. Prerequisite: Majors only.

**REC 203 Resource Law Enforcement (3) (Also listed as FNR 203)**

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.

**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 recreation, parks, and tourism services. 3 lectures, 1 activity. Prerequisite: REC 101, REC 127 or consent of instructor.

**REC 252 Recreation and Special Populations (4)**

Introduction to special populations and therapeutic recreation. Specialized leadership and communication techniques. Modification requirements for programs, areas, facilities, equipment, and supplies. Exploration of disability rights issues, including legislation which impacts the delivery of recreation and leisure services. 3 lectures, 1 activity. Prerequisite: REC 127 or consent of instructor.

**REC 260 Recreational Sport Programming (3)**

Philosophy, foundations, policy and techniques underlying recreational sport programs in schools, public, private and commercial settings. 2 lectures, 1 activity. Prerequisite: Sophomore standing.

**REC 300 Computer Applications in Resource Management (2) (Also listed as FNR 300)**

Resource management applications of microcomputers. Software programs include forest and natural resource management planning, forecasting, analysis of systems, and resource data base management for multiple use objectives. Forestry and natural resource examples will be used. 1 lecture, 1 laboratory. Prerequisite: Consent of instructor.

**REC 302 Environmental and Wilderness Education (4)**

Education and teaching techniques that apply to learning experiences in an outdoor environment. Impact of natural resource usage that affects sociological, biological and physical resources. Educational strategies for presenting environmental learning to grades K-12 in selected environments. 3 lectures, 1 activity. Prerequisite: REC 210 with C- or better or consent of instructor.

**REC 305 Recreation Areas and Facilities Management (4)**

Management of recreation areas and facilities: clientele considerations, facility and outdoor area site planning; day-to-day operations of common recreation areas and facilities. Agency visitation required. 3 lectures, 1 laboratory. Prerequisite: REC 210 with C- or better or consent of instructor.

**REC 311 Environmental Interpretation (4) (Also listed as FNR 311)**

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: SCOM 101 or SCOM 102.

**REC 312 Employee Services and Recreation (3)**

Administrative patterns, financing, programming, personnel, and legal concerns in programs designed to promote employee work/life balance, motivation, productivity, and wellness. Analysis of military, corporate, and contract services. Field visits required. 3 lectures. Prerequisite: REC 210 with C- or better or consent of instructor.

**REC 313 Sustainable Tourism (4)**

Investigation of tourism industry from a sustainable tourism perspective. Examination of ecotourism, agri-tourism, rural tourism, sustainable tourism development, and adventure travel. Emphasis on tourism that sustains social, cultural, heritage, and natural environments while generating economic development. 3 lectures, 1 laboratory. Prerequisite: REC 210 with C- or better or consent of instructor.

**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 with C- or better or consent of instructor.

**REC 315 Leisure Resources and Community Development (4)**

Community development principles, costs and benefits related to leisure, recreation, parks, and tourism. Emphasis on leisure, recreation, park and tourism resources, cultural and social dynamics, economic viability, quality of life, and environmental issues. Community-based learning required. 4 lectures. Prerequisite: Completion of GE Areas A1, A2, A3.

**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 with C- or better or consent of instructor.

**REC 324 Legal Aspects of Recreation, Parks and Tourism (4)**

Legislative and legal aspects of public, private, commercial, and non-profit recreation, parks, and tourism agencies. Emphasis on risk management, liability, insurance, and negligence. Understanding of legal foundations and the legislative process. 3 lectures, 1 laboratory. Prerequisite: REC 210 with C- or better or consent of instructor.

**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 with C- or better and consent of instructor.

**REC 360 Assessment and Evaluation of Recreation, Parks and Tourism (4)**

Evaluation of a full service program delivery system using a variety of research methodologies. Needs assessment, program evaluation, research design, and decision making based on data analysis. 3 lectures, 1 laboratory. Prerequisite: REC 210 with C- or better, STAT 217. Recommended: CSC 110/113/AG 250.

**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 405 Recreation, Parks and Tourism Management (4)**

The study, analysis, and practice of management and leadership processes as they are applied to recreation organizations: planning, organizing, motivating, and controlling. Emphasis upon application of theories, practices and case studies in specific recreation settings. 4 lectures. Prerequisite: REC 324, with C- or better or consent of instructor.

**REC 410 Resource Recreation Management (4) (Also listed as FNR 410)**

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.

**REC 414 Commercial Recreation Enterprise (4)**

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. 4 lectures. Prerequisite: BUS 212, BUS 346, REC 210 with C- or better and senior standing.

**REC 417 Resource Recreation Planning (3) (Also listed as FNR 417)**

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.

#### **REC 420 Festival and Event Management (4)**

Major trends and successful business practices in festival and event management. Event management field as a profession. Emphasis on creation, organization, sponsorship, marketing, and management of small to large scale community events. Service-learning in the community required. 3 lectures, 1 laboratory. Prerequisite: REC 210, BUS 346, junior standing, or consent of instructor.

#### **REC 424 Financing Recreation, Parks and Tourism Services (4)**

Financing leisure products and services in public, private, commercial and voluntary settings. Emphasis on sources and methods of financing; operational/ financial cost analysis; forecasting, budgeting, pricing and fiscal master planning through use of computer technology. 4 lectures. Prerequisite: BUS 212, CSC elective, REC 360 with C– or better, ENGL 310.

#### **REC 450 Grant Development and Writing (4)**

Principles of all aspects of grantmanship; researching grant funding resources from both the private and public sector, preparing the grant proposal, and grant administration. Field visits required. 4 lectures. Prerequisite: Junior standing.

#### **REC 460 Research in Recreation, Parks and Tourism (4)**

Research design, literature review, questionnaire and interview schedule construction, sampling methods, data array and analysis, and computer applications. Selection of senior project topic and proposal development. 3 lectures, 1 laboratory. Prerequisite: CSC 110, 113 or AG 250, STAT 217, REC 360 with C– or better, and successful completion of the GWR.

#### **REC 461 Senior Project (3)**

Completion, under faculty supervision, of an investigative project typical of problems which graduates must solve in their fields of employment. Required minimum of 90 hours. Analytical, formal report is required. Prerequisite: Senior standing and completion of REC 460 with C– or better or consent of instructor.

#### **REC 463 Pre-Internship Seminar (1) (CR/NC)**

Exploration of internship opportunities and practices. Internship selection process and procedures introduced. Recommended enrollment two quarters prior to REC 465. Credit/No Credit grading only. 1 seminar. Prerequisite: 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. Credit/No Credit grading only. Prerequisite: Minimum GPA of 2.0; 1,000 verified hours of advisor-approved paid and/or volunteer experience subsequent to high school; completion of all university coursework other than Internship; approval of Internship Coordinator.

#### **REC 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: Consent of instructor.

#### **REC 471 Selected Advanced Laboratory (1–4)**

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 8 units. 1–4 laboratories. Prerequisite: Consent of instructor.

#### **REC 472 Leadership Practice (1) (Also listed as FNR 472)**

Leadership styles used in the natural resources management and recreation administration professions. Study and practice in setting goals and objectives; developing, evaluating and implementing an entrepreneurial project plan; decision making and problem-solving. Total credit limited to 4 units. 1 laboratory. Prerequisite: Junior standing or 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.

#### **REC 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 and consent of department head.

#### **REC 539 Graduate Internship in Recreation, Parks and Tourism (1–9)**

Application of theory to the solution of problems of recreation, parks and tourism 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 advisor before the internship commences. Degree credit limited to 6 units. Prerequisite: Consent of internship instructor.

#### **REC 570 Selected Topics in Recreation, Parks and Tourism (1–4)**

Directed group study of selected topics for advanced students. *Class Schedule* will list topic selected. Total credit limited to 12 units. 1–4 seminars. Prerequisite: Graduate standing or consent of instructor.

#### **REC 571 Selected Advanced Laboratory in Recreation, Parks and Tourism (1–4)**

Directed group laboratory of selected topics for advanced students. *Class Schedule* will list topic selected. Total credit limited to 12 units. 1–4 laboratories. Prerequisite: Graduate standing and consent of instructor.

#### **REC 581 Graduate Seminar in Recreation, Parks and Tourism (3)**

Group study of selected developments, trends and problems in the field of recreation, parks and tourism. 3 seminars. Prerequisite: Graduate standing.

#### **REC 599 Thesis in Recreation, Parks and Tourism (1–9)**

Individual research in recreation, parks and tourism management under the general supervision of faculty, leading to a graduate thesis. Prerequisite: Graduate standing and consent of instructor.

## **RELS–RELIGIOUS STUDIES**

#### **RELS 304 Judaism (4)**

**GE C4**

Origins, beliefs and practices of Judaism and central themes in the Hebrew Bible. The development of Judaism in the post-biblical and Talmudic period. Jewish philosophy, life, rituals and customs. The emergence of modern Judaism, Zionism and post-Holocaust philosophy. 4 lectures. Prerequisite: Completion of GE Area A, and PHIL 230 or PHIL 231. Philosophy majors will not receive GE C4 credit.

#### **RELS 306 Hinduism (4)**

**GE C4**

Origins, beliefs and practices of Hinduism from the *Veda* and the *Upanishads* through the teachings of the *Bhagavad Gita* and the *Puranas*. Modern Hindu institutions, saints and sages, and social philosophy contrasted with the ancient. 4 lectures. Prerequisite: Completion of GE Area A, and PHIL 230 or PHIL 231. Philosophy majors will not receive GE C4 credit.

**RELS 307 Buddhism (4)****GE C4**

Buddhist origins, viewpoints and practices will be seen in their development in India, Tibet, China, Japan, South Asia and America. The life of Buddha, Gautama, the rise of Theravada, Mahayana and Tantra. Encounters with Shinto and Confucianism. 4 lectures. Prerequisite: Completion of GE Area A, and PHIL 230 or PHIL 231. Philosophy majors will not receive GE C4 credit.

**RELS 309 Monotheism: The Bible and the Quran (4)****GE C4**

The monotheistic traditions of Christianity and Islam, with focus on their origins from Judaism and pre-Judaic Middle Eastern traditions, such as Zoroastrianism. The Christian New Testament, formation of the Church, the Quran and Mohammad. 4 lectures. Prerequisite: Completion of GE Area A and C2. Philosophy majors will not receive GE C4 credit.

**RELS 336 Religion, Gender and Society (4)****(Also listed as WS 336)****GE C4 USCP**

Critical examination of religious ideas and institutions in America in relation to gender, race and politics. Focus on women and religion, the religious experience of minorities, and on politics. 4 lectures. Prerequisite: Completion of GE Area A, and PHIL 230 or PHIL 231; one Religious Studies course or consent of 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 101 Introduction to the Health Professions (1) (CR/NC)**

Preparation for a health professions career and examination of various health professions. Emphasis on planning and developing an individual pre-health plan, including academic course selection, obtaining appropriate experiences/activities, and review of the elements of a strong application. Intended for freshmen and sophomores. Credit/No Credit grading only. 1 lecture.

**SCM 150 Supplemental Instruction Discussion (1) (CR/NC)**

Facilitated study and discussion of theory, concepts, and applications of content material from selected courses. Credit/No Credit grading only. Total credit limited to 4 units. 1 laboratory. Prerequisite: Concurrent enrollment in the designated section of the associated course.

**SCM 201 Orientation to Biotechnology (1)**

Introduction to the diversity of fields in biotechnology. Applications in agriculture, nutrition, medicine and environmental problems. 1 activity. Prerequisite: BIO 151 and CHEM 316 or CHEM 312.

**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.

**SCM 320 Technology in London (4)****GE Area F**

Impact of one or two technologies in modern London. How they developed from the scientific/industrial revolution, as seen through London museums and industries. How solutions to modern problems are dependent on available technology. Specific technology chosen by instructor. 2 lectures, 2 activities. Prerequisite: Completion of GE Area B, and junior standing. Concurrent enrollment in London Study Program.

**SCM 325 Genetic Engineering Technology (4)****GE Area F**

Introduction to the methodology and techniques used in genetic engineering. Applications in agriculture, nutrition, medicine and environmental problems. Potential benefits and problems, including the underlying ethical questions. 3 lectures, 1 activity. Prerequisite: Completion of GE Area B, including a chemistry course, and junior standing. Biococial Sciences and Biochemistry majors will not receive GE Area F credit.

**SCM 350 The Global Environment (4)****GE Area F****(Also listed as AG/BUS/EDES/ENGR/HUM 350)**

Interdisciplinary investigation of how human activities impact the Earth's environment on a global scale. Examination of population, resource use, climate change, and biodiversity from scientific/technical and social/economic/historical/political perspectives. Use of remote sensing maps. Sustainable solutions. 3 lectures, 1 activity. Prerequisite: Completion of GE Areas A and B and junior standing.

**SCM 363 Health Professions Internships (2) (CR/NC)**

Structured experiences for pre-health students, such as County Health Agency internships designed to promote understanding of social and public purpose of chosen professions, or internships designed to provide observational experiences in a modern clinical setting. *Class Schedule* will list topic selected. Limited space availability. Application process for enrollment. Total credit limited to 12 units; a maximum of 6 units may be applied toward degree requirement. Credit/No Credit grading only. Prerequisite: Sophomore standing; must have been enrolled at Cal Poly for at least two quarters; consent of instructor.

**SCM 365 Biosphere 2: Earth Systems Science (6)**

Course offered in partnership with Columbia University at Biosphere 2. Basic principles of geology, geochemistry, geophysics, atmospheric science and oceanography. Global change over varying time scales. Effects of life and society on the environment. 3 lectures, 3 laboratories. Prerequisite: Consent of instructor.

**SCM 366 Biosphere 2: Conservation Biology (6)**

Course offered in partnership with Columbia University at Biosphere 2. Human population growth, ecological principles, the carbon cycle, island biogeography, water resources, environmental health. 3 lectures, 3 laboratories. Prerequisite: Consent of instructor.

**SCM 367 Biosphere 2: Human Role in Environmental Change (5)**

Course offered in partnership with Columbia University at Biosphere 2. Policy issues related to the American Southwest, including management of freshwater resources, conservation of biological diversity, and sustainable development. 2 lectures, 3 laboratories. Prerequisite: Consent of instructor.

**SCM 368 Biosphere 2: Independent Research in Environmental Science and Policy (3)**

Course offered in partnership with Columbia University at Biosphere 2. Team and/or individual laboratory research in environmental science. 3 laboratories. Prerequisite: Consent of instructor.

**SCM 369 Biosphere 2: Planetary Management Seminar and Laboratory (4)**

Course offered in partnership with Columbia University at Biosphere 2. Current environmental issues from multiple perspectives. 1 seminar, 3 laboratories. Prerequisite: Consent of instructor.

**SCM 370 Biosphere 2: Earth, Moon and Planets (4)**

Course offered in partnership with Columbia University at Biosphere 2. Overall structure of the Solar System. Motions of the celestial sphere. Time and the calendar. Major planets, the Earth-Moon system, minor planets, comets. Life in the Solar System and beyond. 4 lectures. Prerequisite: Consent of instructor.

**SCM 371 Biosphere 2: Beyond the Solar System (4)**

Course offered in partnership with Columbia University at Biosphere 2. Survey course in stars, galaxies, and cosmology. Fundamental properties

of nearby stars; nucleosynthesis and stellar evolution; novae and supernovae; galaxies; the structure of the universe and theories of its origin, evolution and ultimate fate. 4 lectures. Prerequisite: Consent of instructor.

#### **SCM 372 Biosphere 2: Seminar on Puzzles in Our Universe (1)**

Course offered in partnership with Columbia University at Biosphere 2. Current topics may include astrobiology, the discovery of extrasolar planets, and the SETI search. 1 seminar. Prerequisite: Consent of instructor.

#### **SCM 373 Biosphere 2: Stellar Astrophysics (4)**

Course offered in partnership with Columbia University at Biosphere 2. Physics of stellar interiors and atmospheres, energy generation and nucleosynthesis, novae and supernovae, stellar necrology, interacting binary stars. 4 lectures. Prerequisite: One year of calculus and consent of instructor.

#### **SCM 374 Biosphere 2: Galactic and Extragalactic Astrophysics (4)**

Course offered in partnership with Columbia University at Biosphere 2. Structure of our galaxy, the interstellar medium star clusters, properties of external galaxies, clusters of galaxies, active galactic nuclei, and cosmology. 4 lectures. Prerequisite: One year of physics or astronomy and consent of instructor.

#### **SCM 375 Biosphere 2: Waves, Optics, and Modern Physics (4)**

Course offered in partnership with Columbia University at Biosphere 2. Classical waves and the wave equation, geometric optics, interference and diffraction, Fourier series and integrals, normal modes, wave-particle duality, the uncertainty principle, basic principles of quantum mechanics, energy levels, reflection and transmission coefficients, the harmonic oscillator. 4 lectures. Prerequisite: One year of physics or astronomy and consent of instructor.

#### **SCM 376 Biosphere 2: Astrophysics of the Solar System (4)**

Course offered in partnership with Columbia University at Biosphere 2. Mechanics, thermodynamics, basic fluid mechanics, rotational dynamics, radiative transfer, and magneto hydrodynamics. 4 lectures. Prerequisite: One year of physics and consent of instructor.

#### **SCM 377 Biosphere 2: Observational Astronomy (4)**

Course offered in partnership with Columbia University at Biosphere 2. Topics will include: techniques of optical and radio astronomy, asteroid searches, light curves of variable stars, identification of radio and X-ray source optical counterparts, studies of periodic and quasi-periodic signals in stars. 4 lectures. Prerequisite: Consent of instructor.

#### **SCM 378 Biosphere 2: Independent Research Projects (3)**

Course offered in partnership with Columbia University at Biosphere 2. Individual research projects in small teams. Observational, theoretical, and experimental work in galactic and extragalactic astronomy and cosmology. 3 laboratories. Prerequisite: Consent of instructor.

#### **SCM 451 Ethics in the Sciences (3)**

The practice, performance and application of science from the standpoint of ethics. Includes issues involving plagiarism, data handling, fraud, safety and selected applications in specific science careers. Models for the analysis and resolution of ethical dilemmas are presented. 3 seminars. Prerequisite: Junior standing.

## **SCOM—SPEECH COMMUNICATION**

#### **SCOM 101 Public Speaking (4)** **GE A2** (Also listed as **HNRS 101**) (formerly *SPC 201*)

Introduction to the principles of public speaking. Practical experience in the development, presentation, and critical analysis of speeches to inform, to persuade, and to actuate. Not open to students with credit in SCOM 102. 4 lectures.

#### **SCOM 102 Principles of Speech Communication (4)** **GE A2** (formerly *SPC 202*)

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 SCOM 101. 4 lectures.

#### **SCOM 126 Argument and Advocacy (4)** **GE A3**

The nature of critical thinking as applied in written and oral argument. Analysis of inductive and deductive reasoning. Analysis of reasoning, argument, forms of support and fallacies of argument and language. Instruction in and practical experience in writing sound persuasive arguments and engaging in oral argumentation assignments. 4 lectures. Prerequisite: Completion of GE Area A2.

#### **SCOM 145 Reasoning, Argumentation, and Writing (4)** **GE A3** (Also listed as **ENGL/HNRS 145**) (formerly *SPC 215*)

The principles of reasoning in argumentation. Examination of rhetorical principles and responsible rhetorical behavior. Application of these principles to written and oral communications. Effective use of research methods and sources. 4 lectures. Prerequisite: Completion of GE Area A1.

#### **SCOM 201 Advanced Public Speaking (4)** (formerly *SPC 321*)

Further consideration of the principles of public address. Advanced practice in manuscript, extemporaneous, and impromptu speaking. 4 lectures. Prerequisite: SCOM 101 or SCOM 102.

#### **SCOM 208 Performance of Literature (4)** **GE C3** (formerly *SPC 305*)

Poetry, prose, nonfiction and dramatic literature performed to communicate the levels of meaning within each work to the audience. 4 lectures. Prerequisite: Completion of GE Areas A and C1.

#### **SCOM 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: SCOM 101 or SCOM 102.

#### **SCOM 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: SCOM 101 or SCOM 102.

#### **SCOM 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: SCOM 101 or SCOM 102.

#### **SCOM 226 Applied Argumentation (4)** (formerly *SPC 325*)

Intermediate level course in the theory and practice of everyday argument. Select theories of argumentation, and practical experience arguing in a wide variety of contexts. 4 lectures. Prerequisite: Completion of GE Area A.

#### **SCOM 250 Forensic Activity (2)**

Introduction to competitive debate activities. Research, analysis, and debating about contemporary issues. Any student who wishes to receive academic credit for participation in such activities during the quarter should enroll. Total credit limited to 6 units. 2 laboratories. Prerequisite: SCOM 101 or SCOM 102 or equivalent experience.

#### **SCOM 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: SCOM 101 or SCOM 102.

**SCOM 308 Group Performance of Literature (4)**  
(formerly SPC 405)

GE C4

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: Completion of GE Areas A, C3 and junior standing. Speech Communication majors will not receive GE C4 credit.

**SCOM 310 Storytelling: The Oral Tradition (4)**  
(Also listed as LS 310)

Techniques for performing traditional folktales and myths in primary and secondary teaching situations. Selection, preparation and presentation of folklore for an audience; lectures on function of folk literature and mythology in modern society. 4 lectures. Prerequisite: SCOM 101 or SCOM 102.

**SCOM 311 Communication Theory (4)**  
(formerly SPC 312)

Concepts and theories of the human communication process from a social science perspective. 4 lectures. Prerequisite: Completion of GE Area A.

**SCOM 312 Communication Research (4)**  
(formerly SPC 411)

Exploration of communication research strategies and methodologies. Basic methods of designing research in empirical communication studies. 4 lectures. Prerequisite: SCOM 311, junior standing. For majors only.

**SCOM 317 Technology and Human Communication (4)**

Impact of technological change upon human communication. Past, present, and future technological developments that have affected how humans communicate. Emphasis on new communication technologies. 4 lectures. Prerequisite: Completion of GE Area B, and junior standing.

**SCOM 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: Completion of GE Area A.

**SCOM 330 Classical Rhetorical Theory (4)**

Early development of rhetorical theory in Greco-Roman civilization. Analysis of the canons of rhetoric. Rhetorical thought of Sophists, Isocrates, Plato, Aristotle, Cicero and Quintilian. 4 lectures. Prerequisite: Completion of GE Area A requirements and junior standing.

**SCOM 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: Completion of GE Area A and junior standing.

**SCOM 332 Rhetorical Criticism (4)**  
(formerly SPC 430)

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, SCOM 330.

**SCOM 350 Advanced Forensic Activity (2)**

Advanced participation in intercollegiate speech activities. Intercollegiate tournament competition, judging speech competition and other communication-related public service on campus and in the community. Total credit limited to 6 units. 2 activities. Prerequisite: SCOM 250.

**SCOM 385 Mass Media Criticism (4)**

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: SCOM 101 or SCOM 102, and junior standing.

**SCOM 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units. Prerequisite: Consent of instructor, junior standing.

**SCOM 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, SCOM 213 and SCOM 301.

**SCOM 416 Intercultural Communication (4)**  
(formerly SPC 316)

USCP

Examination and clarification of cultural aspects of communication within and among ethnic groups. 4 lectures. Prerequisite: SCOM 101 or SCOM 102.

**SCOM 418 Health Communication (4)**  
(formerly SPC 375)

Communication in health contexts. Topics include interpersonal communication (e.g., health professional/patient), group and organizational communication (e.g., health-related groups), and mass communication (e.g., persuasive health campaigns). Open to all majors and valuable to laypersons who are consumers of health care, and pre-health professionals. 4 lectures. Prerequisite: Junior standing.

**SCOM 419 Media Effects (4)**  
(formerly SPC 380)

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: Junior standing.

**SCOM 420 Nonverbal Communication (4)**  
(formerly 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: SCOM 101 or SCOM 102.

**SCOM 421 Gender and Communication (4)**  
(formerly SPC 370)

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: Junior standing.

**SCOM 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, Completion of GE Area A.

**SCOM 435 American Political Rhetoric (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.

**SCOM 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.

**SCOM 460 Undergraduate Seminar (1)**

Discussion and design of individual projects, oral reports on material in current professional writings. 1 seminar. Prerequisite: Senior standing; completion of SCOM 311 and SCOM 330. For majors only.

**SCOM 461 Senior Project (3)**

Completion of approved project under faculty supervision. Project results are presented in a formal written report. Minimum 90 hours total time. Prerequisite: SCOM 460. For majors only.

**SCOM 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, Completion of GE Area A.

**SCOM 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: 2.5 GPA and consent of instructor.

**SOC–SOCIOLOGY****SOC 105 Introduction to Sociology (4)**

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. 4 lectures.

**SOC 106 Social Problems (4)**

A revisiting of introduction to sociology with emphasis on problems inherent in selected social institutions. Instruction in social analysis, including theories of social problems, how those problems are studied, and a survey of possible solutions. 4 lectures. Prerequisite: SOC 105.

**SOC 110 Comparative Societies (4)****GE D3**

Comparative analysis of the contemporary societies in major world regions, with a focus on major social institution, including the family, religion, politics, economy, education, as well as social change. Direct comparisons made to the American society for a better understanding of American social institutions, how they function and why compared to other societies, as well as their history, social problems and social change. Not for Social Science majors. 4 lectures.

**SOC 218 International Political Economy (4)****GE D2**

Principles of international political economy in their social and cultural context. Sociological perspectives on the historical development of the world system and the current patterns of global inequality. Comparison of the political economy of major nations and their relation to the overall world system. 4 lectures.

**SOC 301 Social Work and Social Welfare Institutions (4)**

Introduction to the field of social welfare. Development of social work and social welfare services; major issues in social service policy. Scope and diversity of specific programs in the social services. Analysis of current programs and the recipients of welfare services. 4 lectures. Prerequisite: Junior standing or consent of instructor.

**SOC 305 Sociology of Social Movements (4)**

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. 4 lectures. Prerequisite: Junior standing or consent of instructor.

**SOC 306 Sociology of the Family (4)**

Description and analysis of family relationships; role of family in society, effects of society on family economy, structure and change. Other topics include courtship, marriage, parenting, divorce and alternative family forms. 4 lectures. Prerequisite: Junior standing or consent of instructor.

**SOC 309 The World System and Its Problems (4)**

Analysis of the historical background, structure, and dynamics of the world system; examines such issues as the origins of Third World poverty, colonialism, the changes in the world's dominant economic powers, the fall of communism, the growing economic competition between Europe, North America, and Asia; and possible strategies for the economic development of the Third World. 4 lectures. Prerequisite: Junior standing.

**SOC 310 Self, Organizations and Society (4)**

Analysis of the interactions relating to the development of self. Examination of the reciprocal interactions between biology, personal environment, and society. 4 lectures. Prerequisite: Junior standing or consent of instructor.

**SOC 311 Sociology of Gender (4)**

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, family and abusive relationships. Focus on media presentation of gender and effects of ethnicity and class. 4 lectures. Prerequisite: Junior standing.

**SOC 313 Urban Sociology (4)**

Description of the context of urban development; analysis of various forces generating urbanization. Investigation of urban models and spational relationships; urban processes; and problems. 4 lectures. Prerequisite: Junior standing or consent of instructor.

**SOC 315 Global Race and Ethnic Relations (4)****GE D5**

Diverse structures of unequal relationships among racial and ethnic groups in several countries including the United States. Theories about sources of economic and social discrimination and colonialism. Focus on the concept of ethnicity. Evaluation methods to restructure race and ethnic relations. International case histories. 4 lectures. Prerequisite: Completion of GE Area A, one course from D1 and one course from D3. Social Sciences majors will not receive GE Area D5 credit.

**SOC 316 American Ethnic Minorities (4)****USCP**

Exploration of the issues and problems facing 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. 4 lectures. Prerequisite: Junior standing.

**SOC 323 Social Stratification (4)**

Social class and the distribution of income, wealth, status and power in society, with emphasis on contemporary United States; social mobility; race, gender, and ethnic inequalities; political power and the nature of welfare; the nature, causes and solutions to poverty. A comparative perspective also taken with a focus on Japan and Europe. 4 lectures. Prerequisite: Junior standing or consent of instructor.

**SOC 326 Sociology of the Life Cycle (4)****GE D5**

Change and continuity of the self through the life course. Impact of aging on the physical, emotional, intellectual and social aspects of well being, and how this knowledge can be applied to enhance the quality of life. 4 lectures. Prerequisite: Completion of GE Area A, one course from D1 and one course from D3. Social Sciences majors will not receive GE Area D5 credit.

**SOC 330 Social Change (4)**

Interpretation of major social trends, movements and changes in the U.S. of the 20<sup>th</sup> Century; the causation, patterns and direction of these changes in continuum with the present; theories of change; and the special impact of technology upon social events. 4 lectures. Prerequisite: Junior standing or consent of instructor.

**SOC 350 Social Organization of Modern Japan (4)**

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. 4 lectures. Prerequisite: Junior standing or consent of instructor.

**SOC 351 Women in East Asia (4)**

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. 4 seminars. Prerequisite: Junior standing.

**SOC 355 Social Data Collection and Analysis (4)**

The basics of how to do social research. Includes topics on data collection techniques such as surveys, experiments, participant observation, content analysis and the use of existing data. Also includes topics on univariate, bivariate, and multivariate analysis and the use of SPSS for data analysis. 3 lectures, 1 activity. Prerequisite: STAT 221 or STAT 217 or equivalent with a C- or better, CSC 110, and two sociology courses.

**SOC 377 Sociology of Religion (4)****GE D5**

Religion from a sociological perspective. Topics may include the nature of religious experience, the role of religion in politics, economics, and social change, and the role that social forces have in influencing religious beliefs and practices. 4 lectures. Prerequisite: Completion of GE Area A, and two courses from two categories in Area D. Social Sciences majors will not receive GE Area D5 credit.

**SOC 395 Sociology of Complex Organizations (4)**

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. 4 lectures. Prerequisite: Junior standing or consent of instructor.

**SOC 402 Crime and Violence (4)**

Criminal behavior of individuals and groups; special categories include drug use, sex offenders, property crime, syndicated crime, interpersonal violence, and white-collar criminality. Legal definitions of crime and their implications, theories of causation, the sources of criminological data, and possible responses to the problems posed by criminal behavior. 4 lectures. Prerequisite: Junior standing or consent of instructor.

**SOC 406 Juvenile Delinquency (4)**

Sociological examination of juvenile delinquency as a social and legal concept, covering the nature, volume and social distribution of juvenile crime; the formal structure of juvenile justice; and how justice for juveniles is applied in practice. 4 lectures. Prerequisite: One course in sociology.

**SOC 412 Criminal Justice (4)**

Approaches to the control and rehabilitation of adult and juvenile offenders; philosophy of treatment strategies; history and analysis of probation, imprisonment, parole and preventive programs. 4 lectures. Prerequisite: SOC 402.

**SOC 413 Methods of Social Work (4)**

Skills, values and knowledge emphasized in social work. The generic perspective. Methods in social case work, group work, community organization, and social action. Alternative models. Settings of social work practice. Discussion of case material and professional literature. Case work management. Traditional and innovative therapy techniques. 4 seminars. Prerequisite: SOC 301 or consent of instructor.

**SOC 421 Social Theory (4)**

Concepts and theories in sociology, anthropology and geography. Development and history of social sciences. Paradigms and sociology of knowledge. Modern and classical perspectives. Importance of theories for understanding of present social arrangements and problems. 4 lectures. Prerequisite: SOC 106 or consent of instructor.

**SOC 431 Population Problems (4)**

Description and analysis of basic population processes of fertility, mortality and migration. Emphasis on understanding significance of today's growth rates for the future, especially in relationship to resources and standards of living. 4 lectures. Prerequisite: SOC 106 or consent of instructor.

**SOC 470 Selected Advanced Topics in Sociology (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.

**SOC S-SOCIAL SCIENCES****SOCS 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.

**SOCS 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.

**SOCS 440 Internship (4-8) (CR/NC)**

Supervised training, research, and work in public and private organizations. Credit/No Credit grading only. 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: 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-SPANISH

### SPAN 101, 102, 103 Elementary Spanish (4) (4) (4)

For beginners. Class practice and assigned outside work in pronunciation, sentence structure, reading, writing, and basic conversation using the communicative approach. Laboratory drill required. Language taught in its cultural context. Credit not available for students who have completed SPAN 104, or sequentially completed SPAN 111, SPAN 112, or SPAN 113. 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. Credit not available for students who have completed SPAN 101, SPAN 102, SPAN 103, SPAN 111, SPAN 112, or SPAN 113. Laboratory drill required. 9 lectures, 3 activities.

### SPAN 111, 112, 113 Elementary Hispanic Language and Culture (4) (4) (4) USCP

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. To be taken in numerical sequence. Credit not available for students who have sequentially completed SPAN 101, SPAN 102, SPAN 103, or SPAN 104. 3 lectures, 1 activity.

### SPAN 121, 122 Fundamentals of Spanish (4) (4)

Review of Spanish grammar and practice in writing and oral expression within a cultural context. To be taken in numerical sequence. Students with credit in SPAN 123 cannot take SPAN 122. 3 lectures, 1 activity. Prerequisite: SPAN 103, placement exam or equivalent.

### SPAN 123 Spanish for Heritage Speakers (4) USCP

Focus on the grammatical, cultural and linguistic needs of Spanish speakers in the United States who have not had formal study of the language. Emphasis on morphological, lexical and cultural understanding of the Spanish language. Designed to prepare students for upper-division Spanish coursework in language and culture. Students with credit in SPAN 122 cannot take SPAN 123. 3 lectures, 1 activity. Prerequisite: SPAN 121, placement exam or consent of instructor.

### SPAN 124 Composition in Spanish (4)

Practice of essay writing in Spanish with particular attention to the process of writing. Analysis of word usage, sentence development and structure, and review of grammar, spelling and accentuation. Practice in writing descriptions, narration, reports, opinions and expositions. 3 lectures, 1 activity. Prerequisite: SPAN 122 or SPAN 123.

### SPAN 125 Intensive Fundamentals of 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 205 Introduction to Spanish Linguistics (4)

Introduction to the scientific study of the Spanish language with an overview of theoretical and applied linguistics and special emphasis on Spanish phonetics and phonology. 3 lectures, 1 activity. Prerequisite: SPAN 124.

### SPAN 210 Introduction to Research Methods in Spanish (4)

Methods and techniques of doing research. Critical thinking and library research. Introduction to the most important philosophical and theoretical schools of thought, as seen and applied in the Spanish-speaking world. 3 lectures, 1 activity. Prerequisite: SPAN 124.

### SPAN 233 Introduction to Hispanic Readings (4) GE C1

Selected readings from major Hispanic authors that show the Hispanic literary tradition from the Middle Ages to the present in Spain, Latin America, and of Latino(a) writers in the United States. 4 lectures. Prerequisite: Completion of GE Area A, and SPAN 124.

### SPAN 301 Advanced Composition in Spanish (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 124.

### SPAN 305 Significant Writers in Spanish (4) GE C4

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: Completion of GE Area A, and SPAN 233. Modern Languages and Literatures majors will not receive GE C4 credit.

### SPAN 340 Chicano/a Authors (4) GE C4 USCP

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: Completion of GE Area A, one course in Area C, and SPAN 233. Modern Languages and Literatures majors will not receive GE C4 credit.

### SPAN 350 Hispanic Literature in English Translation (4) GE C4

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: Completion of GE Area A, one course in Area C, and SPAN 233. Modern Languages and Literatures majors will not receive GE C4 credit.

### SPAN 351 Latino/a Writers in the United States (4) GE C4 USCP

Analysis and exploration of the major themes of Latino(a) literature in the United States today. Emphasis on Chicano(a), Puerto Rican, Cuban American and other Caribbean writers. Focus on novel writers who are not as well known or read in traditional Latino(a) courses. All readings and discussions in English. 4 lectures. Prerequisite: Completion of GE Area A, one course in Area C. Modern Languages and Literatures majors will not receive GE C4 credit.

### SPAN 402 Advanced Linguistics in Spanish (4)

The more relevant aspects of Spanish linguistics today. Topics may include morphology, semantics, syntax, phonetics, phonology, theoretical linguistics, history of the language, and teaching methodology and applied linguistics in Spanish. Conducted completely in Spanish. *Class Schedule* will list topic selected. Total credit limited to 8 units. 4 lectures. Prerequisite: SPAN 205.

### SPAN 410 Advanced Literature in Spanish (4)

In-depth study of literature in Spanish. Specific genre, literary period, authorial group, or country. Chicano(a)/Latino(a) literature, Latin American literature, and Spanish literature. Conducted in Spanish. *Class Schedule* will list topic selected. Total credit limited to 8 units. 4 lectures. Prerequisite: SPAN 301 and SPAN 305.

### SPAN 416 Don Quixote (4)

Intensive reading of Cervantes' novel, *Don Quixote* (Part 1, 1605 and Part 2, 1615) in the context of Cervantes' life and the history and social context of Spanish renaissance and baroque culture. Course taught in Spanish. 4 lectures. Prerequisite: SPAN 233 or equivalent, or consent of instructor.

### SPAN 470 Selected Advanced Topics (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. 4 lectures. Prerequisite: Consent of instructor.

## SPC-SPEECH COMMUNICATION

See SCOM-Speech Communication

## SS—SOIL SCIENCE

### SS 110 Orientation in Soil Science (1) (CR/NC) (Also listed as ERSC 110)

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) GE B5

Biological, chemical, physical and genetic properties of soils. Application of scientific principles to solving land use, water management, and soil conservation problems. Interpretation of soils data for making environmental decisions, applying management practices, and sustainable food production. 3 lectures, 1 laboratory. Prerequisite: College chemistry and completion of the ELM requirement.

### 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 Erosion and Water Conservation (4) (Also listed as ERSC 202)

Development of an erosion and sediment control plan using climate, topography, soils and land use in relation to soil and water quality. Evaluation of soil and water conservation plans and best management practices for agriculture, urban, riparian, and rangelands. 3 lectures, 1 activity. 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) (Also listed as ERSC 223)

Origin, composition, identification and weathering of rocks, minerals, and clays important in the development of soils. Parent materials as related to the nature and properties of soils. 3 lectures, 1 laboratory. Prerequisite: SS 121, CHEM 111 or CHEM 128.

### SS 301 Soils Practicum (2) (CR/NC)

Supervised practice in technical, educational, professional, and operational applications related to soil science. Students participate in faculty-supervised group or individual activities that support educational and professional goals. Credit/No Credit grading only. 2 activities. Prerequisite: SS 110 or SS 121.

### SS 310 Urban Soils (4)

Management and manipulation of soils in urban environments. Measurement and interpretation of morphological, physical and chemical properties. Selection and treatment of soil materials for interior and exterior plantings. 3 lectures, 1 laboratory. Prerequisite: SS 121.

### SS 321 Soil Morphology (4) (Also listed as ERSC 321)

Identification of soil morphological and site properties. Correlation of soil physical and chemical properties with soil taxonomy and land use. Techniques of interpretations for agriculture, forest lands, range lands and urban development. 3 lectures, 1 laboratory. 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 111 or CHEM 128.

### SS 323 Geomorphology (4)

Recognizing and identifying major landforms and their components by interpretation of aerial photographs and topographic maps, and observations. Emphasis on analyzing common landforms in the western United States for application in soil science, physical geography, hydrology, and geology. 2 lectures, 1 laboratory, 1 activity. Prerequisite: SS 121 and GEOL 201; or consent of instructor.

### 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 345 Soil Interpretations and Management (4)

Calculate, graph, and interpret physical, chemical, and microbiological data from soils and reports. Apply laboratory results to field conditions. Debate efficacy of soil management and environmental practices considering social, economic and political implications of soil science. 2 lectures, 2 activities. Prerequisite: SS 121, CHEM 129, MATH 119 or MATH 141, PHYS 121 or PHYS 131, 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 421 Wetlands (4) (Also listed as BIO/FNR 421)

The formation, characteristics, and functions of wetlands. Genesis of hydric soils. Plant adaptations to saturated soils. Wetlands as wildlife habitat. Policies and social issues associated with wetlands. The procedures of wetland delineations. 3 lectures, 1 laboratory. Prerequisite: CHEM 128, BOT 223, SS 321.

### SS 422 Soil Microbiology and Biochemistry (4)

Biochemical activities, ecology and environmental implications of soil organisms. Effects on the formation, characteristics, and productivity of soils. Methods of studying soil organisms. 3 lectures, 1 laboratory. Prerequisite: SS 221 and SS 345, MCRO 221, CHEM 313, or consent of instructor.

### SS 423 Soil and Water Chemistry (5)

Chemical processes governing weathering, soil mineral formation and stability, common solubility equilibria. Use of chemical principles to explain surface chemical properties of soils and environmental problems in water and soil chemical systems. Preparation of professional quality reports based on laboratory data and library research. 3 lectures, 1 laboratory, 1 activity. Prerequisite: SS 223, SS 345, CHEM 129, CHEM 212/312, or CHEM 216/316, MATH 118 or MATH 141.

### SS 431 Soil Resource Inventory (4)

Development and production of soil surveys for interpretive purposes. Use of soil taxonomy and land classification systems to evaluate land for best management practices. 2 lectures, 2 laboratories. Prerequisite: SS 223; SS 321.

### SS 432 Soil Physics (5)

Matter and energy in soils, with emphasis on properties and behavior of solids, water, air, and heat. Applications to agriculture, forestry, range management, engineering, and environmental sciences. Preparation of professional reports based on laboratory data and library research. 3 lectures, 1 laboratory, 1 activity. Prerequisite: SS 121, SS 345, PHYS 121 or PHYS 131, CHEM 129, MATH 118 or MATH 141, 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 chemical, biological, physical and mechanical properties of forest and range soils. Site quality, nutrient cycling, erosion and mass movement, fire effects. Preparation of soil management reports similar to those required by various land management organizations. Overnight field trips. 3 lectures, 1 laboratory. Prerequisite: SS 121, SS 321 or consent of instructor.

#### **SS 442 Soil Vadose Zone Remediation (4)**

Redox transformations and removal or immobilization of inorganic pollutants. Microbial degradation and elimination of organic contaminants. Monitoring and predicting management strategies for vadose zone enhancement. Reclamation of disturbed lands. 3 lectures, 1 activity. Prerequisite: CHEM 212/312 or CHEM 216/316, GEOL 201, SS 121 or consent of instructor.

#### **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 111 or CHEM 128.

#### **SS 461 Senior Project (1)**

(Also listed as ERSC 461)

Senior project topic selection and contract development with project advisor. Statement of problems, subproblems, assumptions, objectives, hypothesis, methods of analysis and statistical design. Development of literature review and budget of time and finances. Proper format and presentation of tabular and graphic information. 1 activity. Prerequisite: MATH 118 or MATH 131, STAT 211 or STAT 321 or CRSC 411.

#### **SS 462 Senior Project (3)**

(Also listed as ERSC 462)

Implementation of materials and methods. Collection, analysis and interpretation of data. Completion of formal written report under advisor supervision. Minimum 90 hours. Prerequisite: SS 461.

#### **SS 463 Undergraduate Soils Seminar (2)**

Review of current research, experiments, and problems related to the student's major field of interest. Preparation and presentation of reports on problems or research activities. 2 seminars.

#### **SS 470 Selected Advanced Topics (1-4)**

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.

#### **SS 471 Selected Advanced Laboratory (1-4)**

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 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

#### **SS 500 Individual Study in Soil Science (1-6)**

Advanced independent study planned and completed under the direction of a member of the Earth and Soil Sciences faculty. Total credit limited to 6 units. Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

#### **SS 501 Research Planning (4)**

Problem solving and research planning for agriculture, natural resources and related sciences. Preparation of study plans that identify problems,

review appropriate literature, formulate objectives, develop methods and provide for presentation and interpretation of results. Oral reports. 4 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. 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. Pre-requisite: 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.

#### **SS 599 Thesis (1-6)**

Individual research in soil science under faculty supervision, leading to a scholarly written presentation exhibiting originality, clarity, critical and independent thinking, proper analysis of data, appropriate organization and format, and accurate and thorough documentation. Six units required for the M.S. degree. Prerequisite: Graduate standing and consent of instructor.

## **STAT-STATISTICS**

#### **STAT 130 Introduction to Statistical Reasoning (4)**

GE B1

Survey of statistical ideas and philosophy. Emphasis on concepts rather than in-depth coverage of statistical methods. Topics include sampling, experimentation, data exploration, chance phenomena, and methods of statistical inference. Credit not allowed for students with a previous statistics course. 4 lectures. Prerequisite: Appropriate score on the ELM examination for MATH 116 eligibility, or an ELM exemption, or MATH 104.

#### **STAT 150 Introduction to Statistical Investigations (4)**

Orientation to the statistics program. Introduction to the discipline of statistics and the nature of statistical reasoning. Design of surveys and experiments, graphical and numerical summaries, statistical models, and interpretation of results. Development of discussion, writing, presentation, and evaluation skills. 4 lectures.

#### **STAT 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

#### **STAT 211 Elementary Probability and Statistics (3)**

Classification of statistical data. Calculation and uses of various averages, measures of variability, elementary probability. Binomial and normal distributions. Random sampling, confidence intervals. Introduction to hypothesis testing. 3 lectures. Prerequisite: Intermediate algebra, appropriate score on ELM.

**STAT 212 Statistical Methods (2)**

Tests of hypotheses and confidence intervals on common parameters, linear regression and correlation, analysis of variance, and analysis of enumerative data. 2 lectures. Prerequisite: STAT 211 or equivalent.

**STAT 217 Introduction to Statistical Concepts and Methods (4)****GE B1**

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. Not open to students with credit in STAT 212 or STAT 218 or STAT 221 or STAT 251. 4 lectures. Prerequisite: Appropriate score on the ELM examination for MATH 116 eligibility, or an ELM exemption, or MATH 104.

**STAT 218 Applied Statistics for the Life Sciences (4)****GE B1**

Data collection and experimental design, descriptive statistics, confidence intervals, parametric and non parametric one and two-sample hypothesis tests, analysis of variance, correlation, simple and multiple linear regression, chi-square tests. Applications of statistics to the life sciences. Use of a statistical computer package. Not open to students with credit in STAT 212 or STAT 217 or STAT 221 or STAT 251. 4 lectures. Prerequisite: Appropriate score on the ELM examination for MATH 116 eligibility, or an ELM exemption, or MATH 104.

**STAT 221 Introduction to Probability and Statistics (5)****GE B1**

Data classification, descriptive statistics, elementary probability. Binomial and normal distributions. Random sampling, confidence intervals and hypothesis testing on common parameters. Introduction to regression and correlation, analysis of variance, contingency table analysis. Not open to students with credit in STAT 217 or STAT 218. 5 lectures. Prerequisite: Appropriate score on the ELM examination for MATH 116 eligibility, or an ELM exemption, or MATH 104.

**STAT 251 Statistical Inference for Management I (4)****GE B1**

Descriptive statistics. Probability and counting rules. Random variables and probability distributions. Sampling distributions. Large sample point and interval estimation of population parameters. Large sample hypothesis tests for population means and proportions. 4 lectures. Prerequisite: Completion of the ELM requirement and a passing score on appropriate Mathematics Placement Examination for MATH 221 eligibility, or MATH 118 or equivalent.

**STAT 252 Statistical Inference for Management II (5)****GE B1**

Small sample confidence intervals and hypothesis tests. Introduction to ANOVA, regression, correlation, multiple regression, time series, and forecasting. Statistical quality control. Enumerative data analysis. Statistical software used throughout course. 5 lectures. Prerequisite: STAT 251 with a minimum grade of C-.

**STAT 312 Statistical Methods for Engineers (4)****GE B6**

Descriptive and graphical methods. Discrete and continuous probability distributions. One and two sample confidence intervals and hypothesis testing. Single factor analysis of variance. Quality control. Introduction to regression and to experimental design. Use of computer to solve problems. 4 lectures. Prerequisite: MATH 142

**STAT 313 Applied Experimental Design and Regression Models (4)****GE B1**

Analysis of variance and regression analysis for students not majoring in statistics or mathematics. Includes one-way classification, randomized blocks, Latin squares, factorial designs, multiple regression, diagnostics, and model comparison. 4 lectures. Prerequisite: STAT 212 or STAT 217 or STAT 218 or STAT 221.

**STAT 321 Probability and Statistics for Engineers and Scientists (4)****GE B6**

tabular and graphical methods for data summary, numerical summary measures, probability concepts and properties, discrete and continuous probability distributions, expected values, statistics and their sampling distributions, point estimation, confidence intervals for a mean and

proportion. Use of MINITAB computer package. 4 lectures. Prerequisite: MATH 142.

**STAT 322 Statistical Analysis for Engineers and Scientists (4)**

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 Design and Analysis of Experiments I (4)**

Principles, construction and analysis of experimental designs. Includes completely randomized, randomized complete block, Latin squares, Graeco Latin squares, factorial, and nested designs. Fixed and random effects, expected mean squares, multiple comparisons, and analysis of covariance. 4 lectures. Prerequisite: STAT 322.

**STAT 324 Applied Regression Analysis (4)**

Simple linear regression and associated special topics, multiple linear regression, indicator variables, influence diagnostics, assumption analysis, selection of "best subset", nonstandard regression models, logistic regression, nonlinear regression models. 4 lectures. Prerequisite: STAT 252 or STAT 313 or STAT 322.

**STAT 330 Statistical Computing I: SAS (4)**

Techniques available to the statistician for efficient use of computers to perform statistical computations and to analyze large amounts of data. Use of SAS throughout the course. Includes data preparation, report writing, and basic statistical methods. 4 lectures. Prerequisite: STAT 212 or STAT 252 or STAT 313 or STAT 322.

**STAT 350 Probability and Random Processes for Engineers (4)****GE B6**

Random events, random variables, and random processes, with emphasis on probabilistic treatment of signals and noise. Specific topics include: sample spaces, probability, distributions, independence, moments, covariance, time/ensemble averages, stationarity, common processes, correlation and spectral functions, physical noise sources. 4 lectures. Prerequisite: MATH 241, EE 228.

**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 416 Statistical Analysis of Time Series (4)**

Time series components, descriptive smoothing methods, regression models for time series data, forecasting via exponential smoothing, evaluation of forecasts, autocorrelation, ARIMA models and Box-Jenkins methods, combining forecasts, frequency domain analysis, filtering. 4 lectures. Prerequisite: STAT 252 or STAT 322.

**STAT 418 Analysis of Cross-Classified Data (4)**

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. 4 lectures. Prerequisite: Two courses in statistics and MATH 206.

**STAT 419 Applied Multivariate Statistics (4)**

Continuous multivariate statistics. Multivariate linear model, principal components and factor analysis, discriminant analysis, clustering, and canonical correlation. Use of Minitab and SAS throughout the course. 4 lectures. Prerequisite: Two courses in statistics and MATH 206, or consent of instructor.

**STAT 421 Sampling Techniques (4)**

Planning, execution, and analysis of sampling from finite populations. Sampling designs, including simple random, stratified, systematic, cluster and two-stage cluster. Estimation procedures and sample size calculations. Post-stratification techniques. Estimating population size. 4 lectures. Prerequisite: One of the following: STAT 212, STAT 217, STAT 218, STAT 221, STAT 252, STAT 322, or STAT 512.

**STAT 423 Design and Analysis of Experiments II (4)**

Continuation of STAT 323.  $2^k$  factorial designs,  $3^k$  factorial designs, balanced and partially balanced incomplete block designs, nested designs, split-plot designs, response surface methodology, confounding, repeated measures, and other design approaches. 4 lectures. Prerequisite: STAT 323.

**STAT 425 Probability Theory (4)**

Basic probability theory, combinatorial methods, stochastic independence, conditional and marginal probability, probability models for random phenomena, random variables, probability distributions, distributions of functions of random variables, mathematical expectation, covariance and correlation, conditional expectation. 4 lectures. Prerequisite: STAT 321, MATH 241, and MATH 248.

**STAT 426 Estimation and Sampling Theory (4)**

Properties of statistics obtained from samples. Sample mean properties, convergence in probability, law of large numbers, and central limit theorem. Selected probability distributions. Theory of estimation. Sampling distribution of estimators. Introduction to hypothesis testing. 4 lectures. Prerequisite: STAT 425.

**STAT 427 Mathematical Statistics (4)**

The theory of hypothesis testing and its applications. Nonparametric methods. Linear statistical models including linear regression, and analysis of variance. The general linear model, full-rank models, constrained models, and tests of linear hypotheses. 4 lectures. Prerequisite: STAT 426.

**STAT 430 Statistical Computing II: S-Plus (4)**

Design and use of statistical software in programming statistical applications; object oriented statistical languages; random number generation; Monte Carlo methods including resampling (bootstrap and jack-knife), randomization tests, and simulation; exploratory data analysis using linked, Trellis, and dynamic graphics; smoothing algorithms; and regression trees. 4 lectures. Prerequisite: STAT 322, STAT 330, and STAT 323 or STAT 324.

**STAT 461, 462 Senior Project (1) (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 90 hours total time.

**STAT 465 Statistical Communication and Consulting (4)**

Blending of the theoretical and practical aspects of statistical consulting. Development of tools necessary to conduct effective consulting sessions, present oral arguments and written reports, work collaboratively to solve problems, and utilize professional publications in statistics. 2 lectures, 2 activities. Prerequisite: Successful completion of at least one STAT 400-level course and senior standing.

**STAT 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: 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: Graduate standing and intermediate algebra or equivalent.

**STAT 513 Applied Experimental Design and Regression Models (4)**

Applications of statistics for graduate students not majoring in 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. 4 lectures. Not open to students with credit in STAT 313. Prerequisite: One of the following: STAT 512, STAT 212, STAT 217, STAT 218, STAT 221, STAT 252, or equivalent.

**STAT 530 Statistical Computing I: SAS (4)**

Techniques available to the statistician for efficient use of computers to perform statistical computations and to analyze large amounts of data. Use of the SAS software system. Includes data preparation, report writing, basic statistical methods, and a research project. Not open to students with credit in STAT 330. 4 lectures. Prerequisite: STAT 512 or STAT 513 or STAT 542 or equivalent

**STAT 542 Statistical Methods for Engineers (4)**

Descriptive and graphical methods. Discrete and continuous probability distributions. One and two sample confidence intervals and hypothesis testing. Single factor analysis of variance. Quality control. Introduction to regression and to experimental design. Use of computer to solve problems. 4 lectures. Prerequisite: MATH 142 and graduate standing.

**TH–THEATRE****TH 210 Introduction to Theatre (4)****GE C3**

Principles of theatre and production process, including theatrical terminology, methods, dramatic literature, aesthetics, and technology. 4 lectures.

**TH 227 Theatre History: Classical (4)****GE C3**

Highlights of European theatrical history – Greeks, Romans, Medieval English and French theatre through the 17<sup>th</sup> century. Production methods, acting styles, playwriting theories and representative plays. 4 lectures.

**TH 228 Theatre History: 18<sup>th</sup> Century to Contemporary (4)****GE C3**

Highlights of European and American theatrical history from the 18<sup>th</sup> to 20<sup>th</sup> century. Production methods, acting styles, playwriting theories and representative plays. 4 lectures.

**TH 240 Improvisational Theatre (4)**

Objectives and techniques of improvisational theatre. Participation in a series of exercises designed to develop skills in dramatic structure formatting, interactive problem solving, spontaneous scripting, dynamic communications, and applied performance styles. 2 lectures, 2 activities.

**TH 250 Costume and Craft Construction (4)**

Basic costume and craft construction techniques used in the entertainment industry. Building of all costumes and special craft projects for main stage theatre productions. Total credit limited to 12 units. Major credit limited to 4 units; repeated units are free electives. 4 laboratories.

**TH 260 Voice and Diction for the Stage (4)**

Theory and practice in developing command of oral techniques for the stage including breath support, resonance and articulation. 4 lectures.

**TH 270 Make-Up for Theatre and Film (4)**

Introduction to the art of theatrical and film make-up design and application. Techniques for producing character, old age, fantasy and

special effects make-up. Demonstration and discussion of various design and application styles. 3 lectures, 1 activity.

**TH 310 Women's Theatre (4)** **GE C4**

Examination of a variety of female theatre artists from the Greeks to the present and the socio-political contexts from which they emerged. Analysis of a variety of classic and contemporary playscripts emphasizing evolving visions of women. 4 lectures. Prerequisite: Completion of GE Area A; TH 210, TH 227, or TH 228. Theatre Arts majors will not receive GE C4 credit.

**TH 320 Black Theatre (4)** **GE C4 USCP**

African-American theatre artists from the 17<sup>th</sup>-20<sup>th</sup> century, and the socio-political contexts from which they emerged. Particular emphasis on 20<sup>th</sup> century African-American plays and playwrights: Hansberry, Baldwin, Shange, Baraka, Gordone, and Wilson. 4 lectures. Prerequisite: Completion of GE Area A; TH 210, TH 227, or TH 228. Theatre Arts majors will not receive GE C4 credit.

**TH 330 Stagecraft (4)**

Basic stagecraft technique used in the entertainment industry. Students construct and paint scenery, build and gather properties, hang and focus lighting instruments, assist on costumes and act as running crew for department production each term. Total credit limited to 12 units. Major credit limited to 4 units; repeated units are free electives. 4 laboratories. Prerequisite: Consent of instructor.

**TH 340 Fundamentals of Acting (4)**

Analysis of play, scene and character for the stage through the development of skills in movement, voice and rehearsal technique. 4 lectures. Prerequisite: TH 210.

**TH 342 Directing (4)**

Principles, philosophies, analytical methods, business practices, organizational techniques and interpersonal strategies of directing for the stage. Intensive rehearsals and performance of a one-act play (directed by each student) is expected outside of class hours. 4 lectures. Prerequisite: TH 210 and consent of instructor.

**TH 345 Rehearsal and Performance (4)**

Preparation of a play for public presentation, including acting, stage management, publicity, or serving as a key member of the artistic team. Total credit limited to 12 units. Major credit limited to 4 units; repeated units are free electives. 4 laboratories. Prerequisite: By audition only.

**TH 350 Seminar in Playwriting (4)**

Examines dramatic structure, techniques of dialogue, and means of characterization in variety of plays. Relates dramatic writing to technical, design, directorial and acting demands. Compositions of monologues, scenes and one-act play; works read and critiqued in class. 4 seminars. Prerequisite: TH 210, completion of GE Area A.

**TH 370 Costume History (4)**

Dress worn in Western society from Ancient Egypt through AD 2000. Silhouette; how, when, and why particular garments were worn; emphasis on social, political, and economic context. 4 lectures. Prerequisite: TH 210 or consent of instructor.

**TH 380 Children's Drama (4)**

Techniques for teaching theatre performance skills to children. Creation of small group seminar performance projects that are performed before an audience of elementary school children. 2 lectures, 2 seminars. Prerequisite: TH 210 or upper-division Liberal Studies or Human Development course.

**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 (4)**

Scenic design process used in the entertainment industry, including concept development, research, sketching, drafting, color rendering using a variety of media, 3D model building, and the presentation of design material. 3 lectures, 1 activity. Prerequisite: TH 210 or consent of instructor.

**TH 432 Introduction to Stage Design: Costume (4)**

Costume design process used in the entertainment industry, including concept development, research, sketching, color rendering in a variety of media, and the presentation of design material. 3 lectures, 1 activity. Prerequisite: TH 210 or consent of instructor.

**TH 434 Introduction to Stage Design: Lighting and Sound (4)**

Lighting and sound design process used in the entertainment industry, including concept development, research, the functional aspects of lighting and sound equipment, drafting techniques, the development of production paperwork and the presentation of design material. 3 lectures, 1 activity. Prerequisite: TH 210 or consent of instructor.

**TH 440 Advanced Acting (4)**

Introduction to the technical aspects of nonrealistic acting through analysis and studio performance of scenes from a Shakespearian tragedy and a 17th century French farce. 4 lectures. Prerequisite: TH 340.

**TH 460 Senior Project (4)**

Selection and completion of a project under faculty supervision. Examples include: A formal report, an original play, producing a creative work, conceiving and completing a theatrical design, or a combination of these or similar assignments. Prerequisite: Consent of department head.

**TH 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.

**TH 471 Selected Advanced Laboratory (1-4)**

Directed group laboratory study of selected topics for theatre students. *Class Schedule* will list topics selected. Total credit limited to 12 units. 1-4 laboratories. Prerequisite: Consent of instructor.

**TH 480 Internship (4) (CR/NC)**

Part-time work experience in the entertainment industry. Ability to work independently; strong verbal and written skills. Faculty approval of job position required. Evaluations by job supervisor and written reports by student required. 120 hours of work experience. Credit/No Credit grading. Prerequisite: Junior standing with a minimum 3.0 GPA.

## VGSC-VEGETABLE SCIENCE

**VGSC 202 Enterprise Project (2-4) (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. 1 lecture, variable practicum. Prerequisite: HCS 110, or consent of instructor.

**VGSC 230 Introduction to Vegetable Science (4)**

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, precooling methods and packaging. Survey of vegetable production for other than crop science majors. 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. 3 lectures, 1 laboratory. Prerequisite: CRSC 133.

#### **VGSC 260 Vegetable Gardening, Nutrition and History (4)**

Seedbed preparation, mulching, composting, fertilizers, transplanting, seeding, irrigation and pest control in an urban setting. Nutritional value of specific vegetables and their relationship to current dietary recommendations. Historical and cultural uses of vegetables. Instructional plots may be grown organically. 3 lectures, 1 laboratory.

#### **VGSC 402 Enterprise Project Management (2-4) (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. 1 lecture, variable practicum. Prerequisite: VGSC 202, and consent of instructor.

#### **VGSC 423 Advanced Vegetable Science (4)**

Agricultural land conservation; current laws impacting vegetable production and marketing. Environmental and cultural effects on selected vegetables including specific effects on growth, flowering, fruiting and yield. Field trip to desert vegetable production regions required. 3 lectures, 1 laboratory. Prerequisite: VGSC 230 or VGSC 232, or consent of instructor.

#### **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. 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. 3 lectures, 1 laboratory. Prerequisite: Graduate standing and consent of instructor.

## **VS—VETERINARY SCIENCE**

#### **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 instructor.

#### **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: BIO 111, or BIO 151.

#### **VS 223 Anatomy and Physiology of Farm Animals (4)**

Comprehensive overview of the principal systems of farm animals using an integrative, systemic approach to learning the homeostasis of mammalian organisms so the information can be applied to their daily care and management. 3 lectures, 1 laboratory. Prerequisite: BIO 111, or BIO 151.

#### **VS 310 Technical Veterinary Skills (4)**

Restraint and handling of animals, physical examination, necropsy procedure, basic wound management, applied pharmacology. Reproduction and herd health programs. 3 lectures, 1 laboratory. Prerequisite: VS 223 or two of the following: ASCI 221, ASCI 222, ASCI 223, or ASCI 224.

#### **VS 312 Production Medicine (3)**

Basic disease concepts. Fundamentals of immunology and therapeutics. Disease prevention principles, infectious and non-infectious. Pre-harvest food safety and milk and meat quality assurance. Herd health management programs for production efficiency and product quality. 3 lectures. Prerequisite: ASCI 221, ASCI 222, ASCI 223, ASCI 224, and VS 223.

#### **VS 320 Zoonoses and Veterinary Public Health Concerns (4)**

Public health concerns including: animal and bird diseases which may be transmitted to people; pre-harvest food safety and handling concerns; and environmental public health hazards. 3 lectures, 1 activity. Prerequisite: BIO 111, or BIO 151.

#### **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 instructor.

#### **VS 438 Systemic Animal Physiology (4)**

Homeostatic relationships of organ systems. Cardiovascular, respiratory, urogenital and neuro-endocrinological functions. 3 lectures, 1 laboratory. Prerequisite: VS 223, CHEM 313 or CHEM 371.

## **WS—WOMEN'S STUDIES**

#### **WS 301 Introduction to Women's Studies (4) GE D5 USCP**

Introduction to theories and research on gender and sexuality, gender stratification, and gender role development. Broad interdisciplinary examination of issues involving gender and sexuality, as well as race and ethnicity, with special emphasis on how these issues affect both women's and men's lives. Issues such as reproductive rights, gender and body image, the origins of patriarchy, gender and class. 4 lectures. Prerequisite: Completion of GE Area A and completion of two lower division Area D courses or consent of instructor.

#### **WS 311 Women in Cross Cultural Perspectives (4) GE D5**

Similarities and differences in women's lives internationally. Cultural influences such as class, ethnicity, and religion on women's status. Study of global feminism, reproductive rights, women's labor, women in development, women's politics. 4 lectures. Prerequisite: Completion of GE Area A, and one course from D2 and one from D3 or consent of instructor.

#### **WS 316 Women as Subject and Object in Art History (4) (Also listed as ART 316)**

Exploration of the role of women in the visual arts. Women as artists, women as portrayed in art, and feminist theory as it applies to the study of the visual arts and art history. 4 lectures. Prerequisite: ART 111, ART 112 or consent of instructor.

#### **WS 336 Religion, Gender and Society (4) (Also listed as RELS 336) GE C4 USCP**

Critical examination of religious ideas and institutions in America in relation to gender, race and politics. Focus on women and religion, the religious experience of minorities, and on politics. 4 lectures. Prerequisite: Completion of GE Area A, and PHIL 230 or PHIL 231; one Religious Studies course or consent of instructor.

#### **WS 350 Gender, Race, Science and Technology (4)**

Applications and histories of reproductive technologies and the ways in which these technologies are linked to the science of the body. How these technologies help to construct and deconstruct race and gender in the United States. 3 lectures, 1 activity. Prerequisite: Completion of GE Area B requirements.

#### **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 (4)**

Intensive study of a selected topic in Women's Studies (such as women and work, women and the law, women in the arts). The topic will be listed in the *Class Schedule*. Field experience may be required as appropriate. May be repeated for up to 8 units. 3 seminars and a research project. Prerequisite: WS 301 or consent of instructor and upper division standing.

**WS 434 American Women's History to 1870 (4)**  
(Also listed as HIST 434)

Female ideology and experience from the colonial period through the American Civil War. Use of a variety of sources, including women's own writing, in order to understand the history of women as it both reflects and shapes American culture and society. 3 lectures and research project. Prerequisite: Junior standing or consent of instructor.

**WS 435 American Women's History from 1870 (4)**  
(Also listed as HIST 435)

The female past in the 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 lectures and research project. Prerequisite: Junior standing or consent of instructor.

**WS 450 Feminist Theory (4)**

USCP

USCP

History and evolution of ideas about gender, race/ethnicity and sexual identity. Special attention as to how social, historical, and ideological forces, organized by the central, intertwined concepts of gender and race, shape both our critical thinking and our lives. 3 lectures, 1 activity. Prerequisite: WS 301 or consent of instructor.

## ZOO-ZOOLOGY

**ZOO 240 Essentials of Human Anatomy and Physiology I (5)**

Structural and functional organization of the skeletal, muscular, and nervous systems. Includes discussion of molecular, cellular, and organ system levels of organization. Activities emphasize histology, cadaver anatomy, physiology of muscle contraction, nerve impulse initiation and conduction, sensory and motor functions. 3 lectures, 2 activities. Prerequisite: BIO 111 or BIO 115 or BIO 151, CHEM 111 or CHEM 127, sophomore standing.

**ZOO 241 Essentials of Human Anatomy and Physiology II (5)**

Structural and functional organization of the circulatory, respiratory, digestive, excretory, and reproductive systems. Emphasizes cellular, tissue, and organ system integration of anatomical and physiological mechanisms. Laboratory includes histology, cadaver anatomy, and experiments emphasizing physiological regulation involved in the above systems. 3 lectures, 2 activities. Prerequisite: BIO 111 or BIO 115 or BIO 151, CHEM 111 or CHEM 127, sophomore standing.

**ZOO 321 Mammalogy (4)**

Biology and economic importance of mammals. Classification and identification of mammals, with emphasis on California species. 2 lectures, 2 laboratories. Prerequisite: BIO 153.

**ZOO 322 Ichthyology (4)**

Phylogeny, anatomy, functional morphology, physiology, and ecology of marine and freshwater fishes. Special reference to local and economically important species. Laboratory emphasis on taxonomy of California species, especially marine groups. 2 lectures, 2 laboratories. Prerequisite: BIO 153.

**ZOO 323 Ornithology (4)**

Classification and identification of birds, with emphasis on California species. Anatomy, physiology, ecology and behavior. Saturday field trips required. 2 lectures, 2 laboratories. Prerequisite: BIO 153.

**ZOO 329 Vertebrate Field Zoology (4)**

Identification and natural history of terrestrial vertebrates, with emphasis on field studies and local species. 2 lectures, 2 laboratories. Prerequisite: BIO 153.

**ZOO 331 Human Anatomy and Physiology I (5)**

Structural and functional organization of the skeletal, muscular, and nervous systems. Includes discussion of molecular, cellular, and organ system levels of organization. Activities emphasize histology, cadaver anatomy, physiology of muscle contraction, nerve impulse initiation and conduction, sensory and motor functions. 3 lectures, 2 activities.

Prerequisite: BIO 111 or BIO 115, or BIO 151, CHEM 111 or CHEM 127, junior standing.

**ZOO 332 Human Anatomy and Physiology II (5)**

Structural and functional organization of the circulatory, respiratory, digestive, excretory, and reproductive systems. Includes discussion of molecular, cellular, and organ system levels of organization. Activities emphasize histology, cadaver anatomy, physiology of muscle contraction, nerve impulse initiation and conduction, sensory and motor functions. 3 lectures, 2 activities. Prerequisite: BIO 111 or BIO 115, or BIO 151, CHEM 111 or CHEM 127, junior standing.

**ZOO 335 General Entomology (4)**

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)**

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 (1)**

Functional organization of the human muscular system, utilizing cadavers and human preparations. All major muscle groups. 1 laboratory. Prerequisite or concurrent: ZOO 240/331; sophomore standing.

**ZOO 341 Herpetology (4)**

Living and extinct reptiles and amphibians; an adaptive approach to their diversity, biology, and classification. 2 lectures, 2 laboratories. Prerequisite: BIO 153.

**ZOO 405 Vertebrate Development (5)**

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 or BIO 351.

**ZOO 421 Immature Stages of Insects (4)**

Identification, biology, and economic importance of preimaginal insect forms. 2 lectures, 2 laboratories. Prerequisite: ZOO 335 or consent of instructor.

**ZOO 422 Functional Histology (4)**

Functional microscopic anatomy of principal tissues and organs of vertebrates, including humans. Structural studies to determine mechanisms underlying physiological processes and their clinical applications in medicine. 2 lectures, 2 laboratories. Prerequisite: BIO 153.

**ZOO 423 Fisheries Science and Resource Conservation (4)**

Basic approaches in scientific investigation of marine and freshwater fisheries. Includes methodologies and quantitative strategies for study of finfish and invertebrates, user-group conflict issues, regional/global controversies in fisheries, species identification, lab/field protocols, general statistical procedures, and computer simulations. 3 lectures, 1 laboratory. Prerequisite: BIO 153. Recommended: ZOO 322.

**ZOO 425 Parasitology (4)**

External and internal parasites of man and animals. Life history. Parasite-host relationships. Control and recognition of species of clinical importance. 2 lectures, 2 laboratories. Prerequisite: BIO 153 and MCRO 221 or MCRO 224.

**ZOO 426 Immunology and Serology (4)**

Development, function, mechanisms, and consequences of immune responses. Beneficial and harmful immune reactions. Applications of serologic methods to diagnosis of diseases. Suitable for preparing laboratory technologists. 2 lectures, 2 laboratories. Prerequisite: BIO 351 and consent of instructor. Recommended: Biochemistry course.

**ZOO 428 Hematology (4)**

Development of blood as a tissue. Composition, function and mechanisms of formation and destruction of blood components in health and disease.

Methods for examination of blood. Suitable for preparing laboratory technologists. 2 lectures, 2 laboratories. Prerequisite: BIO 351 and consent of instructor. Recommended: Biochemistry course.

**ZOO 436 Comparative Invertebrate Physiology (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.

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Dean (Interim), K. Richard Zweifel	
Associate Dean (Interim), Allan R. Cooper	
Architectural Engineering .....	Paul Fratessa
Architecture.....	Margot McDonald (Interim)
City and Regional Planning .....	William J. Siembieda
Construction Management .....	Allan Hauck
Landscape Architecture.....	Dale A. Sutliff

## ORFALEA COLLEGE OF BUSINESS

Dean (Interim), Terri Swartz	
Associate Dean, Douglas C. Cerf	
Accounting .....	Charles R. (Tad) Miller
Economics.....	Alden F. Shiers
Finance .....	Kenneth Riener
Graduate Management Programs (MBA).....	Barry Floyd
Industrial Technology .....	James Sena
Management.....	James Sena
Marketing.....	Norm A. Borin

## COLLEGE OF ENGINEERING .....

Dean, Peter Y. Lee	
Associate Dean, Paul E. Rainey	
Associate Dean, Daniel W. Walsh	
Aerospace Engineering .....	Daniel J. Biezad
Civil and Environmental Engineering .....	Alypios Chatziioanou
Computer Engineering Program.....	Art MacCarley
Computer Science .....	Timothy J. Kearns
Electrical Engineering .....	Michael M. Cirovic
General Engineering Program .....	Daniel W. Walsh
Industrial and Manufacturing Engineering.....	Vacant
Materials Engineering .....	Linda S. Vanasupa
Mechanical Engineering.....	William E. Clark (Interim)

## COLLEGE OF LIBERAL ARTS

Dean, Harold Hellenbrand	
Associate Dean, Susan Currier	
Performing Arts Center, Director, Ron Regier	
Art and Design .....	Eric B. Johnson
English .....	David Kann
Ethnic Studies .....	Debra Valencia-Laver
Graphic Communication .....	Harvey Robert Levenson
History.....	Carolyn J. Stefanco
Humanities Program.....	Richard K. Simon
Journalism .....	Nishan R. Havandjian
Liberal Studies .....	Susan Duffy
Modern Languages and Literatures.....	William Martinez, Jr.
Music.....	Clifton Swanson
Philosophy.....	Linda Bomstad
Political Science.....	Philip L. Fetzer
Psychology and Child Development .....	Donald H. Ryujin
Social Sciences.....	Patrick C. McKim
Speech Communication.....	James R. Conway

Theatre and Dance ..... Maria Junco (Interim)  
 Western Intellectual Tradition Program ..... George M. Lewis  
 Women's Studies Program ..... Mary A. Armstrong

## COLLEGE OF SCIENCE AND MATHEMATICS

Dean, Philip S. Bailey  
 Associate Dean, Roxy L. Peck

Biological Sciences ..... V. L. Holland  
 Chemistry and Biochemistry ..... John C. Maxwell  
 Kinesiology ..... Andrea Brown  
 Mathematics ..... Kent E. Morrison  
 Physics ..... Richard A. Saenz  
 Statistics ..... Jay L. Devore

## UNIVERSITY CENTER FOR TEACHER

EDUCATION ..... Dean, Bonnie Konopak  
 Associate Dean, Carl R.V. Brown

## ADMINISTRATION AND FINANCE

Vice President for Administration and

Finance ..... Lawrence R. Kelley  
 Associate Vice President for Administration ..... Vicki Stover  
 Associate Vice President for Finance/Director, Budget  
 and Analytic Business Services ..... Richard R. Ramirez  
 Fiscal Services, Director ..... Lorlie Leetham  
 Contract and Procurement Services,  
 Director ..... Matthew Roberts  
 Facilities Planning, Director ..... Robert E. Kitamura  
 Facility Services, Director ..... Edward M. Naretto  
 Human Resources and Employment  
 Equity, Director ..... Barbara Melvin  
 Risk Management Manager ..... Joseph C. Risser  
 University Police Chief, Director ..... Anthony Aeilts

## STUDENT AFFAIRS

Vice President for Student Affairs ..... Cornel N. Morton  
 Assistant Vice President ..... Preston C. Allen  
 Associated Students, Inc., Executive  
 Director ..... Rick Johnson  
 Career Services and Testing Center,  
 Director ..... Richard M. Equinoa  
 Disability Resource Center, Director ..... William Bailey  
 Health and Counseling Services, Director ..... Martin Bragg  
 Housing and Residential Life, Director ..... Preston C. Allen  
 Judicial Affairs, Director ..... Ardith Tregenza  
 Student Academic Services, Director (Interim) ..... Susan Sparling  
 Student Life and Leadership, Director ..... Kenneth B. Barclay

## UNIVERSITY ADVANCEMENT

Vice President, University Advancement ..... William G. Boldt  
 Associate Vice President ..... Richard E. Ellison  
 Advancement Services, Director ..... Robert J. Drury  
 Cal Poly Fund, Director ..... Craig Nelson  
 Corporate and Foundation Relations,  
 Director ..... Linda Kristenson  
 Advancement Programs, Director ..... Polly Harrigan  
 Alumni Relations, Director ..... Kim R. Gannon  
 Community and Government Relations, Director .. Allen Haile  
 Planned Giving and Endowments,  
 Director ..... Michael D. McCall  
 Public Affairs, Director ..... Leah Kolt  
 Communications Director ..... Vacant

## AUXILIARY ORGANIZATIONS

### Associated Students, Inc.

Executive Director ..... Rick Johnson  
 Business Services, Director ..... Bill Ashby  
 Children's Center, Director ..... Tonya Iversen  
 Recreational Sports, Director ..... Marcy Maloney

### Foundation

Executive Director ..... Frank Mumford  
 Director Emeritus ..... Al Amaral  
 Associate Executive Director ..... Bob Ambach  
 Chief Financial Officer ..... Dale Texter  
 Business Development Director ..... James Reinhart  
 Campus Dining Director ..... Nancy Williams  
 El Corral Bookstore Director ..... Frank Cawley  
 General Counsel ..... Starr Lee  
 Human Resources Director ..... Joanne Williams  
 MIS Director ..... Holly Sletteland  
 Sponsored Programs Director ..... Jill Keezer

## CAL POLY CHIEF EXECUTIVE OFFICERS

Cal Poly has been guided by the following chief executive officers:

Leroy Anderson	1902 to 1908
Leroy Burns Smith	1908 to 1914
Robert W. Ryder	1914 to 1921
Nicholas Ricciardi	1921 to 1924
Margaret Chase (acting)	1924
Benjamin Ray Crandall	1924 to 1933
Julian A. McPhee	1933 to 1966
Dale W. Andrews (acting)	1966 to 1967
Robert E. Kennedy	1967 to 1979
Dale W. Andrews (acting)	1979
Warren J. Baker	1979 to Present

## FACULTY EMERITI

(Dates indicate period of service)

### Robert E. Kennedy (1940–1979) ..... President Emeritus

Fred Abitia (1969–2002)	Industrial Technology
Franklin P. Abshire (1977–2000)	Mathematics
Doris (Pat) M. Acord (1980–1998)	Physical Education & Kinesiology
Robert W. Adamson (1953–1983)	Aeronautical and Mechanical Engineering
William Alexander (1958–1988)	Political Science
John W. Algeo (1949–1954, 1985–1992)	Animal Sciences and Industry
Sabah Al-Hadad (1965–1996)	Mathematics
John K. Allen (1952–1970)	Veterinary Science
Ray R. Allen (1955–1986)	Engineering Technology
Gaston Amedee (1976–2001)	Earth and Soil Sciences
Olive M. Andersen (1957–1972)	Mathematics
Elizabeth B. Anderson (1958–1980)	English
Marshall L. Anderson (1975–1991)	Civil and Environmental Engineering
Richard A. Anderson (1947–1983)	Physical Education
Roy E. Anderson (1949–1978)	Business
Russell K. Anderson (1955–1991)	Animal Sciences and Industry
Warren R. Anderson (1946–1979)	Electronic and Electrical Engineering
Robert L. Andreini (1954–1983)	Speech Communication
Alfred E. Andreoli (1963–1990)	Aeronautical Engineering
Charles T. Andrews (1972–1994)	Accounting
Dale W. Andrews (1950–1983)	Executive Vice President
Hershel L. Apfelberg (1971–2000)	Graphic Communication
John H. Applegarth (1952–1972)	Biological Sciences
William W. Armentrout (1953–1980)	Education
Gene A. Armstrong (1967–2002)	Animal Science
Robert F. Asbury, Jr. (1964–1988)	Architecture
Charles B. Atlee, Jr. (1969–1990)	Crop Science

- Emile E. Attala (1970–1997) ..... Computer Science  
 Linda Atwood (1970–1998) ..... Chemistry and Biochemistry  
 James H. Babb (1959–1982) ..... Graphic Communications  
 Paraschos Babos (1972–1991) ..... Biological Sciences  
 Alfred M. Bachman (1970–1994) ..... Mathematics  
 James R. Bagnall (1969–2000) ..... Architecture  
 Allan S. Baillie (1978–1991) ..... Management  
 Edward H. Baker (1968–1999) ..... Mechanical Engineering  
 Thomas J. Ballew (1975–1993) ..... Architectural Engineering  
 Lawrence H. Balthaser (1969–1999) ..... Physics  
 Stanley L. Barr (1959–1980) ..... English  
 Katharine M. Barthels (1978–1996) ..... Physical Education & Kinesiology  
 Ronald E. Batterson (1971–1994) ..... Architecture  
 Lawrence E. Baur, Jr. (1965–1997) ..... Accounting  
 Lloyd N. Beecher (1969–2002) ..... History  
 Joy G. Berghell (1956–1975) ..... Library  
 James Bermann (1964–2000) ..... BioResource and Agricultural Engineering  
 Ellard W. Betz (1947–1976) ..... Engineering Technology  
 Richard Birkett (1955–1988) ..... Animal Science and Industry  
 Charles H. Black (1973–1989) ..... Mechanical Engineering  
 Jack Blackmon (1980–1996) ..... Architectural Engineering  
 Ernest W. Blattner (1983–2000) ..... Mechanical Engineering  
 Raymond E. Boche (1969–1999) ..... Computer Science  
 Enrico P. Bongio (1948–1979) ..... Engineering Technology  
 James S. Booth (1972–1988) ..... Biological Sciences  
 Michael Botwin (1981–2000) ..... Architectural Engineering  
 William C. Boynton (1985–2000) ..... Dean, College of Business, Accounting  
 Mary L. Brady (1968–2000) ..... University Library  
 Connie R. Breazeale (1966–1998) ..... Food Science and Nutrition  
 Patricia Brenner (1970–1992) ..... English  
 David A. Brodie (1970–2001) ..... Architecture  
 Howard C. Brown (1943–1983) ..... Ornamental Horticulture  
 William H. Brown (1957–1992) ..... Architecture  
 William L. Bruckart (1969–1984) ..... Industrial Technology  
 Athol J. D. Brunk (1957–1980) ..... Physics  
 Victor A. Buccola (1962–1996) ..... Physical Education and Kinesiology  
 Richard A. Bucich (1963–1988) ..... Electronic and Electrical Engineering  
 L. LaVerne Bucy (1955–1978) ..... Animal Science  
 Charlotte B. Burns (1974–1992) ..... Ornamental Horticulture  
 Sarah E. Burroughs (1967–1997) ..... Food Science and Nutrition  
 Wallace Burt (1968–1986) ..... Accounting  
 Robert E. Burton (1968–1999) ..... History  
 William O. Buschman (1956–1980) ..... Computer Science and Statistics  
 J. Kent Butler (1977–2000) ..... Industrial and Manufacturing Engineering  
 James M. Buxbaum (1978–1992) ..... Business Administration  
 Edward A. Cairns (1969–1991) ..... English  
 Edgar J. Carnegie (1963–1995) ..... Agricultural Engineering  
 Thomas W. Carpenter (1968–2001) ..... Mechanical Engineering  
 Laurence H. Carr (1963–1980) ..... Engineering Technology  
 Lark P. Carter (1981–1994) ..... Dean, College of Agriculture  
 Arthur S. Cary (1974–1996) ..... Physics  
 Marjorie Cass (1957–1974) ..... Education  
 Jose H. Castellano-Girón (1986–2002) ..... Modern Languages & Literatures  
 Everett M. Chandler (1951–1977) ..... Student Affairs  
 Daniel C. Chase (1954–1979) ..... Agricultural Management  
 Donald K. Cheek (1973–1997) ..... University Center for Teacher Education  
 F. Stuart Chestnut (1963–1990) ..... Physical Education and Recreation Administration  
 Gaylord Chizek (1958–1989) ..... Agricultural Management  
 Thomas T. L. Chou (1961–1986) ..... Electronic and Electrical Engineering  
 Robert A. Christenson (1970–2001) ..... Psychology and Child Development  
 Robert L. Cleath (1965, 1968–1980) ..... Speech Communication  
 Edward Clerkin (1964–1987) ..... Electronic and Electrical Engineering  
 Fred L. Clogston (1960–1992) ..... Biological Sciences  
 Clifford B. Cloonan (1957–1990) ..... Electronic and Electrical Engineering  
 George Clucas (1968–1982) ..... Political Science  
 Donald M. Coats (1964–1988) ..... Educational Services  
 Willi M. Coleman (1980–1997) ..... Ethnic Studies  
 Ralph C. Collins (1955–1974) ..... Education  
 John B. Connely (1970–2000) ..... Computer Science  
 E. Wesley Conner (1963–1988) ..... Ornamental Horticulture  
 Lee C. Coombs (1970–2001) ..... Chemistry and Biochemistry  
 Mark A. Cooper (1978–2002) ..... Industrial and Manufacturing Engineering  
 M. Polly Cooper (1974–2002) ..... Architecture  
 Frank G. Coyes (1965–1983) ..... Agricultural Engineering  
 Franklin S. Crane (1958–1985) ..... Mechanical Engineering  
 Randal L. Cruikshanks (1972–2000) ..... Political Science  
 James T. Culbertson (1953–1977) ..... Philosophy  
 John H. Culver (1975–2001) ..... Political Science  
 Carl C. Cummins (1958–1983) ..... Dean, Human Development and Education  
 William D. Curtis (1961–1989) ..... Psychology and Human Development  
 James A. D'Albro (1969–1994) ..... Environmental Horticultural Science  
 Charles H. Dana, Jr. (1982–2002) ..... Computer Science  
 Max Darnielle (1967–1989) ..... English  
 Samir K. Datta (1968–1999) ..... Electrical Engineering  
 Otto C. Davidson (1968–1996) ..... Mechanical Engineering  
 M. LeRoy Davis (1976–2002) ..... Agribusiness  
 James E. Delany (1970–2001) ..... Mathematics  
 Warren W. DeLey (1971–1997) ..... Social Sciences  
 Robert S. Densham (1976–2002) ..... Art and Design  
 Erland G. Dettloff (1967–1997) ..... University Center for Teacher Education  
 Robert H. Dickerson (1970–2001) ..... Physics  
 Richard Dickey (1956–1986) ..... Electronic and Electrical Engineering  
 Bruce A. Dickson (1952–1978) ..... Soil Science  
 Charles E. Dills (1963–1988) ..... Chemistry  
 Douglas D. Donaldson (1968–1998) ..... Biological Sciences  
 Robert Dourson (1967–1987) ..... Computer Science  
 Howard Drucker (1979–1998) ..... University Center for Teacher Education  
 Arthur C. Duarte (1965–2000) ..... Agribusiness  
 John E. Dunn, Sr. (1961–1981) ..... Agricultural Engineering  
 Wesley T. Dunn (1959–1974) ..... Graphic Communications  
 George M. Eastham (1966–1992) ..... Economics  
 Norman L. Eatough (1968–1998) ..... Chemistry and Biochemistry  
 John W. Edmisten (1968–1994) ..... Architectural Engineering  
 Walter E. Elliott (1965–1983) ..... Physics  
 Charles A. Elston (1947–1973) ..... Mathematics  
 James Emmel (1967–1988) ..... Speech Communication  
 David L. Englund (1973–2000) ..... Psychology and Human Development  
 Jon M. Ericson (1970–1991) ..... Speech Communication  
 Angela Estes (1983–2001) ..... English  
 Eugene D. Fabricius (1970–1995) ..... Electrical Engineering  
 Gerald P. Farrell (1970–2001) ..... Mathematics  
 Warren S. Farrell (1967–1981) ..... Agricultural Management  
 M. Dale Federer (1963–1987) ..... Psychology and Human Development  
 Harry L. Fierstine (1966–1994) ..... Assoc. Dean, College of Science and Mathematics  
 Harry C. Finch (1962–1980) ..... Biological Sciences  
 Michael J. Fitzpatrick (1962–1992) ..... Electronic and Electrical Engineering  
 James R. Flanagan (1959–1994) ..... Animal Sciences  
 William D. Forgeng (1980–1997) ..... Materials Engineering  
 Millard J. Fötter (1954–1976) ..... Industrial Engineering  
 H. Paul Fountain (1965–2001) ..... Crop Science  
 Frank Fox (1957–1988) ..... Animal Science and Industry  
 Freeman Freitag (1966–1992) ..... Electronic and Electrical Engineering  
 Winton H. Frey, Jr. (1963–1990) ..... Ornamental Horticulture  
 Fred S. Friedman (1975–2000) ..... Mechanical Engineering  
 Clara B. Froggatt (1964–1980) ..... Counseling and Testing  
 Robert H. Frost (1953–1983) ..... Physics  
 George S. Furimsky (1955–1973) ..... Engineering Technology  
 Merrill C. Gaines (19976–2002) ..... Architecture  
 Timothy A. Gaskin (1970–1991) ..... Ornamental Horticulture  
 Larry W. Gay (1979–2002) ..... Industrial Technology  
 Teymoor Gedayloo (1965–1992) ..... Physics  
 Douglas G. Genereux (1970–2002) ..... Agribusiness  
 David L. George (1970–2002) ..... Political Science  
 Curtis F. Gerald (1964–1980) ..... Computer Science and Statistics  
 Peter Giambalvo (1968–1992) ..... Engineering Technology  
 William R. Gibford (1955–1979) ..... Animal Science  
 John F. Gillham (1973–1994) ..... Landscape Architecture  
 Jack E. Girolo (1970–2002) ..... Mathematics

- Margaret J. Glaser (1973-1992) ... University Center for Teacher Education  
 L. Joe Glass (1970-2001) ... BioResource and Agricultural Engineering  
 Sonja S. Glassmeyer (1973-2001) ... Kinesiology  
 Wallace F. Glidden (1961-1992) ... Animal Sciences and Industry  
 Saul Goldberg (1970-2000) ... Electrical Engineering  
 James R. Golden (1967-1983) ... Industrial Engineering  
 Reginald H. Gooden, Jr. (1970-2002) ... Political Science  
 Raymond G. Gordon (1967-2002) ... Mechanical Engineering  
 Robert Gordon (1967-1992) ... Ornamental Horticulture  
 George G. Gowgani (1970-1997) ... College of Agriculture  
 Donald P. Grant (1967-2000) ... Architecture  
 Rufus L. Graves, Jr. (1951-1954, 1957-1982) ... Architecture  
 Theodore G. Graves (1947-1984) ... Engineering Technology  
 James S. Greil (1974-1996) ... Crop Science  
 Donald A. Grinde, Jr. (1977-1996) ... History  
 Robin R. Grinnell (1967-1997) ... BioResource and Agricultural Engineering  
 John E. Groves (1968-2001) ... Statistics  
 Lester W. Gustafson (1947-1971) ... Aeronautical Engineering  
 David W. Hafemeister (1969-2000) ... Physics  
 Kenneth L. Haggard (1967-1986) ... Architecture  
 Thomas E. Hale (1966-2000) ... Mathematics  
 Barbara M. Hallman (1973-1991) ... History  
 Reino Hannula (1962-1981) ... Computer Science and Statistics  
 Phyllis J. Hansen (1963-1990) ... Library  
 F. Sheldon Harden (1948-1987) ... Physical Education and Recreation Administration  
 Adelaide T. Harmon-Elliott (1974-1996) ... Mathematics  
 John E. Harrigan (1969-1996) ... Architecture  
 Leroy M. Harris (1954-1986) ... Animal Sciences and Industry  
 Charles Haskell (1963-1988) ... Mathematics  
 David S. Hatcher (1980-1992) ... Architectural Engineering  
 James H. Hayes (1969-1992) ... Journalism  
 Dwayne G. Head (1966-2000) ... Physical Education and Kinesiology  
 Henry J. Heesch (1986-2001) ... Graphic Communication  
 Anatol Helman (1957-1974) ... Architecture  
 Frank J. Hendel (1967-1984) ... Aeronautical Engineering  
 Donald W. Hensel (1960-1990) ... History  
 Charles A. Herald (1958-1975) ... Electronic and Electrical Engineering  
 John J. Herlihy (1975-2000) ... Agribusiness  
 Earl R. Hesck (1956-1983) ... Engineering Technology  
 William R. Hicks (1957-1983) ... Physical Education  
 Robert Hill (1976-1991) ... Accounting  
 Vaughan Hitchcock (1962-1997) ... Physical Education and Kinesiology  
 Jon A. Hoffmann (1968-2002) ... Aerospace Engineering  
 Roy B. Hollstien (1973-1988) ... Computer Science  
 Ray J. Holt (1955-1978) ... Physics  
 Walter E. Holtz (1954-1966, 1968-1982) ... Environmental Engineering  
 Dennis N. Homan (1966-1997) ... Biological Sciences  
 Gilbert L. Homfeld (1960-1976) ... Mathematics  
 Harry Honegger (1961-1986) ... Metallurgical Engineering  
 Robert L. Hoover (1970-1998) ... Social Sciences  
 William F. Horton (1968-1998) ... Electrical Engineering  
 H. Clyde Hostetter (1958-1983) ... Journalism  
 A. L. Houk (1946-1972) ... Chemistry  
 Laurence D. Houlgate (1979-2002) ... Philosophy  
 William A. Howard (1980-1994) ... City and Regional Planning  
 Carl C. F. Hsieh (1970-2000) ... Civil and Environmental Engineering  
 John Y. S. Hsu (1970-2002) ... Computer Science, Computer Engineering  
 Earl D. Huff (1970-1996) ... Political Science  
 Robert J. Huot (1963-1986) ... English  
 James R. Hutchinson (1971-1997) ... Graphic Communication  
 Rex L. Hutton (1966-2000) ... Mathematics  
 C. Dennis Hynes (1957-1990) ... Biological Sciences  
 Michael A. Iannce (1978-2002) ... Mechanical Engineering  
 George K. Ikenoyama (1963-1998) ... Architecture  
 Gloria Jameson (1967-1988) ... English  
 Starr Jenkins (1961-1988) ... English  
 Eric V. Johnson (1969-1998) ... Biological Sciences  
 Mead R. Johnson (1956-1980) ... English  
 Miles B. Johnson (1957-1983) ... English  
 Richard F. Johnson (1950-1988) ... Animal Sciences and Industry  
 Robert M. Johnston (1946-1954, 1956-1974) ... Engineering Technology  
 Thomas V. Johnston (1967-1985) ... Art, and Associate Dean of Communicative Arts and Humanities  
 Jack B. Jones (1969-1991) ... University Center for Teacher Education  
 William B. Judd (1956-1981) ... Mathematics  
 John J. Kane (1969-1984) ... Aeronautical and Mechanical Engineering  
 James Y. Katekaru, (1969-1992) ... Chemistry  
 Thomas D. Kay (1958-1991) ... Engineering Technology  
 Roger A. Keech (1965-1983) ... Aeronautical and Mechanical Engineering  
 Roger L. Keep (1968-2001) ... Industrial Technology  
 Brent H. Keetch (1969-1998) ... English  
 Rodney Keif (1960-1988) ... Mechanical Engineering  
 Elmo A. Keller (1963-2000) ... Computer Science  
 Martin A. Kellerman (1968-2000) ... Chemistry and Biochemistry  
 Helen P. Kelley (1966-1985) ... Art  
 Paul Kenyon (1957-1982) ... Business Administration  
 Timothy W. Kersten (1971-2002) ... Economics  
 Chi Su Kim (1974-1992) ... University Library  
 George N. Knecht (1973-2002) ... Biological Sciences  
 Donald Koberg (1962-1992) ... Architecture  
 Irvin J. Kogan (1957-1985) ... Engineering Technology  
 Joseph M. Kourakis (1970-1997) ... City and Regional Planning  
 Richard B. Kranzdorf (1971-2001) ... Political Science  
 Richard J. Krejsa (1968-1994) ... Biological Sciences  
 Royce L. Lambert (1969-1994) ... Soil Science  
 Alfred W. Landwehr (1970-1999) ... English  
 Alexander Landyshev (1956-1972) ... Electronic and Electrical Engineering  
 Martin T. Lang (1969-1999) ... Mathematics  
 James A. Langford (1955-1976) ... Education  
 Paul S. Lansman (1964-1979) ... Mathematics  
 Stuart E. Larsen (1969-2001) ... Civil and Environmental Engineering  
 Donald P. Lazere (1977-1995) ... English  
 Thomas Lee (1952-1988) ... Physical Education and Recreation Administration  
 Robert B. Leonesio (1972-1992) ... Materials Engineering  
 Robert L. Levison (1969-1997) ... University Center for Teacher Education  
 Vance D. Lewis (1946-1972) ... Physics and School of Science and Mathematics  
 Karl D. Lilje (1981-1994) ... Engineering Technology  
 John R. Lindvall (1973-2002) ... Finance  
 H. Clay Little (1973-1992) ... Agribusiness  
 Alice C. Loh (1974-2001) ... Landscape Architecture  
 Larry Loh (1978-2002) ... Architecture  
 Willard H. Loper (1955-1983) ... Agricultural Engineering  
 Bernice B. Loughran (1958-1980) ... Art  
 John J. Lowry (1962-1987) ... Mathematics  
 Nancy J. Lucas (1975-2002) ... English  
 Thomas M. Lukes (1962-1985) ... Food Science  
 George R. Mach (1954-1991) ... Mathematics  
 Leon W. Magur (1958-1983) ... Physics  
 Y. Leon Maksoudian (1963-1994) ... Statistics  
 Anthony K. Mason (1980-1998) ... Industrial and Manufacturing Engineering  
 Scott J. Maughan (1965-1980) ... History  
 Edward L. Mayo (1968-2000) ... History  
 Susan L. McBride (1979-2002) ... University Center for Teacher Education  
 John W. McCombs (1960-1991) ... Electronic and Electrical Engineering  
 Robert E. McCorkle (1962-2001) ... Agribusiness  
 Robert F. McDonnell (1975-1991) ... English  
 Michael E. McDougall (1972-1992) ... City and Regional Planning  
 Willard L. McGonagill (1967-1989) ... Architecture  
 Carroll R. McKibbin (1974-2000) ... Political Science  
 Malcolm McLeod (1973-1988) ... Biological Sciences  
 Mac McRobbie (1962-1979) ... Industrial Technology  
 Shien-Yi Meng (1968-2000) ... Electrical Engineering  
 John L. Merriam (1958-1978) ... Agricultural Engineering  
 Thomas O. Meyer (1955-1979) ... Food Science  
 Allen D. Miller (1960-1983) ... Mathematics

- Harold R. Miller (1968–1991) ..... Accounting  
 Dragoslav M. Misic (1970–1991) ..... Civil and Environmental Engineering  
 Karen Moerman (1969–1989) ..... Home Economics  
 Neil J. Moir (1970–2001) ..... Chemistry and Biochemistry  
 Sixto E. Moreira (1972–1991) ..... Architecture  
 Kris S. Morey (1970–1999) ..... Food Science and Nutrition  
 Ann Morgan (1980–1998) ..... Psychology and Human Development  
 Donald Morgan (1968–1988) ..... Industrial Engineering  
 Don M. Morris (1957–1962, 1969–1992) ..... University Center for  
 Teacher Education  
 Lynn S. Mosher (1974–2000) ..... Industrial Technology  
 John H. Mott (1967–1983) ..... English  
 W. Stephen Mott (1972–2000) ..... Graphic Communication  
 Billy W. Mounts (1956–1977) ..... Health Center Physician and Surgeon  
 James L. Murphy (1981–1994) ..... Industrial Technology  
 Paul F. Murphy (1970–2002) ..... Mathematics  
 George T. Murray (1978–1992) ..... Materials Engineering  
 Randall L. Murray (1977–2001) ..... Journalism  
 Ronald L. Mussulman (1986–2001) ..... Mechanical Engineering  
 Paul R. Neel (1962–1996) ..... Dean, College of Architecture and  
 Environmental Design, Architecture  
 Richard F. Nelson (1960–1989) ..... Biological Sciences  
 Lawrence H. Nelson (1972–1998) ..... Mechanical Engineering  
 Loren L. Nicholson (1956–1979) ..... Journalism  
 Dell O. Nickell (1964–1980) ..... Architectural Engineering  
 Keith E. Nielsen (1959–1991) ..... Speech Communication  
 Philip W. B. Niles (1967–1992) ..... Mechanical Engineering  
 Shien Hwei Niu (1969–1992) ..... University Library  
 Glenn A. Noble (1947–1973) ..... Biological Sciences  
 William E. Noble (1973–1995) ..... Environmental Horticultural Science  
 Thomas F. Nolan (1949–1974) ..... Political Science  
 Raymond E. Nordquist (1965–1991) ..... Architecture  
 O. Robert Noyes (1974–2001) ..... Food Science and Nutrition  
 David E. Nutter (1974–1992) ..... Accounting  
 Eugene L. O'Connor (1964–1991) ..... Business Administration  
 Timothy G. O'Keefe (1983–2003) ..... Natural Resources Management  
 Barton C. Olsen (1968–1990) ..... History  
 Thomas D. O'Neil (1973–2002) ..... Mathematics  
 Gertrudis M. O'Neill (1972–1998) ..... Library  
 Michael P. Orth (1967–2002) ..... English  
 Maria E. Ortiz (1972–2002) ..... Biological Sciences  
 Roger J. Osbaldeston (1972–1994) ..... Landscape Architecture  
 Leon Osteyee (1957–1983) ..... Aeronautical and Mechanical Engineering  
 Frederick J. O'Toole (1972–2000) ..... Philosophy  
 Philip H. Overmeyer (1958–1972) ..... Business Administration  
 Kenneth S. Ozawa (1963–2000) ..... Physics  
 P. Lane Page (1963–1997) ..... University Library  
 Panagiotis Papakyriazis (1971–2001) ..... Economics  
 William B. Patterson (1977–2001) ..... Mechanical Engineering  
 Gordon J. Paul (1969–1983) ..... Accounting  
 Roland K. Pautz (1959–1995) ..... Animal Science  
 Evelyn I. Pellaton (1966–1982) ..... Physical Education  
 Dominic Perello (1954–1987) ..... Economics  
 James M. Peters (1958–1980) ..... Chemistry  
 James J. Peterson (1964–1984) ..... English  
 William Phillips (1957–1987) ..... Architectural Engineering  
 David R., Pierce, Jr. (1981–1992) ..... Construction Management  
 Richard A. Pimentel (1952–1983) ..... Biological Sciences  
 Louis D. Pippin (1970–1992) ..... University Center for Teacher Education  
 Timothy R. Plumb (1981–1997) ..... Natural Resources Management  
 Clifford J. Price (1956–1974) ..... Aeronautical Engineering  
 Derek Price (1957–1989) ..... Mechanical Engineering  
 Eileen Pritchard (1973–2000) ..... Library  
 Charles W. Quinlan (1966–1994) ..... Architecture  
 Peter Rabe (1967–1986) ..... Psychology and Human Development  
 Jimmy H. Railey (1977–1992) ..... Physical Education  
 Larry P. Rathbun (1970–1992) ..... Agricultural Education  
 Evelyn D. Reagan (1946–1948, 1954–1977) ..... Library  
 R. Howell Reece (1946–1964) ..... Mechanical Engineering  
 Ronald D. Regan (1977–1991) ..... Ornamental Horticulture  
 Gary D. Reif (1967–2002) ..... Dairy Science  
 Robert G. Reynolds (1963–1996) ..... Art and Design  
 Marilyn F. Rice (1977–2000) ..... Psychology and Human Development  
 Walter E. Rice (1964–2000) ..... College of Business, Economics  
 Glenn W. Rich (1953–1979) ..... Agricultural Engineering  
 Carlos C. Richards (1946–1971) ..... Engineering Technology  
 Thomas L. Richards (1969–2000) ..... Biological Sciences  
 Herman E. Rickard (1959–1990) ..... Dairy Science  
 Rolla W. Rider, Jr. (1960–1982) ..... Business Administration  
 Max E. Riedlsperger (1969–2000) ..... History  
 William C. Rife (1977–1998) ..... Chemistry and Biochemistry  
 Rhonda L. Riggins-Pimentel (1972–1994) ..... Biological Sciences  
 Eugene A. Rittenhouse (1949–1976) ..... Economics and Placement  
 David M. Roach (1966–2000) ..... Physics  
 James A. Rodger (1986–2002) ..... Construction Management  
 Aryan I. Roest (1955–1990) ..... Biological Sciences  
 John A. Rogalla (1959–1992) ..... Agribusiness  
 John M. Rogers (1970–2000) ..... Statistics  
 Rolf E. Rogers (1975–1994) ..... Management  
 Arthur Z. Rosen (1953–1993) ..... Physics  
 Robert L. Rosenberg (1970–1985) ..... History  
 Mona G. Rosenman (1971–1992) ..... English  
 Bianca Rosenthal (1971–2001) ..... Modern Languages and Literatures  
 Mildred Roske (1967–1988) ..... Home Economics  
 Pasha Rostov (1978–1992) ..... Computer Science  
 John G. Russell (1968–2000) ..... Music  
 Patricia Saam (1966–1992) ..... Food Science and Nutrition  
 Joe Sabol (1972–2002) ..... College of Agriculture, Agricultural Education  
 and Communication  
 Glenn W. Salo (1955–1990) ..... Agricultural Engineering  
 James D. Sanderson (1967–1992) ..... Intercollegiate Athletics  
 Doral R. Sandlin (1969–1992) ..... Aeronautical Engineering  
 Leo E. Sankoff (1942, 1946–1980) ..... Agricultural Education  
 Harry H. Scales (1958–1976) ..... Education  
 Helmut Schleicher (1970–1988) ..... Construction Management  
 Walter P. Schroeder (1957–1980) ..... Education  
 Thomas G. Schumann (1971–2000) ..... Physics  
 Kenneth E. Schwartz (1952–1988) ..... Architecture  
 Jack F. Scott (1967–2000) ..... Agribusiness  
 Kenneth C. Scotto (1970–2001) ..... Animal Science  
 Glenn E. Seeber (1954–1979) ..... Engineering Technology  
 Robert E. Sennett (1970–1997) ..... Civil and Environmental Engineering  
 Harry Sharp, Jr. (1975–2000) ..... Speech Communication  
 Habib Sheikh (1967–2000) ..... English  
 James E. Simmons (1966–1994) ..... English  
 Orien W. Simmons (1961–1980) ..... Metallurgical and Welding Engineering  
 Gerald L. Smith (1980–2000) ..... Landscape Architecture  
 Howard F. Smith (1968–1983) ..... Economics  
 M. Eugene Smith (1946–1974) ..... History  
 Nelson L. Smith III (1962–1994) ..... Industrial Technology  
 John G. Snetsinger (1970–2001) ..... History  
 L. Robert Sorensen (1966–1983) ..... Psychology  
 Shirley R. Sparling (1963–1991) ..... Biological Sciences  
 Ruth G. Spencer (1967–1982) ..... Library  
 Verlan Stahl (1968–1987) ..... Foreign Languages  
 Mary L. Stallard (1965–1994) ..... Physical Education and Kinesiology  
 William D. Stansfield (1963–1992) ..... Biological Sciences  
 Eugene E. Starkey (1978–1991) ..... Dairy Science  
 John Stechman (1960–1989) ..... Animal Sciences and Industry  
 Howard Steinberg (1970–1991) ..... Mathematics  
 Fred H. Steuck (1947–1978) ..... Electronic and Electrical Engineering  
 Edward O. Stoffel (1957–1988) ..... Mechanical Engineering  
 J. Edward Strasser (1960–1984) ..... Industrial Technology  
 H. Bernard Strickmeier (1970–2002) ..... Mathematics  
 Rollin D. Strohmman (1969–2002) ..... BioResource and Agricultural  
 Engineering  
 Charles W. Strong (1971–2000) ..... English  
 John S. Stuart (1964–1983) ..... Architecture  
 Daniel F. Stubbs (1963–1997) ..... Computer Science

W. Fred Stultz (1977–1999).....Psychology and Human Development  
 George J. Suchand (1971–2000).....Social Sciences  
 Gerald J. Sullivan (1968–1996).....English  
 Vern Swansen (1969–1989).....Architecture  
 Ronald D. Taskey (1977–2001).....Soil Science  
 Fuad H. Tellew (1960–1991).....Economics  
 John W. Thomas (1968–1992).....Biological Sciences  
 William Thurmond (1951–1989).....Biological Sciences  
 Russell L. Tice (1965–2000).....Chemistry and Biochemistry  
 Neal R. Townsend (1965–1991).....Mathematics  
 Dean Trembly (1961–1976).....Counseling and Testing  
 William R. Troutner (1942–1976).....Crop Science  
 Bernard A. Troy (1970–1998).....University Center for Teacher Education  
 Joseph Truex (1954–1986).....Graphic Communication  
 James H. W. Tseng (1969–1994).....Electrical Engineering  
 Pearl Turner (1951–1974).....Library  
 Robert G. Valpey (1972–1983).....Dean, School of Engineering and Technology  
 Gordon L. Van de Vanter (1968–86).....Crop Science  
 Willem L. Van Wyngaarden (1965–2002).....Physics  
 Herman C. Voeltz (1965–1983).....History  
 Evelyn K. Voros (1955–1974).....Speech  
 Joseph J. Waddell (1976–2000).....University Library  
 William B. Wahl (1966–1985).....English  
 David B. Walch (1980–2000).....University Library  
 Howard D. Walker (1957–1991).....Chemistry  
 Isaac N. Walker (1967–1983).....English  
 Matthias R. Wall (1976–2000).....Construction Management  
 Gustav N. Wassel (1980–1995).....Electrical Engineering  
 Joseph N. Weatherby, Jr. (1968–2000).....Political Science  
 James L. Webb (1969–1999).....Physical Education and Kinesiology  
 Barbara P. Weber (1966–1992).....Home Economics  
 Neil W. Webre (1969–1992).....Computer Science  
 James Webster, Jr. (1965–1987).....Agricultural Engineering  
 Stephen T. Weinstein (1969–2000).....Mathematics  
 Henry J. Wessels (1970–1996).....Art and Design  
 James D. Westover (1971–2000).....Chemistry and Biochemistry  
 Glenn V. Whaley (1963–1992).....University Library  
 Marvin J. Whalls (1968–1989).....Biological Sciences  
 Jo Ann C. Wheatley (1980–2000).....Crop Science  
 Patrick O. Wheatley (1970–1998).....Computer Science  
 Marylinda Wheeler (1975–1992).....Physical Education  
 Robert R. Wheeler (1961–1992).....Animal Sciences and Industry  
 Mary Lou White (1961–1979).....Physical Education  
 H. Glenn Wight (1952–1990).....Chemistry  
 J. Barron Wiley (1956–1978).....Education  
 Richard C. Wiley (1946–1983).....Metallurgical and Welding Engineering  
 Edward A. Wilk (1966–1998).....University Library  
 Graydon J. Williams (1970–1991).....Music  
 David G. Williamson (1968–1996).....Chemistry  
 Irwin A. Willson (1958–1975).....Education  
 Jack D. Wilson (1976–2000).....Mechanical Engineering  
 Malcolm W. Wilson (1968–1989).....Academic Affairs Vice President  
 Walter D. Wilson (1969–1998).....Physics  
 Donley J. Winger (1963–2000).....Electrical Engineering  
 Paul Wolff (1971–1992).....Architecture  
 John A. Woodworth (1949–1974).....Mathematics  
 John Wordeman (1973–1988).....Graphic Communication  
 Marshall S. Wright, Jr. (1969–1988).....Chemistry  
 Sing Chou Wu (1969–1999).....Statistics  
 Raymond A. Wysock (1967–1991).....Industrial Technology  
 Steven H. Yoneda (1970–2002).....Athletics  
 James B. Zetzsche, Jr. (1968–2001).....BioResource and Agricultural Engineering

## DISTINGUISHED TEACHER AWARD RECIPIENTS

In 1963 the University instituted a program of recognizing outstanding teaching efforts through the Distinguished Teacher Awards. Selections for this honor are based upon recommendations of the Academic Senate committee which follows the procedure of soliciting nominations from students and colleagues. Evaluations and recommendations of the nominees are based upon an in-depth review by the committee, including classroom visitations. Recipients of the Distinguished Teacher Awards and their departments are listed below.

1963–64 Robert E. Holmquist, Physics  
 John L. Merriam, Agricultural Engineering  
 1964–65 Joy O. Richardson, Mechanical Engineering  
 Milo E. Whitson, Mathematics  
 1965–66 A. Norman Cruikshanks, Social Sciences  
 Richard F. Johnson, Animal Husbandry  
 George R. Mach, Mathematics  
 1966–67 Robert W. Adamson, Mechanical Engineering  
 Kenneth G. Fuller, Mathematics  
 William D. Curtis, Psychology  
 1967–68 Rodney G. Keif, Environmental Engineering  
 David M. Grant, English  
 Wesley S. Ward, Architecture  
 1968–69 Robert M. Johnson, Mechanical Engineering  
 Bruce Kennelly, Chemistry  
 Alice E. Roberts, Education  
 1969–70 Donald W. Hensel, History  
 David H. Montgomery, Biological Sciences  
 Philip H. Overmeyer, Business Administration  
 Willard M. Pederson, English  
 Omer K. Whipple, Chemistry  
 1970–71 Robert L. Cleath, Speech  
 Kenneth E. Schwartz, Architecture  
 Hewitt G. Wight, Chemistry  
 1971–72 Stuart E. Larsen, Aeronautical Engineering  
 Barton C. Olsen, History  
 Ronald L. Ritschard, Biological Sciences  
 Joseph N. Weatherby, Political Science (Social Sciences)  
 1972–73 Lyle G. McNeal, Animal Science  
 Charles W. Quinlan, Architecture  
 James E. Simmons, English  
 1973–74 William J. Phaklides, Engineering Technology  
 Louis D. Pippin, Education  
 Duane O. Seaberg, Agricultural Management  
 1974–75 Peter Jankay, Biological Sciences  
 Josephine S. Stearns, Child Development  
 George J. Suchand, Social Sciences  
 1975–76 James Hayes, Journalism  
 William V. Johnson, Music  
 Erna Knapp, Art  
 1976–77 Harry L. Fierstine, Biological Sciences  
 Grant D. Venerable II, Chemistry  
 Ralph M. Warten, Mathematics  
 1977–78 Timothy M. Barnes, History  
 Donald P. Grant, Architecture and Environmental Design  
 John C. Syer, Political Science  
 1978–79 Pat Pendse, Biological Sciences  
 Dane Jones, Chemistry  
 Adelaide Harmon-Elliott, Mathematics  
 1979–80 David J. Keil, Biological Sciences  
 Thomas Ruehr, Soil Science  
 Stephen Weinstein, Mathematics  
 Michael D. Zohns, Ornamental Horticulture

- 1980-81 Sarah E. Burroughs, Food Science and Nutrition (Child Development and Home Economics)  
Christina Orr-Cahall, Art  
Kendrick W. Walker, Philosophy
- 1981-82 Christina A. Bailey, Chemistry  
Kenneth E. Ozawa, Physics  
Thomas L. Richards, Biological Sciences
- 1982-83 James Bermann, Agricultural Engineering  
Donald J. Koberg, Architecture  
Jack D. Wilson, Aeronautical and Mechanical Engineering
- 1983-84 Euel W. Kennedy, Mathematics  
William L. Preston, Social Sciences  
Michael J. Wenzl, English
- 1984-85 Robert S. Cichowski, Chemistry  
Harvey C. Greenwald, Mathematics  
Max E. Riedlsperger, History
- 1985-86 Edward H. Baker, Mechanical Engineering  
Sue McBride, Education  
Phillip K. Ruggles, Graphic Communication
- 1986-87 Boyd W. Johnson, Mathematics  
Craig H. Russell, Music  
Calvin H. Wilvert, Social Sciences
- 1987-88 James R. Mueller, Mathematics  
Ronald S. Mullisen, Mechanical Engineering  
Robert G. Reynolds, Art and Design
- 1988-89 Stephen W. Ball, Philosophy  
George Cotkin, History  
Abraham B. Shani, Management
- 1989-90 Lloyd N. Beecher, History  
Talmage E. Scriven, Philosophy  
Jan W. Simek, Chemistry
- 1990-91 Jay L. Devore, Statistics  
Linda H. Halisky, English  
Ann Morgan, Psychology  
James L. Webb, Physical Education & Recreation Admin.
- 1991-92 Mary E. Pedersen, Food Science and Nutrition  
John Snetsinger, History  
W. Fred Stultz, Psychology and Human Dev.
- 1992-93 Susan Duffy, Speech Communication  
Donald K. Maas, University Center for Teacher Education  
Charles M. Slem, Psychology and Human Development
- 1993-94 William T. Little, Foreign Languages and Literatures  
Steven R. Marx, English  
Raymond M. Nakamura, Physical Education & Kinesiology
- 1994-95 Ronald F. Brown, Physics  
Lee B. Burgunder, Business Administration  
Nancy Lucas, English
- 1995-96 David Keeling, Chemistry and Biochemistry  
John Russell, Music  
Richard Simon, English
- 1996-97 Leonard Davidman, University Center for Teacher Education  
Al Landwehr, English  
Robert Thompson, Agribusiness
- 1997-98 John Culver, Political Science  
Jay S. DeNatale, Civil and Environmental Engineering  
David R. Henry, Speech Communication
- 1998-99 Colette Frayne, Global Strategy and Law  
Carol MacCurdy, English  
Leonard Myers, Computer Science
- 1999-00 J. Michael Geringer, Global Strategy and Law  
Brent G. Hallock, Soil Science  
Clinton A. Staley, Computer Science
- 2000-01 Sky Bergman, Art and Design  
Phillip M. Doub, Agribusiness  
William Martinez, Jr., Modern Languages and Literatures

- 2001-02 Kevin Clark, English  
Alyson McLamore, Music  
Mark Zohns, BioResource and Agricultural Engineering

## OUTSTANDING FACULTY ADVISOR AWARD

In 2001-02 the University instituted a program of recognizing outstanding achievement by a faculty member in the area of student advising. Nominations are solicited from the faculty and staff and students. Recipients' names will be displayed on a perpetual plaque. The first recipient of the Outstanding Faculty Advisor Award and her department is listed below:

- 2001-02 Kathryn Rummell, English

## STAFF EMERITI *(Dates indicate period of service)*

- Jeanne C. Aceto (1980-1996).....College of Engineering  
Vic Allen (1951-1976).....Custodial Services  
Alfred W. Amaral (1967-2000).....Foundation Executive Office  
Edna Anderson (1964-1986).....Foundation  
Clarence Armstrong, Jr. (1962-1994).....Facility Services  
Peggy Arnold (1965-1991).....School of Business  
Grace Arvidson (1951-1991).....President's Office  
Antonio Avelar (1972-1992).....Facilities Services  
Mary L. Bachino (1968-1991).....Alumni Relations  
Shirley Backer (1968-1988).....Foreign Languages  
Spencer S. Bain (1979-2001).....Facility Services  
Sharon Y. Baldwin (1975-2001).....Health Services  
R. Wayne Ball (1969-2001).....Health Services  
Fern Ballard (1954-1974).....Foundation  
Patricia Barker (1964-1988).....Foundation  
Joe C. Baze (1962-1980).....Plant Operations  
Betsy L. Bazzani (1986-2002).....Institutional Planning and Analysis  
Gertrude E. Beck (1968-1983).....Activities Planning  
Sandra L. Beck (1978-1998).....Library  
James P. Becker (1962-1980).....Plant Operations  
Pat Belveal (1977-1992).....Budget Planning and Administration  
Darrell F. Bennett (1971-2000).....Health and Counseling Services  
Dolores Bennett (1971-1988).....Evaluations  
Raymond G. Berrett (1983-2002).....University Police  
Luther A. Bertrando (1968-1994).....Administrative Systems  
Leon R. Bierly (1978-2002).....Information Technology Services  
Dorothy M. Bishop (1962-1980).....Education  
Charles Boling (1968-1988).....Athletics  
Robert V. Bonds, Jr. (1972-1991).....Learning Center  
Robert M. Bostrom (1956-1992).....Housing  
Zoe A. Brazil (1970-1999).....Library Services  
Phyllis Breckan (1973-1990).....Academic Programs  
Breckenridge, Patricia H. (1974-1998).....Environmental Horticultural Science  
Lee R. Brown (1974-1999).....Graphic Communications  
Elinor Bullock (1970-1986).....General Office  
Harold A. Burnett (1962-1977).....Agriculture and Natural Resources  
Carma Burns (1966-1990).....Electronic and Electrical Engineering  
Rosemary Cameron (1964-1989).....University Library  
James Capetillo (1969-1991).....Plant Operations  
Delores A. Carlson (1978-2000).....Foundation Business Office  
Noel Carmack (1974-1989).....Public Safety  
Orlan Casey (1957-1983).....Plant Operations  
Fred Casillas (1964-1989).....Plant Operations  
Guadalupe Casillas (1969-1992).....Facilities Services  
Aurelia Castaneda (1973-1993).....Health Services  
Barbara F. Ciesielski (1962-1999).....Telephone Administration  
Joan M. Ciron (1972-1999).....Health and Psychological Services  
Robert Clark (1975-1990).....Plant Operations  
Walter B. Clark (1970-2000).....Industrial and Manufacturing Engineering  
Harriet M. Clendenen (1977-1994).....Disabled Student Services  
Carol F. Clifford (1981-2002).....Fiscal Services  
Robert C. Clover (1990-2002).....Information Technology Services  
Mona Cochrane (1970-1995).....Health Services  
George W. Cockriel (1957-1977).....University Police

Charles S. Coe (1980–1997) .....	College of Architecture and Env. Design
Clarice Cook (1979–1994) .....	El Corral Bookstore
Bernard R. Cox (1968–1988) .....	Aeronautical Engineering
Jane M. Cox (1977–1999) .....	Fiscal Services
Loree Creath (1974–2002) .....	Housing and Business Services
Donald J. Curtis (1960–1976) .....	Health Center
Thomas E. Dana (1972–2000) .....	Facility Services
Roy E. Darr (1953–1971) .....	Plant Operations
Susan Dawson (1981–2001) .....	El Corral Bookstore
Jean D. Degan (1980–2001) .....	Agribusiness
Gloria J. DeKleine (1977–2002) .....	Health Services
Yvonne Dengler (1967–1991) .....	Theatre and Dance
Elizabeth D. Dickens (1961–1980) .....	Architecture and Environmental Design
Lloyd G. Dietrich (1953–1973) .....	University Police
Susan E. Dietrick (1981–2000) .....	Enrollment Support Services
Robert J. Dignan (1974–2001) .....	Fiscal Services
Paul S. Dillon (1947–1971) .....	Foundation
Johnie Dixson (1973–1992) .....	Facilities Services
Robesrt E. Dominguez (1985–2001) .....	Facility Services
Zeta DuBarry (1974–1992) .....	Financial Aid
Colier Duncan (1955–1977) .....	Plant Operations
John Dyer (1963–1979) .....	Plant Operations
Dianne E. Ellis (1982–2000) .....	College of Engineering
Lilly Ellsworth (1969–1989) .....	Housing and Conference Services
Johanna K. Enos (1977–1994) .....	Health Services
George A. Enriquez (1984–2002) .....	Facility Services
Robert A. Escobedo (1969–1985) .....	Plant Operations
Juanita Faye Esmon (1972–1991) .....	Plant Operations
Lloyd R. Evans (1959–1978) .....	Grounds
Mary Eyler (1961–1980) .....	Financial Aid
James Farrar (1968–1989) .....	Facilities Administration
Patricia A. Eilers Farrow (1957–1972) .....	Health Center
Leroy Fauset (1966–1983) .....	El Corral Bookstore
Albert Felis (1951–1991) .....	Plant Operations
James Fiscalini (1966–1982) .....	Farm Shop
Norma M. Fitton (1969–1994) .....	Psychology and Human Development
Lana K. Fleming (1974–2002) .....	University Police
David Focht (1969–1991) .....	Ornamental Horticulture
Alice Foy (1962–1987) .....	Foundation Business Office
Sidney C. Francis (1984–2000) .....	Information Technology Services
Altha Freeman (1967–1988) .....	Evaluations
Diana G. Frey (1969–2000) .....	Animal Sciences
Robert J. Fritts (1965–1985) .....	Plant Operations
Jack Fryer (1968–1984) .....	Foundation Personnel
Sandra J. Furtney (1982–2002) .....	Disability Resource Center
Melissa G. Gallagher (1978–2002) .....	Health Services
Donna D. Gang (1968–1991) .....	Student Health Services
Edward R. Garner (1967–1998) .....	Mechanical Engineering
Gerard Gentilucci (1973–1991) .....	Plant Operations
Locksley D. Geoghagen (1977–1999) .....	Student Life and Leadership
E. Douglas Gerard (1952–1991) .....	Facilities Administration
Roy Gersten (1967–1984) .....	Associated Students, Inc.
John R. Gonzales (1969–1994) .....	Facility Services
Jean Gordon (1969–1992) .....	Library Services
Janice M. Gould (1960–1995) .....	Information Technology Services
Joan P. Graham (1978–1998) .....	Risk Management
Ruth Gran (1957–1975) .....	Health Center
Josephine R. Graves (1964–1982) .....	Health Center
Margaret Green (1960–1977) .....	Food Services
Robert Griffin (1976–2002) .....	Foundation Executive Office
Michael C. Grom (1968–1986) .....	Plant Operations
Meri K. Gurnee (1971–2002) .....	Art and Design
Leonard Hall (1968–1991) .....	Plant Operations
Joseph C. Hampf (1943–1971) .....	Foundation
Sandra V. Harris (1973–2000) .....	Payroll Services
Richard Harrison (1969–1988) .....	Art and Design
Bina Harrison (1972–1997) .....	El Corral Bookstore
Bill Hart (1960–1991) .....	Plant Operations
Dora L. Harter (1968–1983) .....	Learning Assistance Center
Florence I. Hauge (1962–1983) .....	Library
Eugene Haugh (1966–1988) .....	Ornamental Horticulture
Jill E. Hayden (1984–2000) .....	Career Services
Walter Heffner (1965–1983) .....	Computer Center
John A. Heinz (1953–1986) .....	Audiovisual Services
Norma Henderson (1949–1983) .....	Academic Affairs
Kathlene A. Henry Gorman (1982–1997) .....	Facility Services
Beverly J. Hensel (1972–1994) .....	College of Business
Ferdinand Herriman (1966–1987) .....	Plant Operations
Vivian E. Herriman (1973–1998) .....	Admissions
Edna X. Hjerrild (1973–2000) .....	Library Services
Jarilyn H. Hobberlin (1968–1987) .....	Payroll Services
Betty L. Holland (1973–1998) .....	Communications
Alicemae Hollings (1966–1982) .....	Foundation
Lillian R. Hooks (1964–1980) .....	Library
Catherine Hoover (1945–1946, 1962–1983) .....	Science and Mathematics
Irene R. Horvath (1950–1983) .....	Communicative Arts and Humanities
Lorraine H. Howard (1964–1991) .....	Psychological Services
Mary L. Howard (1981–1996) .....	Campus Dining
Margaret Hoyt (1948–1981) .....	El Corral Bookstore
Clara Huffman (1959–1974) .....	El Corral Bookstore
Hazel L. Hunter (1965–1980) .....	Evaluations
Esther Iglesias (1972–1988) .....	Philosophy
Leola H. Imel (1973–2002) .....	Library Services
Marie Williams Janolis (1962–1977) .....	Engineering Technology
Frank Jansen (1971–1992) .....	Electronic/Electrical Engineering
Dorothy Jefferson (1982–1998) .....	Minority Engineering
Edwin Jensen (1976–1993) .....	Campus Dining
Elmer R. Johnson (1966–1982) .....	Physics
John Johnson (1965–1992) .....	Facilities Services
Mary L. Johnson (1950–1976) .....	Administrative Affairs
Michael A. Johnson (1975–2002) .....	Administration and Finance
Norm E. Johnson (1957–1998) .....	Communications Services
Connie Jonte (1961–1983) .....	Alumni Services
Joyce Kalicicki (1960–1996) .....	University Center for Teacher Education
Frank P. Kassak (1970–2001) .....	Reprographics and Mail Services
Fred C. Kelley (1962–2000) .....	Reprographics and Mail Center
Robert Kimble (1963–1992) .....	Theatre & Dance
Jack Kirchner (1969–1990) .....	Plant Operations
Carlo D. Klitgaard (1970–2000) .....	Journalism
Edwin Koch (1961–1976) .....	Foundation Custodial
Geraldine Krenkel (1972–1998) .....	Housing Services
Catharine T. Krupp (1978–1996) .....	Library Services
Edna J. Kuhnes (1969–1984) .....	Library
Edith A. Kurtz (1985–2002) .....	Facility Services
Jeanne L. LaBarbera (1984–2000) .....	Associated Students, Inc.
Dale C. Lackore (1960–1999) .....	Campus Dining
Zoilo Lagunday (1977–1991) .....	Plant Operations
Dorothy I. Lambert (1979–2000) .....	Fiscal Services
Walter M. Lambert (1975–2000) .....	Student Life and Activities
George Lancaster (1962–1979) .....	Plant Operations
S. Dianne Lane (1966–1996) .....	Library Services
James R. Landreth (1956–1991) .....	Business Affairs
Ronald J. Larsen (1968–1983) .....	Public Safety
Lois L. Larson (1962–1978) .....	Health Center
Frank T. Lebens (1972–2001) .....	Administration and Finance
Marianne Lefebvre (1968–1984) .....	Financial Operations
Ervin A. Lembcke (1962–1980) .....	Plant Operations
Alfons P. Lerno (1965–1983) .....	Plant Operations
Francisco Limon (1961–1991) .....	Physical Education and Recreation Admin.
Neile Lincoln (1968–1992) .....	Public Safety
Wayne Lindsey (1953–1983) .....	Farm Shop
Joe A. Lipe (1965–1980) .....	Plant Operations
Vernon Lopes (1973–1997) .....	College of Agriculture
Richard T. Lorton (1975–2002) .....	Facility Services
Robert A. Lucas (1975–1992) .....	Graduate Studies and Research
Irene Lund (1961–1984) .....	Foundation
Ruth Lundquist (1960–1979) .....	Business Affairs
Patricia S. Lutrin (1976–2002) .....	Student Life and Leadership
Ray Macias (1980–1998) .....	Support Services

Josephine E. Maddalena (1965–1980)	Physical Education
James Mapes (1961–1977)	University Police
Anne B. Marcell (1961–1982)	Evaluations
Salvador R. Mares (1974–1991)	Physical Education and Recreation Admin.
Naomi Marks (1970–1993)	Health Services
Anna M. Martinez (1974–1991)	Fiscal Operations
Alfredo G. Mascorro (1972–2000)	Facility Services
Marguerite Maxwell (1977–1995)	Electrical Engineering
K. Jon Mayeda (1954–1982)	Plant Operations
Barbara A. McCaleb (1975–1991)	Ornamental Horticulture
Donald L. McCaleb (1962–1991)	Communications and Special Events
Marion McCoy (1973–1990)	Foundation Food Services
Daniel H. McCreedy, Jr. (1961–1983)	Plant Operations
Jackie McDaniel (1970–1990)	Warehouse
Dorothy J. McDonald (1963–1985)	Telecommunications
John McGrath (1970–1988)	Warehouse
Charles A. McMeans (1969–2002)	Information Technology Services
Wayne E. McMorran (1962–1998)	Electrical Engineering
Sally A. Mello (1981–2001)	Associated Students, Inc.
Florence H. Mesler (1962–1983)	Health Center
Julius F. Metz (1968–1983)	Plant Operations
Viola E. Hughes Milburn (1956–1978)	Health Center
Robert J. Miller (1960–1980)	Business Affairs
Peggy Milburn (1966–1988)	Foundation
William J. Minshull (1973–2002)	Facility Services
Diane J. Miramon (1983–2002)	Architecture
David Mosher (1974–1992)	Materials Engineering
A. Teresa Mounier (1970–1986)	Purchasing
Nancy Muir (1962–1991)	Psychological Services
George Mulder (1968–1991)	Counseling Services
Robert Myers (1967–1988)	Architecture
Valdora Myers (1960–1978)	Health Center
Harold A. Nash (1947–1974)	Power Plant
Donna D. Nash (1980–1998)	Campus Dining
James Neal (1954–1990)	Foundation
James G. Neelands (1957–1991)	School of Science and Mathematics
Rodney K. Neubert (1979–2001)	Associated Students, Inc.
Avice I. Nolan (1960–1980)	Audiovisual
Edward L. Nolan (1953–1979)	Mechanical Engineering
Eugene Nowicki (1976–2001)	Facility Services
Stella M. Nuncio (1962–1993)	Learning Resources and Curriculum
Margot R. Ochoa (1973–1996)	Support Services Purchasing
Aldyth O'Brien (1979–1992)	Agricultural Engineering
Jack O'Dell (1953–1986)	Foundation
Isao Okada (1973–2002)	Chemistry and Biochemistry
Carol L. Osgood (1978–2001)	Modern Languages and Literatures
Lee Owen (1946–1978)	Plant Operations
L. Ruth Palmer (1971–1987)	Foundation Business Office
Elizabeth S. Patterson (1982–2001)	Political Science
Kathryn Patterson (1960–1982)	Procurement and Support Services
Jacqueline S. Paulsen (1976–2000)	University Police
Alfred J. Pelucca (1956–1971)	Custodial Services
Audun Pettersen (1973–2000)	Food Science and Nutrition
Armando Pezo-Silva (1973–2002)	Student Academic Services
Peter K. Phillips (1968–1997)	Facilities Planning
Wilma Pierce (1971–1988)	Foundation
Shirley L. Platt (1978–1997)	Fiscal Services
Donna Porter (1962–1986)	Student Health Services
June Powell (1947–1991)	University Relations
Gerald N. PUNCHES (1971–1992)	Enrollment Support Services
Helen PUNCHES (1973–1992)	University Outreach
Joan M. Radabaugh (1980–1994)	Ornamental Horticulture
Infante V. Ramelb (1985–2000)	El Corral Bookstore
Judy K. Ramos (1979–2000)	Academic Records
John Rankin (1974–1991)	Facility Services
Lois J. Richardson (1984–1999)	Campus Dining
Lorraine Ridgeway (1955–1995)	Student Affairs
Paula J. Ringer (1974–1994)	Enrollment Support Services
Jerry Roberts (1974–1992)	Payroll Services
Joan Roberts (1958–1980)	Foundation
Kerry Roberts (1967–1997)	El Corral Bookstore
Henry Robinson (1958–1992)	Foundation
Concho Robles (1985–2002)	Facility Services
Connie M. Rogalla (1979–2000)	University Center for Teacher Education
Stanley B. Rosenfield (1979–2000)	Fiscal Services
William N. Routh (1975–1999)	El Corral Bookstore
Gerolamo Salmira (1969–1991)	Plant Operations
Rafael Sanchez (1970–1991)	Plant Operations
Al Sanders (1964–1979)	Grounds
Gloria Sanderson (1978–1993)	Campus Dining
Julia Sandoval (1973–1993)	Campus Dining
Edmond L. Schellenger (1966–1983)	Plant Operations
Byrle Schoepf (1973–1991)	Plant Operations
Stephen M. Schroeder (1970–2001)	University Police
Robert C. Schumacher (1982–2000)	University Police
Ralph Schurtz (1949–1973)	Custodial Services
Mary E. Scrivner (1966–1983)	Academic Programs
Virgina A. Severa (1984–2002)	Academic Records
Pauline Shaffer (1957–1989)	Foundation Food Services
Donald K. Shemenske (1982–1999)	Foundation Business Office
Tania Shwetz (1969–1992)	School of Liberal Arts
Alexandria W. Sidah (1968–2000)	Administration and Finance
Jerome Silbert (1979–2002)	Facility Services
Joseph V. Silva (1977–1997)	Facility Services
Diane E. Simoes (1979–2000)	Extended University Programs
Yvonne M. Simpkins (1984–2001)	Health Services
David L. Simpson (1966–1999)	Campus Dining
Darlene L. Slack (1983–2003)	University Advancement
Mary Smith (1960–1988)	Personnel and Employee Relations
David H. Snyder (1970–1989)	Enrollment Support Services/Admiss.
Alice Soto (1976–1997)	El Corral Bookstore
Daniel Soto (1979–1999)	Facility Services
Ethel Spry (1962–1985)	Associated Students, Inc.
James Stacy (1970–1988)	Audio Visual Services
Estelle S. Stanhill (1984–1999)	Intercollegiate Athletics
Nettie L. Steels (1978–1998)	Facility Services
Marcie Steger (1962–1979)	Food Services
Martha J. Steward (1977–1994)	College of Architecture and Env. Design
Walter Stier (1970–1991)	School of Architecture and Env. Design
Elisa Story (1973–1994)	Enrollment Support Services
Mary Jo Summers (1962–1980)	Health Center
Frank Y. Sweeney (1963–1983)	Plant Operations
Meredith R. Takken (1976–2000)	Financial Aid
Alfred Tartaglia (1970–1991)	Plant Operations
Harold S. Tartaglia (1969–1986)	Plant Operations
Richard A. Tartaglia (1959–1989)	Plant Operations
John J. Teclaw (1987–2002)	Chemistry and Biochemistry
Joanne N. Temple (1978–1998)	Information Technology Services
Melvin Thomas (1960–1992)	Facilities Services
Linda Lee Thoresen (1984–2001)	Associated Students, Inc.
Richard P. Tibbetts (1972–1996)	Information Technology Services
Gwen Tognazzini (1983–1999)	Financial Aid
Yvonne B. Toma (1983–2002)	Horticulture and Crop Science
Henry V. Trevino (1973–2000)	Custodial Services
Patricia D. Tschohl (1981–2000)	Fiscal Services
Patricia K. Tupac-Yupanqui (1964–1996)	Social Sciences
Billie R. Turner (1979–2000)	Library Services
Sondra M. Tuttle (1975–1991)	Industrial Technology
Donald E. Van Acker, Jr. (1976–1994)	Public Safety-Health/Safety
Gerry D. Wagner (1967–1993)	Dairy Science
Richard Walker (1979–1996)	Campus Dining
William C. Wallace (1970–2000)	University Center for Teacher Education
Robert W. Walters (1970–2000)	Student Life
Merlin Ward (1946–1974)	Plant Operations
Thomas Ward (1969–1989)	Civil and Environmental Engineering
Charles Warren (1978–1996)	El Corral Bookstore
Edith Welter (1963–1988)	Business Affairs
Antoinette Wensley (1976–1997)	Fiscal Services
Boyd Wetlaufer (1960–1976)	Audiovisual

Gerald Whiteford (1960–1983)	El Corral Bookstore
Willard Whitmer (1967–1992)	Public Safety
Mathew J. Wiener (1975–2001)	Associated Students, Inc.
Alfred T. Wilcox (1960–1975)	Custodial Services
John Wilcox (1963–1986)	Foundation
Smiley E. Wilkins (1974–1989)	Personnel and Employee Relations
David G. Williamson (1968–1998)	Chemistry and Biochemistry
Samuel Willis (1978–1992)	Farm Operations
Margaret Wilmot (1952–1979)	Library
Lawrence J. Wolf (1970–1990)	Financial Aid
Janis K. Woolpert (1982–1997)	College of Liberal Arts
Lawrence Wright (1976–1991)	Plant Operations
Patricia Wright (1978–1991)	Library
Frank H. Wyman (1956–1972)	Plant Operations
Kerry T. Yamada (1981–1994)	Student Affairs
Arthur J. Young (1958–1985)	Plant Operations
Peggy Young (1974–1992)	Mathematics Department
Rita R. Zamora (1975–2000)	Fiscal Services
Davod S. Zarek (1971–1992)	Health and Psychological Services
Howard Zaugg (1966–1983)	Plant Operations
Carolyn D. Zsadanyi (1976–2002)	Foundation – CADRC

## OUTSTANDING STAFF EMPLOYEE AWARD

The 1972–73 academic year saw the inception of the Out-standing Staff Employee Award. This honor is bestowed upon permanent, full-time employees of the university, Foundation, or Associated Students, Inc. who are in at least their third year of employment at Cal Poly. In order to be considered for this award, an employee should be truly dedicated and loyal; exhibit expertise in job performance; demonstrate a willingness to assist others enthusiastically; take initiative in making his or her department more efficient and productive; maintain an excellent relationship with co-workers, faculty, and students; and make contributions to both the university and the community. Nominations are solicited from staff employees, faculty members, and department or division heads. Selection of the awardees is made by a committee of former recipients of the award. Outstanding Staff Employees Award recipients are listed here.

1972-73	Everette Dorrough	1987-88	Lynette Klooster
1973-74	Vic Allen		Judi Pinkerton
	Florence Hauge		Nancy Raetz
	Lionel Middlecamp	1988-89	Debbie Arseneau
	Jim Neelands		June Powell
1974-75	Robert Baldridge		Jacquie Rossi
	John Lee	1989-90	Grace Arvidson
	Gerry Wagner		Janet Carlstrom
	Arthur Young		Ronald Christensen
1975-76	Merriam Erickson	1990-91	Barbara Ciesielski
	Viola Hughes		Harriet Clendenen
	Mary Johnson		Harriet Ross
	Boyd Wettlaufer	1991-92	Wanda Bolt
1976-77	Trudy Beck		Pam Parsons
	Stella Nuncio		Joe Risser
1977-78	Luther Bertrando	1992-93	Rosemary Bowker
	Pauline Shaffer		Deborah L. Brothwell
	Joanna DeRosier		Andy McMeans
1978-79	Harold Miller	1993-94	Connie Davis
	Doris Anderson		Jim McLaughlin
	Richard Tartaglia		Richard Tibbetts
	Frank Lebens	1994-95	Francesca Fairbrother
1979-80	Dale Lackore		Joyce Kalicicki
	Steven Riddell		Lorraine Ridgeway
	Joan Roberts	1995-96	George Enriquez
1980-81	Joan Cirone		Cynthia Jelinek
	Farlin Halsey		Carol Montgomery
	Irene Lund	1996-97	Kristina Pena
1981-82	James Neal		Don Shemenske
	Connie Jonte		Judy Swanson
	Frank Kassak	1997-98	Richard Equinoa
1982-83	Barbara Lund		Pat Harris
	Larry Grimes		Nettie Steels
	Norman Johnson	1998-99	Darrell Blankenship
1983-84	Jerald (Louie) Budoff		Delores Estrada
	Walter Clark		Rosemary Wagner
	Gail Simmons	1999-00	Bonnie Krupp
1984-85	Alfred W. Amaral		Druci Reese
	Ethel Spry		Ellen Stier
	Kathleen Lamoree	2000-01	Donna Amos
1985-86	James Landreth		Stacey Breitenbach
	Geraldine Montgomery		Joyce Haratani
	Vicki Stover	2001-02	Margaret Booker
1986-87	Lee Brown		Judy Drake
	Gary Ketcham		Jimmy Ray Motley
	French Morgan		

# Faculty and Staff

(Number in parentheses indicates year of appointment)

Listed as of February, 2003.

- ABITIA, FRED (1969).....Industrial Technology  
B.A., San Jose State College, 1964; M.A., 1966; Ed.D., Washington State University, 1971. Professor Emeritus.
- ABNEY, M. JEANNIE (2000).....Housing and Residential Life  
B.S., California Polytechnic State University, San Luis Obispo, 1994. Information Technology Consultant.
- ADAMS, NIKKI L. (2002).....Biological Sciences  
B.A., University of California, Santa Barbara, 1988; M.S., University of Maine, 1995; Ph.D., 2000. Assistant Professor.
- AEILTS, ANTHONY A. (1999).....Administration and Finance  
B.S., California State University, Chico, 1979; M.S., 1981. University Police Chief and Director, University Police. California Department of Justice Executive Certification.
- AGBO, SAMUEL O. (1991).....Electrical Engineering  
B.Sc., University of Nigeria, 1975; M.S.E., University of Michigan, 1978; Ph.D., University of Houston, 1984. Professor.
- AGRONSKY, STEVEN J. (1981).....Mathematics  
B.A., University of California, Santa Barbara, 1970; M.S., 1972; Ph.D., 1974. Professor.
- AHERN, JAMES J. (1980).....Agribusiness  
B.S., California State Polytechnic College, Pomona, 1971; M.S., University of Maryland, 1973; Ph.D., 1980. Professor.
- AHLGREN, WILLIAM L. (1999).....Electrical Engineering  
S.B., Massachusetts Institute of Technology, 1975; M.S., University of Arizona, 1977; Ph.D., University of Southern California, 1981. Assistant Professor.
- AHTEN-ANDERSON, ELIZABETH (1997).....Orfalea College of Business  
B.S., California Polytechnic State University, San Luis Obispo, 1996. Academic Advisor.
- AIKEN, DONNA (1995).....College of Engineering  
B.A., California Polytechnic State University, San Luis Obispo, 1988. College Relations Coordinator.
- ALLEN, PRESTON C. (1993).....Student Affairs  
B.A., Michigan State University, 1980; M.S., California State University, Fullerton, 1989. Assistant Vice President of Student Affairs, and Director, Housing and Residential Life.
- ALLEN, TERESA (2001).....Journalism  
B.A., University of Washington at Seattle, 1976; M.A., University of Colorado at Boulder, 1993; additional graduate study. Associate Professor.
- ALESHIRE, SHELLEY (1992).....Disability Resource Center  
B.A., California State University, Fullerton, 1974. M.A., La Salle University, 1994. Disability Management Specialist/Visual Impairment Specialist.
- ALONGI, JOHN M. (2001).....Mathematics  
B.A., Northwestern University, 1993; M.S., 1994; Ph.D., 1998. Assistant Professor.
- ALPTEKIN, SEMA E. (1994).....Industrial and Manufacturing Engineering  
B.Sc., Istanbul Technical University, Istanbul, 1973; M.Sc., 1975; Ph.D., 1981. Professor.
- AMANZIO, JOSEPH C. (1971).....Architecture  
B.Arch., University of Florida, 1967; M.Arch., Washington University, 1974. Professor. Registered Architect, California.
- AMBACH, BOB (2001).....University Foundation  
B.B.A., University of Cincinnati, 1989; M.P.A., 1997. Associate Executive Director.
- AMSPACHER, WILLIAM H. (1985).....Agribusiness  
B.S., Clemson University, 1978; M.S., 1980; Ph.D. University of California, Davis, 1988. Professor.
- ANDERSON, C. ROBERT (1982).....University Advancement  
B.A., Duke University, 1965; M.A., University of Missouri, 1973. Public Affairs Officer.
- ANDERSON, JAMES A. (1987).....Accounting  
B.A., DePauw University, 1968; Ph.D., Washington University, 1973. Professor.
- ANDERSON, JOHN E. (1995).....Financial Aid  
B.S., Western Illinois University, 1968; M.S., Chicago State University, 1972; Ph.D., University of Northern Colorado, 1974. Director of Financial Aid.
- ANDLIG, MAYA (2000).....Student Life and Leadership  
B.A., University of the State of New York, Albany, 1995; M.A., University of Pittsburgh, 1999. Coordinator of Student Community Services.
- ANDOLI, FREDERICK P. (1968).....Biological Sciences  
B.A., Upsala College, 1963; M.S., Utah State University, 1968; D.A., Idaho State University, 1974. Professor.
- ANDRE, BARBARA R. (1973).....International Education and Programs  
B.A., Humboldt State College, 1969; M.A., California State Polytechnic College, 1971; Ed.D., University of San Francisco, 1986. Associate Director, International Student Services and Programs.
- ANGLEY, STEPHEN F. (1982).....Horticulture and Crop Science  
B.S., Berea College, 1969; M.S., Clemson University, 1972. Professor.
- APFELBERG, HERSCHEL L. (1971).....Graphic Communication  
B.S., Rochester Institute of Technology, 1965; M.S., California Polytechnic State University, San Luis Obispo, 1973. Professor Emeritus.
- APPEL, CHRISTOPHER S. (2002).....Earth and Soil Sciences  
B.S., California Polytechnic State University, San Luis Obispo, 1995; M.S., 1998; Ph.D., University of Florida, 2001. Assistant Professor.
- ARAKAKI, DEAN Y. (2001).....Electrical Engineering  
B.S., California State Polytechnic University, Pomona, 1984; M.B.A., California State University, Long Beach, 1989; M.S., 1992; Ph.D., The Pennsylvania State University, State Park, 2000. Assistant Professor.
- ARCENEUX, CRAIG (2001).....Political Science  
B.A., California State University, Fullerton, 1989; M.A., Ohio State University, 1991; Ph.D., University of California, Riverside, 1997. Assistant Professor.
- ARCHER, GRAHAM C. (2002).....Architectural Engineering  
B.A.Sc., University of Waterloo, Canada, 1985; M.A.Sc., 1986; Ph.D., University of California, Berkeley, 1996. Assistant Professor.
- ARMSTRONG, MARY A. (2000).....English, Women's Studies  
B.A., College of the Holy Cross, 1987; M.A., Duke University, 1989; Ph.D., 1995. Assistant Professor, and Director, Women's Studies.
- ARMSTRONG, MARY BETH (1984).....Accounting  
B.S., University of Nevada, Reno, 1968; M.B.A., California State Polytechnic University, Pomona, 1976; Ph.D., University of Southern California, 1984. Professor and Area Chair.. Certified Public Accountant.
- ARNOLD, MARK (1997).....Journalism  
B.S., Grand Valley University, 1975; M.S., University of Missouri at Columbia, 1985; Ph.D., University of Alabama, 1996. Assistant Professor.
- ARVIZU-RODRIGUEZ, MARIA (1987).....Student Academic Services  
B.S., California Polytechnic State University, San Luis Obispo, 1987. Academic Advisor/Summer Institute Coordinator.
- ASCOLI, RICHARD V. (1986).....Health and Counseling Services  
B.S., College of William and Mary, 1965; M.D., Medical College of Virginia, 1974; Internship and Residency in Emergency Medicine, University of Southern California-Los Angeles County General Hospital, 1982. Physician.
- ATRE, SHARAD D. (1974).....Architecture  
B.Arch., University of Baroda, India, 1963; B.Arch., Washington University, 1965; M.Arch., University of Colorado, 1972. Professor. Registered Architect: California and India.

- AUBOURG, VICKIE (1997) ..... College of Architecture and Environmental Design  
B.A., Montclair University, 1968; M.S., Pratt Institute, 1972; M.A., University of California, Davis, 1986. Media Resource Center Coordinator.
- AVAKIAN, GREGORY (2000) ..... Associated Students, Incorporated  
B.A., California State University, Long Beach, 1992. Aquatics and Summer Programs Coordinator.
- AVEY, RENNY J. (1973) ..... Agribusiness  
B.S., California State Polytechnic College, 1969; M.S., Oregon State University, 1972; Ph.D., University of Hawaii, 1974. Professor.
- AVILA, MARY-ALICE (2000) ..... Administration and Finance  
B.Arch., California Polytechnic State University, San Luis Obispo, 1976.  
Licensed Architect, California; Certified Construction Specifier. Project Manager, Facilities Planning and Capital Projects.
- AXELROTH, ELIE (1984) ..... Health and Counseling Services  
B.A., State University of New York, Albany, 1976; M.A., University of Maryland, 1978; Psy.D., University of Denver, 1983. Psychologist.
- AYRAL-CLAUDE, ODILE M. (1976) ..... Modern Languages and Literatures  
B.A., University of Wyoming, 1967; M.A., 1968; Ph.D., University of Colorado, 1975. Professor.
- BACHMAN, DAVID C. (2002) ..... Mathematics  
B.S., State University of New York at Binghamton, 1993; Ph.D., University of Texas at Austin, 1999. Assistant Professor.
- BAGNALL, JAMES R. (1969) ..... Architecture  
B.A., Occidental College, 1957; M.Arch., University of California, Berkeley, 1974. Professor Emeritus.
- BAILEY, CHRISTINA ANNE (1978) ..... Chemistry and Biochemistry  
B.S., College of Saint Elizabeth, New Jersey, 1964; Ph.D., Purdue University, 1970. Professor.
- BAILEY, PHILIP S. (1969) ..... College of Science and Mathematics, Chemistry and Biochemistry  
B.S., University of Texas, 1964; Ph.D., Purdue University, 1969. Professor and Dean.
- BAILEY, WILLIAM (1995) ..... Disability Resource Center  
B.A., University of California, Riverside, 1975; M.A., Pepperdine University, 1975. Director.
- BAKER, WARREN J. (1979) ..... President  
B.S., University of Notre Dame, 1960; M.S., 1962; Ph.D., University of New Mexico, 1966. President.
- BALDWIN, MARYLUD (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.
- BALL, STEPHEN W. (1983) ..... Philosophy  
B.A., Purdue University, 1972; M.A., University of Michigan, 1973; Ph.D., 1978. Professor.
- BALTHASER, LAWRENCE H. (1969) ..... Physics  
B.A., Rutgers University, 1960; M.A., Indiana University, 1963; Ph.D., 1969. Professor Emeritus.
- BALTIMORE, CRAIG V. (2001) ..... Architectural Engineering  
B.S., California Polytechnic State University, San Luis Obispo, 1986; M.S., Duke University, 1996; Ph.D., 1998. Assistant Professor. Registered Structural Engineer and Professional Engineer, California. Registered Professional Engineer, Kansas.
- BARATA, ANTONIO G. (1985) ..... Music  
B.A., Towson State University, 1977; M.M., Northwestern University, 1979; D.M.A., University of Illinois, 1985. Professor.
- BARBER, CLIFFORD S. (1986) ..... Industrial Technology  
B.A., California Polytechnic State University, San Luis Obispo, 1982; M.A., 1986; Ed.D., University of Southern California, 1999. Licensed General Contractor. Assistant Professor.
- BARBOZA, VALERIE M. .... Financial Aid  
B.S., California Polytechnic State University, San Luis Obispo, 1990; M.A., 1994. Counselor.
- BARCLAY, KENNETH B. (1979) ..... Student Life and Leadership  
B.A., Bowling Green State University, 1967; M.A., University of Massachusetts, 1969; Ph.D., Kent State University, 1975. Director.
- BARNES, CAROL E. (1993) ..... University Center for Teacher Education  
B.A., Arizona State University, 1961; M.A.T., Miami University, 1968; Ph.D., 1981. UCTE Advancement Director.
- BARNES, TIMOTHY M. (1969) ..... History  
B.A., University of New Mexico, 1965; M.A., 1966; Ph.D., 1970. Professor.
- BASOR, 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, 1989. Professor.
- BEARDSLEY, GEORGE L., JR. (1975) ..... Economics  
B.A., University of California, Berkeley, 1971; M.A., University of Pennsylvania, 1973; Ph.D., 1974. Professor.
- BECKETT, JONATHAN L. (1998) ..... Animal Science  
B.S., University of Wisconsin-River Falls, 1989; M.S., University of California, Davis, 1992; Ph.D., 1996. Associate Professor.
- BEECHER, LLOYD N. (1969) ..... History  
B.A., California State College, Fullerton, 1965; M.A., 1966; Ph.D., University of Georgia, 1970. Professor Emeritus.
- BENADIBA, MARC F. (2002) ..... Administration and Finance  
B.S., California Polytechnic State University, San Luis Obispo, 1990. Assistant Director for Payroll Services, Fiscal Services. Certified Public Accountant.
- BENEDICT, WILLIAM R. (1990) ..... Architecture  
B.Arch., Kansas State University, 1967; M.Arch., University of Texas at Austin, 1989. Associate Professor.
- BENSKY, THOMAS (2002) ..... Physics  
B.S., California State University, Northridge, 1992; Ph.D., University of Virginia, 1998. Assistant Professor.
- BERG, LORRAINE M. (1983) ..... Health and Counseling Services  
R.N., Cuesta College, 1975; N.P. Family Planning, San Jose State University, 1982. Nurse Practitioner.
- BERGMAN, SKY (1995) ..... Art and Design  
B.S., University of South Florida, 1987; M.F.A., University of California, Santa Barbara, 1991. Associate Professor.
- BERNER, LOUISE A. (1987) ..... Food Science and Nutrition  
B.S., Pennsylvania State University, 1979; M.S., Cornell University, 1982; Ph.D., 1986. Professor.
- BERNING, LEANNE M. (1990) ..... Dairy Science  
B.S., California Polytechnic State University, San Luis Obispo, 1982; M.S., University of Wisconsin, 1985; Ph.D., University of Maryland, 1990. Associate Professor.
- BERRIO, MARGARET M. (1989) ..... Psychology and Child Development  
B.Mus., Oberlin College, 1964; M.A., Southern Illinois University, 1967; M.S., Tufts University, 1972; Ph.D., Indiana University, 1974. Professor.
- BERTOZZI, DAN, JR. (1974) ..... Accounting  
A.B., University of California, Berkeley, 1966; M.B.A., 1969; J.D., 1971. Professor.
- BETHEL, A. C. W. (1968) ..... Philosophy  
B.A., University of California, Santa Barbara, 1964; M.A., 1968; Ph.D., 1974. Professor.
- BEUG, JAMES L. (1973) ..... Computer Science, Computer Engineering  
B.A., Northwestern University, 1962; Sc.M., Ohio State University, 1971; Ph.D., 1974. Professor.
- BEYER, EDGAR H. (1981) ..... Horticulture and Crop Science  
B.S., University of Illinois, 1958; M.S., Purdue University, 1963; Ph.D., 1964. Professor.
- BIEZAD, DANIEL J. (1990) ..... Aerospace Engineering  
B.S., Illinois Institute of Technology, 1966; M.S., Air Force Institute of Technology, 1972; Ph.D., Purdue University, 1984. Professor and Department Chair. Registered Professional Engineer, Ohio.
- BIGGS, JOSEPH R. (1988) ..... Management  
B.S.B.A., Ohio State University, 1968; M.B.A., University of Missouri, Kansas City, 1971; Ph.D., Ohio State University, 1975. Professor.

- BIRDSONG, CHARLES B. (2003).....Mechanical Engineering  
B.S., California Polytechnic State University, San Luis Obispo, 1991; M.S.,  
Michigan State University, 1996; Ph.D., 1999. Assistant Professor.
- BLACK, MICHAEL W. (2001).....Biological Sciences  
B.S., Southwest Missouri State, 1993; Ph.D., Stanford University, 1999. Assistant  
Professor.
- BLODGET, ROBERT L. (1974).....Psychology and Child Development  
B.A., Willamette University, 1965; Ed.D., University of Massachusetts, 1973.  
Professor.
- BLUM, MICHAEL L. (1981) (1984).....Graphic Communication  
B.A., University of California, Los Angeles, 1971; M.S., Rochester Institute of  
Technology, 1979. Professor.
- BOCHE, RAYMOND E. (1969).....Computer Science  
B.S., California State Polytechnic College, 1958; M.S., San Jose State College,  
1966; Ph.D., Texas Tech University, 1971. Professor Emeritus.
- BOLAÑOS, THERESA A. (1998).....Chemistry and Biochemistry  
B.S., University of Houston, 1993; Ph.D., University of Texas, Austin, 1998.  
Assistant Professor.
- BOLDT, WILLIAM (1994).....University Advancement  
B.S., University of Oregon, 1971; M.S., 1975; Ph.D., 1980. Vice President for  
University Advancement.
- BOMSTAD, LINDA (1994).....Philosophy  
B.A., University of California, Davis, 1974; M.A., 1976; Ph.D., 1982. Associate  
Professor and Department Chair.
- BOONE, JOSEPH C. (1968).....Physics  
B.A., Earlham College, 1962; M.A., University of Wisconsin, 1967; Ph.D., 1970.  
Professor.
- BORIN, NORM. A. (1992).....Marketing  
B.S., University of California, Davis, 1981; M.B.A., California State University,  
Sacramento, 1987; Ph.D., University of Virginia, Charlottesville, 1992. Professor  
and Area Chair.
- BORZELLINO, JOSEPH E. (2001).....Mathematics  
B.S., University of California, Irvine, 1987; M.A., University of California, Los  
Angeles, 1989; Ph.S., 1992. Assistant Professor.
- BOSWELL, MICHAEL (1998).....City and Regional Planning  
B.A., University of Central Florida, 1989; M.S.P., Florida State University,  
Tallahassee, 1991; Ph.D., 1999. Assistant Professor.
- BOWDICH, CARY A. (1996).....College of Science and Mathematics  
B.S., University of New Mexico, 1977; M.S., Purdue University, 1983. Director  
of Advancement.
- 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  
B.A., Creighton University, 1983; M.A., Idaho State, 1988. Head Coach.
- BRADY, LOIS (1988).....Computer Science  
B.A., Wagner College, 1958; M.S., University of Iowa, 1960; M.S., University of  
Wisconsin, 1984; Ph.D., 1988. Professor.
- BRADY, PAMALEE (1998).....Architectural Engineering  
B.S., California Polytechnic State University, San Luis Obispo, 1979; M.S.,  
University of California, Berkeley, 1980. Assistant Professor. Registered Civil  
Engineer, California.
- BRAGG, MARTIN E. (1995).....Health and Counseling Services  
B.A., Indiana University, Bloomington, 1971; M.A., University of California, Los  
Angeles, 1972; Ph.D., 1979. Director.
- BRAMMEIER, MEREDITH (2001).....Music  
B.A., Princeton University, 1992; M.M., Eastman School of Music, 1995;  
D.M.A., University of Southern California, 2000. Assistant Professor.
- BRANCART, VICTOR N. (1994).....Administration and Finance  
B.A., California State University, Fullerton, 1989; M.A., California Polytechnic  
State University, San Luis Obispo, 2000. Enterprise Initiatives Analyst, Budget  
and Analytic Business Services.
- BRAR, NAVJIT (1998).....University Library  
B.A., Government College for Girls, India, 1981; M.L.S., Panjab University,  
India, 1983; M.A., 1985; M.L.S., San Jose State University, 1992. Associate  
Librarian.
- BRAUN, DAVID B. (1996).....Electrical Engineering, Computer Engineering  
B.S., Stanford University, 1985; M.S., 1986; Ph.D. University of California,  
Santa Barbara, 1991. Professor.
- BRAUNINGER, ANDREA L. (1986).....Health and Counseling Services  
A.B., San Jose State College, 1966; M.D., University of Southern California,  
1971; Medical Internship, University of Florida, 1972. Physician.
- BREAM, HUGH (2000).....Intercollegiate Athletics  
B.S., California Polytechnic State University, 1980; M.S., 1982. Head Coach.
- BREITENBACH, JEROME R. (1986).....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; M.A., 1994.  
Director of Advising Center.
- BREMER, WALTER D. (1981).....Landscape Architecture  
B.F.A., Mankato State University, 1973; M.L.A., Utah State University, 1977.  
Professor.
- BRIGGS, STEVEN M. (2000).....Health and Counseling Services  
B.S., University of Pacific, Stockton, 1971; MBA, California State University,  
Bakersfield, 1993. Pharmacist-in-Charge.
- BRODIE, DAVID A. (1970).....Architecture  
B.Arch., University of Capetown, South Africa, 1953; M.Arch., University of  
California, Berkeley, 1964. Professor Emeritus.
- BROOM, MICHELLE (2001).....Associated Students, Incorporated  
B.S., California Polytechnic State University, San Luis Obispo, 1996. Public  
Relations/Marketing Coordinator.
- BROTHWELL, DEBBIE L. (1976).....Administration and Finance  
B.S., California Polytechnic State University, San Luis Obispo, 1976. Associate  
Director, Budget and Analytic Business Services.
- BROWN, C. ANDREA (1987).....Kinesiology  
1<sup>st</sup> Teachers Certificate, University of Liverpool, 1961; Specialist Certificate,  
University of Birmingham, England, 1968; M.S., Washington State University,  
1978; M.A., 1979; Ph.D., University of Idaho, 1984. Professor and Department  
Chair.
- BROWN, CARL R.V. (1982).....English, University Center for Teacher Education  
B.A., Arizona State University, 1971; M.A., 1972; Ph.D., Stanford University,  
1977. Professor of English, and Associate Dean, University Center for Teacher  
Education.
- BROWN, J. WYATT (1990).....Horticulture and Crop Science  
B.S., Louisiana State University, 1978; M.S., 1985; Ph.D., Cornell University,  
1990. Professor. Pest Control Advisor, California.
- BROWN, JOHANNA B. (1969-1973) (1974).....University Library  
B.A., Saint Mary's College, 1966; M.L.S., State University of New York at  
Geneseo, 1967. Associate Librarian.
- BROWN, KENNETH J. (1991).....English  
B.A., Xavier University of Louisiana, 1971; M.A., University of Iowa, 1975;  
Ph.D., 1987. 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  
B.A., University of California, Riverside, 1962; M.A., 1964; Ph.D., 1968.  
Professor.
- BRUMMETT, DWAYNE (2001).....Associated Students, Incorporated  
B.A., University of California, Santa Barbara, 1986. Director of Business  
Services.
- BUCKALEW, W. CHRIS (1990).....Computer Science  
B.S., North Texas State University, 1980; M.S., 1982; M.S., 1984; Ph.D.,  
University of Texas, 1990. Professor.
- BUECHNER, PAUL E. MAJ (2002).....Military Science  
B.S., United States Military Academy, 1981; M.A., University of Florida, 1992.  
Assistant 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).....Accounting  
B.A., Dartmouth College, 1977; M.B.A., Stanford University, 1981; J.D., 1981.  
Professor.
- BURKE, KENA C. (1998).....College of Engineering  
B.A., Texas Tech University, 1989. Director, Engineering Assessment and  
Accreditation Center.
- BURN, SHAWN MEGHAN (1990).....Psychology and Child Development  
B.S., Virginia Commonwealth University, 1982; M.A., The Claremont Graduate  
University, 1984; Ph.D., 1988. Professor.
- 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.
- BURT, CHARLES M. (1978).....BioResource and 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.
- BUSSELEN, HARRY J., JR. (1975).....Psychology and Child 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  
B.S., Arizona State University, 1961; M.S., 1963; Ph.D., 1971. Professor  
Emeritus.
- CAMPBELL, DENISE (1995).....Academic Affairs  
B.A., University of California, Irvine, 1977; M.A., American University,  
Washington, D.C. 1979. Special Assistant to the Provost.
- CANO, RAÚL J. (1974).....Biological Sciences  
B.S., Eastern Washington State College, 1970; M.S., 1972; Ph.D., University of  
Montana, 1974. Professor.
- CANTU, R. DAVID (1980).....College of Engineering  
B.S., California State Polytechnic College, 1969; M.S., California Polytechnic  
State University, San Luis Obispo, 1974; M.A., 1975. Director, MESA  
Engineering Program.
- CAPPELLOTTI-BOWMAN, DARLENE (1988).....Financial Aid  
B.A., California State University, Humboldt, 1971; M.A., 1972; M.A., California  
Polytechnic State University, San Luis Obispo, 1999. Counselor.
- CARLTON, MATTHEW A. (1999).....Statistics  
B.A., University of California, Berkeley, 1994; M.A., University of California,  
Los Angeles, 1996; Ph.D., 1999. Assistant Professor.
- CARPENTER, THOMAS W. (1968).....Mechanical Engineering  
B.S., Virginia Polytechnic Institute, 1961; M.S., 1964; Ph.D., Purdue University,  
1969. Professor Emeritus.
- CARR, CHRIS A. (1998).....Accounting  
B.A., University of Nebraska, 1987; M.A., University of California, Los Angeles,  
1998; J.D., Santa Clara University, 1990. Associate Professor.
- CARR, JANICE L. (1983).....Accounting  
B.S., California State University, Northridge, 1971; M.S., 1975; Ph.D., Arizona  
State University, 1985. Associate Professor. Certified Public Accountant.
- CARRUTHERS, KELLY (1996).....Administration and Finance  
B.S., California Polytechnic State University, San Luis Obispo, 1997. CMS  
Finance Project Coordinator, Budget & Analytical Business Services.
- CARTWRIGHT, LIONEL SCOTT (2001).....Intercollegiate Athletics  
B.S., California State University, Fullerton, 1980. Head Coach.
- CARTTER, MARLENE A. (1985-88) (1993).....Academic Records  
B.A., California State University, Los Angeles, 1976; M.A., California  
Polytechnic State University, San Luis Obispo, 2001. Associate Registrar.
- CASEY, GLEN R. (1982).....Agricultural Education and Communication  
B.S., Chico State College, 1966; M.S., California Polytechnic State University,  
San Luis Obispo, 1979; Ed.D., Oklahoma State University, Stillwater, 1987.  
Professor.
- CASTELLANO-GIRÓN, HERNÁN (1986).....Modern Languages and Literatures  
B.A., University of Chile, 1960; M.A., University of Rome, 1981; Ph.D., Wayne  
State University, 1986. Associate Professor Emeritus.
- CAVALETTO, RICHARD A. (1990).....BioResource and Agricultural Engineering  
B.S., California Polytechnic State University, San Luis Obispo, 1981; M.S.,  
University of California, Davis, 1983; Ph.D., 1987. Professor. Registered  
Mechanical Engineer, California.
- CAWLEY, FRANK (1996).....University Foundation  
B.A., St. Patrick's College, 1969; M.A., 1971; M.Div., St. Patrick's Seminary,  
1971. Director, El Corral Bookstore.
- CENSULLO, ALBERT C. (1974).....Chemistry and Biochemistry  
B.S., Villanova University, 1969; Ph.D., Pennsylvania State University, 1975.  
Professor.
- CERF, DOUGLAS C. (1990).....Orfalea College of Business, Accounting  
B.S., University of California, Berkeley, 1978; M.A., University of California,  
Davis, 1987; Ph.D., 1991. Associate Dean and Professor.
- CHANCE, BETH L. (1999).....Statistics  
B.S., Harvey Mudd College, 1990; M.S., Ph.D., Cornell University, 1994.  
Associate Professor.
- 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.
- CHATZIOANOOU, ALYPIOS E. (1992).....Civil and Environmental Engineering  
B.S., Athens Polytechnic, 1980; M.S., University of California, Berkeley, 1982;  
Ph.D., 1989. Professor and Department Chair. Registered Professional Engineer,  
Greece.
- CHAVARRIA, GWEN E. (1995).....Administration and Finance  
B.A., California Polytechnic State University, San Luis Obispo, 1990. Manager,  
Human Resources.
- CHEN, KATHERINE C. (1999).....Materials Engineering  
B.S., B.A., Michigan State University, 1990; Ph.D., Massachusetts Institute of  
Technology, 1996. Associate Professor.
- CHENEY, CHARISE (1999).....Ethnic Studies  
B.S.J., Northwestern University, 1993; M.A., University of Illinois at Urbana-  
Champaign, 1995; Ph.D., 1999. Assistant Professor.
- CHEW, MARIE E. (1976).....Health and Counseling Services  
R.N., St. Joseph College, Maryland; 1959; B.S., 1959. N.P., Brigham Young  
University, 1981. ANA Board Certificate, 1983. Nurse Practitioner.
- CHILDERS-KRAFT, SUSAN E. (1988).....College of Liberal Arts  
B.S., California Polytechnic State University, San Luis Obispo, 1976; M.A., Mills  
College, 1978. Director of Advancement.
- CHIN, ELAINE Y. (1996).....University Center for Teacher Education  
B.A., University of Chicago, 1979; M.A.T., 1980; Ph.D., Stanford University,  
1991. Professor.
- CHIPPING, DAVID H. (1971).....Physics  
B.S., Cambridge University, England, 1965; M.S., Stanford University, 1967;  
Ph.D., 1970. Professor.
- CHIRICA, LAURIAN M. (1984).....Computer Science  
M.S., University of Bucharest, Romania, 1964; Ph.D., University of California,  
Los Angeles, 1976. Professor.
- CICHOWSKI, ROBERT S. (1971).....Chemistry and Biochemistry  
B.S., Purdue University, 1964; Ph.D., Alfred University, 1968. Professor.
- CIROVIC, MICHAEL M. (1968).....Electrical Engineering  
B.E., New York University, 1965; M.S., 1968. Professor and Department Chair.
- CLARK, KEVIN (1988).....English  
B.A., University of Florida, 1972; M.A., 1979; Ph.D., University of California,  
Davis, 1986. Professor.
- CLARK, NANCY A. (2000).....Associated Students, Incorporated  
B.A., Washington State University, 1982; M.S., 1990. Fitness Programs  
Coordinator.
- CLARK, NANCY L. (1989).....History  
B.A., University of California, Los Angeles, 1972; M.A., 1974; M.A., Yale  
University, 1982; M.Phil., 1983; Ph.D., 1988. Professor.
- CLARK, RUSSELL P., MAJ (2002).....Military Science  
B.S., Mesa State College, 1983; M.A., Chapman University, 2001. Assistant  
Professor.
- CLARK, WILLIAM E. (1977).....Mechanical Engineering  
B.M.E., University of Minnesota, 1964; M.S., 1966; Ph.D., 1972. Professor and  
Interim Department Chair. Registered Professional Engineer, California.

- CLAY, GARY R. (1995)..... Landscape Architecture  
B.L.A., Utah State University, 1974; M.L.A., University of Illinois, 1986; Ph.D., University of Arizona, 1996. Associate Professor.
- CLIFT, LISA R. (2002)..... Health and Counseling Services  
B.S., Montana State University, Bozeman, 1987. Clinical Laboratory Scientist.
- COCHRAN, BURT, JR. (1976)..... Health and Counseling Services  
M.D., University of Southern California Medical School, 1949. Certified American Board of Internal Medicine, 1957. Physician. Head, Medical Services.
- COKAL, SUSANN (2001)..... English  
B.A., University of California, San Diego, 1986; M.A., University of California, Berkeley, 1989; Ph.D., State University of New York, Binghamton, 1997; Ph.D., University of California, Berkeley, 2001. Assistant Professor.
- COLEMAN, JAMES W. (1973)..... Social Sciences  
B.A., California State University, Northridge, 1969; M.A., University of California, Santa Barbara, 1971; Ph.D., 1975. Professor.
- COLLINS, KATHLEEN A. (1992)..... Admissions  
B.S., California Polytechnic State University, San Luis Obispo, 1992. Assistant Director.
- COLOMÉ, JAIME S. (1972)..... Biological Sciences  
B.A., University of California, Santa Barbara, 1966; M.A., 1973; Ph.D., 1974. Professor.
- COLVARD, ANTHONY (1999)..... Associated Students, Incorporated  
B.S., California State University, Fresno, 1987. Information Technology Coordinator.
- COLVIN, KURT (1999)..... Industrial and Manufacturing Engineering  
B.S., California Polytechnic State University, San Luis Obispo, 1991; M.S., Oregon State University, 1997; Ph.D., 1999. Assistant Professor.
- COLVIN, MICHAEL R. (1979)..... Mathematics  
B.A., University of Houston, 1968; M.A., 1970; Ph.D., 1976. Professor.
- CONE, ALISON (1994)..... Intercollegiate Athletics  
B.S., Washington State University, 1975; M.A., Cal State Dominguez Hills, 1990. Sr. Associate Director of Athletics.
- CONN, W. DAVID (1999)..... Academic Programs, City and Regional Planning  
B.A., Oxford University, 1968; M.A., 1972; D.Phil., 1973. Vice Provost for Academic Programs and Undergraduate Education, and Professor.
- CONNELY, JOHN B. (1970)..... Computer Science  
B.A., University of Southern California, 1958; M.S., Oregon State University, 1988; Ph.D., University of Southern California, 1970. Professor Emeritus.
- CONNOR, DAREN (1993)..... Associated Students, Incorporated  
B.S., California Polytechnic State University, San Luis Obispo, 1990. Assistant Director for Programs.
- CONWAY, JAMES R. (1969)..... Speech Communication  
B.A., California State College, Los Angeles, 1966; M.A., 1968; Ph.D., University of Southern California, 1977. Professor and Department Chair.
- COOK, BARBARA E. (1972)..... Social Sciences  
A.B., Duke University, 1965; M.A., Stanford University, 1967; Ph.D., 1974. Associate Professor.
- COOK, GAYLE (1991)..... Physics  
B.Sc., Imperial College, London, 1973; M.S., University of Colorado, 1977; Ph.D., 1982. Professor.
- COOKE, GILBERT D. (1995)..... Architecture  
B.S. Arch., University of Cincinnati, 1962; M.Arch., Cranbrook Academy of Art, 1964. Professor. NCARB, AIA, Registered Architect, Maryland.
- COOKE, SCOTT (1980)..... Administration and Finance  
B.S., California Polytechnic State University, San Luis Obispo, 1985. Assistant Director, Fiscal Services-Financial Reporting.
- COOMBS, LEE C. (1969)..... Chemistry and Biochemistry  
B.A., San Diego State College, 1963; M.S., 1965; Ph.D., Purdue University, 1970. Professor Emeritus.
- COOPER, ALAN F. (1970)..... Biological Sciences  
B.S., California State Polytechnic College, Pomona, 1964; Ph.D., University of California, Riverside, 1969. Professor.
- COOPER, ALLAN R. (1975)..... College of Architecture and Environmental Design  
B.A., Rice University, 1967; B.Arch., 1968; M.Arch., Cornell University, 1971. Interim Director, Professor and Interim Associate Dean. AIA, Registered Architect, California.
- COOPER, MARK A. (1978)..... College of Engineering, Industrial and Manufacturing Engineering  
B.S., California State Polytechnic College, 1968; M.S., Arizona State University, 1978. Industrial and Manufacturing Engineering Professor Emeritus, and Director of Corporate Relations, College of Engineering.
- COOPER, MARY P. (POLLY) (1974)..... Architecture  
B.A., Wellesley College, 1963; M.Ed., Harvard University, 1964; M.Arch., University of California, Berkeley, 1971; M.L.A., 1974. Professor Emeritus. Registered Architect, California.
- CÓRDOVA, CARLOS (1994)..... Office of the President  
B.A., Loyola-Marymount University, 1980; M.A., University of California, Santa Barbara, 1982; J.D., University of California, Los Angeles, 1985. Member of the California Bar. University Legal Counsel.
- CORTEZ, SAMUEL (1990)..... Student Academic Services  
B.A., California Polytechnic State University, San Luis Obispo, 1992. Director, Upward Bound.
- COTA, HAROLD M. (1966)..... 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.
- COTKIN, GEORGE (1980)..... History  
B.A., Brooklyn College (C.U.N.Y.), 1972; M.A., Ohio State University, 1974; Ph.D., 1978. Professor.
- COWELL, LENNIS (1985)..... Intercollegiate Athletics  
B.S., California Polytechnic State University, San Luis Obispo, 1971; M.A., 1972. Head Coach.
- COZZI, DIANA (1998)..... Associated Students, Incorporated  
B.S., California State University, Fresno; M.A., California Polytechnic State University, San Luis Obispo, 1985. Assistant Director for Programs.
- CRAIN, CARSON (1989)..... College of Liberal Arts  
B.A., California Polytechnic State University, San Luis Obispo, 1972. Administrative Operations Analyst.
- CRAMP, CATHERINE (1999)..... Associated Students, Incorporated  
B.A., California State University, Long Beach, 1992; M.S., University of Illinois, 1996. Assistant Director, Rec Sports.
- CRAWFORD, TERRY (1992)..... Intercollegiate Athletics  
B.S., University of Tennessee, 1970; M.S., 1972. Head Coach.
- CROTHER, CYNTHIA A. (1994)..... Industrial Technology  
B.S. Cal Poly, California Polytechnic State University, San Luis Obispo, 1992; M.A., 1994; M.A., University of California, Santa Barbara, 1995; Ph.D., 1997. Assistant Professor.
- CROZIER, ALEX (1992)..... Intercollegiate Athletics  
B.S., California Polytechnic State University, San Luis Obispo, 1984. Head Coach.
- CRUIKSHANKS, RANDAL L. (1972)..... Political Science  
B.A., University of California, Berkeley, 1963; M.A., University of Oregon, 1965; Ph.D., 1968; additional graduate study, University of Michigan. Professor Emeritus.
- CULVER, JOHN H. (1975)..... Political Science  
B.S., University of Oregon, 1968; M.S., 1970; Ph.D., University of New Mexico, 1975. Professor Emeritus.
- CUMMINGS, RUSSELL M. (1986)..... Aerospace Engineering  
B.S., California Polytechnic State University, 1977; B.A., 1999; M.Eng., 1985; Ph.D., University of Southern California, 1988; E.A.E., 1982. Professor.
- CURRIER, SUSAN (1980)..... College of Liberal Arts, English  
A.B., Mount Holyoke College, 1969; M.A., University of Massachusetts, 1973; Ph.D., 1979. Associate Dean and Professor.
- DALTON, LINDA C. (1983)..... Institutional Planning and Analysis, City and Regional Planning  
A.B., Radcliffe/Harvard, 1967; M.U.P., University of Washington, 1974; Ph.D., 1978. Executive Vice Provost and Chief Planning Officer, and Professor. American Institute of Certified Planners.

- DALY, JAMES C. (1972).....Statistics  
B.S., Gonzaga University, 1966; Ph.D., Oregon State University, 1973. Professor.
- DANES, JEFFREY E. (1986).....Marketing  
B.A., San Jose State University, 1972; M.A., 1974; Ph.D., Michigan State University, 1976. Professor.
- D'ACQUISTO, JOSH (2002).....Associated Students, Incorporated  
B.S., California Polytechnic State University, San Luis Obispo, 1995. Assistant Director of Operations.
- DAUGHERTY, M. STEVEN (1988).....Animal Science  
B.S., New Mexico State University, 1977; M.S., Colorado State University, 1979; Ph.D., New Mexico State University, 1984. Professor.
- DAVIDMAN, LEONARD (1977).....University Center for Teacher Education  
B.A., Brooklyn College, 1966; M.A., 1972; Ph.D., Stanford University, 1976. Professor.
- DAVIDMAN, PATRICIA (1992).....University Center for Teacher Education  
B.A., Brooklyn College, 1968; M.A., Stanford University, 1975; Ph.D., University of California, Santa Barbara, 1992. Professor.
- DAVIES, THOMAS H. (1983).....Music  
B.M.E., Bowling Green State University, 1975; M.A., 1977; D.M.A., University of Southern California, 1983. Professor.
- DAVIS, DONNA (1984).....Student Academic Services  
B.A., California Polytechnic State University, San Luis Obispo, 1976; M.A. 1977. Academic Advisor/Instructor; Coordinator, Connections for Academic Success.
- DAVIS, HIRAM L. (1996).....University Library  
B.S., Missouri Valley College, 1966; M.L.S., Emporia State University, 1969; Ph.D., University of Michigan, 1984. Dean of Library Services.
- DAVIS, MARJORIE A. (1976).....Health and Counseling Services  
B.S., University of Oklahoma, 1956; C.L.T., M.T., A.S.C.P., P.H. Microbiologist. Clinical Laboratory Scientist.
- DAVIS, STEPHEN D. (2002).....College of Liberal Arts  
B.S., Stanford University, 1981. Administrative Operations Analyst.
- DAVIS, STEVEN C. (1987).....Kinesiology  
B.S., University of California, Davis, 1979; M.S., San Diego State University, 1983; Ph.D., Pennsylvania State University, 1986. Professor.
- DAVOL, ANDREW I. (1999).....Mechanical Engineering  
B.S.M.E., California Polytechnic State University, San Luis Obispo, 1987; M.S.M.E., University of California, San Diego, 1993; Ph.D., 1998. Assistant Professor.
- DAWSON, MADOKA (1993).....Food Science and Nutrition  
B.S., Illinois State University, 1982; M.S., 1983; Ed.D., Pepperdine University, 1991. Associate Professor. Registered Dietitian.
- DAY, LINDA L. (1993).....City and Regional Planning  
B.S., State University of New York-Brockport, 1964; B.S.Arch., Minnesota, 1989; M.Arch./Urban Design, University of Wisconsin, Milwaukee, 1992; Ph.D., Syracuse, 1970. Professor.
- DAZA, OSCAR H. (2002).....BioResource and Agricultural Engineering  
B.S., Universidad Nacional/Universidad del Valle, Palmira/Col., Colombia, 1976; M.S., Wageningen University, The Netherlands, 1983; Ph.D., Utah State University, 1994. Assistant Professor.
- DeCOSTA, JEAN (1994).....Academic Personnel  
B.A., San Francisco State University, 1972; M.S., California Polytechnic State University, San Luis Obispo, 1986; Ph.D., Fielding Institute, 1993. Director, University Ombuds, and Director, Office of Campus Relations.
- De JONG, ALVIN A. (1974).....Biological Sciences  
B.S., Seattle Pacific College, 1965; Ph.D., Washington State University, 1972. Professor.
- 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  
A.B., San Diego State College, 1961; Ph.D., Iowa State University, 1966. Professor Emeritus.
- DEL RIO, VICENTE (2001).....City and Regional Planning  
B.Arch., Universidade Federal do Rio de Janeiro, 1978; M.U.R.P., Universidade do Estado do Rio de Janeiro, 1979; M.A., Oxford Polytechnic, 1981; Ph.D., Universidade de São Paulo, 1991. Associate Professor.
- DeMERS, GERALD E. (1989).....Kinesiology  
B.S., Mankato State University, 1971; M.S., 1972; Ph.D., University of Utah, 1979. Professor.
- DeNATALE, JAY S. (1988).....Civil and Environmental Engineering  
B.S., University of California, Davis, 1977; M.S., 1979; Ph.D., 1983. Professor. Registered Professional Engineer, California.
- DENEL, M. BILGI (1981).....Architecture  
B.S.C.E., Robert College, Istanbul, 1959; M.F.A., Princeton University, 1963; Ph.D., Istanbul Technical University, 1981. Professor. Registered Civil Engineer and Architect, Turkey.
- 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  
B.A., California State College, Long Beach, 1967; M.F.A., California State University, Long Beach, 1980. Professor Emeritus.
- DePIERO, FRED W. (1996).....Electrical Engineering, Computer Engineering  
B.S., Michigan State University, 1985; M.S., 1987; Ph.D., University of Tennessee, 1996. Professor.
- DETURRIS, DIANNE J. (1998).....Aerospace Engineering  
B.S., Georgia Institute of Technology, 1984; M.S., Pennsylvania State University, 1986; Ph.D., Virginia Polytechnic Institute and State University, 1992. Associate Professor.
- DETWEILER, ROBERT C. (1998).....Office of the President  
B.A., Humboldt State University, 1960; M.A., San Francisco State University, 1968; Ph.D., University of Washington, 1968. Trustee Professor and Special Assistant to the President.
- DEUTSCH, ERNESTO (2001).....College of Engineering  
B.A., University of California, Los Angeles, 1975; M.A., United States International University, 1990. Academic Advisor, MESA Engineering Program.
- 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 and Department Chair.
- DIAMOND, BETH (2002).....Landscape Architecture  
B.A., Friends World College, 1990; B.L.A., University of Oregon, 1995; M.L.A., 1997. Assistant Professor.
- DIAZ, JOE V. (1976).....Health and Counseling Services  
B.A., University of Arizona, 1970; M.Ed., 1971; Ph.D., 1976. Psychologist.
- DICKERSON, ROBERT H. (1970).....Physics  
B.S., University of Arizona, 1959; M.S., 1963; Ph.D., 1964. Professor Emeritus.
- DICUS, CHRISTOPHER A. (2001).....Natural Resources Management  
B.S., Louisiana Tech University, 1992; M.S., Utah State University, 1995; Ph.D., Louisiana State University, 2000. Assistant Professor.
- 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. Associate Professor.
- DILL, JOANNE L. (1988).....College of Liberal Arts  
B.A., California State University, Fullerton, 1983. Administrative Operations Analyst.
- DILLS, KEITH W. (1983).....Art and Design  
B.A., State University of Iowa, 1961; M.A., San Francisco State College, 1969; Ph.D., University of California, Berkeley, 1981. Professor.
- DIMMITT, LAURA SAENZ (1975).....Financial Aid  
B.A., University of California, Santa Barbara, 1971; M.A., California Polytechnic State University, San Luis Obispo, 1980. Assistant Director, Scholarships and Special Programs.
- DINGUS, DELMAR D. (1973).....Earth and Soil Sciences  
B.S., Berea College, 1966; M.S., West Virginia University, 1968; Ph.D., Oregon State University, 1973. Professor.
- DI PASQUALE, JEANNINE (1999).....Student Academic Services  
B.A., California State University, Northridge, 1995; M.S., 1998. Program Coordinator/Advisor, Student Support Services.

- DOAN, ALESHA E. (2000).....Political Science  
B.A., University of New Mexico, 1995; M.A., University of Wisconsin, 1997;  
Ph.D., Texas A & M University, 2000. Assistant Professor.
- DOBSON, JOHN (1990).....Finance  
B.A., University of Lancaster, England, 1979; M.A., University of South  
Carolina, 1981; Ph.D., 1988. Associate Professor.
- DOMINGUES, ANTHONY (1985).....Admissions  
B.S., California Polytechnic State University, San Luis Obispo, 1979. Assistant  
Director.
- DOMINGUEZ, ROJEAN Y. (1994).....Health and Counseling Services  
B.S., Central Michigan University, 1972; M.P.H., University of Michigan, 1997.  
Health Educator.
- DOMPKKE, JOANNE (1982).....Health and Counseling Services  
R.N., Cuesta College, 1976; N.P., University of California, Davis, 1986. Nurse  
Practitioner.
- DONEGAN, LORRAINE D. (2002).....Graphic Communication  
B.S., California Polytechnic State University, San Luis Obispo, 1997; M.A., 2001.  
Assistant Professor.
- DONG, KEVIN J. (2001).....Architectural Engineering  
B.S., California Polytechnic State University, San Luis Obispo, 1986; M.S.,  
University of California, Berkeley, 1988. Assistant Professor. Registered  
Structural Engineer and Professional Engineer, California.
- DONNELL, ROSEMARY T. (1977).....Health and Counseling 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).....Agribusiness, Horticulture and Crop Science  
B.S., California State Polytechnic College, 1966; M.B.A., College of William and  
Mary, 1971. Professor and Department Head, Horticulture and Crop Science.
- DOYLE, D. GREGG (2002).....City and Regional Planning  
B.A., University of California, Berkeley, 1989; M.U.R.P., University of  
Washington, 1994. Assistant Professor. American Institute of Certified Planners.
- 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.  
Professor. American Institute of Certified Planners.
- DUCHOWNY, LAUREL A. (2001).....Social Sciences  
B.A., University of New Mexico, 1995; M.A., State University of New York,  
Stonybrook, 1997; Ph.D., 2001. Professor.
- DUERK, DONNA P. (1981).....Architecture  
B.Arch., North Carolina State University, 1971; B.A., 1972; M.Arch.A.S.,  
Massachusetts Institute of Technology, 1980. Professor. Registered Architect,  
Texas.
- DUFFY, BERNARD K. (1988).....Speech Communication  
B.A., San Jose State College, 1970; M.A., 1971; Ph.D., University of Pittsburgh,  
1976. Professor.
- DUFFY, SUSAN (1988).....Liberal Studies  
B.A., Seton Hill College, 1973; M.A., University of Pittsburgh, 1974; Ph.D.,  
1979. Professor and Department Chair.
- DUGAN, TIMOTHY J. (1999).....Theatre and Dance  
B.A., California State University, Sacramento, 1993; M.F.A., Temple University,  
1996. Assistant Professor.
- DUNKLAU, KATHERINE A. (1997).....Administration and Finance  
B.S., California Polytechnic State University, San Luis Obispo, 1982. Project  
Manager, Facilities Planning and Capital Projects.
- DURAN, DAVID (1998).....University Center for Teacher Education  
B.A., California State University, Fresno, 1990; Ph.D., Stanford University, 1998.  
Assistant Professor.
- DWYER, GARY COLBURN (1973).....Landscape Architecture  
B.F.A. and B.L.A., Syracuse University, 1967; B.S.L.A., New York State  
University, 1967; M.A., University of Denver, 1970. Professor.
- ECHOLS, ROBERT (2002).....Physics  
B.S., University of California, Davis, 1992; M.S., 1994; M.S., University of  
California, Santa Cruz, 1996; Ph.D., 1999. Assistant Professor.
- EDWARDS, DAVE (2001).....Associated Students, Incorporated  
B.S., University of Evansville, 1992; M.S., Southern Illinois University, 1994.  
Assistant Director of Julian A. McPhee University Union.
- ELFRINK, T. LEIGH (1980).....Administration and Finance  
B.A., California Polytechnic State University, San Luis Obispo, 1978; M.A.,  
1998. Associate Director, Facilities Administration.
- ELIJAH, MATHEWS M. (1980).....Administration and Finance  
B.S., California Polytechnic State University, San Luis Obispo, 1984; M.S., 1990.  
Supervising Custodian, Facility Services.
- ELLERSON, RICHARD (2000).....Intercollegiate Athletics  
B.Ed., University of Hawaii at Manoa, 1977; M.Ed., 1978. Head Coach.
- ELLIOT, DENNIS K. (1985).....Administration and Finance  
B.S., California Polytechnic State University, San Luis Obispo, 1993. Registered  
Professional Engineer. Chief Engineer, Facility Services.
- ELLIS, REBECCA (1987).....Management  
B.A., University of Wisconsin, Madison, 1969; M.A., 1971; M.S., 1981; Ph.D.  
1984. Professor.
- ELLISON, RICHARD E. (1998).....University Advancement  
B.S., Pepperdine University, 1978; M.B.A., 1984. Associate Vice President for  
University Advancement.
- ELLISON, STACY (2001).....University Advancement  
B.A., University of Colorado at Boulder, 1994; M.B.A., University of Denver,  
1998. Associate Director, Planned Giving and Endowments.
- ELROD, SUSAN L. (1997).....Biological Sciences  
B.S., California State University, Chico, 1986; Ph.D., University of California,  
Davis, 1995. Assistant Professor.
- ELTZROTH, THOMAS E. (1967).....Horticulture and Crop Science  
B.S., Ohio State University, 1965; M.S., 1966. Professor.
- ENDRES, LELAND S. (1969).....Chemistry and Biochemistry  
A.B., Middlebury College, 1958; M.A., University of Oregon, 1963; Ph.D.,  
University of Arizona, 1966. Professor.
- ENGLE, PATRICE L. (1980).....Psychology and Child Development  
B.A. Wellesley College, 1966; Ph.D., Stanford University, 1971. Professor.
- ENGLUND, DAVID L. (1973).....Psychology and Child Development  
B.A., Ohio State University, 1956; M.A., University of Hawaii, 1965; Ph.D.,  
University of Wisconsin, 1969. Professor Emeritus.
- EPSTEIN, GARY M. (1969).....Mathematics  
B.A., University of California, Riverside, 1964; Ph.D., 1969. Professor.
- EPSTEIN, WILLIAM C. (1996).....Construction Management  
B.S., University of Miami, 1984; M.S., University of Florida, 1988; Ph.D., 1995.  
Professor. Certified General Contractor, Florida. Registered Professional  
Engineer, Florida. OSHA 500 Certified.
- EQUINOVA, RICHARD M. (1973).....Career Services, Testing  
B.S., California State Polytechnic College, San Luis Obispo, 1967; M.S., 1970.  
Director of Career Services and Testing Center.
- EVNINE, SIMON J. (1996).....Philosophy  
B.A., Kings College, London, 1981; M.A., Bedford College, London, 1983;  
M.Phil., University College, London, 1988; Ph.D., University of California, Los  
Angeles, 1996. Associate Professor.
- FABONAR, MARK (2001).....Student Life and Leadership  
B.A., University of California, Santa Cruz, 1995; M.A., California State  
University, Fullerton, 2000. Coordinator, Multicultural Center.
- FAHS, 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, PHILLIP (1991).....Economics  
D.U.E.S., University of Paris, 1969; B.A., University of California, Santa Barbara,  
1972; M.A., 1975; M.A., 1978; Ph.D., 1982. Associate Professor.
- FARKYE, NANA Y. (1990).....Dairy Science  
B.Sc. (Hon), University of Ghana, 1980; M.S., Utah State University, 1985;  
Ph.D., 1986. Professor.
- FARUQUE, OMAR (1989).....Landscape Architecture  
B.S.L.A., Texas A & M University, 1971; M. Arch., 1972. Professor. Registered  
Architect, Texas, and Landscape Architect, Texas and Indiana.

- FERNANDO, RAYMOND (2002)..... Chemistry and Biochemistry  
B.S., University of Sri Jayewardenepura, Sri Lanka, India; Ph.D., North Dakota State University, Fargo, 1986. Professor, The Arthur C. Edwards Endowed Chair in Coatings Technology and Ecology.
- 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 and Department Head, and Director of the Dairy Products Technology Center.
- FETZER, PHILIP L. (1988)..... Political Science  
A.B., Princeton University, 1965; M.A.T., Reed College, 1970; Ph.D., University of Oregon, 1981. Professor and Department Chair.
- FIEGEL, GREGG L. (1995)..... Civil and Environmental Engineering  
B.S., California Polytechnic State University, San Luis Obispo, 1990; M.S., University of California, Davis, 1992; Ph.D., 1995. Professor. Registered Professional Engineer, California.
- FIELD, GARY G. (1984)..... Graphic Communication  
Certificate of Printing, Melbourne School of Printing and Graphic Arts, Australia, 1966; Diploma in Printing Technology, Nottingham Trent University, England, 1970; M.B.A., University of Pittsburgh, 1975. Professor. Accredited Senior Imaging Scientist.
- FINGER, HELENE M. (1997)..... College of Engineering  
B.S., California Polytechnic State University, San Luis Obispo, 1988; M.S., 1998. Director of Women's Engineering Program. Registered Professional Engineer, California.
- FIORITO, BASIL A. (1977)..... Psychology and Child 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.
- FISH, MICHAEL (1995)..... Research and Graduate Programs  
B.A., St. Joseph's College, 1965; M.A., The Catholic University of America, 1971. Director of Grants Development.
- FISHER, GENE L. (1991)..... Computer Science  
B.S., University of California, Irvine, 1973; Ph.D., 1985. Professor.
- FISHER, GWEN (2001)..... Mathematics  
B.A., University of California, Santa Barbara, 1992; M.A., 1996; Ph.D., University of Wisconsin, Madison, 2001. Assistant Professor.
- FITZHENRY, WILLIAM (1997)..... English  
B.A., State University of New York at Buffalo, 1984; M.A., University of Colorado, 1991; Ph.D., Duke University, 1997. Assistant 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, FRANCISCO (2000)..... Philosophy  
B.Sc., University of Toronto, 1992; M.A., University of Western Ontario, 1993; Ph.D., 1998. Assistant Professor.
- FLORES, ROBERT A. (1983)..... Agricultural Education and Communication  
B.S., California Polytechnic State University, San Luis Obispo, 1977; M.S., 1978; Ph.D., Texas A & M University, 1989. Professor and Department Head.
- FLOREZ-DUQUET, MARIA (1999)..... Biological Sciences  
B.S., New Mexico State University, 1990; Ph.D., University of California, Davis, 1997. Assistant Professor.
- FLOYD, BARRY (1990)..... Orfalea College of Business, Management  
B.S., Michigan State University, 1973; M.S., 1974; M.B.A., University of Michigan, 1983; Ph.D., 1985. Associate Professor and Director, Graduate Management Programs.
- FOROOHAR, MANZAR (1987)..... History  
B.A., National University of Iran; M.A., California State University, Northridge, 1973; C. Phil., University of California, Los Angeles, 1978; Ph.D., 1984. Professor.
- FOSTER, THEODORE C. (1970)..... Physics  
B.S., University of Santa Clara, 1961; M.S., University of Washington, 1963; Ph.D., 1965. Professor.
- FOWLER, THOMAS, IV (1995)..... Architecture  
B.Arch., New York Institute of Technology/Old Westbury, 1984; M.Arch., Cornell University, 1994. Associate Professor.
- FOX, JENNIFER RYDER (2002)..... Horticulture and Crop Science  
B.S., California Polytechnic State University, San Luis Obispo, 1978; M.S., New Mexico State University, 1980; Ph.D., 1989. Professor and Department Head.
- FRANKEL, RICHARD B. (1988)..... Physics  
B.S., University of Missouri, 1961; Ph.D., University of California, Berkeley, 1965. Professor.
- FRANZ-KNIGHT, KIRA (2001)..... Theatre and Dance  
B.A., California Polytechnic State University, San Luis Obispo, 1994; M.F.A., University of Washington, 1998. Assistant 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. Professor.
- FREBERG, LAURA A. (1987)..... Psychology and Child Development  
B.A., University of California, Los Angeles, 1974; M.A., 1975; Ph.D., 1979. Professor.
- FREED, TALI (2001)..... Industrial and Manufacturing Engineering  
B.Sc., Technion-Israel Institute of Technology, Israel, 1983; M.Sc., 1988; Ph.D., University of California, Berkeley, 1995. Assistant Professor.
- FREEMAN, CAROL A. (1985)..... Health and Counseling Services  
B.A., Aurora University, 1978; R.N., Ventura College, 1982; N.P., Family Practice, University of California, Davis, 1989. Nurse Practitioner.
- 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. Registered Professional Engineer, California.
- FRENCH, BRIAN (2002)..... Associated Students, Incorporated  
B.S., California Polytechnic State University, San Luis Obispo, 1993. Project Coordinator.
- FREY, DENNIS F. (1970)..... Biological Sciences  
B.S., Oklahoma State University, 1963; M.S., Virginia State College, 1967; Ph.D., Oklahoma State University, 1970. Professor.
- FREY, THOMAS G. (1970)..... Chemistry and Biochemistry  
B.A., University of Oregon, 1965; Ph.D., University of Idaho, 1970. Professor.
- FRIEDMAN, MARCIA A. (1973)..... Academic Records  
B.S., California Polytechnic State University, San Luis Obispo, 1984. Records Process Manager.
- FRISCH, SHERYL (1990)..... Art and Design  
B.A., University of California, Riverside, 1983; M.A., 1988. Slide Curator.
- FRITZ, SUZANNE (1992)..... Housing and Residential Life  
B.S., University of California, Davis, 1985; M.Ed., University of Vermont, 1987. Education and Training Specialist.
- FRYER, ANN (1983)..... Disability Resource Center  
B.A., University of San Francisco, 1972; M.A., California Polytechnic State University, San Luis Obispo, 1983. Assistant Director/Disability Management Specialist.
- FUJITANI, SHARON H. (1977)..... University Library  
B.A., University of California, Santa Barbara, 1963; M.L.S., University of Hawaii, 1974; M.A., Pepperdine University, 1976. Senior Assistant Librarian.
- GAINES, MERRILL C. (1976)..... Architecture  
B.B.A., University of Wisconsin, Milwaukee, 1965; M.Arch. 1973. Professor Emeritus. Registered Architect: California, Wisconsin. NCARB Certificate.
- GAMBLE, LYNNE E. (1976)..... University Library  
B.A., University of Texas at Austin, 1968; M.L.S., 1969; M.A., California Polytechnic State University, San Luis Obispo, 1979. Associate Librarian.
- GAMBS, ROGER D. (1974)..... Biological Sciences  
B.S., University of Idaho, 1963; M.S., 1965; Ph.D., University of Montana, 1973. Professor.
- GANNON, KIM RUTLEDGE (2002)..... University Advancement  
B.A., Washburn University, 1988. Director, Alumni Relations.

- GARCIA, ANTONIO F. (2002)..... Physics  
B.A., University of California, Los Angeles, 1988; B.S., San Jose State University, 1994; M.S., The University of New Mexico, 1996; Ph.D., University of California, Santa Barbara, 2001. Assistant Professor.
- GARTNER, WOLFGANG (1979)..... Intercollegiate Athletics  
B.A., University of the Pacific, 1973. Head Coach.
- GAY, LARRY W. (1979)..... Industrial Technology  
B.A., California Polytechnic State University, San Luis Obispo, 1975; M.A., 1976; Ed.D., Brigham Young University, 1980. Professor Emeritus.
- GEE, VERA (1986)..... Admissions  
B.S., California Polytechnic State University, San Luis Obispo, 1983. Assistant Director.
- GEORGE, DAVID L. (1970)..... Political Science  
A.B., San Diego State College, 1962; M.A., 1968; Ph.D., University of Oregon, 1970; additional graduate study, Yale University, University of Michigan Survey Research Center. Professor Emeritus.
- GEORGE, TERESA (2001)..... Health and Counseling Services  
B.S., San Jose State University, 1986; M.A., University of Maryland, 1988; Ph.D., Arizona State University, 1992. Head of Counseling Services.
- GERINGER, J. MICHAEL (1992)..... Management  
B.S., Indiana University, 1980; M.B.A., University of Washington, 1983; Ph.D., 1986. Professor.
- GIBERTI, BRUNO (1994)..... Architecture  
B.S. Arch., California Polytechnic State University, San Luis Obispo, 1980; M.Arch., University of California, Berkeley, 1989; Ph.D., 1994. Associate Professor.
- GILBERT, BARBARA J. (2003)..... Health and Counseling Services  
A.B., University of Missouri, 1982; M.A., Southern Illinois University, 1985; Ph.D., 1988. Psychologist.
- GILL, SAMANTHA J. (1997)..... Natural Resources Management, BioResource and Agricultural Engineering  
B.S., Humboldt State University, 1991; M.S., 1993; Ph.D., University of California, Berkeley, 1997. Associate Professor.
- GILLETTE, DAVID (2001)..... English  
B.A., University of Iowa, 1985; M.A., University of New Mexico, 1992; Ph.D., 1995. Assistant Professor.
- GILLIS, WILLIAM T. (1987)..... Dairy Science  
B.S., Mississippi State University, 1973; M.S., 1975; Ph.D., 1979. Professor.
- GLASSMEYER, SONJA S. (1979)..... Kinesiology  
B.S., California Polytechnic State University, San Luis Obispo, 1973; M.S., 1974; Ed.D., Brigham Young University, 1981. Professor Emeritus.
- GOEL, RAKESH K. (1997)..... Civil and Environmental Engineering  
B.Tech, Indian Institute of Technology, New Delhi, 1982; M.S., University of California, Berkeley, 1985; Ph.D., 1990. Professor. Registered Professional Engineer, California.
- GOERS, JOHN W. F. (1980)..... Chemistry and Biochemistry  
B.S., University of Illinois, 1969; Ph.D., University of California, Los Angeles, 1974. Professor.
- GOLDBERG, SAUL (1970)..... Electrical Engineering  
B.S., Fairleigh Dickinson University, 1963; M.E., University of Florida, 1964; Ph.D., 1968. Professor Emeritus.
- GOLDENBERG, STUART (1970)..... Mathematics  
B.S., University of California, Los Angeles, 1965; M.S., University of California, Riverside, 1969; Ph.D., 1970. Professor.
- GOODEN, REGINALD H., JR. (1970)..... Political Science  
B.A., University of California, Los Angeles, 1962; M.A., University of California, Santa Barbara, 1969; Ph.D., 1972. Professor Emeritus.
- GORDON, RAYMOND G. (1967)..... Mechanical Engineering  
B.S., Western New England College, 1966; M.S., University of Michigan, 1967; Ph.D., University of California, Santa Barbara, 1974. Professor Emeritus. Registered Professional Engineer, California.
- GORMAN, LARRY R. (1997)..... Finance  
B.S., Washington State University, 1985; M.B.A., Western Washington University, 1988; Ph.D., Northwestern University, 1998. Associate Professor.
- GRADY, DAVID V. (1971)..... Biological Sciences  
A.B., University of California, Los Angeles, 1964; Ph.D., 1974. Professor.
- GRAGSON, DEREK E. (1999)..... Chemistry and Biochemistry  
B.S., California State University, Hayward, 1991; M.S., University of Oregon, 1995; Ph.D., 1997. Assistant Professor.
- GRANNEMAN, GARY A. (1978)..... Electrical Engineering  
B.S., Iowa State University, 1962; M.S., 1972; Ph.D., 1978. Professor. Registered Professional Engineer, Iowa.
- GREEN II, DAVID E. (1999)..... Horticulture and Crop Science  
B.S., Kansas State University, 1985; M.S., 1993; Ph.D., University of Georgia, 1997. Professor.
- GREENWALD, HARVEY C. (1973)..... Mathematics  
B.S., Massachusetts Institute of Technology, 1964; M.A., Washington University, 1966; Ph.D., 1970. Professor.
- GREIG, PATRICIA (1983)..... Associated Students, Incorporated  
B.S., California Polytechnic State University, San Luis Obispo, 1981. Assistant Director, Children's Programs.
- GRIFFIN, LANNY (1997)..... Materials Engineering  
B.S., California Polytechnic State University, San Luis Obispo, 1992; Ph.D., University of California, Davis, 1996. Associate Professor.
- GRIFFIN, PATRICK E. (1983)..... Administration and Finance  
B.A., California Polytechnic State University, San Luis Obispo, 1982; M.A., 1989. Supervisor, Building Trades, Facility Services.
- GRIGGS, KENNETH A. (1999)..... Management  
B.A., University of Maryland, 1972; M.S., 1975; M.B.A., 1979; Ph.D., 1989. Associate Professor.
- GRIMES, JOSEPH E. (1973)..... Academic Affairs, Computer Science, Computer Engineering  
B.A., St. Ambrose University, 1963; M.S., Illinois State University, 1968; Ph.D., Iowa State University, 1973. Special Assistant to the Provost for Faculty Development and Relations with Industry, and 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 Emeritus.
- GU, CAIXING (1998)..... Mathematics  
B.S., Zhejiang University, 1982; M.S., China Textile University, 1986; Ph.D., Indiana University, 1994. Assistant Professor.
- HAGEN, CHARLES T. (1980)..... Philosophy  
B.A., Harvard University, 1968; M.A., University of Michigan, 1977; Ph.D., 1981. Professor.
- HAILE, ALLEN (1993)..... University Advancement  
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. Director, Community and Government Relations.
- HALISKY, LINDA H. (1984)..... International Education and Programs, English  
B.A., Whittier College, 1968; M.A., University of California, Riverside, 1978; Ph.D., 1984. Professor of English; Director, International Education and Programs; Director, London Study Program.
- HALL, GARRETT J. (2002)..... Civil and Environmental Engineering  
B.S., Worcester Polytechnic Institute, 1992; M.S., University of Washington, 1993; Ph.D., University of California, Berkeley, 2001. Assistant Professor.
- HALL, KELLIE G. (1990)..... Kinesiology  
B.S., Rocky Mountain College, 1977; M.S., Eastern Washington University, 1987; Ph.D., Louisiana State University, 1990. Professor and Graduate Coordinator.
- 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)..... Earth and Soil Sciences  
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.
- HAMILTON, LYNN (1996)..... Agribusiness  
B.S., Ohio State University, 1988; M.S., University of Minnesota, 1995; Ph.D., 1996. Associate Professor.
- HAMPSEY, JOHN C. (1992)..... English  
B.A., Holy Cross College, 1976; Ph.D., Boston College, 1982. Professor.

- HAMPSON, BRIAN C. (1991)..... Food Science and Nutrition  
B.S., University of Illinois at Champaign-Urbana, 1981; M.S., 1983; Ph.D., 1988.  
Professor.
- HANLEY, JEREMIAH (JERRY) J. (1997)..... Information Technology Services  
B.A., St. Bonaventure University, 1965; M.A., New York University, 1967. Vice  
Provost and Chief Information Officer.
- HANNINGS, DAVID W. (1974)..... Horticulture and Crop Science  
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.
- HANSON, VICTORIA E. (1993)..... University Advancement  
B.A., University of the Redlands, 1968; M.A., Colorado State University, 1975.  
Publications Editor.
- 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. Manager, Human Resources.
- HARGRAVE, TERRY C. (1979)..... Architecture  
B.Arch.Eng., Washington State University, 1965; M.Arch., Massachusetts  
Institute of Technology, 1978. Professor. Architect, California.
- HARLAN, CRAIG (1986)..... History  
B.A., University of California, Irvine, 1971; M.A., 1973; Ph.D., 1981. Associate  
Professor.
- HARMS, MARTIN J. (1997)..... College of Architecture and Environmental Design  
B.Arch., University of Liverpool, 1962; M.S., 1985; Ph.D., University of  
Pennsylvania, 1991. Professor. Registered Architect, Pennsylvania. Member,  
American Institute of Architects.
- HARRIGAN, POLLY (1983)..... University Advancement  
B.A., University of Massachusetts, 1979; M.S.W., University of Connecticut,  
1981. Director, Advancement Programs.
- HARRINGTON, JOHN F. (1976)..... English  
B.A., Washington State University, 1964; M.A., 1966; Ph.D., University of  
Illinois, 1970. Professor.
- HARRIS, JAMES G. (1982)..... Electrical Engineering, Computer Engineering  
B.S., University of California, Berkeley, 1961; M.S., 1962; Ph.D., Syracuse  
University, 1968. Professor.
- HARRIS, JOHN H. (1978)..... Natural Resources Management  
B.S., Humboldt State College, 1968; M.S., 1970; Ph.D., Utah State University,  
1972. Professor.
- HARRIS, PATRICIA (1984)..... Student Life and Leadership  
B.A., University of the State of New York, Albany, 1989; M.A., California  
Polytechnic State University, San Luis Obispo, 1995. Assistant Director,  
Leadership Education and Development.
- HARRIS, WALTER L. (1973)..... Admissions  
B.S., California Polytechnic State University, San Luis Obispo, 1973; M.A., 1975.  
Associate Director.
- 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.
- HAUCK, ALLAN (2002)..... Construction Management  
B.A., Kalamazoo College, 1973; M.Ed., Bowling Green State University, 1979;  
Ph.D., University of Maryland, 1990. Professor and Department Head. Certified  
Professional Constructor (CPC).
- HAVANDJIAN, NISHAN (1980)..... Journalism  
B.A., Haigazian University, Beirut, Lebanon, 1970; M.A., University of Georgia,  
1972; Ph.D., University of Texas at Austin, 1979. Professor and Department  
Chair.
- HAWES, MICHAEL (1967)..... Electrical Engineering  
B.Eng., University College, Dublin, Ireland, 1958; M.S., Ohio State University,  
1967. Professor. Registered Professional Engineer, Ohio.
- HAWK, SUSAN N. (2002)..... Food Science and Nutrition  
B.A., Reed College, 1991; Ph.D., University of California, Davis, 1999. Assistant  
Professor. Registered Dietitian.
- HEAD, DWAYNE G. (1966)..... Kinesiology  
B.S., Jamestown College, 1958; M.S., South Dakota State University, 1963;  
Ed.D., University of Oregon, 1967. Professor Emeritus.
- HEADRICK, DAVID H. (1998)..... Horticulture and Crop Science  
B.S., California State Polytechnic University, Pomona, 1986; M.S., University of  
California, Riverside, 1988; Ph.D., 1992. Assistant Professor. Pest Control  
Advisor, California.
- 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. Associate Professor  
Emeritus.
- HELLENBRAND, HAROLD (1998)..... College of Liberal Arts  
A.B., Harvard College, 1975; Ph.D., Stanford University, 1980. Dean.
- HENDERSON, STANLEY L. (1990)..... Dairy Science  
B.S., Iowa State University, 1973; M.S., Southern Illinois University, 1976;  
Ph.D., Utah State University, 1990. Professor.
- HENDRICKS, WILLIAM W. (1994)..... Natural Resources Management  
B.A., California State University, Chico, 1980; M.B.P.A., John F. Kennedy  
University, 1984; Ph.D., University of Utah, 1993. Associate Professor.
- HERNANDEZ, ANITA (1999)..... University Center for Teacher Education  
B.A., California State University, Chico, 1978; M.A., California State University,  
Sacramento, 1990; Ph.D., Stanford University, 1999. Assistant Professor.
- HERTER, ROBERTA J. (1998)..... University Center for Teacher Education  
B.A., Michigan State University, 1969; M.A., 1979; Ph.D., University of  
Michigan, 1998. Associate Professor.
- HEWITT, CLARISSA (1976)..... Art and Design  
B.A., California State University, Northridge, 1971; M.F.A., Cranbrook Academy,  
1976. Professor.
- HEWES, AMY B. (1995)..... College of Engineering  
B.A., Smith College, 1974; M.A., California Polytechnic State University, San  
Luis Obispo, 1997. Director, Publications and Communications.
- HIGGINS, BRIAN S. (2001)..... Mechanical Engineering  
B.S., University of Colorado at Boulder, 1989; M.S., University of California,  
Berkeley, 1991; Ph.D., 1995. Assistant Professor.
- HILL, PATRICK D. (1975)..... Architecture  
B.Arch., University of Illinois, 1970; M.S., 1972. Professor. Registered Architect,  
California.
- HILTPOLD, PAUL (1989)..... History  
B.A., University of Texas, 1974; M.A., 1976; Ph.D., 1981. Associate Professor.
- HINKLE, MARY ANN (1978)..... Financial Aid  
B.S., California State Polytechnic College, San Luis Obispo, 1969. Loan Program  
Manager.
- HITCHNER, LEWIS E. (1996)..... Computer Science, Computer Engineering  
A.B., Dartmouth College, 1967; M.S., University of California Berkeley, 1968;  
Ph.D., University of Utah, 1984. Professor.
- 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.
- HOELLWARTH, CHANCE (2002)..... Physics  
B.S., California Polytechnic State University, San Luis Obispo, 1991; M.S.,  
University of California, Davis, 1994; Ph.D., 1997. Assistant Professor.
- HOFFMAN, KENNETH A. (1974)..... Physics  
B.A., University of California, Berkeley, 1966; M.A., 1969; Ph.D., 1973.  
Professor.
- HOLLAND, V. L. (1972)..... Biological Sciences  
B.A., Fresno State College, 1966; M.A., 1969; Ph.D., University of California,  
Berkeley, 1973. Professor and Department Chair.
- HOLMAN, BRETT (2002)..... Administration and Finance  
B.S., California Polytechnic State University, San Luis Obispo, 1988. Assistant  
Director for Accounts and Payment Management, Fiscal Services. Certified Public  
Accountant.
- HOLZ, ALAN W. (1974)..... Mathematics  
B.A., University of Washington, 1963; M.A., Bowdoin College, 1968; Ph.D.,  
Purdue University 1972. Professor.
- HOOD, J. MYRON (1977)..... Mathematics  
B.A., Grinnell College, 1963; M.S., Northwestern University, 1965; Ph.D.,  
Washington University, 1970. Professor.

- HORELICK, WALTER D. (2000).....Graphic Communication  
B.S., California University of Pennsylvania, 1991; M.I.E., Clemson University,  
1997. Assistant Professor.
- HORTON, WILLIAM F. (1968).....Electrical Engineering  
B.S., California Institute of Technology, 1946; M.S., 1948; Ph.D., University of  
California, Los Angeles, 1966. Professor Emeritus.
- HOSKINS, RALPH (1995).....College of Liberal Arts  
B.F.A., Bowling Green State University, 1980. Director, Cal Poly Arts.
- HOULGATE, LAURENCE D. (1979).....Philosophy  
B.A., California State College, Los Angeles 1960; M.A., Ph.D., University of  
California, Los Angeles, 1967. Professor Emeritus.
- HOWARD, WAYNE H. (1999).....Agribusiness  
B.A., California State University, 1974; M.Sc., University of Florida, 1982; Ph.D.,  
Texas A&M University, 1987. Associate Professor.
- HOWARD-GREENE, DANIEL (1994).....Office of the President  
B.S., University of California, Santa Cruz, 1975; M.S., University of Chicago,  
1978; Ph.D., 1983. Executive Assistant to the President.
- HOWELL, ROBERT (1974).....Art and Design  
B.A., Brooks Institute, 1973; M.A., Pepperdine University, 1976. Professor.
- HSU, JOHN Y. S. (1970).....Computer Science, Computer Engineering  
B.S., National Taiwan University, 1959; M.S., University of California, Berkeley,  
1964; Ph.D., 1969. Professor Emeritus.
- HUDSON, LYNN M. (1996).....History  
B.A., University of California, Santa Cruz, 1983; M.A., University of North  
Carolina, Chapel Hill, 1987; Ph.D., Indiana University, 1996. Associate Professor.
- HUDSON, MANDILIN (2002).....Associated Students, Incorporated  
B.S., Willamette University, 2000. Program Coordinator.
- HUNT, ROGER M. (1979).....Animal Science  
B.S., California State Polytechnic College, 1971; M.S., California Polytechnic  
State University, San Luis Obispo, 1978. Professor.
- HUNTER, MARK A. (2001).....Administration and Finance  
B.S., California Polytechnic State University, San Luis Obispo, 1987. Associate  
Director, Facility Services.
- HURLEY, SEAN P. (2002).....Agribusiness  
B.A., University of San Francisco, 1994; Ph.D., Iowa State University, 2000.  
Assistant Professor.
- IKEDA, KIMI M. (1985-88, 1989).....Academic Affairs  
B.S., California Polytechnic State University, San Luis Obispo, 1988; M.A., 1996.  
Assistant Vice Provost for Systems and Resource Management.
- IKENOYAMA, GEORGE K. (1964).....Architecture  
B.S., California State Polytechnic College, 1955; M.Arch., University of Hawaii,  
1972. Professor Emeritus. Registered Architect, California.
- INCHAUSTI, ROBERT L. (1984).....English  
B.A., California State University, Sacramento, 1974; M.A., 1976; Ph.D.,  
University of Chicago, 1981. Professor.
- IQBAL, M. ZAFAR (1979).....Accounting  
B.S., University of Nevada, Reno, 1969; M.B.A., Northern Illinois University,  
1972; Ph.D., University of Nebraska, Lincoln, 1979. Professor. Certified Public  
Accountant, Certified Management Accountant, Certified Internal Auditor,  
Certified Cost Analyst.
- IVERSEN, TONYA (1990).....Associated Students, Incorporated  
B.S., California Polytechnic State University, San Luis Obispo, 1986; M.B.A.,  
1996. Director, Children's Programs.
- JACKSON, BARBARA (1998).....Construction Management  
B.S., Colorado State University, 1975; M.S., 1998; Ph.D., 2000. Associate  
Professor. Class A General Contractor, Virginia. Designated Design-Build  
Professional (DBIA).
- JACKSON, LORRAINE D. (1992).....Speech Communication  
B.A., University of Western Ontario, 1987; M.A., Pennsylvania State University,  
1989; Ph.D., 1992. Associate Professor.
- JACOBSON, RALPH A. (1975).....Chemistry and Biochemistry  
B.A., Montclair State College, 1962; Ph.D., Cornell University, 1966. Professor.
- JANKAY, PETER (1973).....Biological Sciences  
B.A., San Fernando Valley State College, 1966; M.S., 1969; Ph.D., University of  
California, Santa Barbara, 1973. Professor.
- JANKOVITZ, KRISTINE Z. (1996).....Kinesiology  
B.S., California Polytechnic State University, San Luis Obispo, 1984; M.S., 1989;  
Ph.D., University of Nebraska-Lincoln, 1995. Assistant Professor.
- JANOWICZ, ROSEMARIE (1993).....Health and Counseling Services  
B.S., California Polytechnic State University, San Luis Obispo, 1978. Clinical  
Laboratory Scientist.
- JASTER, EDWIN H. (1992).....Dairy Science  
B.S., University of Wisconsin, 1970; M.S., University of Arizona, 1977; Ph.D.,  
1979. Professor.
- JELINEK, CYNTHIA J. (1976).....College of Science and Mathematics  
B.S., Marietta College, 1967; M.A., California Polytechnic State University,  
1994. Director of Advising Center.
- JENKINS, MICHELLE (2002).....College of Engineering  
B.A., California Polytechnic State University, San Luis Obispo, 1990. Associate  
Director of Development.
- JENNINGS, CHARLES W. (1968).....Art and Design  
B.A., Wheaton College, 1966; M.A., M.F.A., Northern Illinois University, 1968.  
Professor.
- JERCICH, GEORGE D. (1976).....Art and Design  
B.A., San Jose State University, 1972; M.A., 1976; M.F.A., 1983. Professor.
- JIMÉNEZ-FLORES, RAFAEL (1995).....Dairy Science  
B.S., U. La Salle, Mexico City, 1981; M.S., Cornell University, 1984; Ph.D.,  
University of California, Davis, 1989. Professor.
- JOHNSON, EDWARD F. (1995).....Administration and Finance  
B.A., University of California, Santa Barbara, 1978. Energy and Utilities  
Manager, Facility Services.
- JOHNSON, ERIC B. (1980).....Art and Design  
B.A., University of Oregon, 1971; M.A., University of New Mexico, 1975;  
M.F.A., 1978. Professor and Department Chair.
- JOHNSON, JANE (1980).....Career Services  
B.S., California Polytechnic State University, San Luis Obispo, 1978; M.A., 1998.  
Career Counselor.
- JOHNSON, MARK, MAJ (1999).....Military Science  
B.S., University of Wisconsin – La Crosse, 1978; M.A., Webster University,  
1994. Assistant Professor.
- JOHNSON, RICK (1987).....Associated Students, Incorporated  
B.A., University of the Pacific, 1978; M.A., 1982; D.P.A., University of La Verne,  
1999. Executive Director.
- JOHNSON, WILLIAM V. (1966).....Music  
B.M.E., Indiana University, 1962; M.M., University of Michigan, 1966. Professor.
- JOHNSTON, HAL (1988).....Construction Management  
B.S., Washington State University, 1970; M.S., University of Florida, 1983.  
Professor. Certified Professional Estimator, Licensed General Contractor.
- JOINES-NOVOTNY, LAURA E. (1989).....Architecture  
A.B. Vassar College, 1981; M.Arch., North Carolina State University, 1987.  
Associate Professor. Registered Architect, California.
- JONES, BARRY (2001).....Construction Management  
M.Sc., University of Aston, U.K., 1980; Ph.D., University of Southampton, U.K.,  
1999. Associate Professor. Chartered Builder (MCIOB); Member, ASCE.
- JONES, CAROLYN (1973).....Career Services  
B.S., Kansas State University, 1972; M.A., California Polytechnic State  
University, San Luis Obispo, 1975. Career Counselor.
- JONES, DANE R. (1976).....Chemistry and Biochemistry  
B.A., University of Utah, 1969; Ph.D., Stanford University, 1974. Professor.
- JONES, ROBERTA A. (2000).....Accounting  
B.B.A., Pacific Lutheran University, 1982; M.B.A., University of Houston, 1992;  
Ph.D., University of Illinois, 1996. Associate Professor.
- JONES, TERRY L. (1998).....Social Sciences  
B.A., University of California, Santa Cruz, 1978; M.A., Sonoma State University,  
1982; M.A., University of California, Davis, 1989; Ph.D., 1995. Professor.

- JUNCO, MARIA L. (1989)..... Theatre and Dance  
B.A., University of California, Los Angeles, 1985; M.A., 1988. Professor and Interim Department Chair. C.M.A. – Certified Movement Analyst.
- KACHLAKEV, DAMIAN I. (2000)..... Civil and Environmental Engineering  
B.S., University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria, 1986 and 1988; M.S., 1988; Ph.D., Oregon State University, Corvallis, 1997. Assistant Professor. Registered Professional Engineer, Bulgaria.
- KAIWI-LENTING, ANDRENE (1994)..... Student Life and Leadership  
B.A., California Polytechnic State University, San Luis Obispo, 1991. Coordinator of New Student Orientation Programs and Services.
- KALATHIL, JAMES S. (1965)..... Physics  
B.S., University of Madras, 1956; M.A., Southern Illinois University, 1963; Ph.D., University of Nevada, 1977. Professor Emeritus.
- KALISKI, MARTIN E. (1986)..... Electrical Engineering, Computer Engineering  
B.S., Massachusetts Institute of Technology, 1966; M.S., 1968; Ph.D., 1971. Professor.
- KAMALU, NGOZI (1989)..... Mechanical Engineering  
B.S., Portland State University, 1982; M.S., 1984; Ph.D., Washington State University, 1989. Associate Professor.
- KAMINAKA, M. STEPHEN (1984)..... BioResource and Agricultural Engineering  
B.S., University of California, Davis, 1968; M.S., University of Hawaii, 1973; Ph.D., Cornell University, 1977. Professor.
- KANE, STEVEN (1994)..... Disability Resource Center  
B.A., California State Polytechnic University, Pomona, 1985; M.A., University of California, Los Angeles, 1989; Ph.D., 1993. Coordinator of Assessment/Disability Management Specialist.
- KANN, DAVID J. (1969)..... English  
B.A., Brandeis University, 1964; M.A., New York University, 1966; Ph.D., Occidental College, 1971. Postdoctoral study, State University of New York, Buffalo. Professor and Department Chair, and Director of Writing.
- KASPER, ERIC P. (1997)..... Civil and Environmental Engineering  
B.S., California Polytechnic State University, San Luis Obispo, 1991; M.S., University of California, Davis, 1992; Ph.D., University of California, Berkeley, 1997. Associate Professor. Registered Professional Engineer, California.
- KATO, GORO C. (1981)..... Mathematics  
B.S., Shizuoka University, Japan, 1972; M.A., West Virginia University, 1974; Ph.D., University of Rochester, 1979. Professor.
- KEARNS, TIMOTHY J. (2000)..... Computer Science  
B.A., Boston College, 1969; M.S., University of Notre Dame, 1970; Ph.D., 1976. Associate Professor and Department Chair.
- KEELING, DAVID L. (1975)..... Chemistry and Biochemistry  
B.S., Arizona State University, 1969; Ph.D., University of Hawaii, 1974. Professor.
- KEEN, AARON W. (2002)..... Computer Science  
B.S., University of California, Davis, 1997; M.S., 2000; Ph.D., 2002. Assistant Professor.
- KEEN, DIANA M. (2002)..... Computer Science, Computer Engineering  
B.S., University of California, Davis, 1997; M.C.S., University of Illinois, Urbana-Champaign, 1999; Ph.D., University of California, Davis, 2002. Assistant 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 Emeritus. Licensed General Contractor.
- KEESEY, DOUGLAS (1988)..... English  
B.A., University of California, Berkeley, 1982; M.A., 1984; Ph.D., Princeton University, 1988. Professor.
- KEEZER, JILL (2001)..... University Foundation  
B.A., University of California, San Diego, 1984; M.B.A., San Diego State University, 1989. Sponsored Programs Director.
- KEIF, MALCOLM G. (2001)..... Graphic Communication  
B.S., California Polytechnic State University, San Luis Obispo, 1986; M.A., California State University, Long Beach, 1989; Ph.D., University of Missouri, 1995. Assistant Professor.
- KEIL, DAVID J. (1976)..... Biological Sciences  
B.S., Arizona State University, 1968; M.S., 1970; Ph.D., Ohio State University, 1973. Professor.
- KELLER, EARL C. (1987)..... Accounting  
B.B.A., University of Houston, 1963; M.B.A., University of Washington, 1970; Ph.D., University of Washington, 1973. Professor. Certified Public Accountant.
- KELLER, ELMO A., JR. (1963)..... Computer Science  
B.A., Brigham Young University, 1959; M.A., 1961; Ph.D., Iowa State University, 1972. Professor Emeritus.
- KELLERMAN, MARTIN A. (1968)..... Chemistry and Biochemistry  
B.S., Polytechnic Institute of Brooklyn, 1953; Ph.D., University of Washington, 1966. Associate Professor Emeritus.
- KELLEY, LAWRENCE R. (2002)..... Administration and Finance  
B.A., University of Akron, 1971; M.S., 1980. Vice President, Administration and Finance.
- KELLEY, MEREDITH (1986)..... Financial Aid  
B.S., University of the State of New York, Albany, 1991; M.A., California Polytechnic State University, 1994. Assistant Director, Operations.
- KELLOGG, WILLIAM C. (1983)..... Agricultural Education and Communication  
B.S., California Polytechnic State University, San Luis Obispo, 1976; M.S., 1983; Ph.D., Colorado State University, 1987. Professor.
- KELLY, JENNIFER E. (2002)..... Admissions  
B.A., University of California, Davis, 2000. Admissions Officer.
- KELLY, SHAUN F. (2002)..... BioResource and Agricultural Engineering  
B.S., Michigan State University, 1985; M.S., 1990; Ph.D., Oregon State University, 1998. Assistant Professor. Registered Professional Engineer, Oregon.
- KENNEDY, EUEL W. (1974)..... Mathematics  
B.S., East Central State University, 1962; M.S., University of Utah, 1964; Ph.D., 1972. Professor.
- KERBO, HAROLD R. (1977)..... Social Sciences  
B.A., University of Oklahoma, 1970; M.A., 1972; Ph.D., Virginia Polytechnic Institute and State University, 1975. Professor.
- KERSTEN, TIMOTHY W. (1971)..... Economics  
B.A., Sacramento State College, 1967; M.A., University of Oregon, 1970; Ph.D., 1973. Professor Emeritus.
- KESNER, BRIAN B. (1980)..... Architecture  
B.Arch., University of California, Berkeley, 1967; M.Arch., 1968. Professor. Registered Architect, Colorado.
- KHALIL, HANY M. (1987)..... Food Science and Nutrition  
B.S., University of Alexandria, Egypt, 1973; M.S. University of Illinois, Champaign-Urbana, 1983; Ph.D., 1987. Professor.
- KIANI, TANYA L. (2000)..... College of Architecture and Environmental Design  
B.A., California State University, Long Beach, 1984; M.B.A., California Polytechnic State University, San Luis Obispo, 1993. Director of Advancement.
- KING, LAURA M. (1989)..... Psychology and Child Development  
B.A., University of Arkansas, 1977; M.S., Kansas State University, 1980; Ph.D., 1989. Associate Professor.
- KING, RITA M. (1995)..... University Center for Teacher Education  
B.Ed., University of Toledo, 1964; M.Ed., 1973; Ed.Spec., 1976; Ed.D., University of San Diego, 1988. Professor.
- KINGSBURY, KEVIN B. (1996)..... Chemistry and Biochemistry  
B.S., College of William and Mary, 1986; Ph.D., Stanford University, 1993. Associate Professor.
- KIRK, COLLEEN M. (2001)..... Mathematics  
B.S., Stanford University, 1994; M.S., Southern Illinois University, Carbondale, 1995; Ph.D., Northwestern University, 1999. 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 and Capital Projects.
- KITTS, CHRISTOPHER L. (1995)..... Biological Sciences  
B.Sc., University of Auckland, New Zealand, 1984; Ph.D., University of California, Santa Cruz, 1992. Associate Professor.
- KLISCH, STEPHEN M. (2001)..... Mechanical Engineering  
B.S., University of Virginia, 1991; M.S., 1994; Ph.D., University of California, Berkeley, 1999. Assistant Professor.

- KLOOSTER, LYNETTE C. (1980)..... Information Technology Services  
B.S., Loma Linda University, 1980. Financial Assurance Specialist, Office of the CIO.
- KNABLE, ANTHONY E. (1973)..... Biological Sciences  
B.A., Blackburn College, 1965; M.A., Southern Illinois University, 1967; Ph.D., 1972. Professor.
- KNIGHT, CHARLES A. (2003)..... Biological Sciences  
B.S., Western Washington University, 1996; Ph.D., Stanford University, 2002. Assistant Professor.
- KNIGHT, RANDALL D. (1989)..... Physics  
B.S., Washington University, 1972; Ph.D., University of California, Berkeley, 1979. Professor.
- KOHLEN, KEN (1983)..... Architecture  
B.S., California State Polytechnic College, 1965; B.Arch., 1966; M.Arch., Sheffield University, England, 1982. Professor. Registered Architect: California, Maryland, and Virginia.
- KOLKAILAH, FAYSAL A. (1984)..... Aerospace Engineering  
B.S., Cairo University, Egypt, 1969; M.S., University of Cincinnati, 1978; Ph.D., Louisiana State University, 1982; additional graduate study, Cairo University. Professor. Registered Professional Engineer, Egypt.
- KOLT, LEAH (2003)..... University Advancement  
B.A., University of Mississippi, 1971; M.M.A., University of South Carolina, 1984. Director, Public Affairs.
- KONOPAK, BONNIE (2000)..... University Center for Teacher Education  
B.A., University of California, Los Angeles, 1970; M.A., 1974; Ph.D., University of California, Santa Barbara, 1984. Dean.
- KOUTSOS, ELIZABETH (2003)..... Animal Science  
B.S., University of Maryland, College Park, 1998; M.S., University of California, Davis, 2000; Ph.D., 2002. Assistant Professor.
- KRANZDORF, RICHARD B. (1971)..... Political Science  
A.B., University of Pennsylvania, 1958; M.A., 1959; M.A., University of California, Los Angeles, 1970; Ph.D., 1973. Professor Emeritus.
- KRIEGER, DANIEL E. (1971)..... History  
B.A., San Jose State College, 1965; Ph.D., University of California, Davis, 1973. Professor.
- KRISHNAN, R. (1987)..... Marketing  
B.Eng., College of Engineering, Guindy, India, 1974; M.Tech.I.E., Indian Institute of Technology, New Delhi, India, 1976; Ph.D., Virginia Polytechnic and State University, 1984. Professor.
- KRONEMANN, TREVOR (2001)..... Intercollegiate Athletics  
B.S., University of California, Irvine, 1990. Head Coach.
- KRUPP, BONNIE L. (1989)..... Institutional Planning and Analysis  
B.A., San Jose State University, 1973; M.A., California Polytechnic State University, San Luis Obispo, 1994. Deputy Director.
- KUBINSKI, A. MARK (1975)..... Biological Sciences  
B.S., Gonzaga University, 1968; M.S., Washington State University, 1971; Ph.D., 1974. Professor.
- KUCHTA, TRACI L. (2001)..... Administration and Finance  
B.A., Calvin College, 1993; J.D., Vanderbilt University, 1996. Contracts Manager, Contract and Procurement Services.
- KURFESS, FRANZ J. (2000)..... Computer Science  
M.S., Technical University of Munich, 1984; Ph.D., 1990. Associate Professor.
- LABHARD, LEZLIE A. (1967)..... Industrial Technology  
B.S., University of California, Davis, 1965; M.S., 1967. Professor.
- LAKEMAN, SANDRA DAVIS (1981)..... Architecture  
M.Arch., University of Oregon, 1977. Professor. Registered Architect, Oregon.
- LAMB, STEPHAN R. (1979)..... Student Life and Leadership  
B.A., Santa Clara University, 1973; M.A., University of the Americas, 1975; M.A., University of California, Santa Barbara, 1996. Director, Center for Community Volunteerism and Service Learning.
- LAMPMAN, GREGORY B. (1995)..... Administration and Finance  
Bachelor of Architecture, California Polytechnic State University, San Luis Obispo, 1975. Project Manager, Facility Services.
- LANCASTER, KATHRYN A. S. (1997)..... Accounting  
B.A., Fort Lewis College, 1990; M.S., Colorado State University, 1991; Ph.D., Texas A & M University, 1997. Associate Professor. Certified Public Accountant.
- LANDWEHR, ALFRED W. (1970)..... English  
B.A. University of Missouri, 1963; M.A., 1964; Ph.D., 1970. Professor Emeritus.
- LANG, ROBERT J. (1991)..... Civil and Environmental Engineering  
B.S., University of California, Davis, 1978; M.S., 1982; Ph.D., 1989. Professor. Registered Professional Engineer, California, National Council of Examiners for Engineering and Surveyors.
- LANGE, JOHN H. (1975)..... Architecture  
B.S., University of Cincinnati, 1968; M.Arch., Stanford University, 1972; Ph.D., University of Pennsylvania, 1975. Professor. Registered Architect, California.
- LANGE, KAREN F. (1989)..... Architecture  
B.Arch., California Polytechnic State University, San Luis Obispo, 1980; M.Arch., Columbia University, 1982. Professor. Registered Architect, California.
- LAPORTE, MARY L. (1985)..... Art and Design  
B.A., Washington State University, 1975; M.F.A., 1980. Professor.
- LASCOLA, RUSSELL A. (1970)..... Philosophy  
B.A., California State College, Los Angeles, 1962; M.A., University of Southern California, 1964; Ph.D., 1969. Professor.
- LASSANSKE, DANIEL E. (1975)..... Horticulture and Crop Science  
B.S., California State Polytechnic College, 1970; M.S., 1971. Professor.
- LAVER, GARY D. (1998)..... Psychology and Child Development  
B.A., University of California, Santa Cruz, 1983; M.A., Claremont Graduate University, 1987; Ph.D., 1992. Associate Professor.
- LEAPHART, JANE R. (1987)..... Academic Records  
B.A., California Polytechnic State University, San Luis Obispo, 2002. Assistant Director.
- LEE, LARRY (2002)..... Intercollegiate Athletics  
B.S., Pepperdine University, 1983; M.S., California Polytechnic State University, San Luis Obispo, 1985. Head Coach.
- 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.
- LEE, RICHARD (1999)..... City and Regional Planning  
B.A., Carlton College, 1978; M.Sc., University of California, Berkeley, 1984; M.C.P., 1986; Ph.D., 1995. Assistant Professor.
- LEE, STARR (2001)..... University Foundation  
B.A., Kansas State University, 1981; J.D., University of San Diego, 1990; M.B.A., University of Texas, Austin, 1995. General Counsel.
- LEETHAM, LORLIE (1996)..... Administration and Finance  
B.S., California Polytechnic State University, San Luis Obispo, 1991. Certified Public Accountant. Director, Fiscal Services.
- LEONG, KINGSTON L. (1970)..... Biological Sciences  
B.S., University of Hawaii, 1963; M.S., 1966; Ph.D., Oregon State University, 1970. Professor.
- LEROY, RICHARD (2000)..... International Education and Programs  
B.A., Louisiana State University, Baton Rouge, 1995. M.A., California Polytechnic State University, San Luis Obispo, 2002. Pacific Programs Director.
- LEVENSON, HARVEY ROBERT (1983)..... Graphic Communication  
B.S., Rochester Institute of Technology, 1967; M.S., South Dakota State University, 1968; Ph.D., University of Pittsburgh, 1980. Professor and Department Head.
- LEVI, DANIEL J. (1982)..... Psychology and Child Development  
B.A., Lehigh University, 1973; M.S., University of Arizona, 1979; Ph.D., 1981. Professor.
- LEVINE, ELENA (1997)..... Biological Sciences  
B.S., Yale University, 1989; Ph.D., University of California, San Francisco, 1996. Assistant Professor.
- LEWIS, GEORGE M. (1967)..... Mathematics  
B.A., Stanford University, 1961; M.A., University of Southern California, 1964; Ph.D., 1970. Professor.
- LI, ELTON Y. (1982)..... Management  
B.Commerce, National Chengchi University, Taiwan, 1975; M.S.B.A., Texas Tech University, 1978; Ph.D., 1981. Professor.

- LIDDICOAT, ALBERT A. (2002) ... Electrical Engineering, Computer Engineering B.S., California Polytechnic State University, San Luis Obispo, 1989; M.S., Stanford University, 1996; M.S., 1998; Ph.D., 2002. Assistant Professor.
- LITTLE, WILLIAM T. (1983) ... Modern Languages and Literatures B.A., California State College, Northridge, 1966; M.A., Indiana University, 1968; Ph.D., Washington University, 1973. Professor.
- LITUCHY, TERRI R. (2000) ... Management B.S., State University of New York at Binghamton, 1985; M.S., Colorado State University, 1987; Ph.D., University of Arizona, 1992. Associate Professor.
- LIU, MEI-LING (1994) ... Computer Science B.S., Iowa State University, 1972; M.S., 1974; M.S., California Polytechnic State University, San Luis Obispo, 1982; Ph.D., University of California, Santa Barbara, 1994. Associate 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.
- LOCASCIO, JAMES GASPARE (1981) ... Mechanical Engineering B.S., Newark College of Engineering, 1970; M.S., University of California, Santa Barbara, 1971; Ph.D., 1988. Associate Professor.
- LOE, NANCY E. (1982) ... University Library B.A., Aurora College, 1975; M.S., M.A., Catholic University of America, 1977. Assistant Dean, Collections Management and Special Collections.
- LONDON, BLAIR (1993) ... Materials Engineering B.S. Drexel University, 1981; M.S., Stanford University, 1983; Ph.D., 1986. Professor.
- LONG, DIANNE N. (1982) ... Political Science B.S., State University of New York College at Buffalo, 1964; M.P.A., Michigan State University, 1977; Ph.D., 1982. Professor.
- LONG, JOSEPH (1995) ... Associated Students, Incorporated B.A., California State University, Long Beach, 1968; M.S., 1977. Assistant Director, Rec Sports.
- LORD, DAVID (1985) ... Architecture B.S., University of Arizona, 1962; M.S., 1966; M.Arch., University of California, Berkeley, 1972; Ph.D., University of London, 1987. Professor.
- LOVAGLIO, ENRICA (2002) ... Art and Design M.A., University of California, Santa Barbara, 2001; M.F.A. equivalent, University of Studies of Genova, Italy, 1996. Assistant Professor.
- LOVE, TERESA (2001) ... Natural Resources Management B.A., University of Oregon, 1995; M.S., University of Tennessee, Knoxville, 1998; Ph.D., Washington State University, 2001. Assistant Professor.
- LUCAS, MICHAEL A. (1998) ... Architecture B.Arch., University of Cincinnati, 1979; M.Arch., Morgan State University, 1995. Assistant Professor. Registered Architect, Maryland.
- LUCAS, NANCY (1977) ... English B.A., Incarnate Word College, 1964; M.A., University of Illinois, 1966; Ph.D., 1973. Professor Emeritus.
- LUNA, GEORGE W. (1977) ... Mathematics B.A., University of California, Santa Barbara, 1962; M.A., University of California, Los Angeles, 1965; Ph.D., University of Washington, 1973. Professor.
- LUND, JOAN M. (1977) ... Administration and Finance B.A., California Polytechnic State University, San Luis Obispo, 1985; M.A., 1990. Manager, Human Resources.
- LUND, MICHAEL W. (1984) ... Animal Science B.S., North Dakota State University, 1970; M.S., 1981. Professor.
- LUND, ULRIC J. (2001) ... Statistics B.S., University of California, San Diego, 1990; M.S., University of California, Santa Barbara, 1993; Ph.D., 1998. Assistant 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 Leadership B.A., St. Cloud State University, 1965; M.A., University of Iowa, 1969. Associate Director, Student Life, and Coordinator, Community Services.
- LYNCH, JOSEPH (2001) ... Philosophy B.A., Virginia Commonwealth University, 1982; M.A., Claremont Graduate School, 1985; Ph.D., 1989. Assistant Professor.
- LYNN, ABRAHAM C. (1996) ... Architectural Engineering B.S., California Polytechnic State University, San Luis Obispo, 1986; M.S., University of California, Berkeley, 1991; Ph.D., 2001. Associate Professor.
- MAAS, DONALD K. (1976) ... University Center for Teacher Education B.A., University of California, Los Angeles, 1966; M.Ed., State University of New York at Buffalo, 1969; Ed.D., 1971. Professor.
- MADDREN, JESSE (1999) ... Mechanical Engineering B.S.M.E., University of California, Santa Barbara, 1985; M.S.M.E., 1988; Ph.D., 1994. Associate Professor. Registered Professional Engineer, California.
- MacCARLEY, C. ARTHUR (1988) ... Electrical Engineering, Computer Engineering B.S., University of California, Los Angeles, 1976; M.S., 1978; Ph.D., Purdue University, 1987. Professor and Director, Computer Engineering. Registered Professional Engineer, Colorado.
- MacCURDY, CAROL A. (1987) ... English B.A., Southwestern at Memphis, 1972; M.A., University of South Carolina, 1975; Ph.D., 1980. Professor.
- MacDOUGALL, NEAL A. (1997) ... Agribusiness B.A., Williams College, 1984; Ph.D., University of California, Berkeley, 1999. Assistant Professor.
- MACEDO, JOSE (2002) ... Industrial and Manufacturing Engineering B.S., Catholic University of Peru, Peru, 1982; M.S., University of California, Berkeley, 1984; Ph.D., Lehigh University, 1991. Assistant Professor.
- MACRO, KENNETH L. (2000) ... Graphic Communication B.A., Pennsylvania State University, University Park, 1993; M.A., The University of Akron, 2000. Assistant Professor.
- MADJEDI, JOHANNA J. (1992) ... Information Technology Services B.S., California Polytechnic State University, San Luis Obispo, 1988. Director, Communications and Computing Services.
- MALKIN, MICHAEL R. (1974) ... Theatre and Dance A.B., Tufts University, 1965; M.A., 1970; Ph.D., 1971. Professor.
- MALLAREDDY, H. (1981) ... Civil and Environmental Engineering B.E., Mysore University, India, 1958; M.E., University of Oklahoma, 1966; Ph.D., 1968. Professor. Registered Professional Engineer, California, Indiana and Louisiana.
- MALMBORG, FREDRICK B. (1969) ... Mechanical Engineering B.S., New York University, 1955; M.S., Columbia University, 1963. Associate Professor.
- MALONEY, MARCY (1990) ... Associated Students, Incorporated B.A., California Polytechnic State University, San Luis Obispo, 1976; M.A., 1991. Director, Rec Sports.
- MARAVIGLIA, JAMES L. (1991) ... Admissions B.S., Elmhurst College, 1976; M.S., Chicago State University, 1984. Assistant Vice President of Admissions, Recruitment and Financial Aid.
- MARK, WALTER R. (1972) ... Natural Resources Management B.S., Utah State University, 1968; M.S., Colorado State University, 1970; Ph.D., 1972. Professor. Registered Professional Forester, California.
- MARLIER, JOHN F. (1981) ... Chemistry and Biochemistry B.S., University of Wisconsin, Stevens Point, 1972; Ph.D., University of Wisconsin, Madison, 1978. Professor.
- MARLOW, MICHAEL L. (1988) ... Economics B.A., George Washington University, 1975; Ph.D., Virginia Polytechnic Institute, 1978. Professor.
- MARTIN, TAMMY S. (1998) ... Career Services B.A., Buena Vista College, 1987. Career Counselor.
- MARTINEZ, WILLIAM, JR. (1993) ... Modern Languages and Literatures B.A., San Diego State University, 1986; M.A., 1988; Ph.D., University of California, Irvine, 1993. Professor.
- MARX, STEVEN R. (1988) ... English A.B., Columbia University, 1963; A.M., 1966; Ph.D., Stanford University, 1981. Professor.

- MAXWELL, JOHN C. (1978) ..... Chemistry and Biochemistry  
B.S., Whitworth College, 1969; Ph.D., Colorado State University, 1979. Professor  
and Department Chair.
- MAY, THOMAS A. (1979) ..... Administration and Finance  
B.S., California Polytechnic State University, San Luis Obispo, 1977. Licensed  
Building Contractor (B), Licensed Landscape Contractor (C27), Certified  
Asbestos Building Inspector, Certified Asbestos Contractor/Supervisor. Project  
Manager, Facility Services.
- MAY, VICKI VANCE (1997) ..... Architectural Engineering  
B.S., University of Minnesota, Minneapolis, 1991; M.S., Stanford University,  
1992; Ph.D., Stanford University, 1996. Assistant Professor. Registered Civil  
Engineer, California.
- McBRIDE, SUSAN L. (1979) ..... University Center for Teacher Education  
B.S., University of Akron, 1963; M.S., 1972; Ph.D., 1979. Professor Emeritus.
- 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. Associate Professor. Registered  
Dietitian.
- McCALL, MICHAEL D. (1999) ..... University Advancement  
B.A., Old Dominion University, 1982; J.D., Wake Forest University, 1986.  
Director, Planned Giving and Endowments.
- McCORKLE, ROBERT E. (1962) ..... Agribusiness  
B.S., California State Polytechnic College, 1960; M.S., University of California,  
1962; additional graduate study, Oregon State University, University of  
Wisconsin. Professor Emeritus.
- McCUTCHEON, JOHN (1992) ..... Intercollegiate Athletics  
B.S., Indiana University of Pennsylvania, 1975; M.S., Ohio University, 1977.  
Director of Athletics.
- McDERMOTT, STEVEN T. (1989) ..... Speech Communication  
B.A., San Jose State University, 1973; M.A., 1976; Ph.D., Michigan State  
University, 1980. Professor.
- McDILL, JEAN M. (1973) ..... Mathematics  
B.S., University of Texas, 1957; M.S., University of Florida, 1968; Ph.D., 1971.  
Professor.
- McDONALD, LUANN A. (1983) ..... Financial Aid  
B.A., California Polytechnic State University, San Luis Obispo, 1978; M.A.,  
1981. Federal Work Study and Scholarship Programs Manager.
- McDONALD, MARGOT K. (1992) ..... Architecture  
B.A., B.S., University of California, Santa Barbara, 1980; M.Arch., University of  
Oregon, 1987. Associate Professor. AIA, Registered Architect, Oregon. NCARB  
Certificate.
- McGEE, DANIEL M. (2000) ..... College of Engineering  
B.S., California Polytechnic State University, San Luis Obispo, 1983; M.S.,  
University of Southern California, 1988; J.D., University of San Diego, 1995.  
Director of Development. Registered Professional Engineer, California. Licensed  
Attorney, State Bar of California.
- McKIBBIN, CARROLL R. (1974) ..... Political Science  
B.A., Drake University, 1959; M.A., 1960; Ph.D., University of Kansas, 1967.  
Professor Emeritus.
- McKIM, BONNIE L. (2001) ..... College of Liberal Arts  
B.S., California Polytechnic State University, San Luis Obispo, 1993; M.S., 2000;  
M.A., 2001. Academic Advisor, College of Liberal Arts.
- McKIM, PATRICK C. (1973) ..... Social Sciences  
B.A., University of California, Berkeley, 1967; M.A., 1970; Ph.D., 1973.  
Professor.
- McKINLAY, KRISTINA I. (2002) ..... Orfalea College of Business  
B.A., Westmont College, 1979; M.Div., San Francisco Theological Seminary,  
1985; M.B.A., California Polytechnic State University, San Luis Obispo, 2001.  
Academic Advisor.
- McKINSTRY, JOHN A. (1968) ..... Social Sciences  
A.B., University of California, Los Angeles, 1961; A.M., University of Southern  
California, 1963; Ph.D., 1970. Professor.
- McLAMORE, ALYSON (1991) ..... Music  
B.A., University of California at Los Angeles, 1982; M.A., 1985; Ph.D., 1991.  
Professor.
- McNEIL, ROBERT J. (1976) ..... Horticulture and Crop Science  
B.S., Rutgers University, 1967; M.S., 1970; Ph.D., 1975. Professor. Pest Control  
Advisor, California.
- McQUAID, PATRICIA (1996) ..... Management  
B.S., Case-Western Reserve University, 1978; M.B.A., Eastern Michigan  
University, 1982; M.S., Auburn University, 1988; Ph.D., Auburn University,  
1996. Associate Professor.
- MEAGHER, JAMES M. (1988) ..... Mechanical Engineering  
B.S., University of Akron, 1978; M.S., 1981; Ph.D., University of California,  
Berkeley, 1987. Professor.
- MEALY, BRYAN J. (2003) ..... Electrical Engineering, Computer Engineering  
B.S., California Polytechnic State University, San Luis Obispo, 1990; M.S., 1993;  
M.S., University of California, Santa Cruz, 1999; Ph.D., 2002. Assistant  
Professor.
- MEDINA, ELSA (2000) ..... Mathematics  
B.S., California Polytechnic State University, San Luis Obispo, 1994; M.S., 1996;  
University of Northern Colorado, 2000. Assistant Professor.
- MEHDIZADEH, A. MASOUD (1984) ..... Mechanical Engineering  
B.S., Abadan Institute of Technology, 1978; M.S., University of Southern  
California, 1980; Ph.D., 1984. Professor.
- MELLO, JOSEPH D. (1998) ..... Mechanical Engineering  
B.S., California Polytechnic State University, 1983; M.S., 1989; Ph.D., University  
of California, Davis, 1996. Associate Professor.
- MELDAL, SIGURD (1998) ..... Computer Science, Computer Engineering  
Cand. Mag., University of Oslo, Norway, 1979; Cand. Real., 1982; Dr. Scient.,  
1986. Professor.
- MELVIN, BARBARA A. (1973) ..... Administration and Finance  
B.S., California Polytechnic State University, San Luis Obispo, 1973; M.P.A.,  
University of San Francisco, 1981. Director, Human Resources.
- MENG, SHIEN-YI (1968) ..... Electrical Engineering  
B.S., Taiwan Provincial Cheng Kung University, 1953; M.S., Oklahoma State  
University, 1958; Ph.D., Ohio State University, 1968. Professor Emeritus.
- MENON, UNNY (1978) ..... Industrial and Manufacturing Engineering  
A.P., Sheffield Polytechnic, England, 1969; M.Phil., 1972; Ph.D. University of  
Nottingham, 1985. Professor. Registered Professional Engineer, Great Britain.
- METCALF, LYNN E. (1986) ..... Marketing  
B.A., University of Oregon, 1978; M.I.M., American Graduate School of  
International Management, 1981; Ph.D., University of South Carolina, 1986.  
Professor.
- 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. Professor.
- MILLÁN, JOSÉ A. (1998) ..... Student Academic Services  
B.S., California Polytechnic State University, San Luis Obispo, 1991. Upward  
Bound Program Coordinator/Academic Guidance Counselor.
- MILLER, CHARLES R. (Tad) (1987) ..... Accounting  
B.A., College of Wooster, 1970; M.B.A., University of Arizona, 1980; Ph.D.,  
1987. Professor. Certified Public Accountant.
- MILLER, MICHAEL B. (1997) ..... Art and Design  
B.A., University of California, Irvine, 1986; M.F.A., University of Southern  
California, 1988. Associate Professor.
- MILLER, SANDRA D. (1984) ..... Architecture  
B.A., Oberlin College, 1963; M.Arch., University of California, Berkeley, 1978.  
Professor. AIA, Registered Architect, California.
- MILOSEVIC, MARY (1980) ..... Career Services  
B.A., Sonoma State College, 1978; M.A., California Polytechnic State University,  
San Luis Obispo, 1988. Computing Consultant.
- MIMNAUGH, FAITH (1996) ..... Intercollegiate Athletics  
B.A., Loyola University of Chicago, 1986; M.S., North Carolina State, 1994.  
Head Coach.
- MOAZZAMI, SARA (1991) ..... Civil and Environmental Engineering  
B.S., George Washington University, 1981; M.S., University of California,  
Berkeley, 1982; Ph.D., 1987. Professor.
- MOBERG, AMIE (2000) ..... Associated Students, Incorporated  
B.A., Occidental College, 1995; M.A., New York University, 1998. Program  
Coordinator.

- MOLINE, MARK A. (1998).....Biological Sciences  
B.A., St. Olaf College, 1987; Ph.D., University of California, Santa Barbara, 1996. Associate Professor.
- MOELTER, MATTHEW J. (1998).....Physics  
B.S., University of California, Irvine, 1981; Sc.M., Brown University, 1983; Ph.D., 1989. Assistant Professor.
- MONTECALVO, JOSEPH (1983).....Food Science and Nutrition  
B.S., University of Rhode Island, 1972; M.S., 1975; Ph.D., 1979. Professor.
- MONTGOMERY, WAYNE R. (1982).....University Library  
A.B., University of California, Berkeley, 1977; M.L.S., University of California, Los Angeles, 1981; M.A., California Polytechnic State University, San Luis Obispo, 1988. Senior Assistant Librarian.
- MOODY, LYNN E. (1999).....Earth and Soil Sciences  
B.S., University of Cincinnati, 1974; M.S., California Polytechnic State University, San Luis Obispo, 1989; Ph.D., University of California, Riverside, 1993. Assistant Professor.
- MOORE, CAROLE M. (1980).....Career Services  
B.A., California Polytechnic State University, San Luis Obispo, 1976; M.A., 1978. Career Counselor/Cooperative Education Coordinator.
- MOOS, THOMAS (2000).....Intercollegiate Athletics  
B.Sc., California State University, Fullerton, 1981; J.D., San Joaquin College of Law, 1984. Head Coach.
- MORENO, J. KELLY (1991).....Psychology and Child Development  
B.S., University of California, Santa Barbara, 1980; M.S., University of Utah, 1985; Ph.D., 1988. Professor. Licensed Psychologist, California.
- MOREY, KRISHNAKUMAR (KRIS) S. (1970).....Food Science and Nutrition  
B.S., Nagpur University, India, 1955; M.S., 1958; M.A., University of California, San Francisco, 1963; Ph.D., University of California, Berkeley, 1967. Professor Emeritus.
- MORI, BARBARA L. ROWLAND (1986).....Social Sciences  
B.A., Hofstra University, 1967; M.A., University of Hawaii, 1983; Ph.D., 1987. Professor.
- MORITZ, MAX A. (1999).....Social Sciences  
B.A., University of California, San Diego, 1987; M.A., Boston University, 1993; Ph.D., University of California, Santa Barbara, 1999. Assistant Professor.
- MORRIS, ANDREW D. (1998).....History  
B.S., Harvey Mudd College, 1991; M.A., 1996; Ph.D., University of California, San Diego, 1998. Assistant Professor.
- MORRISON, KENT E. (1979).....Mathematics  
B.A., University of California, Santa Cruz, 1971; Ph.D., 1977. Professor and Department Chair.
- 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. Professor.
- MORTON, CORNEL N. (2002).....Student Affairs  
B.S., Tennessee State University, 1970; M.A., 1974; Ph.D., Kent State University, 1983. Vice President for Student Affairs.
- MOTTMANN, JOHN (1974).....Physics  
B.A., University of California, Los Angeles, 1966; M.A., 1967; Ph.D., 1972. Professor.
- MUELLER, GERRY K. (1984).....Office of the President  
B.A., University of Hawaii, 1972. Presidential Aide.
- MUELLER, JAMES R. (1980).....Mathematics  
B.A., University of Wisconsin, 1975; Ph.D., California Institute of Technology, 1982. Professor.
- MULLER, BROOK (2000).....Architecture  
B.A., Brown University, 1987; M.Arch., University of Oregon, 1992. Assistant Professor.
- MULLIGAN, PATRICIA A. (1988).....University Center for Teacher Education  
B.A., Arizona State University, 1971; M.Ed., Kent State University, 1977; M.A., Northern Arizona University, 1978; Ph.D., Arizona State University, 1987. Professor.
- MULLISEN, RONALD S. (1977).....Mechanical Engineering  
B.S., California State Polytechnic College, 1969; M.Engr., 1976; Ph.D., Colorado State University, 1983. Professor. Registered Professional Engineer, California.
- MUMFORD, FRANK (1999).....University Foundation  
B.S., Eastern Illinois University, 1976. Executive Director.
- MUNROE, PATRICK A. (1980).....Journalism  
A.O.C.A., Ontario College of Art, 1976; M.F.A., Virginia Commonwealth University, 1986. Professor.
- MURRAY, RANDALL L. (1977).....Journalism  
B.S., Ohio University, 1960; M.S., 1961; Ph.D., University of Minnesota, 1973. Professor Emeritus.
- MURRAY, WILLIAM R. (1999).....Mechanical Engineering  
B.S., University of Texas, Austin, 1975; M.S., 1976; Ph.D., Massachusetts Institute of Technology, 1988. Associate Professor.
- MYERS, LEONARD D. (1984).....Computer Science, Computer Engineering  
B.S., Illinois State University, 1963; M.S., 1966; Ph.D., University of Kansas, 1977. Professor.
- NAFISI, AHMAD (1983).....Electrical Engineering  
B.S., Arya Mehr University of Technology, Iran, 1975; M.S., University of Southern California, 1977; Ph.D., 1983. Professor.
- NAHVI, MAHMOOD (1987).....Electrical Engineering  
B.S., University of Teheran, 1959; M.S., University of Michigan, 1963; Ph.D., Massachusetts Institute of Technology, 1967. Professor.
- NAKAMURA, RAYMOND M. (1980).....Kinesiology  
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  
B.A., University of Hawaii, 1961; M.S., 1965; Ph.D., University of British Columbia, 1970. Professor.
- NARETTO, EDWARD M. (1979).....Administration and Finance  
B.S., California State Polytechnic College, 1967. Director, Facility Services.
- NEEL, JOEL (2002).....Administration and Finance  
B.A., California State University, Hayward, 1989; MCRP, California Polytechnic State University, San Luis Obispo, 1993. Assistant Director, Capital and Environmental Planning, Facilities Planning and Capital Projects.
- NEGRANTI, ROBERT M. (1974).....Health and Counseling Services  
B.S., San Jose State College, 1967. Projects Coordinator, Counseling Services.
- NELSON, CRAIG J. (1994).....University Advancement  
B.S., California Polytechnic State University, San Luis Obispo, 2000. Director, Cal Poly Fund.
- NELSON, LINDEN L. (1970).....Psychology and Child Development  
B.A., University of Northern Iowa, 1966; Ph.D., University of California, Los Angeles, 1970. Professor.
- NELSON, YARROW M. (1999).....Civil and Environmental Engineering  
B.S., University of California, Berkeley, 1979; M.S., Cornell University, 1992; Ph.D., 1997. Associate Professor.
- NEUENHOFER, ANSGAR (2001).....Architectural Engineering  
B.S., Technical University at Aachen, Germany, 1988; M.S., University of California, Berkeley, 1991; Ph.D., Technical University at Aachen, Germany, 1994. Assistant Professor.
- NEUHAUS, TOM (1998).....Food Science and Nutrition  
B.S., Oberlin College, 1975; M.S., University of Maryland, 1982; Ph.D., Cornell University, 2000. Assistant Professor.
- NICKELSEN, NONA (NICKY) (2000).....Student Affairs  
B.S., California Polytechnic State University, San Luis Obispo, 1995. Parent Program Coordinator.
- NICO, PHILLIP L. (2000).....Computer Science, Computer Engineering  
B.A., University of California, Berkeley, 1991; M.S., University of California, Davis, 1994; Ph.D., 2000. Assistant Professor.
- NICOVICH, RALPH R. (1978).....Electrical Engineering  
B.S., California Polytechnic State University, San Luis Obispo, 1975; M.S., 1983. System Specialist, Network Analyst and DLAN Administrator.
- NEBUHR, DAVID (1999).....Materials Engineering  
B.S., California Polytechnic State University, San Luis Obispo, 1993; Ph.D., Oregon Graduate Institute, 1997. Assistant Professor.

- NIKU, SAEED 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.
- NOEL, JAY E. (1990).....Agribusiness  
B.S., University of California, Davis, 1973; M.S., 1974; Ph.D., 1979. Professor.
- NOLAND, JAYMIE J. (1999).....Animal Science  
B.S., Colorado State University, 1981; D.V.M., Colorado State University, 1987.  
Associate Professor.
- NOTERMANN, ELLEN M. (1979).....College of Architecture and  
Environmental Design  
B.S., California Polytechnic State University, San Luis Obispo, 1990; M.A., 1999.  
Director of Advising Center.
- NOVAK, MATTHEW S. (1989).....English  
B.S., Cleveland State University, 1974; B.A., 1976; M.A., 1978; Ph.D., Case  
Western Reserve University, 1989. Professor.
- NOVO, DIANNE (1998).....Student Academic Services  
B.A., California State University, Sacramento, 1993; M.A., California Polytechnic  
State University, San Luis Obispo, 1996. Academic Advisor/Instructor, Math  
Workshop Program Coordinator, Academic Skills Center.
- NOYES, O. ROBERT (1974).....Food Science and Nutrition  
B.A., Norwich University, 1963; M.Ed., University of Georgia, 1970; Ph.D.,  
1974. Professor Emeritus.
- 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.
- NUÑEZ, ALBERT (1991).....Admissions  
B.A., California Polytechnic State University, San Luis Obispo, 1996. Assistant  
Director.
- OBRYANT, CAMILLE P. (1999).....Kinesiology  
B.A., Smith College, 1983; M.S., 1986; Ph.D., Ohio State University, 1996.  
Assistant Professor.
- OCHS, NANCY C. (1977).....Agribusiness  
B.S., St. Louis University, 1966; M.Acct., University of Arizona, 1975. Professor.  
Certified Public Accountant, Certified Financial Planner.
- OFFERMANN, GENE P. (1970).....Horticulture and Crop Science  
B.S., Southern Illinois University, 1964; M.S., 1965; Ph.D., University of  
California, Davis, 1970. Professor.
- OLABI, AMMAR A. (2002).....Food Science and Nutrition  
B.S., American University of Beirut, 1992; M.S., 1994; Ph.D., Cornell University,  
2000. Assistant Professor.
- OLVERA, NELDA (1993).....Student Academic Services  
B.A., California Polytechnic State University, San Luis Obispo, 1993; M.A.,  
1994. Academic Advisor/Instructor; Director, Educational Talent Search.
- O'NEILL, COLLEEN (1999).....Ethnic Studies  
B.A., Pomona College, 1983; M.A., New Mexico State University, 1989; Ph.D.,  
Rutgers University, 1997. Assistant Professor.
- OPAVA-STITZER, SUSAN (1993).....Research and Graduate Programs  
B.S., College of Mt. St. Vincent, New York, 1968; Ph.D., University of Michigan,  
1972. Dean.
- ORTH, MICHAEL P. (1967-69) (1970).....English  
B.A., University of California, Santa Barbara, 1959; M.A., San Francisco State  
College, 1963; Ph.D., Claremont Graduate School, 1974. Professor Emeritus.
- OSMOND, PENNY K. (2000).....Graphic Communication  
B.S., Ferris State University, 1986; M.E., University of Nevada, Las Vegas, 1992;  
Ph.D., University of Idaho, 2002. Assistant Professor.
- OTOOLE, FREDERICK J. (1972).....Philosophy  
B.A., University of California, Los Angeles, 1966; M.A., University of California,  
Davis, 1968; Ph.D., 1972. Professor Emeritus.
- OVERMAN, DOUG (1976).....Administration and Finance  
B.S. California Polytechnic State University, San Luis Obispo, 1976. Assistant  
Director, Facility Services.
- OWEN, FRANKLIN C. (1998).....Mechanical Engineering  
BSME, Mississippi State University, 1978; MSME, Oregon State University,  
1983; Ph.D., University of Texas, 1998. Associate Professor. Registered  
Professional Engineer, Maine.
- OZAWA, KENNETH S. (1963).....Physics  
B.S., John Carroll University, 1959; M.S., 1960; Ph.D., University of Kansas,  
1975. Professor Emeritus.
- PAL, NIRUPAM (1995).....Civil and Environmental Engineering  
B.S., Calcutta University, India, 1984; M.S., 1986; Ph.D., New Jersey Institute of  
Technology, 1993. Associate Professor.
- PALMER, KENNETH F. (1984).....University Center for Teacher Education  
B.S., Iowa State University, 1964; M.S., 1969; Ph.D., 1972. Professor.
- PANETTA, DANIEL L. (1986).....Architecture  
B.S., California Polytechnic State University, San Luis Obispo, 1976; M. Arch.,  
University of California, Berkeley, 1986. Professor. Registered Landscape  
Architect, California. Registered Architect, California.
- PAPAKYRIAZIS, PANAGIOTIS A. (1971).....Economics  
B.A., Athens School of Economics and Business Science, 1964; Ph.D., University  
of California, San Diego, 1974. Professor Emeritus.
- PARKER, LEE R. (1974).....Biological Sciences  
B.S., Brigham Young University, 1966; M.S., 1968; Ph.D., Michigan State  
University, 1976. Professor.
- PARKER-KENNEDY, CHRIS (1989).....Disability Resource Center  
B.A., University of Kansas, Lawrence, 1975; M.A., California Polytechnic State  
University, San Luis Obispo, 1999. Disability Management Specialist/Deaf  
Services Specialist.
- PARKS, DENNIS R. (2000).....Cal Poly Continuing Education  
B.A., Baldwin-Wallace College, 1975; M.A., Kent State University, 1977; Ed.D.,  
University of Virginia, 1982. Dean.
- PASCUAL, CHRISTOPHER C. (2000).....Mechanical Engineering  
B.S., Cornell University, 1985; M.S., Georgia Institute of Technology, 1996;  
Ph.D., 1999. Associate Professor.
- PATTERSON, W. KEITH (1998).....Horticulture and Crop Science  
B.S., B.A., University of Arkansas, 1969; M.S., 1978; Ph.D., University of  
Missouri, 1985. Associate Professor.
- PATTON, JAMES SCOTT (2002).....Mechanical Engineering  
B.S., Georgia Institute of Technology, 1979; M.S., California Institute of  
Technology, 1980; Ph.D., 1985. Associate Professor.
- PATTON, LINDA J. (1991).....Mathematics  
B.A., University of California, San Diego, 1985; M.A., 1987; Ph.D., 1991.  
Professor.
- PAULSON, HASMIK GHARIBYAN (2000).....Computer Science  
M.S., Yerevan State University, Republic of Armenia, USSR, 1981; Ph.D., 1991.  
Associate Professor.
- PEACH, DAVID (1987).....Management  
B.Sc., Ohio University, 1962; M.B.A., 1964; D.B.A., Harvard University, 1969.  
Professor.
- PECK, ROXY L. (1979).....College of Science and Mathematics,  
Statistics  
B.A., University of California, Riverside, 1972; Ph.D., 1979. Associate Dean and  
Professor.
- PEDERSEN, MARY E. (1981).....Food Science and Nutrition  
B.A., University of California, Santa Barbara, 1973; M.S., University of  
California, Los Angeles, 1976; Ph.D., 1980. Professor and Department Head.
- PENDERGAST, WILLIAM R. (2000).....Management  
B.A., University of Notre Dame, 1966; M.A., Columbia University, 1968; Ph.D.,  
1971. Professor.
- PERACCA, MARY L. (2001).....Health and Counseling Services  
M.A., Antioch University, 1991; MFT, 1997. Counselor/Drug and Alcohol  
Specialist.
- PEREZ, MARINA E. (1975).....Health and Counseling Services  
B.S., University of the Philippines, 1961. N.P., California Polytechnic State  
University, San Luis Obispo, 1976. Nurse Practitioner. Head, Nursing Services.

- 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.
- PESACRETA, SANDRA J. (2001) ..... Health and Counseling Services  
B.S., California State University, Dominguez Hills, 1993; Masters in Nursing and  
Family Nurse Practitioner, University of California, Los Angeles, 1995. Nurse  
Practitioner. ANCC Board Certified, 1996.
- PETERS, RALPH A. (1969) ..... Physics  
B.S., Georgetown University, 1949; M.S., Pennsylvania State University, 1951;  
Ph.D., Fordham University, 1967. Professor.
- PHARAOH, CLAYTON (1986) ..... Architectural Engineering  
B.S., California Polytechnic State University, San Luis Obispo, 1972; M.S., 1975.  
Associate Professor. Registered Civil and Structural Engineer, California.
- PHILLIPS, JOHN C. (1974) ..... Horticulture and Crop Science  
B.S., Washington State University, 1967; M.S., Colorado State University, 1969;  
Ph.D., Oregon State University, 1974. Professor. Pest Control Advisor, California.
- PIERCE, MELISSA (2001) ..... Admissions  
B.S., California Polytechnic State University, San Luis Obispo, 1998; M.A., 2000.  
Admissions Officer.
- PIETERS, MARILYN (1979) ..... Health and Counseling Services  
R.N., DeAnza Community College, 1973; F.N.P. Stanford University, 1990.  
Nurse Practitioner.
- PIIRTO, 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 and Department Head.  
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. Registered Professional  
Forester, California.
- PINARD, LEO W., II (1970) ..... Social Sciences  
B.A., University of Santa Clara, 1962; M.A., University of Notre Dame, 1963;  
Ph.D., 1971. Professor.
- 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  
B.Arch., University of Melbourne, Australia, 1964; M.Bldg.Sci., University of  
Sydney, 1967; Ph.D., 1970. Professor, Graduate Coordinator. Registered  
Architect, Australia.
- POKORNY, 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  
B.A., University of Connecticut, 1960; M.A., 1966. Career Counselor.
- PONCE, PATRICIA (1988-1993) (1998) ..... Academic Programs  
B.A., San Diego State University, 1985; M.S., University of Rhode Island, 1987;  
M.A., University of California, Los Angeles, 1995; Ph.D., 2002. Coordinator,  
Accelerated Academic Programs.
- POURAGHABAGHER, 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  
B.A., Fresno State College, 1971; M.A., California State University, Fresno,  
1973; Ph.D., University of Oregon, 1979. Professor.
- PROCTOR, ANDREW J. (1973) ..... Kinesiology  
B.S., California State Polytechnic College, 1970; M.S., 1971; Ph.D., University of  
Utah, 1978. Professor.
- PUHL, SUSAN M. (1999) ..... Kinesiology  
B.S. Ed., Southeast Missouri State University, 1996; M.A.T., 1978; Ph.D.,  
Pennsylvania State University, 1986. Associate Professor.
- PUIG-SUARI, JORDI (1998) ..... Aerospace Engineering  
B.S., Purdue University, 1988; M.S., 1990; Ph.D., 1993. Professor.
- QENANI-PETRELA, EIVIS (2002) ..... Agribusiness  
B.S., University of Tirana, Albania, 1987; M.A., Washington State University,  
1998; Ph.D., 2002. Assistant Professor.
- RAGSDALE, DAVID O. (1991) ..... Administration and Finance  
B.S., California Polytechnic State University, San Luis Obispo, 1984. Registered  
Environmental Health Specialist. Environmental Health and Safety Manager, Risk  
Management.
- RAINEY, PAUL E. (1987) ..... College of Engineering, Materials Engineering  
B.S.M.E., B.S.Met.E., Purdue University, 1967; M.S., Massachusetts Institute of  
Technology, 1968; Ph.D., Texas A & M University, 1981. Professor, Industrial  
and Manufacturing Engineering and Materials Engineering, and Associate Dean.  
Registered Professional Engineer, Texas.
- RALSTON, DAVID W. (2002) ..... Health and Counseling Services  
B.S., University of California, Irvine, 1969. M.D., University of Southern  
California, 1973. Physician.
- RAMEZANI, CYRUS A. (1999) ..... Finance  
B.A., University of California, Santa Cruz, 1984; M.S., 1988; M.S., University of  
California, Berkeley, 1991; Ph.D., 1992. Professor.
- RAMIREZ, RICHARD M. (1975) ..... Administration and Finance  
B.B.A., New Mexico State University, 1971; M.B.A., California Polytechnic State  
University, San Luis Obispo, 1998. Associate Vice President for Finance.
- RANDAZZO, ANTHONY JAMES (1977) ..... Industrial Technology  
B.A., San Jose State College, 1965; M.A., 1968; Ph.D., Washington State  
University, 1976. Professor.
- RAWLINGS, DON (1980) ..... Mathematics  
B.S., Arizona State University, 1974; M.A., University of California, San Diego,  
1976; Ph.D., 1978. Professor.
- REGIER, RONALD (1987) ..... College of Liberal Arts  
B.A., University of Puget Sound, 1973; M.F.A., Michigan State University, 1977;  
M.A., University of Wisconsin, 1987. Managing Director, Performing Arts  
Center.
- REICH, JONATHAN (2001) ..... Architecture  
B.A., University of Washington, Seattle, 1979; B.A.E.D., 1979; M.Arch.,  
University of California, Berkeley, 1983. Associate Professor. AIA, Registered  
Architect, California and Washington.
- REIF, GARY D. (1967) ..... Dairy Science  
B.S., Kansas State University, 1962; M.S., University of Nebraska, 1964; Ph.D.,  
Iowa State University, 1967. Professor Emeritus.
- REIN, STEVEN (1998) ..... Statistics  
B.A., University of California, Los Angeles, 1987; M.A., University of California,  
Berkeley, 1989; Ph.D., 1993. Assistant Professor.
- REINHART, JAMES (2002) ..... University Foundation  
B.S.B.A., Bryant College, 1978; M.B.A., National University, 1982. Business  
Development Director.
- REYNOLDS, NANCY J. (1986) ..... Administration and Finance  
B.S., California Polytechnic State University, San Luis Obispo, 1977. Assistant  
Director, Fiscal Services.
- RICE, MARGARET (PEGGY) S. (1996) ..... Chemistry and Biochemistry  
B.S., University of California, Los Angeles, 1979; Ph.D., University of Oregon,  
1990. Associate Professor.
- RICE, ROBERT P., JR. (1995) ..... Horticulture and Crop Science  
B.S., University of Georgia, 1973; M.S., Michigan State University, 1974; Ph.D.,  
1977. Professor.
- RICE, THOMAS J., JR. (1981) ..... Earth and Soil Sciences  
B.S., University of Wisconsin, Madison, 1974; M.S., Montana State University,  
1976; Ph.D., North Carolina State University, 1981. Professor and Department  
Chair. Certified Professional Soil Scientist.
- RICHARDS, THOMAS L. (1969) ..... Biological Sciences  
B.S., California State College, Long Beach, 1964; M.A., 1966; Ph.D., University  
of Maine, 1969. Professor Emeritus.
- RICKARD, BRADLEY J. (2003) ..... Agribusiness  
B.C., University of Guelph, 1996; M.S., 1998; Ph.D., University of California,  
Davis, 2002. Assistant Professor.

- RICHISON, JEANNINE (2000)** ..... English  
B.A., Point Loma College, 1974; M.A., California State University, San Bernardino, 1979; Ph.D., New York University, 1995. Assistant Professor.
- RIDGELY, JOHN R. (2001)** ..... Mechanical Engineering  
B.S., University of California, Berkeley, 1986; M.S., 1988; Ph.D., 2001. Assistant Professor.
- RIEDLSPERGER, MAX E. (1969)** ..... History  
A.B., Wabash College, 1959; M.A., University of Michigan, 1961; Ph.D., University of Colorado, 1969. Professor Emeritus.
- RIENER, KENNETH (1983)** ..... Finance  
B.S., University of Idaho, 1968; M.S., Purdue University, 1969; Ph.D., 1976. Professor and Area Chair.
- RIGLER, MARY (SAM) N. (1994)** ..... Chemistry and Biochemistry  
B.S., Oakland University, 1982; Ph.D., Wayne State University, 1994. Associate Professor.
- RIHAL, SATWANT S. (1969)** ..... Architectural Engineering  
B.S., University of Delhi, India, 1961; M.S., University of Minnesota, 1964; Ph.D., University of New Mexico, 1969. Professor. Registered Civil Engineer, California.
- RINALDA-ZUNIGA, CHARLOTTE (1999)** ..... Career Services  
B.A., Southern Connecticut State University, New Haven, 1990; M.A., California Polytechnic State University, San Luis Obispo, 1994. Career Counselor.
- RINZLER, PAUL (1997)** ..... Music  
B.A., University of California at Santa Barbara, 1977; M.A., 1980; D.A., University of Northern Colorado, 1988. Associate Professor.
- RISSER, JOSEPH C. (1982)** ..... Administration and Finance  
B.A., Humboldt State College, 1971; M.A., Humboldt State University, 1978. Associate in Risk Management for Public Entities. Risk Manager.
- RITTER, MATTHEW K. (2003)** ..... Biological Sciences  
B.S., University of California, Santa Barbara, 1996; Ph.D., University of California, San Diego, 2002. Assistant Professor.
- RIZZOLI, JANET L. (1976-77)(1996)** ..... Academic Records  
B.S., University of California, Davis, 1980. Articulation Officer.
- ROBERTS, GREGORY (1990)** ..... Student Academic Services  
B.A., Idaho State University, 1978; M.Ed., University of Idaho, 1979. Director, Student Support Services.
- ROBERTS, MATTHEW J. (1997)** ..... Administration and Finance  
B.S., California Polytechnic State University, San Luis Obispo, 1981; M.B.A., Golden Gate University, 1986. Director, Contract and Procurement Services.
- ROBINS, JAMES A. (2000)** ..... Global Strategy and Law  
B.A., Columbia University, 1969; M.A., University of Chicago, 1977; Ph.D., University of California, Los Angeles, 1989. Associate Professor.
- ROBISON, JOHN C. (1985)** ..... Accounting  
B.A., Whittier College, 1968; M.B.A., University of California, Los Angeles, 1971; Ph.D., University of Arizona, 1982. Professor. Certified Public Accountant.
- RODRIGUEZ, VIVIAN J. (2002)** ..... Orfalea College of Business  
B.S., California Polytechnic State University, San Luis Obispo, 1986. Director of Advancement.
- ROGERS, ERIKA (1998)** ..... Computer Science  
B.S., University of Waterloo, 1984; M.S., Georgia Institute of Technology, 1985; Ph.D., 1992. Professor.
- ROGERS, JOHN C. (1986)** ..... Marketing  
B.S., Point Park College, 1970; M.B.A., Pennsylvania State University, 1972; Ph.D., Virginia Polytechnic Institute and State University, 1979. Professor.
- ROSENTHAL, BIANCA (1971)** ..... Modern Languages and Literatures  
B.S., University of Washington, 1952; M.A., 1966; Ph.D., 1970. Professor Emeritus.
- ROSS, DAVID D. (1999)** ..... Information Technology Services  
B.S., Pepperdine University, 1990; M.S., California State University, Sacramento, 1998. Director, Application and Information Management.
- ROSSMAN, ALLAN J. (2001)** ..... Statistics  
B.A., Geneva College, 1984; M.S., Carnegie Mellon University, 1986; Ph.D., 1989. Associate Professor.
- RUBBA, JOHANNA E. (1995)** ..... English  
B.A., Rutgers University, 1975; M.A., Southern Illinois University, 1986; Ph.D., University of California, San Diego, 1993. Associate Professor.
- RUEF, MICHAEL (1999)** ..... University Center for Teacher Education  
B.A., University of San Francisco, 1966; M.A., San Diego State University, 1992; Ph.D., University of Kansas, 1997. Assistant Professor.
- RUEHR, THOMAS A. (1974)** ..... Earth and Soil Sciences  
B.S., Ohio State University, 1966; M.S., Iowa State University, 1970; Ph.D., Colorado State University, 1976. Professor.
- RUGGLES, JOANNE BEAULE (1973)** ..... Art and Design  
B.F.A., Ohio State University, 1968; M.F.A., 1970. Professor.
- RUGGLES, PHILIP K. (1966) (1971)** ..... Graphic Communication  
B.S., West Virginia University, 1965; M.S., South Dakota State University, 1966. Professor.
- RUMMELL, KATHRYN (1997)** ..... English  
B.A., Centre College, 1990; M.A., University of North Carolina at Chapel Hill, 1992; Ph.D., 1997. Assistant Professor.
- RUSSELL, CRAIG H. (1982)** ..... Music  
B.M., University of New Mexico, 1973; M.M., 1976; Ph.D., University of North Carolina, 1981. Professor.
- RUSSELL, JOHN G. (1968)** ..... Music  
B.A., Fresno State College, 1959; M.A., California State University, Chico, 1968. Professor Emeritus.
- 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 Child Development  
B.A., San Diego State University, 1975; M.A., Bowling Green State University, 1978; Ph.D., 1980. Professor.
- RYUJIN, DONALD H. (1989)** ..... Psychology and Child Development  
B.A., Stanford University, 1968; M.A., University of Michigan, 1972; Ph.D., 1983. Professor and Department Chair.
- SAENZ, RICHARD A. (1980)** ..... Physics  
A.B., University of California, Berkeley, 1972; M.S., Cornell University, 1975; Ph.D., 1977. Professor and Department Chair.
- SAGHRI, JOHN A. (2000)** ..... Electrical Engineering, Computer Engineering  
B.S., California Polytechnic State University, San Luis Obispo, 1973; M.S., Oregon State University, 1975; Ph.D., Rensselaer Polytechnic Institute, 1979. Assistant Professor.
- SALTZMAN, JUDY D. (1975)** ..... Philosophy  
B.A., San Jose State College, 1963; M.A., University of California, Berkeley, 1965; M.A., 1973; Ph.D., University of California, Santa Barbara, 1977; Fulbright scholar, Freie Universität, Berlin, 1970-71. Professor.
- SANDIGE, RICHARD S. (1998)** ..... Electrical Engineering, Computer Engineering  
B.S., West Virginia University, 1963; M.S., 1969; Ph.D., Texas A & M University, 1978. Professor. Registered Professional Engineer, West Virginia.
- SCHAFER, CAROLE L. (1987)** ..... Housing and Residential Life  
B.A., Alfred University, 1985; M.S., 1987. Associate Director of Housing/Director of Residential Life and Education.
- SCHAFFNER, ANDREW (1997)** ..... Statistics  
B.S., California Polytechnic State University, San Luis Obispo, 1992; M.S., University of Washington, 1994; Ph.D., 1997. Assistant Professor.
- SCHAFFNER, DAVID J. (1972)** ..... Agribusiness  
B.S., University of California, Davis, 1964; M.B.A., University of California, Berkeley, 1970; M.S., California Polytechnic State University, San Luis Obispo, 1978; Ph.D., Golden Gate University, 1980. Professor.
- SCHECHTER, MONICA (2000)** ..... International Education and Programs  
B.A., University of Minnesota, 1984; M.P.A., University of Colorado, Denver, 1993. Associate Director, Study Abroad and CSU International Programs.
- SCHLICK, STEVE (1996)** ..... Intercollegiate Athletics  
B.A., University of California, Santa Barbara, 1979; M.S., University of Notre Dame, 1994. Head Coach.
- 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. Professor.

- SCHOONOVER, ROD W. (1994)..... Chemistry and Biochemistry  
B.S., University of Kansas, Lawrence, 1986; M.S., University of Michigan, Ann Arbor, 1989; Ph.D., 1993. Associate Professor.
- SCHULTZ, CRAIG J. (1989)..... Information Technology Services  
B.S., California Polytechnic State University, Pomona, 1982; B.S., San Jose State University, 1989; M.B.A., California Polytechnic State University, San Luis Obispo, 1992. Director, User Support Services.
- SCHULTZ, NED W. (1976)..... Psychology and Child Development  
B.S., Pennsylvania State University, 1973; M.A., 1975; Ph.D., Ohio State University, 1976. Professor.
- SCHUMANN, THOMAS G. (1971)..... Physics  
B.S., California Institute of Technology, 1958; M.A., University of California, Berkeley, 1960; Ph.D., 1965. Professor Emeritus.
- SCHUSTER, PETER J. (2003)..... Mechanical Engineering  
B.A., Cornell University, 1991; M.S., Stanford University, 1992; Ph.D., Michigan Technology University, 2000. Assistant Professor.
- SCHWARTZ, DEBORA (1996)..... English  
A.B., Bryn Mawr College, 1982; M.A., Princeton University, 1986; Ph.D., 1994. Associate Professor.
- SCOTT, KENNETH C. (1975)..... Agribusiness  
B.S., Brigham Young University, 1970; Ph.D., Washington State University, 1975. Professor and Department Chair.
- SCRIVEN, TALMAGE ERNEST (1980)..... Philosophy  
B.A., University of South Florida, 1976; M.A., 1977; Ph.D., University of Southern California, 1980. Professor.
- SCZECZOWSKI, JEFFREY G. (1994)..... Civil and Environmental Engineering  
B.S., University of Colorado, Boulder, 1985; M.S., North Carolina State University, 1988; Ph.D., University of Colorado, Boulder, 1994. Associate Professor.
- SEIFODDINI, AHMAD K. (1984)..... Industrial and Manufacturing Engineering  
B.S., Abadan Institute of Technology, 1965; M.S., Oklahoma State University, 1973; Ph.D., 1976. Professor.
- SEIM, EDWIN C. (1978)..... Horticulture and Crop Science  
B.S., University of Missouri, 1954; M.S., University of Minnesota, 1966; Ph.D., 1970. Professor.
- SELBY, MICHAEL J. (1991)..... Psychology and Child 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. Professor. Licensed Psychologist, California.
- SENA, JAMES (1987)..... Industrial Technology, Management  
B.S., Xavier University of Ohio, 1961; M.B.A., 1964; M.S., University of Dayton, 1968; D.B.A., University of Kentucky, 1972. Professor and Area Chairs.
- SETTLE, ALLEN K. (1970)..... Political Science  
B.A., University of California, Santa Barbara, 1966; M.A., 1967; Ph.D., 1970. Professor.
- SHABAN, ALI O. (1984)..... Electrical Engineering  
B.S., University of Tripoli, 1974; M.S., University of Southern California, 1978; Ph.D., Oregon State University, 1985. Professor.
- SHAFFER, MARY K. (1980)..... Information Technology Services  
B.A., Sonoma State University, 1974. Policy and Program Assurance Specialist, Office of the CIO.
- SHAFFER, RICHARD A. (1974)..... Social Sciences  
B.A., Stanislaus State College, 1971; M.A., University of Notre Dame, 1974; Ph.D., 1975. Professor and Department Chair.
- SHAH, RAMESH T. (1969)..... Mechanical Engineering  
B.E., Maharaja Sayajirao University of Baroda, India; Dr. Ing., Hochschule für Schwermaschinenbau, Magdeburg, East Germany, 1959. Professor. Registered Professional Engineer, California.
- SHANI, ABRAHAM B. (Rami) (1983)..... Management  
B.A., University of Tel Aviv, 1972; M.A., 1978; Ph.D., Case Western Reserve University, 1981. Professor.
- SHANK, CAROLYN B. (1974)..... Natural Resources Management  
B.S., California State Polytechnic College, 1969; M.S., 1975; Ed.D., University of Utah, 1981. Professor.
- SHAPIRO, JONATHAN (1998)..... Mathematics  
B.A., University of California, Berkeley, 1988; Ph.D., 1995. Assistant Professor.
- SHARP, HARRY, JR. (1975)..... Speech Communication  
A.B., College of the Pacific, 1959; M.S., Purdue University, 1961; Ph.D., 1967. Professor Emeritus.
- SHARPE, JOHN P. (1995)..... Physics  
B.Sc., Edinburgh University, 1985; Ph.D., 1989. Assistant Professor.
- SHEARER, DEVON (1990)..... Cal Poly Continuing Education  
B.S., California Polytechnic State University, San Luis Obispo, 1984. Director, Conference Services.
- SHEIK, HABIB (1967)..... English  
B.S., Fresno State College, 1959; A.B., 1960; M.A., California State Polytechnic College, 1961; M.A., University of California, Los Angeles, 1966; Ph.D., University of Nebraska, 1979. Professor Emeritus.
- SHELTON, MARK D. (1982)..... College of Agriculture  
B.S., University of Idaho, 1977; M.S., Purdue University, 1980; Ph.D., Utah State University, 1989. Associate Dean. Registered Professional Entomologist.
- 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. Professor and Area Chair.
- SHOLLENBERGER, KIM A. (2002)..... Mechanical Engineering  
B.S., Cornell University, 1989; M.S., University of California, Berkeley, 1991; Ph.D., 1994. Associate Professor.
- SIEMBIEDA, WILLIAM J. (1997)..... City and Regional Planning  
B.A., University of California, Berkeley, 1965; MCRP, University of California, Berkeley, 1967; MPA, California State University, San Diego, 1970; Ph.D., University of California, Los Angeles, 1990. Professor and Department Head. American Institute of Certified Planners.
- SILVESTRI, MICHAEL G. (1978)..... Chemistry and Biochemistry  
B.S., University of California, Santa Barbara, 1973; Ph.D., University of California, Santa Cruz, 1977. Professor.
- SIMEK, JAN W. (1977)..... Chemistry and Biochemistry  
B.A., Kalamazoo College, 1970; M.S., Stanford University, 1971; Ph.D., 1975. Professor.
- SIMON, RICHARD K. (1988)..... English, Humanities  
B.A., University of Michigan, 1967; M.A., 1968; Ph.D., Stanford University, 1977. Professor and Director, Humanities Program.
- SIROIS, DAWN M. (1995)..... College of Engineering  
B.A., University of Rhode Island, 1995. Academic Advisor.
- SLEM, CHARLES M. (1975)..... Psychology and Child Development  
B.A., University of California, Los Angeles, 1968; M.A., 1972; Ph.D., Wayne State University, 1975. Professor.
- SLETTELAND, HOLLY (1999)..... University Foundation  
B.A., San Francisco State University, 1979. MIS Director.
- SMIDT, ROBERT K. (1978)..... Statistics  
B.S., Manhattan College, 1971; M.S., Rutgers University, 1973; Ph.D., University of Wyoming, 1976. Professor.
- SMITH, N. BROOKS (1996)..... Health and Counseling Services  
B.S., University of California, San Francisco, School of Medicine; M.D., 1962. Physician.
- SMITH, DALE A. (1973)..... Animal Science  
B.S., University of California, Davis, 1971; D.V.M., 1973. Professor.
- SMITH, HUGH M. (2000)..... Computer Science, Computer Engineering  
B.S., Xavier University, 1985; M.S., Michigan State University, 1994; Ph.D., 1999. Assistant Professor.
- SMITH, KENT D. (1981)..... Statistics  
B.A., University of Utah, 1967; M.S., Air Force Institute of Technology, 1969; M.S., University of California, Riverside, 1979; Ph.D., 1981. Professor.
- SMITH, RICK (1975)..... College of Engineering  
B.A., University of Central Florida, 1975. Public Affairs Assistant.

- SMITH, TERRY L. (1980)..... Earth and Soil Sciences  
B.S., University of Nebraska, Lincoln, 1972; M.S., 1975; Ph.D., Iowa State University, 1980. Professor.
- SNETSINGER, JOHN (1970).....History  
B.A., 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 Emeritus.
- SOENEN, LUC A. (1989).....Finance  
B.S., Leuven University, Belgium, 1970; M.B.A., Cornell University, 1972; D.B.A., Harvard University, 1977. Professor.
- SOLOMON, KENNETH H. (1996)..... BioResource and Agricultural Engineering  
B.S., Harvey Mudd College, 1967; M.A., Claremont Graduate School, 1976; M.S., Utah State University, 1979; Ph.D., 1983. Professor and Department Head. Registered Agricultural Engineer, California.
- SOMAYAJI, S. (1979)..... Civil and Environmental Engineering  
B.E., Mysore University, 1968; M.Tech., 1974; M.S., South Dakota School of Mines and Technology, 1975; Ph.D., University of Illinois, Chicago, 1979. Professor. Registered Professional Engineer, California.
- SPARLING (SOMPPI), SUSAN (1978)..... Student Academic Services  
B.S., University of Texas, 1970; M.A., California Polytechnic State University, San Luis Obispo, 1978. Academic Advisor/Instructor. Interim Director.
- SPILLER, ROBERT (1989)..... Animal Science  
B.S., California State Polytechnic College, 1969; M.S., 1971; Ph.D., Oregon State University, 1974. Professor.
- SPILLER, WILLIAM T. (1991).....Music  
B.M., University of Washington, 1981; M.M., Indiana University, 1983; D.M.A., University of Southern California, 1991. Associate Professor.
- SPRADLIN, WENDY (1978)..... College of Liberal Arts  
B.A., California Polytechnic State University, San Luis Obispo, 1978; M.A., 1984. Coordinator, Advising Center.
- STALEY, CLINTON A. (1988)..... Computer Science  
B.A., Principia College, 1980; M.S., University of California, Santa Barbara, 1982; Ph.D., 1987. Professor.
- STANKUS, MARK (1998)..... Mathematics  
B.S., Rensselaer Polytechnic Institute, 1987; Ph.D., University of California, San Diego, 1993. Assistant Professor.
- STANLEY, L. JUNE (2002)..... Health and Counseling Services  
B.S., Ohio State University, Columbus, 1975; M.S. and Family Nurse Practitioner Certification, California State University, Fresno, 1993. Nurse Practitioner. ANCC Board Certified, 1998.
- STANNARD, SANDRA (2001)..... Architecture  
B.A., University of California, Berkeley, 1987; M.Arch., University of Washington, 1992. Assistant Professor. AIA, Registered Architect, California and Idaho.
- STANTON, GEORGE C. (1981)..... Student Affairs  
B.A., Lake Forest College, 1963; M.A., Cornell University, 1968; Ph.D., Stanford University, 1980. Program Evaluation Specialist.
- STEARNS, DANIEL J. (1986)..... Computer Science, Computer Engineering  
B.S., University of California, 1965; M.S., California Polytechnic State University, San Luis Obispo, 1974. Associate Professor.
- STEBBINS, MICHAEL W. (1982)..... Management  
B.S., University of California, Berkeley, 1967; M.B.A., 1968; Ph.D., 1973. Professor.
- STEFANCO, CAROLYN J. (1990)..... History  
B.A., University of Colorado, 1979; M.A., S.U.N.Y., Binghamton, 1981; Ph.D., Duke University, 1987. Professor and Department Chair.
- STEINMAUS, SCOTT J. (1998)..... Horticulture and Crop Science  
B.S., University of California, Davis, 1984; Ph.D., 1996. Assistant Professor. Pest Control Advisor, California.
- STEPHENS, SARAH M. (1986)..... Agricultural Education and Communication  
B.A., University of Montana, 1972; Ed.M., Oregon State University, 1977; Ph.D., 1979. Professor.
- STEVENSON, LISA M. (2002)..... Chemistry and Biochemistry  
B.S., University of Michigan, 1997; M.S., University of California, Santa Barbara, 2000; Ph.D., 2002. Assistant Professor.
- STEWART, PATRICIA A. (1971)..... Student Academic Services  
B.S., California State Polytechnic College, 1970; M.A., California Polytechnic State University, San Luis Obispo, 1972. Academic Advisor/Instructor. Coordinator, Academic Skills Center.
- STEWART, SUSAN (1983)..... Student Academic Services  
B.A., California Polytechnic State University, San Luis Obispo, 1983. Information Technology Consultant.
- STIEGEMEYER, JODI K. (2002)..... Orfalea College of Business  
B.S., California Polytechnic State University, San Luis Obispo, 1994. Academic Advisor.
- STONEMAN, PATRICIA-ANN (1990)..... Cal Poly Continuing Education  
B.A., California State University at Northridge, 1974; M.A., 1978. Director, Academic Support.
- STOVER, VICKI R. (1969)..... Administration and Finance  
B.S., California Polytechnic State University, San Luis Obispo, 1979; M.B.A., 1986; D.P.A., University of La Verne, 1996. Associate Vice President for Administration.
- STOWE, KEITH S. (1971)..... Physics  
B.S., Illinois Institute of Technology, 1965; M.S., University of California, San Diego, 1967; Ph.D., 1971. Professor.
- STRAHL, RICHARD A. (1985)..... Industrial and Manufacturing Engineering  
B.S., Michigan Technological University, 1966; M.S., 1969. Associate Professor. Registered Professional Engineer, Ohio.
- STUBLER, CRAIG P. (1997)..... Earth and Soil Sciences  
B.S., California Polytechnic State University, San Luis Obispo. Technician.
- SUCHAND, GEORGE J. (1971)..... Social Sciences  
B.A., Louisiana State University, 1958; M.A., University of Florida, 1967; Ph.D., University of Oklahoma, 1972; M.S., California Polytechnic State University, San Luis Obispo, 1978. Professor Emeritus.
- SUESS, MICHAEL H. (1975)..... Academic Personnel  
B.S., California Polytechnic State College, San Luis Obispo, 1970; M.S., 1971; additional graduate study: Brigham Young University; D.P.A., University of La Verne, 1997. Associate Vice President for Academic Personnel.
- SUHR, MOON JA MINN (1969–71) (1972)..... Theatre and Dance  
B.S., Ewha Women's University, Seoul Korea, 1963; M.A., University of Northern Colorado, 1969; Ph.D., Texas Woman's University, 1988. Professor.
- SULLIVAN, EDWARD C. (1989)..... Civil and Environmental Engineering  
B.S., Massachusetts Institute of Technology, 1966; M.S., 1967; Ph.D., University of California, Berkeley, 1971; M.B.A., John F. Kennedy University, 1987. Professor.
- SUN, CHENG (1989)..... Electrical Engineering  
B.S., National Taiwan University, Taiwan, 1958; M.S., Cornell University, 1962; Ph.D., 1965. Professor.
- SUNGAR, NILGUN (1989)..... Physics  
B.S., Middle East Technical University, Turkey, 1979; Ph.D., University of Missouri, 1985. Associate Professor.
- SUTLIFF, DALE A. (1973)..... Landscape Architecture  
B.S.L.A., California State Polytechnic College, Pomona, 1965; M.R.P., University of Pennsylvania, 1973. Professor and Department Head. Registered Landscape Architect, California.
- SUTLIFF, MICHAEL A. (1997)..... Kinesiology  
B.A., Biola University, 1986; M.S., National University, 1990; Dr. of Arts, Middle Tennessee State University, 1992. Associate Professor.
- SWANSON, CLIFTON E. (1967)..... Music  
B.A., Pomona College, 1963; M.M., University of Texas, 1965; additional graduate study, University of California. Professor and Department Chair.
- SWARTZ, TERESA A. (1991)..... Orfalea College of Business, Marketing  
B.S., Clarion University of Pennsylvania, 1974; M.B.A., 1977; Ph.D., Ohio State University, 1981. Interim Dean and Professor.
- SWEARINGEN, DON E. (1974)..... Architecture  
B.Arch., Oklahoma State University, 1968; M.Arch., University of Illinois, 1972. Professor. Registered Architect, Arizona.
- SWEATT, LISA I. (2000)..... Psychology and Child Development  
B.S., University of California, Irvine, 1989; M.A., Ohio State University, 1992; Ph.D., Loyola University Chicago, 1999. Assistant Professor.

- SYDNOR, WILLIAM E. (1981)..... Student Academic Services  
B.A., Whittier College, 1971; M.A., University of California, Riverside, 1974;  
M.A., California Polytechnic State University, San Luis Obispo, 1986.  
Coordinator, Study Group and Supplemental Instruction Programs. Academic  
Advisor/Instructor, Academic Skills Center.
- SZE, LAWRENCE (1998)..... Mathematics  
B.S., Louisiana State University, Baton Rouge, 1986; M.A., University of  
California, Los Angeles, 1989; Ph.D., Penn State University, 1998. Assistant  
Professor.
- TAMAKI, MATTHEW (1995)..... Housing and Residential Life  
B.S., California Polytechnic State University, San Luis Obispo, 1995. Information  
Technology Consultant.
- TANDON, SHYAMA (1983)..... Electrical Engineering  
B.S., Banaras University, India, 1965; M.S., University of Iowa, 1971; Ph.D.,  
Texas A & M, 1976. Professor.
- TASKEY, RONALD D. (1977)..... Earth and Soil Sciences  
B.S., University of Montana, 1970; M.S., 1972; Ph.D., Oregon State University,  
1978. Professor Emeritus. Certified Professional Soil Scientist, Certified  
Professional Soil Classifier, Certified Professional Soil Erosion and Sediment  
Control Specialist.
- TAUFIK (1999)..... Electrical Engineering  
B.S., Northern Arizona University, 1993; M.S. University of Illinois at Chicago,  
1995; Dr.E., Cleveland State University, 1999. Assistant Professor.
- TAYLOR, KEVIN M. (1999)..... Kinesiology  
B.A., Newcastle and Sunderland Polytechnics, Newcastle, England, 1986; M.S.,  
Central Washington University, 1990; Ph.D., University of South Carolina, 1994.  
Assistant Professor.
- TAYLOR, LINDA L. (1997)..... Student Academic Services  
B.S., University of Connecticut, 1972; M.S., Central Missouri State, 1978.  
Information Technology Consultant.
- TERRY, RAYMOND D. (1974)..... Mathematics  
B.S., State University of New York, 1966; M.S., Michigan State University, 1968;  
Ph.D., 1972. Professor.
- TEXTER, DALE (1991)..... University Foundation  
B.S., California State University, Northridge, 1976. Chief Financial Officer.
- THOMA, JENNIFER A. (1983)..... Academic Records  
B.S., California Polytechnic State University, San Luis Obispo, 1977. Systems  
Analyst.
- THOMPSON, JOHN JAY (1998)..... Modern Languages and Literatures  
B.A., University of California, Santa Barbara, 1986; M.A., Yale University, 1987;  
M.Phil., 1989; Ph.D., 1993. Professor.
- THOMPSON, RICHARD P. (1990)..... Natural Resources Management  
B.S., Oklahoma State University, 1974; M.S., 1978; Ph.D., Texas A&M  
University, 1990. Professor. Registered Professional Forester, California and  
Oklahoma.
- THOMPSON, ROBERT C. (1981)..... Agribusiness  
B.S., California State Polytechnic College, 1969; M.S., University of California,  
Davis, 1970; Ph.D., Colorado State University, 1990. Professor.
- THORNCROFT, GLEN E. (1998)..... Mechanical Engineering  
BSE, University of Central Florida, 1988; MSME, 1991; Ph.D., University of  
Florida, 1997. Assistant Professor.
- THULIN, ANDREW J. (1998)..... Animal Science  
B.S., California Polytechnic State University, San Luis Obispo, 1977; M.S.,  
Kansas State University, Manhattan, 1979; Ph.D., 1985. Professor and  
Department Chair.
- TICE, RUSSELL L. (1965)..... Chemistry and Biochemistry  
B.S., Marshall University, 1960; Ph.D., University of California, Los Angeles,  
1965. Professor Emeritus.
- TIETJE, BRIAN C. (1999)..... Marketing  
B.S.B.A., Bowling Green State University, 1988; M.B.A., University of Hawaii,  
1994; Ph.D., University of Washington, 1999. Assistant Professor.
- TOMASINI, ALICE T. (1998)..... University Center for Teacher Education  
B.A., University of California, Los Angeles, 1980; M.A., University of California,  
Davis, 1986; Ed.D., University of California, Berkeley, 1994. Assistant Professor.
- TONG, PHILLIP S. (1988)..... Dairy Science  
B.S., University of California, Davis, 1977; M.S., Cornell University, 1982;  
Ph.D., 1986. Associate Professor.
- TORRES, EVELYN M. (1989)..... English  
B.A., California Polytechnic State University, San Luis Obispo, 1978; M.A.,  
1983; Ph.D., University of California, San Diego, 1989. Associate Professor.
- TOVAR, NORMA P., LTC (2002)..... Military Science  
B.A., University of California, Santa Barbara, 1980; M.B.A., George Washington  
University, 1990. Professor and Department Head.
- TRAENKLE, WILL (2001)..... Associated Students, Incorporated  
B.S., California Polytechnic State University, San Luis Obispo, 2001. Information  
Technology Assistant Coordinator.
- TREGENZA, ARDITH E. (1999)..... Student Affairs  
B.S., California State University, Sacramento, 1977; M.S., California State  
University, Long Beach, 1993. Director, Judicial Affairs.
- TREW, JOANN (1984)..... Administration and Finance  
B.A., California Polytechnic State University, San Luis Obispo, 1995. Assistant  
Director, Budget & Analytical Business Services.
- TRICE, TOM R. (2002)..... History  
B.A., Louisiana College, 1981; M.A., Louisiana State University, 1987; Ph.D.,  
University of Illinois, 1998. Assistant Professor.
- TROXEL, PATRICIA (1990)..... English  
B.A., Whitman College, 1978; M.A., University of California, Davis, 1981; M.A.,  
Princeton University, 1983; Ph.D., 1986. Associate Professor.
- TRYON, BETTE J. (1976)..... Psychology and Child Development  
B.S., University of Maryland, 1966; M.S., 1973; Ph.D., Syracuse University,  
1976. Professor.
- TRYON, WALTER M. (1976)..... Landscape Architecture  
B.S., Syracuse University, 1964; B.L.A., State University of New York, 1964;  
M.L.A., Syracuse University and State University of New York, 1974. Professor.  
Registered Landscape Architect, Maryland and Massachusetts.
- TSO, JIN (1988)..... Aerospace Engineering  
B.S., National Taiwan University, 1971; M.S., 1973; Ph.D., Johns Hopkins  
University, 1983. Professor.
- TUGGLE, ELIZABETH (2001)..... Housing and Residential Life  
B.A., California State University, Fresno, 1985; M.A., California Polytechnic  
State University, San Luis Obispo, 2000. Learning Community Coordinator.
- TURNER, CLARK S. (1999)..... Computer Science  
J.D., University of Maine, 1986; Ph.D., University of California, Irvine, 1999.  
Associate Professor.
- UYTTEWAAL, JOHAN M. (2000)..... Administration and Finance  
B.S., Lycée Louis Le Grand, Paris-France, 1977; M.S.C.E., School of Public  
Works, Paris-France, 1980; M.S.C.E., University of California, Berkeley, 1982;  
M.B.A., University of California, Los Angeles, 1989. Assistant Director, Building  
Design and Construction, Facilities Planning and Capital Projects. Registered  
Professional Engineer, California.
- UYTTEWAAL, KIMBERLY C. (1998)..... Office of the President  
B.A., University of California, Berkeley, 1983; M.A., New York University,  
1988. Administrative Assistant to the President.
- VALENCIA-LAVER, DEBRA (1991)..... Ethnic Studies, Psychology and Child  
Development  
B.S., University of California, Irvine, 1983; M.S., The Claremont Graduate  
University, 1988; Ph.D., 1992. Associate Professor and Department Chair, Ethnic  
Studies.
- VALENTY, LINDA O. (2002)..... Political Science  
B.A., University of California, Los Angeles; M.S., California State University,  
Sacramento, 1990; M.A., University of California, Davis, 1994; Ph.D., 1998.  
Assistant Professor.
- VALLE, VICTOR (1992)..... Ethnic Studies  
B.A., California State University, Long Beach, 1974; M.A., 1978; M.S.J.,  
Northwestern University, 1981. Professor.
- VANASUPA, LINDA S. (1991)..... Materials Engineering  
B.S., Michigan Technological University, 1985; M.S., Stanford University, 1987;  
Ph.D., 1991. Professor and Department Chair.

- VANCE, ROBERT D. (1972)..... Animal Science  
B.S., Brigham Young University, 1966; M.S., Ohio State University, 1968; Ph.D., 1971. Professor.
- VAN DRAANEN, NANINE A. (1996)..... Chemistry and Biochemistry  
B.S., California Polytechnic State University, San Luis Obispo, 1985; Ph.D., University of California, Berkeley, 1992. Associate Professor.
- VAN EPS, JOHN (1974)..... Mathematics  
B.A., University of California, Berkeley, 1965; Ph.D., 1969. Professor.
- VAN WYNGAARDEN, WILLEM L. (1965)..... Physics  
B.S., McMaster University, 1961; M.S., University of Manitoba, 1964; Ph.D., Louisiana State University and A & M College, 1975. Professor Emeritus.
- VELÁSQUEZ, GLORIA (1985)..... Modern Languages and Literatures  
B.A., University of Northern Colorado, 1978; M.A., Stanford University, 1980; Ph.D., 1985. Professor.
- VERNON, J. SCOTT (1991)..... Agricultural Education and Communication  
B.S., California Polytechnic State University, San Luis Obispo, 1983; M.S., 1985; Ph.D., Texas A&M University, 1991. Associate Professor.
- VIGIL, SAMUEL A. (1982)..... Civil and Environmental Engineering  
B.S., University of California, Berkeley, 1969; M.S., Texas A & M University, 1974; Ph.D., University of California, Davis, 1981. Professor. Registered Professional Engineer, California, Diplomate of the Academy of Environmental Engineers.
- VILKITIS, JAMES R. (1980)..... Natural Resources Management  
B.S., Michigan State University, 1965; M.S., University of Idaho, 1968; Ph.D., University of Massachusetts, 1970; additional graduate study 1973-74. Professor.
- VILLABLANCA, FRANCIS X. (1999)..... Biological Sciences  
B.A., California Polytechnic State University, San Luis Obispo, 1987; Ph.D., University of California, Berkeley, 1993. Assistant Professor.
- VILLEGAS, DANIEL J. (1987)..... Economics  
B.S., University of Southern California, Los Angeles, 1972; A.M., Stanford University, 1975; Ph.D., 1979. Associate Professor.
- VIX, MARLIN DALE (1977)..... Agribusiness  
B.S., San Jose State College, 1968; M.S., California Polytechnic State University, San Luis Obispo, 1977. Associate Professor.
- VREDEVOE, LARISA K. (1999)..... Biological Sciences  
B.S., University of California, Davis, 1992; Ph.D., 1998. Assistant Professor.
- VUOTTO, FRANK (2002)..... University Library  
B.A., Berklee College of Music, 1983; M.A., Northern Illinois University, 1987; M.L.I.S., Rosary College/Dominican University, 1990. Senior Assistant Librarian.
- WACK, PAUL (1997)..... City and Regional Planning  
B.A., San Fernando Valley State College, 1969; M.A., California State University, Northridge, 1974; MPA, University of Southern California, 1976. Associate Professor. American Institute of Certified Planners.
- WALDEN, NANCY J. (1996)..... Health and Counseling Services  
B.S., California State University, Fresno, 1982; N.P., 1986. Nurse Practitioner.
- WALDORF, DANIEL (1998)..... Industrial and Manufacturing Engineering  
B.S., University of Illinois at Urbana-Champaign, 1989; M.S., 1991; Ph.D., 1996. Assistant Professor.
- WALKER, JOHN L. (2001)..... Statistics  
B.S., University of Chicago, 1988; M.S., Cornell University, 1993; Ph.D., 1995. Assistant Professor.
- WALKER, KENDRICK W. (1973)..... Philosophy  
B.A., University of Southern California, 1965; M.A., 1969; Ph.D., 1974. Professor.
- WALKER, ROBERT E. (1983)..... BioResource and Agricultural Engineering  
B.S., California State Polytechnic 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.
- WALLER, JULIA R. (1983)..... Financial Aid  
B.A., California State University, Sacramento, 1982; M.A., California Polytechnic State University, San Luis Obispo, 1987. Counselor.
- WALSH, DANIEL W. (1986)..... College of Engineering, Materials Engineering  
B.S., Rensselaer Polytechnic Institute, 1973; M.S., 1976; Ph.D., 1985. Associate Dean and Professor.
- WALTER, VIRGINIA R. (1974)..... Horticulture and Crop Science  
B.S., Ohio State University, 1970; M.S., 1972. Professor.
- WALTERS, DIRK R. (1969)..... Biological Sciences  
B.S., Western Illinois University, 1965; M.A., Indiana University, 1966; Ph.D., 1969. Professor.
- WARFIELD, DAVID L. (1975)..... Horticulture and Crop Science  
B.S., University of California, Davis, 1966; M.S., 1968; Ph.D., Washington State University, 1973. Professor.
- WARNICK-WAIT, PATRICIA (1977)..... Academic Records  
B.S., California Polytechnic State University, San Luis Obispo, 2001. Assistant to the Director/Registrar.
- WATERBURY, ARCHIE M. (1973)..... Biological Sciences  
B.A., San Jose State College, 1966; M.A., 1968; Ph.D., University of California, Davis, 1972. Professor.
- WEATHERFORD, ALAN M. (1986)..... Finance  
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)..... Kinesiology  
B.S., University of North Dakota, 1962; M.S., 1963; Ph.D., University of Oregon, 1969. Professor Emeritus.
- WEBB, KAREN (1995)..... Administration and Finance  
B.A., University of California, Los Angeles, 1978. Associate Director, Budget and Analytic Business Services.
- WEBBER, ROBERT (2001)..... English  
B.A., State University of New York at Buffalo, 1966; M.A., 1968; Ph.D., 1975. Assistant Professor.
- WEBER, PAUL (1999)..... Construction Management  
B.S., California Polytechnic State University, San Luis Obispo, 1981; B.Arch., 1983; M.B.A., 1992; Ph.D., Colorado State University, 2000. Assistant Professor. Registered Architect, California. Licensed Building Contractor (B), California.
- WEHNER, DAVID J. (1994)..... College of Agriculture,  
B.S., University of Notre Dame, 1972; M.S., Pennsylvania State University, 1975; Ph.D., 1979. Dean.
- WEISENTHAL, HOWARD (1984)..... Architecture  
B. Arch., University of Florida, 1972; M. Arch., 1974. Professor. Registered Architect, Florida.
- 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.
- WETZEL, S. JEAN (1996)..... Art and Design  
B.A., Rockford College, 1982; M.A., University of Kansas, 1985; M.Phil., 1986; Ph.D., 1991. Associate 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.
- WHITE, MATTHEW E. (2001)..... Mathematics  
B.S., Cornell University, 1990; M.S., California Polytechnic State University, San Luis Obispo, 1994; Ph.D., University of California, Santa Barbara, 2000. Assistant Professor.
- WHITEFORD, MARY A. (1982)..... Academic Programs  
B.S., New York University, 1978. Academic Programs Analyst.
- WICKERSHAM, DAVID (1979)..... Financial Aid  
B.S., California Polytechnic State University, San Luis Obispo, 1986. Assistant Director, Systems.
- WILD, ROSEMARY (1999)..... Management  
B.A., University of Arizona, 1980; M.A., 1981; M.S., 1985; Ph.D., 1989. Associate Professor.
- WILLIAMS, DOUGLAS W. (1983)..... BioResource and Agricultural Engineering  
B.S., Kansas State University, 1967; M.S., Iowa State University, 1969; D.Eng., University of California, Davis, 1973. Professor. Registered Mechanical Engineer, California.

- WILLIAMS, JEAN M. (2000) ..... Political Science  
B.A., Pomona College, 1988; M.A., The Johns Hopkins University, 1996; Ph.D., 1998. Assistant Professor.
- WILLIAMS, JOANNE (1991) ..... University Foundation  
B.S., California Polytechnic State University, San Luis Obispo, 1987. Director, Human Resources.
- 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.
- WILLS, MAX T. (1967) ..... Chemistry and Biochemistry  
B.S., University of Puget Sound, 1961; Ph.D., University of Washington, 1965. Professor.
- WILT, PETER J. (1983) ..... College of Liberal Arts  
B.A., Brigham Young University, 1971; M.A. 1980. Manager of Cal Poly Theatre and Program Manager of Cal Poly Arts. Administrative Operations Analyst.
- WILVERT, CALVIN H. (1973) ..... Social Sciences  
B.A., University of California, Los Angeles, 1963; M.A., University of California, Berkeley, 1967; Ph.D., 1971. Professor.
- WINEBRENNER, TERRENCE C. (1983) ..... Speech Communication  
B.S., Southwest Missouri State University, 1971; M.A., 1972; Ph.D., Ohio State University, 1985. Professor.
- WINGER, DONLEY J. (1963) ..... Electrical Engineering  
B.S., University of North Dakota, 1960; M.S., 1963; Ph.D., Iowa State University, 1971. Professor Emeritus.
- WOLF, MARIANNE McGARRY (1994) ..... Agribusiness  
B.A., The Johns Hopkins University, 1976; M.S., 1977; Ph.D., 1979. Professor.
- WOLF, ROBERT S. (1975) ..... Mathematics  
B.S., Massachusetts Institute of Technology, 1966; M.S., Stanford University, 1967; Ph.D., 1974. Professor.
- WOLLMAN, MICHAEL T. (1982) ..... Electrical Engineering  
B.E.E., Cornell University, 1964; M.S., University of Hawaii, 1966; Ph.D., University of California, Santa Barbara, 1975. Professor.
- WONG, JEFFREY C. (2002) ..... Horticulture and Crop Science  
B.S., Saint Mary's College of California, 1994; M.S., University of Illinois at Champaign, 1999; Ph.D., 2002. The J. G. Boswell Foundation of Pasadena Endowed Chair.
- WONG, KINSLEY (1989) ..... Housing and Residential Life  
B.S., California Polytechnic State University, San Luis Obispo, 1990. Assistant Director for Housing Information Systems.
- WOOTEN, RUDY A. (1977) ..... Animal Science  
B.S., University of Arizona, 1971; M.S., 1973; Ph.D., 1976. 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.
- YELLAND, GEORGE L. (1988) ..... Administration and Finance  
B.A., University of California, San Diego, 1972. Director, Administration and Finance Division Technology Services.
- YIP, CHRISTOPHER L. (1988) ..... Architecture  
B.A., University of California, Berkeley, 1971; M. Arch., 1977; Ph.D., 1985. Professor.
- YONG, YUEN-CJEN (1978) ..... Mechanical Engineering  
B.E., University of Malaya, 1969; M.E., University of California, Davis, 1977; Ph.D., 1984. Professor. Registered Professional Engineer, Great Britain and Malaysia.
- YOSHIMURA, MICHAEL A. (1975) ..... Biological Sciences  
B.A., Stanford University, 1970; M.S., University of Hawaii, 1972; Ph.D., University of Arizona, 1975. Professor.
- YU, XIAO-HUA (HELEN) (2000) ..... Electrical Engineering  
B.S., TianJin University, People's Republic of China, 1988; M.S., Temple University, 1992; Ph.D., University of California, Irvine, 1998. Assistant 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) ..... BioResource and Agricultural Engineering  
B.S., Texas Technological College, 1962; M.S., 1967. Professor Emeritus. Registered Agricultural Engineer, California.
- ZEUSCHNER, RAYMOND F. (1980) ..... Speech Communication  
A.B., University of California, Berkeley, 1966; M.A., San Francisco State College, 1968; Ph.D., University of California, Los Angeles, 1973. Professor.
- ZINGG, PAUL J. (1993) ..... Academic Affairs  
B.A., Belmont Abbey College, 1968; M.A., University of Richmond, 1969; Ph.D., University of Georgia, 1974. Provost and Vice President for Academic Affairs.
- ZOHNS, MARK A. (1986) ..... BioResource and Agricultural Engineering  
B.S., California Polytechnic State University, San Luis Obispo, 1981; M.S., University of California, Davis, 1983; D.Eng., 1986. Professor. Registered Mechanical Engineer, California.
- ZOHNS, MICHAEL D. (1974) ..... Horticulture and Crop Science  
B.S., California Polytechnic State University, San Luis Obispo, 1972; M.S., 1975. Professor.
- ZULFACAR, MALIHA (2002) ..... Ethnic Studies  
B.A., Western College, 1971; M.A., University of Cincinnati, 1973; M.S., 1973; Ph.D., Paderborn University, Germany, 1997. Assistant Professor.
- ZUUR, THOMAS L. (1983) ..... Academic Records  
B.S., Sonoma State College, 1967; M.P.A., University of San Francisco, 1981. Registrar/Director.
- ZWEIFEL, K. RICHARD (1972) ..... College of Architecture and Environmental Design  
B.S.L.A., University of Wisconsin, 1970; M.S.L.A., 1975. Professor and Interim Dean. Registered Landscape Architect, California. Fellow, American Society of Landscape Architects.

# Appendix

## HIGHER EDUCATION ACT (HEA)

[www.academics.calpoly.edu/ees/HEA.htm](http://www.academics.calpoly.edu/ees/HEA.htm)

Under the Higher Education Act of 1965 (HEA) and its many amendments, Cal Poly is required to make certain disclosures and institutional information "readily available" to prospective and enrolled students, employees, the general public and the department of education on an annual basis (20 U.S.C. Section 1092(a)). For additional information, please contact the office of Campus Relations at (805) 756-6770.

## Privacy Rights of Students in Education Records

[www.calpoly.edu/records/ferpa\\_use.htm](http://www.calpoly.edu/records/ferpa_use.htm)

The federal Family Educational Rights and Privacy Act (FERPA) of 1974 (20 U.S.C. 1232g) and regulations adopted thereunder (34 C.F.R. 99) set out requirements designed to protect students' privacy in their records maintained by the campus. The statute and regulations govern access to student records maintained by the campus and the release of such records. The law provides that the campus must give students access to records directly related to the student, and must also provide opportunity for a hearing to challenge the records on the grounds that they are inaccurate, misleading or otherwise inappropriate. The right to a hearing under this law does not include any right to challenge the appropriateness of a grade determined by the instructor. The law generally requires the institution to receive a student's written consent before releasing personally identifiable data about the student. The institution has adopted a set of policies and procedures governing implementation of the statute and the regulations. Copies of these policies and procedures may be obtained at the Office of Academic Records or the Educational Equity Services Office. Among the types of information included in the campus statement of policies and procedures are:

- 1) the types of student records maintained and the information they contain;
- 2) the official responsible for maintaining each type of record;
- 3) the location of access lists indicating persons requesting or receiving information from the record;
- 4) policies for reviewing and expunging records;
- 5) student access rights to their records;
- 6) the procedures for challenging the content of student records;
- 7) the cost to be charged for reproducing copies of records;
- and 8) the right of the student to file a complaint with the Department of Education. The Department of Education has established an office and review board to investigate complaints and adjudicate violations. The designated office is: Family Policy Compliance Office, U.S. Department of Education, Washington, D.C. 20202-4605.

The campus is authorized under the Act to release "directory information" concerning students. "Directory information" may include the student's name, address, telephone listing, electronic mail address, photograph, 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, grade level, enrollment status, degrees, honors, 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 the student requests not be released. Written objections should be sent to the University Registrar.

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 have responsibilities in the campus' academic, administrative or service functions and have reason for using student records associated with their campus or other related academic responsibilities. Student records may also be disclosed 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; or to other institutions to which the student is transferring).

## Completion/Graduation Rates

[www.calpoly.edu/~inststdy/federal/fed.html](http://www.calpoly.edu/~inststdy/federal/fed.html)

In 2001, the graduation rate for Cal Poly freshmen who entered the University in the Fall of 1995 was 66%. For more detailed information, please contact Institutional Planning and Analysis at 805 756-2461.

## Equity in Athletics Disclosure Act (EADA)

[www.calpoly.edu/~inststdy/federal/fed.html](http://www.calpoly.edu/~inststdy/federal/fed.html)

In compliance with the Higher Education Act, and the Equity in Athletics Disclosure Act of 1994, information contained in the October 1999 report for Cal Poly San Luis Obispo is available from Cal Poly's Institutional Planning & Analysis Office, (805) 756-2461. Tables 1 through 10 of the report are available to students, potential students, and the public in order to provide full disclosure of participation rates, financial support and other information regarding men's and women's Intercollegiate Athletics Programs. A paper copy of the report is available upon request.

## Campus Security Report (Clery Act)

[www.afd.calpoly.edu/Police/](http://www.afd.calpoly.edu/Police/)

Crime statistics for Cal Poly are provided for all prospective and current students, faculty and staff on the

website, along with critical updates and prevention advisories. These statistics are reported monthly to the Federal and State Departments of Justice as well as to the Office of the Chancellor of the CSU. Crime statistics are published to inform the campus community and to meet mandated reporting requirements. A printed copy of the Campus Security Report is available by request at the University Police Department.

### **Availability of Institutional and Financial Assistance Information**

**Student Financial Assistance.** Director, Financial Aid, Admin. 212, 756-2927:

1. student financial assistance programs, including state grants, available to students who enroll at Cal Poly;
2. procedures and forms by which application for student financial assistance is made;
3. student eligibility requirements for financial assistance and the criteria used in determining how financial assistance is distributed among eligible applicants who enroll at Cal Poly; and
4. rights and responsibilities of students receiving financial assistance including aid provided under federal Title IV student assistance programs.

**Return of Federal Title IV student assistance funds.** Director, Financial Aid, Admin. 212, 756-2927.

**Cost of Attending Cal Poly.** Director, Financial Aid, Admin. 212, 756-2927: fees and tuition (where applicable); the estimated costs of books and supplies; estimates of typical student room and board costs and typical commuting costs; and, if requested, additional costs for specific programs.

**Refund Policies.** Registrar, Admin. 222, 756-2531: return of unearned tuition and fees or other refundable portions of institutional charges.

**Facilities and Services available to Students with Disabilities.** Director, Disability Resource Center, Student Services Bldg. (124), 756-1395.

**Reporting Criminal Actions or Other Emergencies.** University Police, Building 74, 756-2281.

**Prevention of Drug and Alcohol Abuse and Rehabilitation Programs.** Office of the Vice President for Student Affairs, Admin. 209, 756-1521.

**Grievance Procedures for Students.** Office of Campus Relations, Educational Equity and University Ombuds Services, 756-6770, or the Office of Student Affairs, Administration 209, 756-1521.

### **CAREER PLACEMENT**

The Career Services office (805-756-2501) may furnish, upon request, information about the employment of students

who graduate from programs or courses of study preparing students for a particular 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 system.

### **MILITARY SELECTIVE SERVICES ACT**

The federal Military Selective Service Act (the "Act") requires most males residing in the United States to present themselves for registration with the Selective Service System within thirty days of their eighteenth birthday. Most males between the ages of 18 and 25 must be registered. Males born after December 31, 1959 may be required to submit a statement of compliance with the Act and regulations in order to receive any grant, loan, or work assistance under specified provisions of existing federal law. In California, students subject to the Act who fail to register are also ineligible to receive any need-based student grants funded by the state or a public postsecondary institution. Selective Service registration forms are available at any U.S. Post Office, and many high schools have a staff member or teacher appointed as a Selective Service Registrar. Applicants for financial aid can also request that information provided on the Free Application for Federal Student Aid (FAFSA) be used to register them with the Selective Service. Information on the Selective Service System is available and the registration process may be initiated online at <http://www.sss.gov>.

### **DETERMINATION OF RESIDENCE FOR NONRESIDENT TUITION PURPOSES**

The law governing residence for tuition purposes at the California State University is California Education Code sections 68000-68090, 68120-68134, and 89705-89707.5, and California Code of Regulations, Title 5, sections 41900-41916. This material can be viewed on the Internet by accessing the California State University's website at [www.calstate.edu](http://www.calstate.edu).

Each campus's Admissions Office is responsible for determining the residence status of all new and returning students based on the Application for Admission, Residency Questionnaire, Reclassification Request Form, and, as necessary, other evidence furnished by the student. A student who fails to submit adequate information to establish eligibility for resident classification will be classified as a nonresident.

Generally, establishing California residence for tuition purposes requires a combination of physical presence and intent to remain indefinitely. An adult who, at least one full year prior to the residence determination date for the term in which enrollment is contemplated, has been both physically present in the state and has evidence of intent to remain in California indefinitely, may establish California

residence for tuition purposes. Evidence demonstrating intent can vary from case to case and may include, but is not limited to, the absence of residential ties to any other state, California voter registration and voting in California elections, maintaining California registration and driver's license, maintaining active California bank accounts, filing California income tax returns, owning residential property or occupying or renting an apartment where permanent belongings are kept, maintaining active memberships in California professional or social organizations, and maintaining a permanent military address and home of record in California.

Adult noncitizens establish residence in the same manner as citizens, unless precluded by the Immigration and Nationality Act from establishing domicile in the United States. Unmarried minor noncitizens derive their residence in the same manner as unmarried minor citizens except that both parent and minor must have an immigration status consistent with establishing domicile in the United States.

Exceptions to the general residence requirements are contained in California Education Code sections 68070-68084 and Title 5 of the California Code of Regulations, sections 41900-41916, and include, but are not limited to, members of the military and their dependents, certain credentialed employees of school districts and students who have attended high school in California and graduated or attained the equivalent. Whether an exception applies to a particular student cannot be determined before the submission of an application for admission and, as necessary, additional supporting documentation. Because neither campus nor Chancellor's Office staff may give advice on the application of these laws, applicants are strongly urged to review the material for themselves and consult with a legal advisor.

Nonresident students seeking reclassification are required to complete a supplemental questionnaire including questions concerning their financial dependence, which will be considered along with physical presence and intent in determining reclassification.

#### **Residence determination dates**

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

A campus residence classification appeal must be in writing and submitted to:

The California State University  
Office of General Counsel  
401 Golden Shore, 4<sup>th</sup> Floor  
Long Beach, California 90802-4210

The appeal must be submitted within 120 days of notification of the final campus decision. The Office of

General Counsel can either decide the appeal or send the matter back to the campus for further review.

Students incorrectly classified 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 or who no longer meet the criteria for an exception must immediately notify the Admissions Office.

Changes may have been made in the rate of nonresident tuition and in the statutes and regulations governing residence for tuition purposes in California between the time this information is published and the relevant residence determination date. Students are urged to review the statutes and regulations stated above.

#### **USE OF SOCIAL SECURITY NUMBER**

Applicants are required to include their correct social security numbers in designated places on applications for admission pursuant to the authority contained in Section 41201, Title 5, *California Code of Regulations*, and Section 6109 of the Internal Revenue Code (26 U.S.C. 6109). The University uses the social security number to identify students and their records including for purposes of financial aid eligibility and disbursement and the repayment of financial aid and other debts payable to the institution. Also, the Internal Revenue Service requires the University to file information returns that include the student's social security number and other information such as the amount paid for qualified tuition, related expenses, and interest on educational loans. This information is used by the IRS to help determine whether a student, or a person claiming a student as a dependent, may take a credit or deduction to reduce federal income taxes.

Taxpayers who claim Hope Scholarship or Lifetime Learning tax credit will be required to provide the campus with the name, address, and Taxpayer Identification Number to the campus.

#### **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:

**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:

(1) The term "member of the campus community" is defined as meaning California State University Trustees, academic, non-academic and administrative personnel, students, and other persons while such other persons are on campus property or at a campus function.

(2) The term "campus property" includes:

(A) real or personal property in the possession of, or under the control of, the Board of Trustees of the California State University, and

(B) all campus feeding, retail, or residence facilities whether operated by a campus or by a campus auxiliary organization.

(3) The term "deadly weapons" includes any instrument or weapon of the kind commonly known as a blackjack, 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 and the responsible use of information technology resources.

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.

### IMMIGRATION REQUIREMENTS FOR LICENSURE

The Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (P.L. 104-193), also known as the Welfare Reform Act, includes provisions to eliminate eligibility for federal and state public benefits for certain categories of lawful immigrants as well as benefits for all illegal immigrants.

Students who will require a professional or commercial license provided by a local, state, or federal government agency in order to engage in an occupation for which the CSU may be training them must meet the immigration requirements of the new Personal Responsibility and Work Opportunity Reconciliation Act to achieve licensure. Information concerning the regulation is available from the Academic Programs Office, Admin. 315, 756-2246.

### AVERAGE ANNUAL COST OF EDUCATION AND SOURCES OF FUNDS PER FULL-TIME EQUIVALENT STUDENT

The 23 campuses and the Chancellor's Office of the California State University are financed primarily through funding provided by the taxpayers of California. The systemwide cost of education is defined as total support expenditures (State University Fee revenue and General Fund support appropriations) divided by the number of full-time equivalent students. The total 2002/03 state General Fund appropriation to the CSU (not including capital outlay funding in the amount of \$289,861,000) is \$2,680,280,000 and campus budgeted State University Fee Revenue is \$533,430,000 for a total of \$3,213,710,000. The \$3,213,710,000 total cost of education for CSU must provide support for a projected 321,132 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 2002/03 systemwide cost of education per full-time equivalent student is \$10,007. Of this amount, the average student fee support per FTE is \$1,926. (The State University Fee and campus fees that must be paid to apply to, enroll in, or attend the university are included in the average costs paid by the students. Individual students may pay less or more than \$1,926, depending on the campus and whether the student is attending part-time, full-time, or is a resident or nonresident student. Also, other campus fees may be charged that are not required of all enrolled students, which include user and penalty/deposit fee types.)

2002/2003	Amount	Average Cost Per FTE Student	%
Total Cost of Education .....	\$3,213,710,000	\$10,007	100.0
-State Appropriation .....	2,680,280,000	8,346	83
-Student Fee Support .....	533,430,000	1,661	17

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# DIRECTORY OF CAL POLY FACILITIES

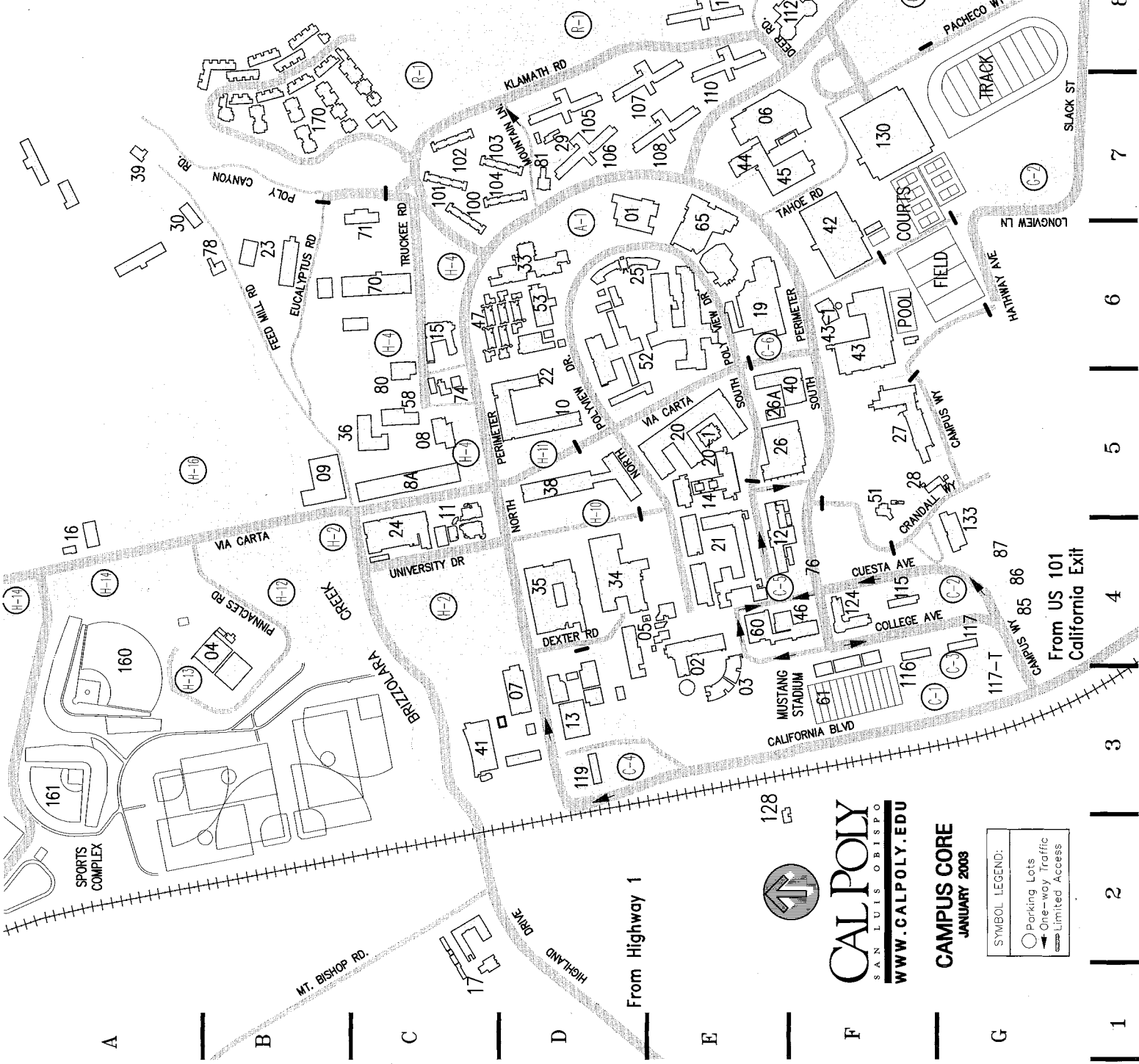
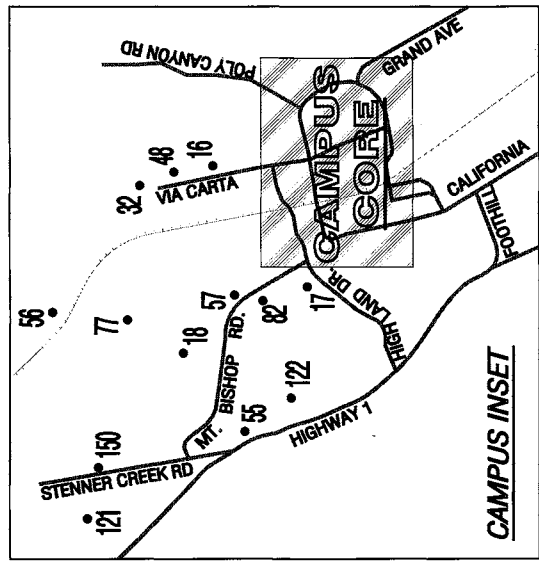
Alphabetical with Aliases

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Advanced Technology Laboratories	7	D 2	Education	2	E 3
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Agricultural Engineering, Bioresource and	8	C 4	Engineering	13	D 2
Agricultural Sciences	11	C 4	Engineering East	20	E 4
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Architecture & Environmental Design	5	D 3	Environmental Health and Safety / Housing Warehouse	80	C 5
ARDFA	4	B 3	Environmental Horticultural Science	48	Inset
Avila Residence	129	E 8	Erhart Agriculture	10	D 4
Baggett Stadium	160	A 2	Escuela Ranch	127	off map
Baseball Stadium	160	A 2	Eugene & Rachel Boon Dairy Science Complex	18	Inset
Beef Cattle Evaluation Center	55	Inset	Facility Services / Receiving Warehouse	70	C 5
Beef Unit	16	A 3	Faculty Offices East	25	D 5
Bioresource and Agricultural Engineering	8	C 4	Faculty Offices North	47	C 5
Bioresource and Agricultural Engineering Shop	8A	C 4	Farm Shop	9	B 4
Bob Janssen Field	161	A 2	Feed Mill	23	B 5
Business	3	E 2	Fisher Science, Clyde P.	33	D 5
CAD Research Center	117T	G 3	Food Processing	24	C 3
Cal Poly Theatre	44	E 6	Foundation Administration	15	C 5
Campus Market	24	C 3	Foundation Warehouse	82	Inset
Chase Hall	115	F 3	Frank E. Pilling Building	14	E 4
Cheda Ranch	121	A 7	Fremont Hall	109	E 7
Cheda Ranch Residence	121	Inset	Grand Avenue Parking Structure	130	F 6
Child Development Lab	38	D 4	Graphic Arts	28	E 4
Children's Center	133	G 3	Gymnasium, Crandall	60	E 3
Chorro Creek Ranch	126	off map	Gymnasium, Mott	42	F 5
Christopher Cohan Center	6	E 6	H. P. Davidson Music Center	45	E 6
Clock Tower Building	2	E 3	Hanger	4	B 3
Clyde P. Fisher Science Hall	33	D 5	Health Center	27	F 4
Computer Science	14	E 4	Heron Hall	117	G 3
Crandall Gymnasium	60	E 3	Hilcrest	81	D 6
Crops Unit	17	C 1	Horse Unit	32	Inset
Dairy Products Technology Center	18A	Inset	Horseshoeing Unit	30	A 6
Dairy Science	18	Inset	Housing Office	29	D 6
Dairy Science Milking Parlor	18	Inset	Housing Warehouse	80	C 5
Dexter Building, Walter F.	34	D 3	Housing Warehouse / Environmental Health and Safety	80	C 5
Diablo Hall	101	C 6	Indoor Pool, Natatorium	46	E 3

Janssen Field	161	A 2
Jespersen Hall	116	F 3
Julian A. McPhee University Union	65	E 5
Kennedy Library, Robert E.	35	D 3
Lassen Hall	104	C 6
Library, Robert E. Kennedy	35	D 3
Manufacturing	36	C 4
Market, Campus	24	C 3
Mathematics and Science	38	D 4
McPhee University Union	65	E 5
Meats Unit, Abattoir	39	A 6
Modoc Hall	119	D 2
Mott Physical Education, Robert E.	42	F 5
Muir Hall	107	D 6
Music Center, H. P. Davidson	45	E 6
Mustang Stadium	61	F 2
Natatorium	46	E 3
North Mountain Residence Halls	100	C 6
Old Power Plant	76	E 3
PAC	6	E 6
Palomar Hall	102	C 6
Parker Ranch	122	Inset
Parking Structure, Grand Avenue	130	F 6
Parson's Residence	128	E 2
Performing Arts Center	6	E 6
Peterson Ranch	123	off map
Physical Education Classrooms and Offices	43A	F 5
Pilling Building	14	E 4
Police Station	74	C 4
Poly Grove	119U	D 2
Poultry Science Instructional Center	150	Inset
Power Plant	40	E 4
President's Residence	51	F 4
Recreation Center	43	F 5
Reprographics	70	C 5
Research Development Center	4	B 3
Residence Hall, Diablo Hall	101	C 6
Residence Hall, Fremont Hall	109	E 7
Residence Hall, Lassen Hall	104	C 6
Residence Hall, Muir Hall	107	D 6
Residence Hall, Palomar Hall	102	C 6
Residence Hall, Santa Lucia Hall	106	D 6

Residence Hall, Sequoia Hall	108	D 6
Residence Hall, Shasta Hall	100	C 6
Residence Hall, Sierra Madre	113	F 8
Residence Hall, Tenaya Hall	110	E 7
Residence Hall, Trinity Hall	105	D 6
Residence Hall, Whitney Hall	103	C 6
Residence Hall, Yosemite	114	F 8
Robert E. Kennedy Library	35	D 3
Robert E. Mott Physical Education	42	F 5
Rodeo Arena	77	Inset
Rose Float Shop	78	B 5
Sandwich Factory	19A	E 5
Santa Lucia Hall	106	D 6
Science	52	D 5
Science North	53	C 5
Science, Fisher	33	D 5
Sequoia Hall	108	D 6
Serrano Ranch	125	off map
Shasta Hall	100	C 6
Sheep Unit, Cheda Ranch	121	Inset
Sierra Madre Hall	113	F 8
Softball Stadium	161	A 2
South Mountain Residence Halls	105	D 6
Sports Complex Baseball Stadium	160	A 2
Sports Complex Softball Stadium	161	A 2
Student Services	124	F 3
Swine Unit	56	Inset
Tenaya Hall	110	E 7
Theater	44	E 6
Transportation Services	71	C 6
Trinity Hall	105	D 6
University Dining Complex	19	E 5
University Police	74	C 4
University Union, Julian A. McPhee	65	E 5
Veterinary Hospital	57	Inset
Visitor Information	134	G 8
Vista Grande Restaurant	112	E 7
Walter F. Dexter Building	34	D 3
Walters Ranch	139	off map
Warehouse, State Receiving	70	C 5
Welding	58	C 4
Whitney Hall	103	C 6
Yosemite Hall	114	F 8



Visitor Information

From US 101  
Cal Poly Exit

From US 101  
California Exit

**CAL POLY**  
SAN LUIS OBISPO  
[WWW.CALPOLY.EDU](http://WWW.CALPOLY.EDU)

**CAMPUS CORE**  
JANUARY 2003

**SYMBOL LEGEND:**

	Parking Lots
	One-way Traffic
	Limited Access

1 2 3 4 5 6 7 8 9

A

B

C

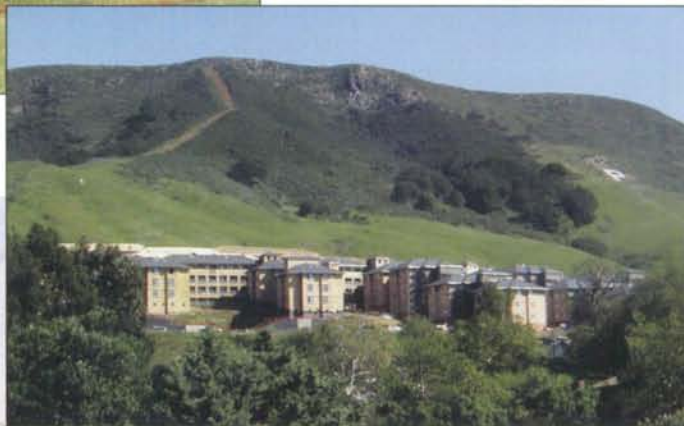
D

E

F

G

From Highway 1



# CAL POLY

CALIFORNIA POLYTECHNIC STATE UNIVERSITY  
SAN LUIS OBISPO, CALIFORNIA 93407

