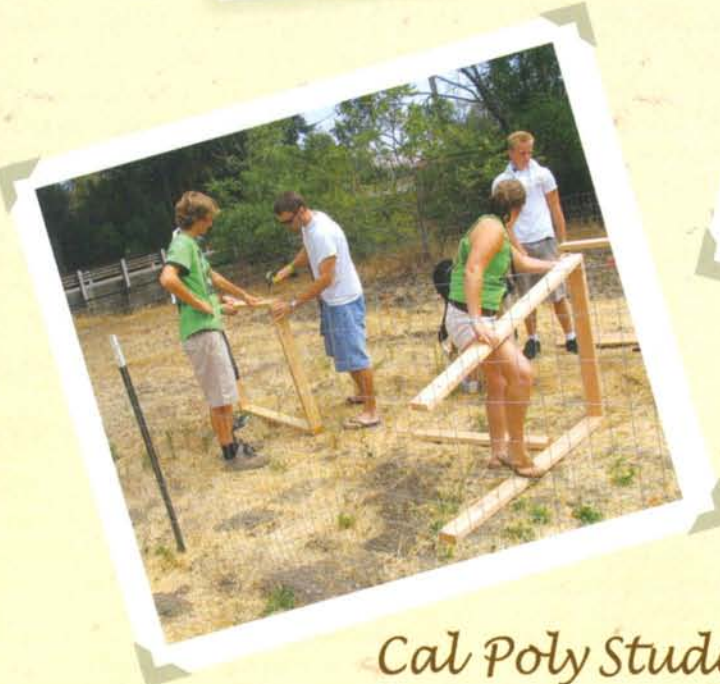


# Cal Poly Catalog

2005-2007



*Community  
Service*

*Cal Poly Students Make a Difference*

**Cover: Student Community Services** provides the opportunity for students to act as vital members of the community, share their resources with others, and develop skills and leadership abilities while creating meaningful social change. For information on volunteering, call (805) 756-5834.

**ACADEMIC RECORDS**

[www.ess.calpoly.edu/\\_records/](http://www.ess.calpoly.edu/_records/)  
Admin. (01-222) 756-2531

**Evaluations**

Admin. (01-218) 756-2396

**ADMISSIONS OFFICE**

[www.ess.calpoly.edu/\\_admiss/admissions@calpoly.edu](http://www.ess.calpoly.edu/_admiss/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

**CAMPUS TOURS**

756-5734

**CAREER SERVICES**

[www.careerservices.calpoly.edu](http://www.careerservices.calpoly.edu)  
Student Services (124-114)  
756-2501

**COMPUTER HELP**

[www.calpoly.edu/computing/computing.html](http://www.calpoly.edu/computing/computing.html)  
Help Desk: 6-7000  
ResNet 756-5600

**CONTINUING EDUCATION**

[www.continuing-ed.calpoly.edu](http://www.continuing-ed.calpoly.edu)  
Jespersen Hall (116-101)  
756-2053

**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.ge.calpoly.edu](http://www.ge.calpoly.edu)  
756-2228

**GRADUATE PROGRAMS**

[www.calpoly.edu/~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/~mculture](http://www.calpoly.edu/~mculture)  
University Union (65-217B)  
756-1405

**MustangInfo**

<https://miserve.its.calpoly.edu/prod.html>

**MyCalPoly** (Web Portal)

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

**PARKING & COMMUTER SERVICES** 756-6654

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/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

*Cal Poly*

Area Code 805  
San Luis Obispo, CA 93407  
[www.calpoly.edu](http://www.calpoly.edu)



### **Cal Poly's Mission**

As a predominantly undergraduate, comprehensive, polytechnic university serving California, the mission of Cal Poly is to discover, integrate, articulate, and apply knowledge. This it does by emphasizing teaching; engaging in research; participating in the various communities, local state, national and international, with which it pursues common interests; and where appropriate, providing students with the unique experience of direct involvement with the actual challenges of their disciplines in the United States and abroad.

Cal Poly is dedicated to complete respect for human rights and the development of the full potential of each of its individual members. Cal Poly is committed to providing an environment where all share in the common responsibility to safeguard each other's rights, encourage a mutual concern for individual growth and appreciate the benefits of a diverse campus community.

California Polytechnic State University

*2005-2007 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 2005-2007 Cal Poly Catalog*

Copies of the *Catalog* and quarterly *Class Schedule* may be purchased at El Corral Bookstore on the Cal Poly campus or at the Cal Poly Downtown store located at 959 Higuera Street in San Luis Obispo. 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, and the 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.

Nothing in this catalog shall be construed as, operate as, or have the effect of an abridgment or a limitation of any rights, powers, or privileges of the Board of Trustees of the California State University, the Chancellor of the California State University, or the President of the campus. The Trustees, the Chancellor, and the President are authorized by law to adopt, amend, or repeal rules and policies which apply to students. This catalog does not constitute a contract or the terms and conditions of a contract between the student and the institution or the California State University. The relationship of the student to the institution is one governed by statute, rules, and policy adopted by the Legislature, the Trustees, the Chancellor, the President and their duly authorized designees.

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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.

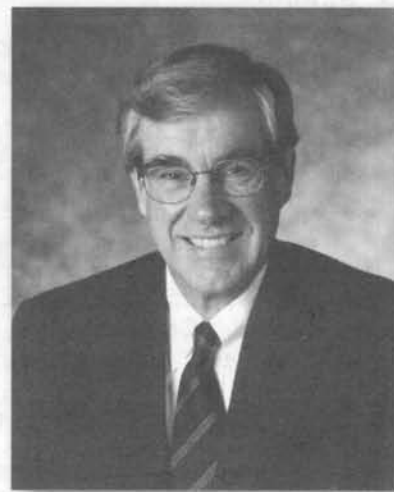
***Polytechnic Mission:*** At Cal Poly, we recognize that the liberal arts and sciences provide a critical and indispensable foundation for education in all academic disciplines and for the broader life of the University, as a living and learning community. At the same time, from its inception, Cal Poly 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

**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"

**Main Campus size:** 1,321 acres, of which 155 are the "campus core"  
San Luis Creek Ranches, adjacent to campus: 1,614 acres  
Western Ranches, not contiguous to campus: 3,043 acres  
Swanton Pacific Ranch, Santa Cruz County: 3,200 acres  
Valencia Property, Santa Cruz County: 500 acres  
Total: 9,678 acres

### FACULTY

**Faculty (including part-time):** About 1,182

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

### ACADEMIC UNITS

College of Agriculture  
College of Architecture and Environmental Design  
Orfalea College of Business  
College of Education  
College of Engineering  
College of Liberal Arts  
College of Science and Mathematics

### ACADEMICS

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

**Accreditation:** Cal Poly is fully accredited by the Western Association of Schools and Colleges (WASC). 27 academic programs are accredited by discipline-related accrediting agencies.

**Programs offered:** 65 bachelor's, 24 master's, 1 doctorate, 64 minors, 8 credentials

**U.S. News & World Report:** Rated the No. 1 public, comprehensive undergraduate university in the West for the twelfth consecutive year (2004)

**Competitive admissions:** More than 25,000 undergraduate applicants compete each year for approximately 3,600 spaces – a ratio that places Cal Poly among the most selective institutions in the United States (2004)

**FEES – see [www.fees.calpoly.edu](http://www.fees.calpoly.edu)**

### 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 2004

**Student body:** Approximately 15,827

**Men:** 57%

**Women:** 43%

**Ethnic minorities:** 26%

**Average age:** 21.48 years

#### Geographic origin of students:

California resident status: 94%

Central Coast (San Luis Obispo, Santa Barbara, Monterey Counties): 20%

San Francisco Bay area: 24%

Los Angeles area: 15%

Central Valley: 14%

Outside California (USA): 6%

International students: 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:** 634,400 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

# Academic Calendar

# 2005–2007

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

## SUMMER TERM 2005

June 20	Beginning of university year Beginning of summer term – classes begin
June 28	Last day to enter ePermit numbers
June 29	Last day to add a class; last day to drop a class; last day to register late and pay late registration fee
July 1	End of second week of instruction
July 4	Academic holiday – Independence Day
July 11	End of third week of instruction – Census date
August 8	End of seventh week of instruction
August 26	Last day of classes
August 29 – September 2	Final examination period
September 2	End of summer term
September 3–11	Academic holiday

## FALL TERM 2005

September 12	Beginning of fall term (faculty only)
September 19	Fall term classes begin
September 27	Last day to enter ePermit numbers
September 28	Last day to add a class; last day to drop a class; last day to register late and pay late registration fee
September 30	End of second week of instruction
October 7	End of third week of instruction – Census date
November 4	End of seventh week of instruction
November 11	Academic holiday – Veterans' Day
November 23–27	Academic holiday – Thanksgiving
December 2	Last day of classes
December 5–9	Final examination period
December 10	Mid-Year Commencement End of fall term
December 11– January 2	Academic holiday

## WINTER TERM 2006

January 3	Beginning of winter term – classes begin
January 11	Last day to enter ePermit numbers
January 12	Last day to add a class; last day to drop a class; last day to register late and pay late registration fee
January 16	Academic holiday – Martin Luther King, Jr.'s Birthday observed
January 17	End of second week of instruction
January 24	End of third week of instruction – Census date
February 17, Friday	Academic holiday – George Washington's Birthday observed
February 22	End of seventh week of instruction
March 10	Last day of classes
March 13–17	Final examination period
March 20	*Evaluation Day
March 21	*Grades Due day, End of winter term
March 22–26	Academic holiday

## SPRING TERM 2006

March 27	Beginning of spring term – classes begin
March 31	Academic holiday – Cesar Chavez's Birthday observed
April 5	Last day to enter ePermit numbers
April 6	Last day to add a class; last day to drop a class; last day to register late and pay late registration fee
April 10	End of second week of instruction
April 17	End of third week of instruction – Census date
May 15	End of seventh week of instruction
May 29	Academic holiday – Memorial Day observed
June 2	Last day of classes
June 5–9	Final examination period
June 10	Commencement End of spring term
June 11–18	End of university year (faculty only) Academic holiday

\* Faculty work day; not a class day.

**SUMMER TERM 2006**

June 19	Beginning of university year Beginning of summer term – classes begin
June 27	Last day to enter ePermit numbers
June 28	Last day to add a class; last day to drop a class; last day to register late and pay late registration fee
June 30	End of second week of instruction
July 4	Academic holiday – Independence Day
July 10	End of third week of instruction – Census date
August 7	End of seventh week of instruction
August 25	Last day of classes
August 28– September 1	Final examination period
September 1	End of summer term
September 2–10	Academic holiday

**FALL TERM 2006**

September 18	Beginning of fall term (faculty only)
September 25	Fall term classes begin
October 3	Last day to enter ePermit numbers
October 4	Last day to add a class; last day to drop a class; last day to register late and pay late registration fee
October 6	End of second week of instruction
October 13	End of third week of instruction – Census date
November 10	Academic holiday – Veterans' Day observed
November 13	End of seventh week of instruction
November 22–26	Academic holiday – Thanksgiving
December 8	Last day of classes
December 11–15	Final examination period
December 16	Mid-Year Commencement End of fall term
December 17– January 7	Academic holiday

**WINTER TERM 2007**

January 8	Beginning of winter term – classes begin
January 15	Academic holiday – Martin Luther King, Jr.'s Birthday observed
January 17	Last day to enter ePermit numbers
January 18	Last day to add a class; last day to drop a class; last day to register late and pay late registration fee
January 22	End of second week of instruction
January 29	End of third week of instruction – Census date
February 16, Friday	Academic holiday – George Washington's Birthday observed
February 27	End of seventh week of instruction
March 16	Last day of classes
March 19–23	Final examination period
March 24– April 1	Academic holiday

**SPRING TERM 2007**

April 2	Beginning of spring term – classes begin
April 10	Last day to enter ePermit numbers
April 11	Last day to add a class; last day to drop a class; last day to register late and pay late registration fee
April 13	End of second week of instruction
April 20	End of third week of instruction – Census date
May 18	End of seventh week of instruction
May 28	Academic holiday – Memorial Day observed
June 8	Last day of classes
June 11–15	Final examination period
June 16	Commencement End of spring term End of university year (faculty only)

# 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.ge.calpoly.edu](http://www.ge.calpoly.edu)

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. 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 12.

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 25.

## 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 69.

**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** are one or more courses that must be completed or other knowledge, skills, or standards that must be demonstrated before a student is permitted to take certain courses. Prerequisites (if any) for a course are listed in the Catalog. Some prerequisites have their own prerequisites, forming a string of courses that must all be taken. The catalog course description shows the last course in the prerequisite string of courses. For example, ME 212 Engineering Dynamics has prerequisites of MATH 241 and ME 211. MATH 241 requires MATH 143, which requires MATH 142, which requires MATH 141. ME 211 requires ME 241 and PHYS 131. To enroll in ME 212, students must have successfully completed MATH 241, 143, 142, 141 and ME 211 and PHYS 131.

### 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 90.
- 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 15 and 68.

### Quarters and Quarter Units

Cal Poly's academic calendar consists of four quarters – Fall, Winter, Spring and Summer (see page 8 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

<b>BA</b>	Bachelor of Arts	<b>AG</b>	College of Agriculture
<b>BFA</b>	Bachelor of Fine Arts	<b>AED</b>	College of Architecture & Environmental Design
<b>BS</b>	Bachelor of Science	<b>BUS</b>	Orfalea College of Business
<b>BArch</b>	Bachelor of Architecture	<b>ED</b>	College of Education
<b>BLA</b>	Bachelor of Landscape Architecture	<b>ENG</b>	College of Engineering
<b>EdD</b>	Doctor of Education	<b>LA</b>	College of Liberal Arts
<b>MA</b>	Master of Arts	<b>SM</b>	College of Science & Mathematics
<b>MS</b>	Master of Science	<b>b</b>	Concentration within bachelor's program
<b>MBA</b>	Master of Business Admin	<b>m</b>	Specialization within master's program
<b>MCRP</b>	Master of City & Regional Planning		
<b>MPP</b>	Master of Public Policy		

Program Title		Department or Program	College
Accounting	<i>b</i>	BS Business Admin	BUS
Aerospace Engineering	<i>BS, MS</i>	Aerospace Engineering	ENG
Agribusiness	<i>MS, m</i>	MS Agriculture MBA	AG BUS
Agricultural Business Ag Finance & Appr Ag Marketing Ag Policy	<i>BS b b b</i>	Agribusiness	AG
Agricultural Education	<i>m</i>	MS Agriculture	AG
Agricultural Engineering Technology	<i>m</i>	MS Agriculture	AG
Agricultural Science Ag Mechanics	<i>BS</i>	Agricultural Education & Communication	AG
Agricultural Systems Management	<i>BS</i>	BioResource & Agric Engineering	AG
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	AG
Animal Science	<i>m</i>	MS Agriculture	AG
Animal Science	<i>b</i>	BS Agricultural Science	AG
Applied Nutrition	<i>b</i>	BS Nutrition Science	AG
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>BFA</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
Bioengineering	<i>b m</i>	BS General Engr MS Engineering	ENG

Program Title		Department or Program	College
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	AG
Business Administration	<i>BS MBA</i>	Business Admin Graduate Programs	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
Communication Studies	<i>BA</i>	Communication Studies	LA
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	ED
Criminal Justice	<i>b</i>	BS Social Science	LA
Crop & Soil Science	<i>b</i>	BS Agric Science	AG
Crop Science	<i>BS m</i>	Hortic & Crop Sci MS Agriculture	AG
Cross-Cultural Studies	<i>b</i>	BS Social Sciences	LS
Culinary Science & Mgmt	<i>b</i>	BS Nutrition	AG

<b>BA</b>	Bachelor of Arts
<b>BFA</b>	Bachelor of Fine Arts
<b>BS</b>	Bachelor of Science
<b>BArch</b>	Bachelor of Architecture
<b>BLA</b>	Bachelor of Landscape Architecture
<b>EdD</b>	Doctor of Education
<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>MPP</b>	Master of Public Policy

<b>AG</b>	College of Agriculture
<b>AED</b>	College of Architecture & Environmental Design
<b>BUS</b>	Orfalea College of Business
<b>ED</b>	College of Education
<b>ENG</b>	College of Engineering
<b>LA</b>	College of Liberal Arts
<b>SM</b>	College of Science & Mathematics

<b>b</b>	Concentration within bachelor's program
<b>m</b>	Specialization within master's program

Program Title		Department or Program	College
Curriculum & Instruction	<i>m</i>	MA Education	ED
Dairy Products Tech	<i>m</i>	MA Agriculture	AG
Dairy Science	<i>BS</i>	Dairy Science	AG
Design Reproduction Technology	<i>b</i>	BS Graphic Communication	LA
Developmental Psych	<i>b</i>	BS Psychology	LA
Document Systems Mgt	<i>m</i>	MBA Business Admin	BUS
Earth Sciences	<i>BS</i>	Earth & Soil Sciences	AG
Ecology	<i>b</i>	BS Biological Sciences	SM
Economics	<i>BS</i>		BUS
Education	<i>MA</i>	College of Education	
Educational Leadership	<i>EdD</i>	College of Education	
Educational Leadership & Admin	<i>m</i>	MA Education	ED
Electrical Engineering	<i>BS, MS</i>	Electrical Engineering	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
Engineering	<i>MS</i>	College of Engineering	
Engineering Management	<i>MBA/MS</i>	Graduate Programs Engineering	BUS ENG
English	<i>BA, MA</i>	English	LA
Enology	<i>b</i>	BS Wine & Viticulture	AG
Entrepreneurship & Small Business	<i>b</i>	BS Business Admin	BUS
Environmental Engr	<i>BS</i>	Civil & Environ Engr	ENG
Environmental Horticultural Science	<i>BS m</i>	Hortic & Crop Science MS Agriculture	AG
Environmental Mgt-Protection	<i>BS</i>	Natural Resources Mgt	AG
Environmental Assess/Plan/Mgt/Science	<i>b b b</i>	BS Earth Science BS Forestry & Nat Res BS Soil Science	AG
Exercise Science & Health Promotion	<i>b</i>	BS Kinesiology	SM
Farm & Ranch Mgt	<i>b</i>	BS Agricultural Bus	AG

Program Title		Department or Program	College
Field & Wildlife Bio	<i>b</i>	BS Biological Sciences	SM
Financial Mgt	<i>b</i>	BS Business Admin	BUS
Food Science	<i>BS</i>	Food Science & Nutrition	AG
Forestry & Natural Resources	<i>BS</i>	Natural Resources Management	AG
Forestry Sciences	<i>MS</i>	College of Agriculture	
Fruit Science	<i>BS</i>	Horticulture & Crop Science	AG
General Engineering	<i>BS</i>	General Engineering	ENG
Graphic Communication	<i>BS</i>	Graphic Communication	LA
Graphic Design	<i>b</i>	BFA Art & Design	LA
Graphics for Packaging	<i>b</i>	BS Graphic Communication	LA
Heating, Ventilating, Air-Cond, Refrig	<i>b</i>	BS Mechanical Engr	ENG
History	<i>BA, MA</i>	History	LA
Industrial & Technical Studies	<i>MS</i>		BUS
Industrial Engineering	<i>BS, MS</i>	Industrial & Manufacturing Engr	ENG
Industrial Technology	<i>BS</i>		BUS
Information Systems	<i>b</i>	BS Business Admin	BUS
Integrated Technology Management	<i>m</i>	MS Engineering	ENG
Interdisciplinary Studies	<i>BA</i>	Continuing Education	
International Affairs	<i>b</i>	BA Political Science	LA
International Agribusiness Mgt	<i>b</i>	BS Agricultural Business	AG
International Business	<i>b</i>	BS Business Admin	BUS
Irrigation	<i>m</i>	MS Agriculture	AG
Journalism	<i>BS</i>	Journalism	LA
Kinesiology	<i>BS, MS</i>	Kinesiology	SM
Land Resources	<i>b</i>	BS Soil Science	AG
Landscape Architecture	<i>BLA</i>	Landscape Arch	AED
Landscape Horticulture	<i>b</i>	BS Environ Hort Sci	AG
Liberal Studies	<i>BA, BS</i>	Liberal Studies	LA

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<b>BA</b>	Bachelor of Arts
<b>BFA</b>	Bachelor of Fine Arts
<b>BS</b>	Bachelor of Science
<b>BArch</b>	Bachelor of Architecture
<b>BLA</b>	Bachelor of Landscape Architecture
<b>EdD</b>	Doctor of Education
<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>MPP</b>	Master of Public Policy

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<b>ENG</b>	College of Engineering
<b>LA</b>	College of Liberal Arts
<b>SM</b>	College of Science & Mathematics
<b>b</b>	Concentration within bachelor's program
<b>m</b>	Specialization within master's program

Program Title		Department or Program	College
Literacy & Reading	<i>m</i>	MA Education	ED
Management	<i>m</i>	MBA Business Admin	BUS
Managing People & Technology	<i>b</i>	BS Business Admin	BUS
Manufacturing Engineering	<i>BS</i>	Industrial & Manufacturing Eng	ENG
Marine Biology & Fisheries	<i>b</i>	BS Biological Sciences	SM
Marketing Management	<i>b</i>	BS Business Admin	BUS
Materials Engineering	<i>BS</i> <i>m</i>	Materials Engineering MS Engineering	ENG
Mathematics	<i>BS</i> , <i>MS</i>	Mathematics	SM
Mechanical Engineering	<i>BS</i> , <i>MS</i>	Mechanical Engineering	ENG
Mechatronics	<i>b</i>	BS Mechanical Engr	ENG
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</i> <i>b</i>	BS Forestry & Nat Res BS Rec, Parks, & Tourism Admin	AG
Nursery & Floriculture	<i>b</i>	BS Environ Hort Sci	AG
Nutrition	<i>BS</i>	Nutrition & Food Science	AG
Organizations	<i>b</i>	BS Social Sciences	LA
Ornamental Horticulture	<i>b</i>	BS Agricult Science	AG
Philosophy	<i>BA</i>	Philosophy	LA
Photography & Digital Imagery	<i>b</i>	BFA Art & Design	LA
Physical Educ-Teaching	<i>b</i>	BS Kinesiology	SM
Physical Science	<i>BS</i>	Physics	SM
Physics	<i>BA</i> , <i>BS</i>	Physics	SM

Program Title		Department or Program	College
Plant Protection Science	<i>BS</i> <i>m</i>	Horticul & Crop Sci MS Agriculture	AG
Political Science	<i>BA</i>	Political Science	LA
Polymers & Coatings Science	<i>b</i> , <i>MS</i>	BS Chemistry	SM
Pre-Law	<i>b</i>	BA Political Science	LA
Printing & Imaging Management	<i>b</i>	BS Graphic Commun	LA
Professional Practice	<i>m</i>	MS Architecture	AED
Psychology	<i>BS</i> , <i>MS</i>	Psychology & Child Development	LA
Public Policy	<i>MPP</i>	Political Science	LA
Recreation, Parks, & Tourism Admin	<i>BS</i> <i>m</i>	Natural Resources Mgt MS Agriculture	AG
Social Sciences Social Services Teaching	<i>BS</i> <i>b</i> <i>b</i>	Social Sciences	LA
Software Engineering	<i>BS</i>	Computer Science	ENG
Soil Science	<i>BS</i> <i>m</i>	Earth & Soil Sciences MS Agriculture	AG
Special Education	<i>m</i>	MA Education	ED
Statistics	<i>BS</i>	Statistics	SM
Studio Art	<i>b</i>	BFA Art & Design	LA
Systematics & Biodiversity	<i>b</i>	BS Biological Sciences	SM
Theatre	<i>BA</i>	Theatre & Dance	LA
Tourism Planning & Management	<i>b</i>	BS Rec, Parks, & Tourism Admin	AG
Transportation Planning	<i>MCRP</i> / <i>MS</i>	City & Regional Plan Civil Engineering	LA ENG
Turfgrass Mgt	<i>b</i>	BS Environ Hort Sci	AG
Urban Forestry	<i>b</i>	BS Forestry & Nat Res	AG
Viticulture	<i>b</i>	BS Wine & Viticult	AG
Water Engineering	<i>m</i>	MS Engineering	ENG
Watershed Hydrology	<i>b</i>	BS Forestry & Nat Res	AG
Wildland Fire/Fuels Mgt	<i>b</i>	BS Forestry & Nat Res	AG
Wine & Viticulture	<i>BS</i>	College of Agriculture	
Wine Business	<i>b</i>	BS Wine & Viticult	AG



## Other Academic Programs

<b>AG</b>	College of Agriculture
<b>AED</b>	College of Architecture & Environmental Design
<b>BUS</b>	Orfalea College of Business
<b>ED</b>	College of Education

<b>ENG</b>	College of Engineering
<b>LA</b>	College of Liberal Arts
<b>SM</b>	College of Science & Mathematics

### MINORS

Program Title	Department	College
Agribusiness	Agribusiness	AG
Agricultural Communication	College of Agriculture	
Anthropology-Geography	Social Sciences	LA
Art	Art and Design	LA
Biology	Biological Sciences	SM
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
Communication Studies	Communication Studies	LA
Computer Science	Computer Science	ENG
Construction Management	Construction Management	AED
Crop Science	Horticulture & Crop Science	AG
Dairy Science	Dairy Science	AG
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	AG
Ethnic Studies	Ethnic Studies	LA
Food Science	Food Science & Nutrition	AG
French	Modern Languages & Lit	LA
Fruit Science	Horticulture & Crop Science	AG
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	AG
Microbiology	Biological Sciences	SM
Military Science	Military Science	AG
Multidisciplinary Design	Aerospace Engineering	ENG

Program Title	Department	College
Music	Music	LA
Nutrition	Food Science & Nutrition	AG
Ornamental Plant Production	Horticulture & Crop Science	AG
Packaging	Orfalea College of Business	
Philosophy	Philosophy	LA
Physics	Physics	SM
Plant Protection	Horticulture & Crop Science	AG
Poultry Management	Animal Sciences	AG
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	AG
Spanish	Modern Languages & Lit	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

College of 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	AG
Technical Communic 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, BFA	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
Graphic Communication, BS	Accreditation Counsel for Collegiate Graphic Communications, Inc.
Industrial Technology, BS	National Association of Industrial Technology
Landscape Architecture, BLA	American Society of Landscape Architects
Music, BA	National Association of Schools of Music
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

## INTRODUCTION

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 Employment Equity and Faculty Recruitment (<http://employeequity.calpoly.edu>), 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.

## NONDISCRIMINATION POLICY

Cal Poly and its auxiliary organizations are committed to maintaining and implementing employment policies and procedures in compliance with applicable state and federal nondiscrimination and affirmative action laws and regulations and ensuring equality of opportunity in all aspects of employment. The University supports an environment free of unlawful discrimination on the basis of race, color, religion, national origin, sex, sexual orientation, marital status, pregnancy, age, disability, medical condition and covered veteran status. Moreover, retaliation against individuals who have or are believed to have filed a discrimination complaint, opposed a discriminatory act, or participated in a discrimination investigation or proceeding, is prohibited. Cal Poly shall, upon request, provide reasonable accommodation to qualified individuals with a disability or medical condition so that they may perform the essential duties of their jobs, unless doing so would impose an undue hardship on the University. Reasonable accommodation is to be determined by the University following receipt of an individual's request for accommodation and subsequent engagement in an interactive process with the individual to identify the nature and extent of the individual's restrictions and the appropriate reasonable accommodation.

### Race, Color, National Origin and Disability

As part of the California State University, Cal Poly complies with the requirements of Title VI and Title VII of the Civil Rights Act of 1964, as well as other applicable federal and state laws prohibiting discrimination. 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. Sections 504 and 508 of the Rehabilitation Act of 1973, the Americans with Disabilities Act of 1990, and various state laws prohibit such discrimination. The Office of Employment Equity and Faculty Recruitment (Health Center (Bldg 27), Room 113, 805-756-6770) has been designed to coordinate the efforts of the campus to comply with all relevant disability laws.

### Sex/Gender

The California State University does not discriminate on the basis of sex or gender in the educational programs or activities it conducts. Title IX of the Education Amendments of 1972 and certain other federal and state laws 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 these laws to programs and activities of California Polytechnic State University, San Luis Obispo may be referred to the Dean of Students, Student Services (Bldg 124), Room 125, 805-756-0327, 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).

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) or the Disability Resource Center (805-756-1395).
- \* Complaints from non-represented employees may be directed to the Office of Employment Equity and Faculty Recruitment (<http://employeequity.calpoly.edu>), Health Center Room 113 (805-756-6770).
- \* Complaints by or against employees who are covered by either collective bargaining agreements or CSU system-wide procedures shall be processed in accordance with the applicable collective bargaining agreement or system-wide procedures. Questions should be directed to: the office of the Associate Vice President for 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." 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 option should be pursued.*

Except as otherwise indicated above, complainants should meet with the Director of Employment Equity and Faculty Recruitment 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 Employment Equity and Faculty Recruitment (<http://employeequity.calpoly.edu>), Health Center (Bldg. 27), Room 113 (805-756-6770) 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, Health Center (Bldg. 27), Room 188 (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 Employment Equity and Faculty Recruitment 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 (AB98-2)

California Polytechnic State University is committed to creating and maintaining an environment in which faculty, staff, and students work together in an atmosphere of mutual respect and unconstrained academic interchange. In the university environment, all individuals are entitled to benefit from university programs and activities without having to tolerate inappropriate behavior because of their gender.

This policy applies to all members of the university community and everyone is expected to give the subject the serious attention it requires. Sexual harassment violates university policy, seriously threatens the academic environment, is contrary to law, and will not be tolerated.

The University also will not tolerate sexually harassing conduct by a non-employee toward any member of the university community where the non-employee and the member of the university community are participating in

university activities. Independent contractors, vendors, and others who do business with the University or on University premises are expected to comply with this policy, and the University will take appropriate action if they fail to do so.

**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 campus sexual harassment advisor or to the department head/chair or program manager.

**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, 805-756-1521).

Employees should contact the Office of Employment Equity and Faculty Recruitment, Health Center Room 113, [www.employequity.calpoly.edu](http://www.employequity.calpoly.edu) (805-756-6770).

**Formal Procedures**

Students file written charges with the office of the Vice President for Student Affairs (Admin. Bldg. 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 Employment Equity and Faculty Recruitment, Health Center, Room 113, [www.employequity.calpoly.edu](http://www.employequity.calpoly.edu) (805-756-6770).

Sexual harassment investigators endeavor to complete a review within 20 days and send a preliminary report of findings to the complainant and the respondent, who have five 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) or the Office of Employment Equity and Faculty Recruitment (<http://employequity.calpoly.edu>) (805-756-6770).

**STATEMENT ON DIVERSITY**

The following excerpts are taken from *The Cal Poly Statement on Diversity*, which has been endorsed by the Cal Poly Academic Senate Resolution AS-506-98/DTF:

"At the heart of a university is the responsibility for providing its students with a well-rounded education, an education that fosters their intellectual, personal and social growth. The ultimate product of universities is education in the broadest sense, including preparation for life in the working world." In this regard, it is in the compelling interest of Cal Poly, the State, and the Nation to provide our students with an education that is rich with a diversity of ideas, perspectives, and experiences."

"Cal Poly's commitment to diversity signals an affirmation of the highest educational goals for this University, including mutual respect, civility, and engaged learning."

**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 of the Fairness Board. Students may contact the Academic Senate (756-1258) for clarification of the description and procedures for the Fairness Board and the appeal process for grade disputes. Students may also contact the Dean of Students (756-0327) 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**

[http://www.ess.calpoly.edu/\\_records/stu\\_info/ferpa.htm](http://www.ess.calpoly.edu/_records/stu_info/ferpa.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 [it-policy@calpoly.edu](mailto:it-policy@calpoly.edu).

# 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 2004 totaled nearly 397,000 students, who were taught by some 21,000 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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*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 alphabetically.*

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| George Gowgani (2010)     |                                     |
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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  
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 Ms. Christine Helwick.....General Counsel  
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**CAMPUSES—THE CALIFORNIA STATE UNIVERSITY**

**California State University, Bakersfield**  
 9001 Stockdale Highway, Bakersfield, CA 93311-1099  
 Dr. Horace Mitchell, President  
 (661) 664-2011 [www.csub.edu](http://www.csub.edu)

**California State University, Channel Islands**  
 One University Drive, Camarillo, CA 93012  
 Dr. Richard Rush, President  
 (805) 437-8400 [www.csuci.edu](http://www.csuci.edu)

**California State University, Chico**  
 400 West First Street, Chico, CA 95929-0150  
 Dr. Paul J. Zingg, President  
 (530) 898-4636 [www.csuchico.edu](http://www.csuchico.edu)

**California State University, Dominguez Hills**  
 1000 East Victoria Street, Carson, CA 90747-0005  
 Dr. James E. Lyons, Sr., President  
 (310) 243-3300 [www.csudh.edu](http://www.csudh.edu)

**California State University, East Bay**  
 25800 Carlos Bee Boulevard, Hayward, CA 94542  
 Dr. Norma Rees, President  
 (510) 885-3000 [www.csueastbay.edu](http://www.csueastbay.edu)

**California State University, Fresno**  
 5241 North Maple Avenue, Fresno, CA 93740  
 Dr. John D. Welty, President  
 (559) 278-4240 [www.csufresno.edu](http://www.csufresno.edu)

**California State University, Fullerton**  
 800 N. State College Boulevard, Fullerton, CA 92834-9480  
 Dr. Milton A. Gordon, President  
 (714) 278-2011 [www.fullerton.edu](http://www.fullerton.edu)

**Humboldt State University**  
 One Harpst Street, Arcata, CA 95521-8299  
 Dr. Rollin C. Richmond, President  
 (707) 826-3011 [www.humboldt.edu](http://www.humboldt.edu)

**California State University, Long Beach**  
 1250 Bellflower Boulevard, Long Beach, CA 90840-0115  
 Dr. Robert C. Maxson, President  
 (562) 985-4111 [www.csulb.edu](http://www.csulb.edu)

**California State University, Los Angeles**  
 5151 State University Drive, Los Angeles, CA 90032  
 Dr. James M. Rosser, President  
 (323) 343-3000 [www.calstatela.edu](http://www.calstatela.edu)

**California Maritime Academy**  
 200 Maritime Academy Drive, Vallejo, CA 94590  
 Dr. William B. Eisenhardt, President  
 (707) 654-1000 [www.csum.edu](http://www.csum.edu)

**California State University, Monterey Bay**  
 100 Campus Center, Seaside, CA 93955-8001  
 Dr. Peter P. Smith, President  
 (831) 582-3330 [www.csumb.edu](http://www.csumb.edu)

**California State University, Northridge**  
 18111 Nordhoff Street, Northridge, CA 91330  
 Dr. Jolene Koester, President  
 (818) 677-1200 [www.csun.edu](http://www.csun.edu)

**California State Polytechnic University, Pomona**  
 3801 West Temple Avenue, Pomona, CA 91768  
 Dr. J. Michael Ortiz, President  
 (909) 869-7659 [www.csupomona.edu](http://www.csupomona.edu)

**California State University, Sacramento**  
 6000 J Street, Sacramento, CA 95819  
 Dr. Alexander Gonzalez, President  
 (916) 278-6011 [www.csus.edu](http://www.csus.edu)

**California State University, San Bernardino**  
 5500 University Parkway, San Bernardino, CA 92407-2397  
 Dr. Albert K. Karnig, President  
 (909) 880-5000 [www.csusb.edu](http://www.csusb.edu)

**San Diego State University**  
 5500 Campanile Drive, San Diego, CA 92182  
 Dr. Stephen L. Weber, President  
 (619) 594-5000 [www.sdsu.edu](http://www.sdsu.edu)

**San Francisco State University**  
 1600 Holloway Avenue, San Francisco, CA 94132  
 Dr. Robert A. Corrigan, President  
 (415) 338-1111 [www.sfsu.edu](http://www.sfsu.edu)

**San José State University**  
 One Washington Square, San Jose, CA 95192-0001  
 Mr. Don Kassing, Interim President  
 (408) 924-1000 [www.sjsu.edu](http://www.sjsu.edu)

**California Polytechnic State University, San Luis Obispo**  
 One Grand Avenue  
 San Luis Obispo, CA 93407  
 Dr. Warren J. Baker, President  
 (805) 756-1111 [www.calpoly.edu](http://www.calpoly.edu)

**California State University, San Marcos**  
 333 S. Twin Oaks Valley Road  
 San Marcos, CA 92096-0001  
 Dr. Karen S. Haynes, President  
 (760) 750-4000 [www.csusm.edu](http://www.csusm.edu)

**Sonoma State University**  
 1801 East Cotati Avenue, Rohnert Park, CA 94928-3609  
 Dr. Ruben Armiñana, President  
 (707) 664-2880 [www.sonoma.edu](http://www.sonoma.edu)

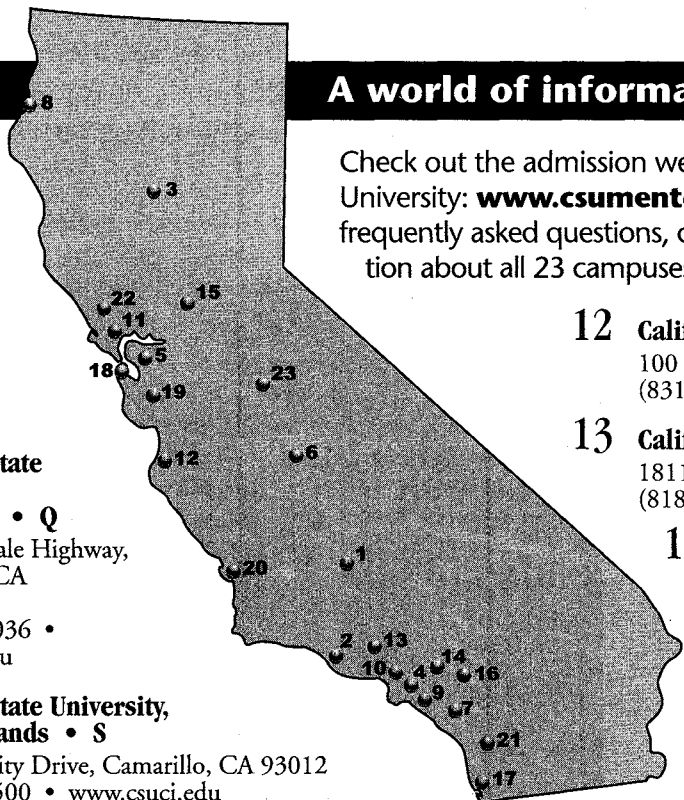
**California State University, Stanislaus**  
 801 West Monte Vista Avenue, Turlock, CA 95382-0299  
 Dr. Marvalene Hughes, President  
 (209) 667-3122 [www.csustan.edu](http://www.csustan.edu)





## A world of information is just a click away.

Check out the admission website for the entire California State University: [www.csumentor.edu](http://www.csumentor.edu). You will find helpful hints, frequently asked questions, campus tours, and general information about all 23 campuses.



- 1 California State University, Bakersfield • Q**  
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(408) 283-7500 • [www.sjsu.edu](http://www.sjsu.edu)
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S - Semester system  
Q - Quarter system

**Note:** Telephone numbers are to the campus admission office.



### **Australia Study Program**

The Australia Study program is a one-quarter off-campus study program led by Cal Poly faculty on the St. Lucia campus of the University of Queensland in Brisbane, Australia. The program is offered during Winter Quarter and students may obtain 12 to 16 units of Cal Poly credit.

Winter 2005 was the program's first year. Professor Tom Rice, Earth and Soil Sciences, led a group of 11 students from all majors.

*Photos courtesy of Tom Rice*



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.caed.calpoly.edu/support/advising/index.html">www.caed.calpoly.edu/support/advising/index.html</a>
Business Advising Center.....	756-2601 <a href="http://www.cob.calpoly.edu/advising/">www.cob.calpoly.edu/advising/</a>
Engineering Advising Center .....	756-1461 <a href="http://ceng-web.calpoly.edu/frames/advising.html">ceng-web.calpoly.edu/frames/advising.html</a>
Liberal Arts Advising Center.....	756-6200 <a href="http://cla.calpoly.edu/cla/advising/advising.html">cla.calpoly.edu/cla/advising/advising.html</a>
Science and Mathematics Advising Center .....	756-2615 <a href="http://www.calpoly.edu/~cosamac/">www.calpoly.edu/~cosamac/</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://drc.calpoly.edu/">drc.calpoly.edu/</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/elmmape.html">www.calpoly.edu/~math/elmmape.html</a>
General Education Program.....	756-2228 <a href="http://www.ge.calpoly.edu">www.ge.calpoly.edu</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/~wrtskils/">www.calpoly.edu/~wrtskils/</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 100,000 students who have attended Cal Poly since 1901. To keep former students connected to the University, the Alumni Association coordinates a variety of programs and functions including newsletters, e-mail updates, continuing education, travel programs, POLY REPS (a student alumni association), GOLD programs for Graduates Of the Last Decade, Homecoming and a host of regional events and activities both in the state of California and beyond.

The Alumni Association is governed by a volunteer Board of Directors. The Office of Alumni Relations coordinates the activities of the association. With nearly 30 alumni chapters, the association sponsors alumni events in numerous locations throughout the state of California and assists special interest alumni chapters such as Vines to Wines, FANS, Rose Float, Graphic Communication, Rugby and WOW.

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 events.

The Cal Poly Alumni Association has a special interest in creating a lifelong connection between the University and its alumni and seeks to engage and serve them in a variety of different ways. The association also provides support to the University through student scholarships and faculty recognition programs.

## 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 applications range from the production of human insulin in bacterial cells to the development and use of genetically modified crops, animals, and microbial fermentation for the production of crop protection products 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 also used in the development of new technologies and therapies applied to health, nutrition, and the treatment of diseases in both human and

non-human animals. Biotechnology is one of the fastest growing areas in genetics, agriculture, food production, environmental sciences, pharmaceuticals and biomedical engineering. Employment opportunities are at a premium with hundreds of biotechnology-related companies located in the San Francisco, Los Angeles and San Diego areas as well as throughout the United States.

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.  
Dr. Elizabeth Koutsos, 756-5462, ekoutsos@calpoly.edu.  
Dr. Dan Peterson, 756-7633, dpeterso@calpoly.edu.

#### *Animal Science Department*

An applied approach to biotechnology with courses such as biotechnology in animal science, advanced molecular techniques in animal science, immunology and diseases of animals, and applied animal embryology that relate biotechnology to animal systems in the agricultural and biomedical fields.

#### **BS BioResource and Agricultural Engineering**

#### **BS Agricultural Systems Management**

Dr. Doug W. Williams, 756-6153, wwillia@calpoly.edu.  
Dr. Stephen Kaminaka, 756-2658, skaminak@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. Jeffrey Wong, 756-2428, jcwong@calpoly.edu.

#### *Horticulture and Crop Science Department*

Incorporation of biotechnology into the introductory level course, Principles of Horticulture and Crop Science, as well as integration of the concepts into the course, Plant Improvement and Commercial Seed Production.

#### **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. Christopher Appel, 756-1691, cappel@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, Minor, Biological Sciences**

Dr. Elena Levine, 756-2175; elevine@calpoly.edu  
Dr. Dennis Frey, 756-2802, dfrey@calpoly.edu  
Dr. Scott Steinmaus, 756-5142, ssteinma@calpoly.edu

#### *Biological Sciences Department*

The BS and minor programs offer 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, Minor, Microbiology**

Dr. Susan Elrod, 756-2875, selrod@calpoly.edu

#### *Biological Sciences Department*

The BS and minor programs offer 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, microbial biotechnology, 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 genetics, biochemistry, and biotechnology laboratory techniques and elective choices in animal biotechnology, bioinformatics, cell and molecular biology, engineering-related biotechnology, ethics, pharmaceutical biotechnology and plant biotechnology. It is open to any major, except students taking the Molecular Biology concentration in Biochemistry or the Cell and Molecular Biology concentration in Biological Sciences. *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. Through research and outreach, undergraduate and graduate programs train 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).

## **CONTINUING EDUCATION and UNIVERSITY OUTREACH**

*Dennis Parks, Dean*

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

*continuing-ed@calpoly.edu www.continuing-ed.calpoly.edu*

Continuing Education and University Outreach (CE&UO) advances the academic and public service mission of Cal Poly beyond the traditional undergraduate and graduate college experience. Its goal is to increase access to the intellectual resources of the University by developing and offering a wide range of innovative lifelong learning opportunities to 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.

Information on programs and current offerings is listed in *Outreach* which is published three times a year and at [www.continuing-ed.calpoly.edu](http://www.continuing-ed.calpoly.edu).

**Adult Degree Program (ADP) – BA Interdisciplinary Studies.** This special session degree program offers a challenging and intellectually stimulating curriculum in a format structured for adults who are balancing careers, family responsibilities and civic obligations. The program operates utilizing a cohort model and classes are offered weekday evenings. For more information, see page 307.

**MA Education.** The Curriculum and Instruction Specialization offers an emphasis area Science, Mathematics, and Research Technology. This special session program is offered in partnership with the College of Education; see the College of Education for additional information or visit <http://coe.calpoly.edu/ProgramsCourses/MAs>

**MS Agriculture, Specialization in Agricultural Education.** Many classes required for this specialization are offered through special session in the summer. See the College of Agriculture for additional information.

**Distance Learning.** Challenges of time and distance often make it impractical for individuals to travel to campus for classroom-based education opportunities. To address this problem, CE&UO offers many programs in a distance learning format. These programs cover a wide-range of subjects including applied technology, graphic communications, business, medical office training and math preparation. They are offered in varied formats from CDs to internet-based instruction. A complete listing of programs and courses is available at [www.continuing-ed.calpoly.edu/distance\\_learning.html](http://www.continuing-ed.calpoly.edu/distance_learning.html).

**Open University.** This option enables members of the community to enroll in 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. Enrollment forms and guidelines for registering may be obtained from CE&UO two weeks prior to the beginning of each quarter.

**Osher Lifelong Learning Institute (OLLI).** Established through a gift from the Bernard Osher Foundation, the Institute offers to people 50 years of age or older the opportunity for continued learning. Programs range from two three-hour discussions to multi-day travel programs. Topics and programs change each term and are led by OLLI members, Cal Poly faculty, and experts in their respective area. Information on current programs and how to join is available at [www.continuing-ed.calpoly.edu/osher.html](http://www.continuing-ed.calpoly.edu/osher.html).

**Programs for Professionals.** For those desiring upgrade skills or knowledge, CE&UO offers a wide range of educational opportunities ranging from complete certificate programs to one-day seminars. Certificate programs are offered in Microsoft certifications, paralegal studies, supervision, technical communications and wine industry. New certificates are being planned; updated information is available on CE&UO's web site.

**Corporate and Organizational Training.** CE&UO will customize training to meet the specific needs of a business, corporation, or organization. This process starts with a needs assessment and continues through design, implementation and evaluation. Past clients include PG&E, the State of California, and the Forest Service.

**Conference and Training Services.** The department develops and coordinates workshops, seminars, and conferences for both on- and off-campus groups and organizations. As a full-service conferencing unit, Conference and Training Services provides registration services, budget management, housing, catering and food service and logistical arrangements. Information on offering a conference or seminar is available at [www.continuing-ed.calpoly.edu/conf\\_services.html](http://www.continuing-ed.calpoly.edu/conf_services.html).

## 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 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.

## CENTER FOR TEACHING AND LEARNING

*Joseph E. Grimes, Director*

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

*<http://www.cctl.calpoly.edu>*

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/staff support, individual and group consultation services for faculty/staff, 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

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

The Commuter Services 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, free and reduced price 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>, and [www.calpoly.edu/computing](http://www.calpoly.edu/computing)*

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; learning management systems; mobile computing, remote access, portal and web development strategies; policy and security development and compliance; and consulting and training on supported hardware, software, and network services.

### Resources and Facilities

Enterprise hardware systems include an IBM mainframe, Dell and Sun servers, various departmental, college and division servers, and advanced modeling and research 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 wireless access in designated classrooms, instructional areas and general purpose campus buildings.

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 many classroom/computing facilities for instruction, independent study, and research and development. Apple, Cisco, Dell, HP, Sun, and other systems are available to students in "hands-on" teaching and learning environments. Extensive efforts are underway to enhance ADA and assistive technology services to make 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 data warehouse serves as a central data repository to meet the University's reporting and data analysis needs.

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 service 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 on the web at [www.calpoly.edu/computing/policy.html](http://www.calpoly.edu/computing/policy.html).

## EL CORRAL BOOKSTORE

*Located in the University Union or online*

*[www.elcorralbookstore.com](http://www.elcorralbookstore.com) 1-800-367-0771*

El Corral Bookstore is the campus source for all required and recommended courseware as well as student supplies. Educational pricing is available on computer hardware and software. Reserve textbooks online and receive a 10% discount on all courseware material. Cal Poly insignia merchandise is offered at the main store, on-line, and downtown at Cal Poly Downtown. All proceeds benefit the University.

## 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 Joseph and Victoria Cotchett endowed professorship in science and mathematics education (College of Education).

## 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, Campus Dining, and Mustang Graphics
- 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*

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/*

The goal of International Education and Programs (IEP) is to assist students in participating in study abroad programs. 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 resources 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 70 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 Programs pays all tuition and administrative costs for participating California resident students to the same extent that such funds would be expended to support similar costs in California.

Participants are responsible for all personal costs, such as transportation, room and board, living expenses, and home campus fees. Financial aid, with the exception of Federal Work-Study, is available to qualified students.

### 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, University of Western Sydney, Victoria University

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

**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 and Engineering  
Univ of Melbourne..... Agriculture

### Austria

FH Joanneum Fachhochschul-  
Studiengängen..... Construction Management

### Brazil

Universidade Federal Do Rio De Janeiro..... Architecture

### Canada

University of Guelph ..... Agriculture

### Denmark

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 ..... Engineering

### Honduras

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

### India

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

### Mexico

Benemérita Universidad Autónoma de  
Puebla ..... City and Regional Planning

### Norway

Agricultural University of Norway ..... Landscape Architecture

### Philippines

Mapua Institute of Technology ..... Engineering

### Sweden

Chalmers University of Technology ..... Mechanical Engineering

### Switzerland

HSR Hochschule für Technik,  
Rapperswil ..... Landscape Arch, City and Regional Planning

### Taiwan (Republic of China)

Chaoyang University of Technology ..... Engineering  
National Yunlin University of Science and  
Technology ..... Engineering

National Cheng Kung University..... 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*. A 500-foot ex-navy oceanographic vessel, ship is a unique living laboratory that offers Cal Poly students (referred to as cadets) two months of shipboard experience, classroom instruction, and a unique international educational experience.

The charted course of the Cal Poly at Sea Cruise rotates on a three-year cycle, each time visiting a different region of the Pacific. The South Pacific 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 Asia Pacific Cruise often visits Hawaii, the Philippines, China, Hong Kong, Vietnam, and Japan. Every participant is required to attend a three-day safety and lifeboat-training program prior to departure at CMA in Vallejo, California, to earn his or her Merchant Mariner's Document.

### Australia Study Program

The Australia Study Program is a one quarter off-campus study program led by Cal Poly faculty on the St. Lucia campus of the University of Queensland in Brisbane, Australia. The program is offered during Winter Quarter, and students may obtain 12 to 16 units of Cal Poly credit. The study program includes 8 weeks of classes with some weekend field trips to nearby sites, including the popular Gold Coast, followed by two weeks of independent travel.

The University of Queensland's main campus is located in the picturesque inner-city suburb of St. Lucia. Bounded by the Brisbane River on three sides and only seven kilometers from Brisbane's vibrant city heart, this 285-acre site provides students with the perfect study, research and living environment.

### 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 a one-quarter study program, offering a variety of courses for all students, and an internship program with U.S. corporations, the American Embassy, and universities for qualified seniors. 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 to have never been colonized or occupied by Western powers, Thailand retains a unique character and charm, with an unusual blend of ancient culture and modern industry.

During the first month of the program, classes are held at Chiang Mai University in Chiang Mai. Following a week-long trip to Koh Tao Island for scuba diving lessons, the group moves to First Global Community College (FGCC) in Nong Khai. The last month of the program is held at Silpakorn University in Bangkok.

### 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 19 Australian and 7 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 federal 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, Child Development, Humanities & Social Sciences, International Business & Economics, Medical Practice & Policy, and Politics of the European Union. 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.

Cal Poly joins 29 member and associated universities that cooperate within the **University Studies Abroad Consortium (USAC)**. USAC has provided quality programs for over 20 years and currently offers 35 study abroad programs at host universities in 24 countries ranging from summer, semester, and year-long programs. USAC offers two types of programs. The language specialty programs focus on language immersion and cultural studies (beginning through advanced language tracks), whereas the partnership programs offer direct enrollment in foreign partner universities offering a full curriculum of studies. USAC offers study abroad opportunities for some underrepresented disciplines (i.e., computer science, education, engineering, viticulture, and women's studies) along with internships, field studies, and community involvement programs. Cal Poly students receive transfer credit for pre-approved courses. Cal Poly disburses federal financial aid for eligible students.

## 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 L. 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 is an information and instructional unit of the university, providing expert assistance on using authoritative paper and electronic information resources to support student and faculty success in learning, teaching, research, and reporting. Library faculty and staff deliver customized information on demand from print and full text digital holdings, as well as interlibrary loan sources.

Digital research portals for academic disciplines guide users through today's extended information universe. Library faculty and staff are available in person and via the 24/7 virtual chat service to help students locate, evaluate, and use information resources for class assignments and research projects. Librarians also work with teaching faculty on customized classroom, laboratory, and digital instruction options.

## Collections

**Print and Electronic Resources.** The Kennedy Library contains a print collection of nearly 3.5 million items, including books, journals, senior projects, master's theses, archives and manuscripts, government documents, and maps. The library also licenses more than 7,000 electronic resources, delivering full-text access to hundreds of journals directly to users via the World Wide Web. Additionally, if the library does not own it, lending services permit accessing other libraries' collections.

**Special Collections and University Archives.** This department offers more than 100 unique research collections in many formats including manuscripts, correspondence, business records, architectural drawings, photographs and negatives, and audio and videotape. 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 Cal Poly. These materials include campus records, publications, photographs, plans, blueprints, and ephemera dating from the founding of the university in 1901 to the present.

## Digital Teaching Library (DTL) Learning Commons

In collaboration with Information Technology Services, the Kennedy Library's DTL Learning Commons provides access to a number of computing and modern collaborative workspaces, complete with the latest technological, print, non-print and human resources tailored to targeted learning and research communities, both for in-class work and for doing work outside of class hours. As a social center on campus, the Kennedy Library building provides space for individual and group study and research.

## Services

**Adaptive Technology Center.** A collaborative effort with the Disabilities Resource Center (DRC), the Adaptive Technology Center is located on the second floor of the Kennedy Library, offering an optical character scanner, voice-activated computer system, Braille printer, computer with screen reading and screen enlarging programs, closed circuit television (print enlarger), and tactile image enhancer.

**Course Reserves.** Offers access to both electronic and print collateral reading materials selected by Faculty.  
<http://poetry.lib.calpoly.edu/screens/reserves.html>

**PolyCAT.** Provides information about books, periodicals, and other library materials either located at Kennedy Library or accessible in electronic format.

<http://poetry.lib.calpoly.edu/search/X>

**MyPolyCAT.** Provides personalized electronic services such as Preferred Searches (automatic customized searches), and online renewals of library materials.

<http://poetry.lib.calpoly.edu/patroninfo>

**PolySearch.** Provides access to web-based bibliographic and full-text resources, including electronic journals and books, reference works, and other useful subject resources. It allows users' to search multiple databases with single search and further links to the full text of available resources. <http://metalib.calstate.edu:8991/V>

**MyPolySearch.** Provides personalized electronic services such as Alerts, my favorites, my eshelf, my ejournal, and search history.

**Pony Prints.** Located on the first floor of Kennedy Library offers a wide variety of services including copying, binding, transparencies, color printing, digital file printing, and faxing.

Other program units located in the Kennedy Library include the Center for Teaching and Learning, the University Honors Program office, and the Peace Corps campus headquarters.

### **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 the campus community 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, honor students, and community members 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.

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 209B*  
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 expected to take at least two honors courses per year in a format that affords 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. Most courses fulfill graduation requirements.

### **UNIVERSITY POLICE**

*Building 74, 805 756-2281, <http://Police.calpoly.edu>*

The California State University Police Department at San Luis Obispo is a full service police agency certified by the California Department of Justice. It has the same responsibilities and authorities as municipal, county or other state law enforcement agencies and has state-wide authority. It includes a 911 emergency dispatch center and Emergency Medical Dispatch capabilities as certified by the Emergency Medical Services Agency. Parking is a major function of the University Police, which includes the management of 6,800 parking spaces, a parking structure, parking planning and traffic flow. Our Special Events management staff is responsible for the coordination of over 300 campus events a year which brings approximately 500,000 visitors to campus who attend concerts, sporting events, Open House, Week of Welcome, Commencement and other community activities. Commuter and Access Services provide resources for alternative transportation in partnership with local bus transit, RideShare, Safe Ride Home, bicycle organizations and others. Our Escort Service provides free transportation for students, faculty and staff on, and in the vicinity of, the University during evening hours. Details about the many services offered by the University Police Department can be found at our website at <http://Police.calpoly.edu> or by calling us at 805-756-2281.



### **“Investing in Greatness”**

Students at Cal Poly have endless opportunities to make a difference in the lives of their peers, in the life of the community, and ultimately in their own lives. Some students help others through the many employment opportunities on campus. They learn valuable administrative skills while assisting others in navigating a complex university community.



Students engage in important teambuilding activities as orientation leaders and WOW participants, or through clubs and organization development. They add new skills to their educational experience that transfer to all areas of their lives by modeling the mentoring they receive from faculty and staff, and passing that mentoring on to others. Students learn the principles of civic responsibility while enjoying the benefits of giving back to their community.



# *Student Affairs*

*Photos courtesy of Student Academic Services  
and Student Life and Leadership*

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# 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 cultivate student learning and success. 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
- Dean of Students
- 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. will be every student's connection to the ultimate college experience.

### 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, project management, 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 Plaza, UU Epicenter, two student lounges: Bishop's Lounge and San Luis Lounge, UU Gallery, ASI Events, Poly Escapes, ASI Craft Center, McPhees' Games Area, BackStage Pizza, Julian's, Mustang Express, Insomniac U, SESLOC Credit Union, Student Life & Leadership, Student Community Services, Multicultural Center, Women's Center, ASI Student Government Office, Chumash Auditorium and UU Reservations.

**UU 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, UU Graphics, Club Programs and Services, and Poly Escapes.

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

**Cal Poly Clubs**

There are more than 200 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/uu/clubprograms](http://www.asi.calpoly.edu/uu/clubprograms)

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 four different program areas: UU Gallery,

concerts, 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*

The UU Gallery is located in the UU 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, surfboard shaping area, 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*

For more than 30 years ASI's Poly Escapes has been sponsoring outdoor trips and programs with volunteer leaders at the core of its leadership program. With a zest for spontaneous adventure and the desire to explore the unknown, Cal Poly students have looked to Poly Escapes to take them on "once in a lifetime adventures." We provide trip coordination, educational experiences, a climbing wall, resource library, and roughly 30 trips per quarter each fall, winter and spring. Students may also rent equipment such as tents, sleeping bags, back packs, cross country skis, surfboards and ice cream makers at reasonable prices.

**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 50 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. Course credit is available for participating in the Rose Float program. The partnership built with the counterpart students of the Pomona campus continues to be an invaluable experience for everyone involved.

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

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

The Orfaea 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 (Main), 805-756-PLAY (Hotline)  
www.asi.calpoly.edu/recsports*

ASI Recreational Sports offers opportunities for all students to participate in aquatics, exercise and instructional classes, intramural sports, informal recreation, Chumash Challenge High Ropes Course 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, a 6,500-square-foot fitness room, nine racquetball courts, an Olympic sized swimming pool and four indoor basketball courts.

ASI's Recreational Sports Program employs more than 160 students each year. Student and fulltime staff members are available to assist with any questions or concerns about Recreational Sports programs.

#### **Programs include:**

**Aquatics** programs are designed for all levels of swimmers ranging from beginning to masters swim classes. Scuba courses, water exercise (aerobic) and stroke clinics are just a few of the classes offered.

**Chumash Challenge** is a unique and comprehensive experiential educational program that develops and empowers groups as well as individuals by incrementally

increasing the complexity of tasks and levels of engagement through initiatives and problem solving activities using Team Building Workshops and High Ropes Workshops. Cal Poly clubs, class labs, and organizations as well as local schools, county government agencies, youth-at-risk groups, and local businesses are all participants of Chumash Challenge. Located in the hills of Stenner Canyon, it is a place of self-discovery where the "challenge by choice" philosophy is followed, where participants are not pressured to move beyond their comfort zone. Group cooperation, leadership skills, decision-making skills, positive risk taking, trust and self confidence are all part of the Chumash Challenge experience. Call 756-2628 for more information.

**Fitness and Instructional** programs are designed for individuals to acquire new skills and participate in personal fitness programs in a relaxed and enjoyable setting. Programs offered include an extensive aerobic schedule, massage instruction, martial arts, belly dancing, East/West Coast Lindy Hop and yoga. Nationally certified personal trainers are on staff to assist in meeting fitness goals.

**Informal Recreation** provides non-structured opportunities to participate in a variety of activities such as swimming, cardiovascular exercise, free weight and weight machines, basketball, volleyball, racquetball and indoor soccer.

**Intramural Sports** provides a variety of structured sports leagues and tournaments in a safe, recreationally competitive environment. The program is open to all Cal Poly students and also to faculty, staff and alumni who are current members of the Recreation Center. Popular sports include: basketball, flag football, soccer, softball and volleyball.

**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.

### **CAREER SERVICES**

*Student Services (124), Room 114, 805 756-2501  
www.careerservices.calpoly.edu*

This centralized service is available to all students and alumni of the University. In conjunction with the seven academic colleges, Career Services assists students with exploring, formulating and implementing career plans. Career Services actively promotes and supports effective professional relationships between the University and employers.

#### **Career Counseling**

Through individual appointments and group workshops, students are guided through the exploration and formation of personal career plans. Students 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. Students are offered the opportunity to meet informally with representatives of companies and graduate programs.

### **Student Employment**

On-campus and off-campus, part-time and summer employment opportunities are available to all currently-enrolled students.

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

Co-op, internship, summer, and seasonal positions are centralized through Mustang Jobs (on-campus interview program, on-line job listings). 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 Mustang Jobs (on-campus interview program, on-line job listings) 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 resources, annual reports, salary trend information, alumni network files, and student workstations allowing Internet research and computer-assisted career exploration programs.

### **DEAN OF STUDENTS**

*Student Services Bldg. (124), Room 125, 805 756-0327*

The Dean of Students Office provides leadership to support student success, strengthen campus community relations, and to provide the initiatives for future student-centered

programs that foster the development of the student academically, socially and ethically.

The Dean of Students supports student learning and service through:

- helping students manage academic and nonacademic situations;
- consulting extensively with faculty and staff on behalf of student concerns;
- interpreting and assisting with understanding campus policies and procedures;
- consulting with student clubs and organizations to foster a healthy student life;
- cultivating a caring, supportive campus and community environment; and
- assisting with parent concerns regarding campus life and policies.

We encourage students with questions or concerns to stop by or contact our office. We answer questions, advocate when appropriate, investigate student complaints of discrimination, and direct students to the appropriate campus or community resource as needed.

### **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 are determined based upon individual need. For further specific information regarding support services, review the DRC Web site at [www.drc.calpoly.edu](http://www.drc.calpoly.edu).

### **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), 805 756-1211*

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. Due to a shortage of doctors in the community in certain specialty areas, students requiring specialty medical care are encouraged to call for appointments with local specialists well in advance.

### Counseling Services

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

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

### 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 on-campus Cerro Vista apartments. 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/Community Advisors.

Resident Advisors and Community Advisors, known as RAs, and CAs, 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 and CAs 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 freshman, transfer, or returning students to take advantage of the on-campus experience. Programmatic support features academic success and retention themes.

#### Apartment Style Living

The Cerro Vista on-campus apartments are offered to returning residents through a lottery process. Student programming supports retention and overall academic success.

#### Community Involvement

Student representatives are elected in fall term to serve on governing boards in each of the halls. Participants contribute to the their hall's community by planning social, recreational, and educational events, and by voicing student-related concerns. Networks in community services,

recreational sports and multicultural issues provide additional opportunities for student involvement.

### ResNet

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

### Applying for On-Campus Housing

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

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 via an online process, 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 2004-05 prices and are subject to change:

Residence Hall Rooms – Double Occupancy (academic year license) .....	\$4,408
Residence Hall Meal Plan (mandatory) .....	\$3,393
Apartments – Private Rooms (academic year license).....	\$598/month (approx.)

### Off-Campus Housing Resources

[www.housing.calpoly.edu](http://www.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 at our Web site. The University does not inspect, approve or disapprove of any housing offered through these rental resources.

### JUDICIAL AFFAIRS

*Student Health Center (27), 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 217, 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-newsletters
- Ask us to connect you with another Cal Poly parent

#### Reasons to Visit

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

#### Ways To Be Involved

- Represent the parent voice as a Parent Advisory Council member
- Host and orient other parents at campus events
- Hire a Cal Poly student:  
[www.careerservices.calpoly.edu](http://www.careerservices.calpoly.edu)
- Support Cal Poly's programs with a gift to a program of your choosing: [www.giving.calpoly.edu](http://www.giving.calpoly.edu)

### STUDENT ACADEMIC SERVICES

*Hillcrest (81), 805 756-2301*

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

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

The ASC offers a wide variety of retention programs and campus support services, including study skills seminars, supplemental workshops, study sessions and tutor referral services.

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

The purpose of EOP College Bound 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 high school 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 CAS provides academic advising and 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*

EOP provides admissions and academic support programs for low-income, historically disadvantaged students. EOP offers academic and personal advising, study sessions, 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*

The purpose of this federally funded program 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 (SI)***Hillcrest (81), 805 756-2301*

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

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

UB is 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 offer 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 Community Center 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, 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 "Community-Based Learning." This program strives to demonstrate that integrating community involvement with classroom discourse enhances learning.

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-four 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.

### **Multicultural Center**

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**

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 PRAXIS Series, Law School Admission Test, and Medical College Admission 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 PPST.

# Intercollegiate Athletics Department

Mott Gym/Physical Education Bldg. (42), Room 207  
(805) 756-2924

Athletic Advising: (805) 756-2762

## Alison Cone, Director

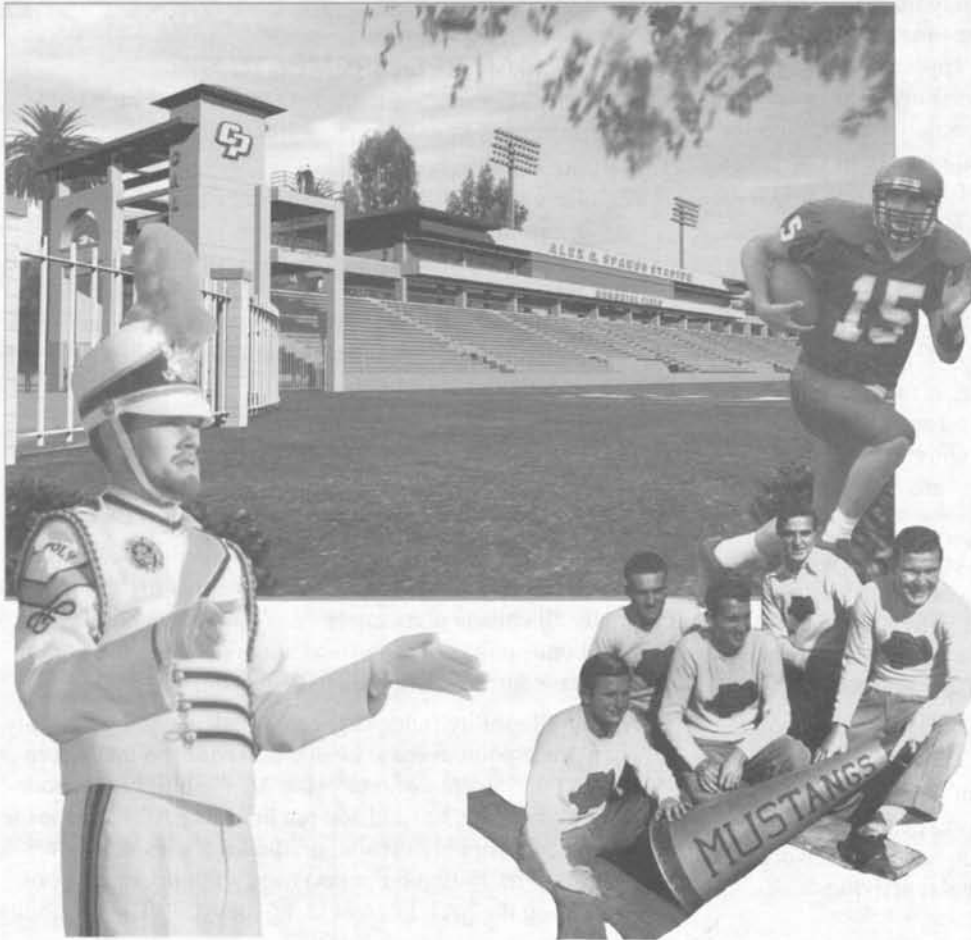
John Azevedo  
Hugh Bream  
Kevin Bromley  
Scott Cartwright  
Jenny Condon  
Mark Conover  
Terry Crawford  
Alex Crozier

Richard Ellerson  
Rich Firman  
Wolfgang Gartner  
Trevor Kronemann  
Larry Lee  
Faith Mimnaugh  
Jon Stevenson

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 twenty teams compete at the NCAA Division I level. The football program competes in the Great West Football Conference (I-AA), wrestling competes in the PAC 10 Conference, and women's indoor track and field competes in the Mountain Pacific Sports Federation. The balance of the men's and women'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.



## Stadium Renovation

Cal Poly alumnus, Alex G. Spanos, and his wife, Faye, have pledged \$4 million to help fund the renovation of Phase I of Mustang Stadium, the University's facility for football, men's and women's soccer and university events such as commencement.

*Rendering and photos  
courtesy of Cal Poly Athletic  
Media Relations, Tim Garcia  
and Cal Poly Foundation*

# 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, at its sole discretion, determines appropriate based on an applicant's suitability and the best interests of the University.

Unlike most other universities, Cal Poly encourages 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 undergraduate 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 are contacted by the major department and asked to submit supplementary information. Art and Design applicants are requested to submit a portfolio based on specific criteria and Music applicants are requested to audition either on tape or in person. Final selection for admission to Art and Design or Music is then 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 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 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 a high school grade point average and a score on either the ACT or the SAT. A grade point average is based on grades earned in courses taken during the final three years of high school that satisfy all college preparatory "a-g" subject requirements, with bonus points for approved honors courses (excluding physical education and military science).

A CSU Eligibility Index (EI) can be calculated by multiplying a grade point average by 800 and adding a total score on the SAT I. Students who took the ACT multiply the grade point average by 200 and add ten times the ACT composite score. California high school graduates (or residents of California for tuition purposes) 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. Persons who neither graduated from a California high school or are residents of California for tuition purposes 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: With a GPA of 2.40 and an SAT I score of 980, minimum eligibility requirements are met.*

\* Below 2.00 does not qualify for regular admission.

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

When the grade point average is 3.00 or above (3.61 for non-residents), applicants are not required to submit test scores. However, all applicants for admission 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. Applicants are unlikely to gain admission to Cal Poly if test scores are not submitted, regardless of grade point average.)*

Applicants qualify for regular admission when the University verifies that they have graduated from high school, have a qualifiable eligibility index, have completed the comprehensive pattern of college preparatory "a-g" 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 for consideration in the overall GPA criteria. Each unit of A in an honors course will receive a total of 5 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 for consideration in the College Preparatory GPA criteria.)*

### 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, or 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 accountable for 15 units of college preparatory study.

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

### TRANSFER REQUIREMENTS

A transfer applicant meets the *minimum* requirements for admission to the CSU system if the applicant has a grade point average of 2.0 (C) or better in all transferable units attempted, is in good standing at the last college or university attended, and meets the following standards:

The applicant is an upper division transfer student (i.e., at least 60 transferable semester {90 quarter} units have been completed) *and* has 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 the applicant graduated from high school in 1988 or later, the applicant 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 the applicant must have completed*

the Inter-segmental General Education Transfer Curriculum (IGETC) requirements in English communication and mathematical concepts and quantitative reasoning.

*If the applicant graduated from high school prior to 1988, the applicant 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**

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/>  
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: Art and Design, and Music.

The following majors will accept new first-time freshman applicants for fall term only and new transfer applicants for both fall and winter terms: Architectural Engineering, Architecture, City and Regional Planning, Construction Management, and Landscape Architecture.

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 15<sup>th</sup>.

## 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 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 (805-756-2311).

### **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 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 \$226 per unit. The maximum nonresident tuition per academic year (as of 2005-06) is \$10,170.

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 \$35.00 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, as well as information regarding on-campus housing, meal costs, and parking fees.

## 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 system-wide 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 with-drawing 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 Student Accounts Office.

## 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

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. 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.

### Student Fee Waivers

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

- § 68120 – Children and surviving spouses/registered domestic partners 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);
- § 66025.3 – Qualifying children, spouses/registered domestic partners, or unmarried surviving spouses/registered domestic partners 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; any dependents or surviving spouse/registered domestic partner who has not remarried 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

- § 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 was 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.

### 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 favor-able vote of two-thirds of the students voting in an election held for this purpose (Ed. Code § 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 (Ed. Code § 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 (Ed. Code § 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, Ed. 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 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.

# 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 or accessing their website.

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 2004-2005 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 2004-05 school year nonresident tuition was an extra \$226 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 .....	1324
Room and board .....	2,646
Books and supplies .....	420
Personal and transportation .....	891
Estimated total per quarter .....	\$5,281

## 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.** 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.

<p><i>Annual Deadline Date:</i> <i>March 2 for the following academic year</i></p>
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## 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 Scholarship  
 Cal Poly Alumni Association—Central California Chapter Scholarships  
 Cal Poly Outreach 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  
 Retired Faculty and Staff 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  
 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  
 Rita B. Hill Memorial Scholarship  
 Robert W. Hill Scholarship  
 Michelle Ann Jacobson Memorial Scholarship  
 Lee P. and Inez Joyce Scholarship  
 Michael Koehn London Study Memorial Scholarship  
 Lukovsky Family Scholarship  
 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  
 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  
 BioResource and Agricultural Engineering Scholarship  
 Boyle-McOmie Scholarships  
 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 League of Food Processors Scholarships  
 California State Grange in Honor of Dr. Joe Sabol Scholarships  
 William, Joseph and Charles Cattaneo Memorial Scholarship  
 Central Coast Branch of the International Geranium Society Scholarship  
 Central Coast Greenhouse Growers' Association 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  
 Elmer W. Eade and Francis Dorothy Eade Scholarship  
 Eberle Winery Scholarships  
 Paul Etchechury Memorial Scholarship  
 Gerald H. Fairbairn Scholarship  
 Max and Verda Foster Memorial Scholarship  
 Forestry and Natural Resources Management Award  
 Woody Frey Scholarship  
 J. Corder Gibson Memorial Award  
 Jack and Harriet Gorski Scholarship  
 Lisle R. Green Memorial Scholarship  
 Jan Guidetti Memorial Agriculture Scholarship  
 Tyler Hammond III Memorial Award  
 Ray Hansen Memorial Scholarship  
 Arnold D. Haskell Scholarships  
 William Randolph Hearst Foundation Agriculture Scholarship  
 H. J. Heinz Endowed Scholarship  
 Ruth A. Hitt Memorial Scholarship  
 William (Ben) and Helen Holman Alumni Scholarship  
 Hort Tech, Inc./Kerns Family 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  
 Omer L. and Claudia L. King Scholarship  
 Kings River Prune and Apricot Scholarships  
 Knight Brothers Scholarships  
 Kruger Bensen Ziemer Architects Scholarship  
 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  
 Alfred G. 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 Scholarships  
 Burt W. Polin Agricultural Scholarship  
 Ranchers Cotton Oil/Earl J. Cecil Scholarship  
 Howard Rhoads Memorial Scholarship  
 Dante Righetti Scholarship  
 Rodeo Club Scholarships  
 Mimi Russell Memorial Scholarship  
 Dorothea Sabol Exemplary New Teacher Award  
 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  
 Save-the-Redwoods League Fellowship  
 Vard M. and Mildred P. Shepard Memorial Scholarship  
 Joe and Florence Silva Memorial Scholarship  
 Oben J. (Ben) Simonson Scholarship  
 Louis H. and Stella S. Soares Achievement Award  
 Herman M. Sperber Memorial Scholarship  
 SunWest Foods Scholarships  
 Richard L. Tate Memorial Scholarship in Dairy Science  
 Terra Scholarship  
 Harmon M. Toone Scholarship  
 Tulare-Kings CAPCA Chapter Scholarship  
 Fred Turner Scholarship  
 Eric C. Twist Memorial Scholarship  
 Valleycrest Companies Academic Award in Honor of Robert Scofield  
 Valleycrest Scholarship  
 Stanley L. Van Vleck Memorial Scholarship  
 Vilkitis Family Scholarship  
 War Veterans Scholarship  
 Barbara Parker Weber Agricultural Education Scholarship  
 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

Alpha Rho Chi Award  
 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

Crawford Multari and Clark Associates Scholarship  
 Errett Family Scholarship  
 Escobar-Woodard Construction Scholarship  
 Richard Lee Fisher Memorial Scholarships  
 Paul F. Fratessa Memorial Scholarship  
 Thor Gulbrand, AIA Memorial Scholarship  
 Matthew D. Hubal Scholarship  
 D. Stewart Kerr Scholarship  
 Don and Caryl Koberg Architecture History Scholarship  
 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 Scholarship  
 Dr. Glenn G. McRae Internships  
 Robert Hifumi Odo Memorial Scholarship  
 Oltmans Construction Company Scholarship for Design Excellence  
 Sean Rogers Memorial Scholarship  
 Robin L. Rossi Award  
 RRM Scholarship  
 Blair Tulloch Memorial Scholarship  
 Robert Cota Vasquez Memorial Scholarship  
 Wood-Rodgers City and Regional Planning Scholarship  
 Frederick Peter Young Scholarship

### Business

Accenture Outstanding Junior Management Award  
 American Public Works Association-Herbert E. Gerfen Scholarship  
 Larry Bennett Memorial Award  
 David Nathan Blanco Scholarship  
 Boeing Scholarships  
 Pete J. Bowden Memorial Scholarship  
 Mickie Burris Award  
 College of Business Household Scholarship  
 Damitz Brooks Nightingale Turner Morrisset 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 Scholarships  
 John S. Maher Scholarships  
 Bert W. Martin Scholarship  
 Merrill Lynch FMA Student Award  
 OCOB Partners' Program Scholarships  
 Price Waterhouse Coopers Scholarship  
 Larry Ratner Scholarship  
 Owen Servatius Scholarships  
 Roy Wheeler III Memorial Scholarship  
 Leopold E. Wrasse Scholarship

### Education

Barbica Family Scholarship  
 Boeing Scholarships  
 California Retired Teachers Association-Laura E. Settle Scholarship  
 Michael and Josephine Cappellotti Scholarship  
 Calista Cheek Memorial Scholarship  
 Cotchett Science and Mathematics Teacher Education Scholarships  
 David Joseph Gill Scholarship  
 Don and Jean Morris Teacher Education Scholarship  
 Larry Ratner Scholarship  
 Mary Stuart Rogers Foundation Scholarships  
 David Sanchez Memorial 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  
 Accenture Outstanding Junior Awards in  
 Aeronautical Engineering  
 Computer Science  
 Mechanical Engineering  
 Accenture 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  
 Gary and Judy Bloom Computer Science Scholarships  
 Boeing Scholarships  
 Pete J. Bowden Memorial Scholarship  
 Grant M. Brown Memorial Foundation Scholarship  
 Richard F. Burris Endowment  
 Alonzo R. and Donald A. Carranza Scholarship  
 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  
 Harry Happ Memorial Scholarship  
 George E. Hoffman Scholarships  
 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  
 Lam Research Corporation Scholarship  
 Allen J. Larsen Memorial Scholarship  
 John Stephen Larson Memorial Scholarship  
 Litton Industries Scholarships in Engineering  
 Lockheed Martin Scholarship  
 William H. McKeen Memorial Award  
 Mechanical Engineering Scholarship  
 Konrad Meissner Scholarship  
 Dragoslav M. Mistic Scholarship  
 J. L. Moore Fellowship  
 Horace C. Morana Scholarship  
 H. Andrew Morse Memorial Scholarship  
 George and Tonny Murray Scholarship  
 MWH Scholarship  
 Osteyee Family Scholarship  
 Frank and Lauri Pilling Scholarship for Senior Projects  
 Frank E. Pilling, Sr. Scholarship  
 Roy N. Poage Memorial Scholarships  
 Rantec Power Systems Electrical Engineering Scholarship

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  
 Solectron Scholarships  
 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 Scholarships  
 Keith Uncapher Memorial Scholarship  
 Unocal Environmental Education Scholarships  
 Andrew Wacht Scholarship  
 Walter T. Wells Engineering Scholarship  
 Charles (Chuck) Peter White Scholarship  
 Wood-Rodgers Civil Engineering Scholarship  
 Brad E. Yackle Scholarship in Computer Sciences

**Liberal Arts**

Hank Apfelberg Graphic Communication Memorial Scholarship  
 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  
 Harold P. and Rosalie Davidson Memorial Music Scholarship  
 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 Scholarships  
 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  
 Lowe Family Mustang Marching Band Scholarship  
 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 Diversity Scholarship  
 Dr. Keith and Lonna Nielsen Scholarship  
 PackagingArts Scholarship  
 Elizabeth Hanlon Parks Memorial Scholarship  
 Willard "Pete" Pederson Scholarship

Virginia Polin Vocal Scholarship  
 George Ramos Scholarship for Journalism Excellence  
 Ronald V. Ratcliffe Award  
 Thomas Redican Memorial Scholarship  
 Beatrice A. Rice Scholarship  
 Astrid and Craig Russell Scholarship  
 Loren Russell Scholarship  
 Sonia Sandoval Memorial Modern Languages and Literatures Award  
 Scitex/Adobe Student Scholarship  
 Vard M. and Mildred P. Shepard Memorial Scholarship  
 J. Irving Snetsinger Memorial Award  
 Neil 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  
 Studio Art Concentration Award  
 Jeri Ewy Thiel Memorial Scholarship  
 Guy Thomas Memorial Scholarship  
 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

Accenture Outstanding Junior Math Award  
 Applegarth Biological Scholarships  
 Tri Beta Biological Society Scholarships  
 Biological Sciences Scholarships  
 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  
 Kappa Mu Epsilon 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  
 Aryan I. Roest Memorial Scholarships  
 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

### 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 Koehn Outstanding Resident Advisor Scholarship  
 Land Family Quest for the Best Award  
 McGowan-Schultz-Widic Community Service Scholarship  
 Murarka Family Scholarship for Leadership  
 President's Community-Based Learning and Service Award  
 Courtney Elizabeth Smyth Memorial Scholarship  
 Dr. Shirley H. Walker Scholarship  
 Ralph R. Wilmar Women's Educational Opportunities 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 several million dollars of outside scholarship assistance each year. Exercise caution in using scholarship search services; many sell information that is readily available at no cost. Other sources of scholarship funding may be keyed to the following areas:

- community organizations
- employers
- professional, career and trade associations

Visit the scholarship website for valuable links at [www.ess.calpoly.edu/\\_finaid/html/schol](http://www.ess.calpoly.edu/_finaid/html/schol).

## LOANS

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

**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 disbursed. To apply, contact the Financial Aid Office.

**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.

**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.

## STATE AID TO THE PHYSICALLY HANDICAPPED

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

# Academic Requirements and Policies

Academic Records Office and Registration Information (805) 756-2531

Evaluations (805) 756-2396, Veterans Affairs Coordinator (805) 756-2531

## 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. Under-graduate 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 "Exempt" on the augmented English CST taken in grade 11.
- 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 or later.
- a score of 680 or above on the re-centered and adjusted College Board SAT II Writing Test taken May 1998 or later.
- 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, 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 “Exempt” on the augmented mathematics California Standards Test (CST) taken in grade 11.
- a score of “Conditionally Exempt” on the augmented mathematics California Standards Test (CST) taken in grade 11 PLUS successful completion of a CSU-approved math or math-related course or activity taken before enrollment at a CSU campus.
- 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 (ACT) Mathematics Test.
- a score of 3 or above on the College Board Advanced Placement Mathematics examination (Calculus 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 mathematics or statistics 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 ELM/MAPE Office (805-756-2268), or online at [www.calpoly.edu/~math/elmmape.html](http://www.calpoly.edu/~math/elmmape.html)

## Cal Poly Mathematics Placement Examination (MAPE)

The Cal Poly Mathematics Placement Exams are 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, 161, 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 American College Testing (ACT) Mathematics Test;
- a score of 3 or above on the College Board Advanced Placement Mathematics (Calculus AB or BC) examination;
- completion and transfer of a college course equivalent to MATH 118 and 119 (Precalculus Algebra/Trig) with a grade of C or better; *or*
- MATH 118 and 119 or equivalent completed at California Polytechnic State University.

### Intermediate Algebra MAPE

Students who anticipate taking Precalculus Algebra (MATH 118) 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 American College Testing (ACT) Mathematics Test; *or*
- a score of 50 or above on the ELM 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 Evaluations Unit in 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 2005 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 - 2004		
Exam Name	#	Credit Granted & GE Area (GE)
Art History	13	ART 112 plus electives (C3)
Art: Drawing	14	9 units electives
Art: 2D Design	15	9 units electives
Art: 3D Design	16	9 units electives
Biology:	20	Score 3 = BIO 111 or 115 plus electives (B2 & B4) Score 4 or 5 = BIO 111 or 115 or 151 or BIO 213/ENGR 213 plus electives (B2 & B4)
Calculus AB	66	MATH 141 or 161 or 221 or 112 or 118 or 118 & 119 or 120 plus GE B1 electives. (B1)
Calculus BC	68	MATH 141 & 142 or 161 & 162 or 141 & 182 or 112 or 118 or 118 & 119 or 120 or 221 plus GE B1 electives. (B1)
Calculus BC: AB Subscore	69	MATH 141 or 161 or 221 or 112 or 118 or 118 & 119 or 120 plus GE B1 electives. (B1)
<i>Note: If both Calculus AB &amp; BC exams are passed, credit is extended only for Calculus BC, since BC duplicates AB material.</i>		



ADVANCED PLACEMENT EXAM CREDIT - 2004		
Exam Name	#	Credit Granted & GE Area (GE)
Chemistry	25	Score 3 = CHEM 110 or 111 or 124 or 127 plus electives. (B3 & B4)
		Score 4 or 5 = CHEM 110 or 111 or 124 or 127 plus electives; check with the Chemistry Dept. for <i>possible</i> credit for CHEM 125 or 128. (B3 & B4)
Comparative Govt & Politics	58	9 units electives
Computer Sci: Test A	31 33	Score 3 = 9 units electives Score 4 or 5 = CSC 101 plus electives
Computer Sci: Test AB	31 33	Score 3 = 9 units electives Score 4 or 5 = CSC 101 plus electives
<i>Note: If both Computer Science A &amp; AB are passed, credit is extended for Computer Science AB, since AB duplicates the A material.</i>		
Economics: Micro	34	ECON 221 plus electives
Economics: Macro	35	ECON 222 plus electives (D2)
English: Lang & Comp	36	ENGL 134 plus electives (A1)
English: Lit & Comp	37	Score 3 = ENGL 134 plus electives (A1)
English: Lit and Comp	37	Score 4 or 5 = ENGL 134 & GE C1 Lit (4 units) plus 1 elective. (A1 & C1) English Majors only: ENGL 134 plus electives (A1 only)
<i>Note: If both English Lit/Comp &amp; Lang/Comp are passed, only 4.5 units of credit are awarded for the second exam (total of 13.5 units).</i>		
Environmental Science	40	FNR 101 plus electives
European History	43	HIST 111 plus electives
French: Language	48	Score 3 = FR 121 plus electives Score 4 or 5 = FR 121 & 122 plus 1 elective
French: Literature	51	Score 3 = FR 121 & 122 plus 1 elective Score 4 = FR 121 & 122 plus 1 elective Score 5 = FR 121 (1 unit) & 122 & 233 (233 = C1)
<i>Note: If both French Language &amp; Literature are passed, only 4.5 units of credit are awarded for the second exam (total of 13.5 units).</i>		

ADVANCED PLACEMENT EXAM CREDIT - 2004		
Exam Name	#	Credit Granted & GE Area (GE)
German Language	55	Score 3 = GER 121 plus electives Score 4 or 5 = GER 121 and 122 plus 1 elective
Human Geog	53	GEOG 150 plus electives (D3)
Latin: Virgil	60	Score 3 = FORL 121 plus electives Score 4 or 5 = FORL 121 & 122 plus 1 elective
Latin: Virgil or Literature	61	Score 3 = FORL 121 plus electives Score 4 or 5 = FORL 121 & 122 plus 1 elective
<i>Note: If both Latin Virgil &amp; Latin Literature are passed, only 4.5 units of credit are awarded for the second exam (total of 13.5 units).</i>		
Music Theory	75	MU 101 plus electives (C3)
Music Theory: Aural	76	MU 104 plus electives
Music Theory: Nonaural	77	MU 101 plus electives (C3)
<i>Note: If exam 75 and/or exam 77 are passed in conjunction with exam 76, credit will be awarded for MU 101 &amp; 104 plus electives (total of 9 units), since material is duplicated in the exams.</i>		
Physics B	78	Score 3 = PHYS 104 plus electives. Present lab book to Physics Dept. for review and <i>possible</i> lab credit) (B3) Score 4 or 5 = PHYS 121 (1 unit) & 122 & 123 (B3 & B4)
Physics C: Mechanics	80	Score 3 = PHYS 121 plus electives (B3 & B4) Score 4 or 5 = PHYS 131 plus electives (B3 & B4)
<i>Note: If both Physics B &amp; C: Mechanics are passed, credit is extended for Physics C (total of 9 units), since C duplicates the B material.</i>		
Physics C: Electricity & Magnetism	82	Score 3 = PHYS 123 plus electives (B3) Score 4 or 5 = PHYS 133 plus electives (B3 & B4)
Psychology	85	Score 3 = PSY 201 or 202 plus electives (D4) CD/PSY Majors only: Score 4 or 5 = PSY 201 or 202 (D4) plus lower-division concentration/ICS electives, if approved by dept. advisor.

ADVANCED PLACEMENT EXAM CREDIT - 2004		
Exam Name	#	Credit Granted & GE Area (GE)
Spanish: Language	87	Score 3 = SPAN 121 plus electives Score 4 or 5 = SPAN 121 & 122 plus 1 elective
Spanish: Literature	89	Score 3 = SPAN 121 plus electives Score 4 = SPAN 121 and 122 plus 1 elective Score 5 = SPAN 121 (1 unit), 122, and 233 (233 only = C1)
<i>Note: If both Spanish Language and Literature are passed, only 4.5 units of credit are awarded for the second exam (total of 13.5 units).</i>		
Statistics	90	Score 3 = STAT 130 plus electives (B1) Score 4 or 5 = STAT 211 or 217 or 218 or 221 or 251 plus electives (B1)
U. S. Government and Politics	57	Upon completion of POLS 111 (1 unit CA Govt.) 3 units of credit are awarded for GE D1 (no credit for USCP) plus electives
U. S. History	07	Upon completion of POLS 111 (1 unit CA Govt.), then 3 units of credit are awarded for GE D1 (no credit for USCP) plus electives
<i>Note: If both US History &amp; US Govt/Politics are passed, upon completion of POLS 111, 3 units of credit are awarded for GE D1 (no credit for USCP) plus electives</i>		
World History	93	HIST 215 plus electives (D3)

### 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:

International Baccalaureate Exam Credit - 2004	
Exam Name	Credit Given & GE Area (GE)
<b>Biology</b>	
Grade of 5 or 6	BIO 111 or 115 plus electives
Grade of 7	BIO 111 or 115 or 151 plus electives
<b>Chemistry:</b>	CHEM 110 or 111 plus electives or 127+128 or 124 plus electives (in lieu of electives with 124, credit for 125 <i>possible</i> with Chem Dept review)
<b>Economics:</b>	ECON 222 plus electives (D2)
<b>English:</b>	
Grade of 5	8 units electives
Grade of 6 or 7	ENGL 253 plus electives (C1)
<b>History:</b>	
European	HIST 111 plus electives
American	Upon completion of POLS 111 (CA Govt.) 3 units of credit are awarded for Area D1 (no credit for USCP) plus electives
<b>Language A1/A2:</b>	
French	FR 305 plus electives
German	GER 305 plus electives
Spanish	SPAN 305 plus electives
<b>Language B:</b>	
French	FR 301 plus electives
German	GER 301 plus electives
Spanish	SPAN 301 plus electives
<b>Mathematics:</b>	MATH 141 or 161 or 221 plus electives (B1)
<b>Physics:</b>	PHYS 121 & 122 & 123 (B3 & B4)
<b>Psychology:</b>	PSY 201 or 202 plus PSY prefix electives
<b>Social Anthropology</b>	ANT 201 and GEOG 150 (D3)

### 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 74.

#### 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 69).

#### 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 General Education website, [www.ge.calpoly.edu](http://www.ge.calpoly.edu). 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 15 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 89 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.ge.calpoly.edu](http://www.ge.calpoly.edu)

*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 70 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, or D5.

### 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.

<b>Chart 1</b> <b>GE Requirements for Catalogs</b> <b>Prior to 2001-03</b>	
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. <p style="text-align: center;"><i>Consult Advising Charts at</i> <i>www.ge.calpoly.edu</i></p>	
<b>AREA A Communication (minimum 11 units)</b>	
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)	
<b>AREA B Science and Mathematics (minimum 15 units)</b>	
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.	
<b>AREA C Arts and Humanities (minimum 15 units)</b>	
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	
<b>AREA D Social, Political, Economic Inst. (min. 15 units)</b>	
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)	
<b>AREA E Life Understanding (minimum 3 units)</b>	
Take one course from E1 or E2: E1 Psychology (Area D4) E2 Life understanding elective (Area D4)	
<b>AREA F Technology (minimum 2 units)</b>	
<b>Non-technical programs.</b> 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) <b>Technical programs.</b> Colleges of Agriculture; Arch & Env Design; Engineering; & BS Industrial Technology program Take one course from F1: F1 Computer literacy (Area F)	
<b>Additional GE Courses</b>	
To complete 72-unit requirement, select additional courses from Areas A, B, C, D, E. No more than one additional course per Area.	

<b>Chart 2</b> <b>Advising Information for Students</b> <b>Changing to the 2001-03 or 2003-05 Catalogs</b>			
<b>Most Majors</b> =Colleges of Agriculture, Architecture & Environ Design, Business, Science & Mathematics. <b>CLA</b> =College of Liberal Arts. <b>ENGR</b> =Engineering Programs. Some programs require specific GE courses in the Major and/or Support. GE Certification <i>may</i> affect the following Area minimums. ✓ non-unit requirement Courses from student's Major Dept will not receive credit for C4, D5 or F <p style="text-align: center;"><i>Consult Advising Charts at</i> <i>www.ge.calpoly.edu</i></p>			
	<b>Most Majors</b>	<b>CLA only</b>	<b>ENGR only</b>
<b>GE Units Taken in Residence</b>	12	12	12
<b>GE Upper Division Units Required</b>	12	12	8
Students must satisfy <i>both</i> the minimum number of units <i>and</i> courses.	<b>Minimum Units</b> (Minimum # Courses)		
<b>AREA A COMMUNICATION</b>	<b>11</b>	<b>11</b>	<b>11</b>
<b>A1 Expository Writing</b>	(1 course)		
<b>A2 Oral Communication</b>	(1 course)		
<b>A3 Reasoning, Argumentation, Writing</b>	(1 course)		
<b>AREA B SCIENCE &amp; MATH</b>	<b>15</b>	<b>18</b>	<b>26</b>
<b>B1 Mathematics/Statistics</b>	(2 courses)		
<b>B2 Life Science</b>	(1 course)		
<b>B3 Physical Science</b>	(1 course)		
<b>B4 One lab taken with B2 or B3 course</b>	✓	✓	✓
<b>B5 elective (for CLA students only)</b>	--	--	--
<b>B6 Upper-division (Engineering)</b>	0	0	(1)
<b>Engineering: Additional Area B</b>	0	0	(2)
<b>CLA students: (1 course from B1-B5)</b>	0	(1)	0
<b>AREA C ARTS AND HUMANITIES</b>	<b>18</b>	<b>15</b>	<b>16</b>
<b>C1 Literature</b>	(1 course)		
<b>C2 Philosophy</b>	(1 course)		
<b>C3 Fine and Performing Arts</b>	(1 course)		
<b>C4 Upper-division elective</b>	(1 course)		
<b>Area C Elective (1 course from C1-C4)</b>	(1)	0	0
<b>AREA D/E SOCIETY/INDIVIDUAL</b>	<b>18</b>	<b>18</b>	<b>16</b>
<b>D1 The American Experience</b>	(1 course)		
<b>D2 Political Economy</b>	(1 course)		
<b>D3 Comparative Social Institutions</b>	(1 course)		
<b>D4 Self Development</b>	(1 course)		
<b>D5 Upper-division elective</b>	(1)	(1)	0
<b>AREA F TECHNOLOGY (upper-div)</b>	<b>3</b>	<b>3</b>	<b>0</b>
<b>ADDITIONAL GE (if needed to complete 72-unit requirement)</b>			
<b>TOTAL GE UNITS</b>	<b>72</b>	<b>72</b>	<b>72</b>



## 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.ge.calpoly.edu/](http://www.ge.calpoly.edu/)

	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
<b>A1 Expository Writing</b>	4	4	4
<b>A2 Oral Communication</b>	4	4	4
<b>A3 Reasoning, Argumentation, and Writing</b>	4	4	4
<b>AREA B SCIENCE &amp; MATH</b>	16	20	28
<b>B1 Mathematics/Statistics</b>	8	8	8
<b>B2 Life Science</b>	4	4	4
<b>B3 Physical Science</b>	4	4	4
<b>B4 One lab taken with B2 or B3 course</b>	✓	✓	✓
<b>B5 elective (for CLA students only)</b>			
<b>B6 Upper-division (Engineering)</b>			4
<b>Engineering: Additional Area B</b>			8
<b>CLA students: (One from B1-B5)</b>		4	
<b>AREA C ARTS AND HUMANITIES</b>	20	16	16
<b>C1 Literature</b>	4	4	4
<b>C2 Philosophy</b>	4	4	4
<b>C3 Fine and Performing Arts</b>	4	4	4
<b>C4 Upper-division elective</b>	4	4	4
<b>Area C Elective (One from C1-C4)</b>	4	0	0
<b>AREA D/E SOCIETY/INDIVIDUAL</b>	20	20	16
<b>D1 The American Experience (40404)</b>	4	4	4
<b>D2 Political Economy</b>	4	4	4
<b>D3 Comparative Social Institutions</b>	4	4	4
<b>D4 Self Development (CSU Area E)</b>	4	4	4
<b>D5 Upper-division elective</b>	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>	12	12	12
<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>	16	20	28
<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 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			
<b>B2 Life Science</b> (B2&4=lab course)	4	4	4
ANT 250 Biological Anthropology ASCI 112 Principles of Animal Science 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 161 Introduction to Cell and Molecular Biology (B2&4)			
BIO 227 Wildlife Conservation Biology			
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) and ENGR/BRAE 213 Bioengineering Fundamentals (2)			
<b>B3 Physical Science (B3&amp;4=lab course)</b>	<b>4</b>	<b>4</b>	<b>4</b>
ASTR 101 Intro to the Solar System			
ASTR 102 Intro to Stars & Galaxies			
ASTR 112 Introduction to the Stars and Galaxies (B3&4)			
CHEM 110 World of Chemistry (B3&4)			
CHEM 111 Survey of Chemistry (5) (B3&4)			
CHEM 124 General Chemistry for Engineers I (B3&4)			
CHEM 125 General Chemistry for Engineers II (B3&4)			
CHEM 127 General Chemistry I (B3&4)			
GEO 102 Introduction to Geology			
GEO 205 Earthquakes			
HNRS 131 General Physics I (B3&4)			
HNRS 132 General Physics II (B3&4)			
HNRS 134 General Physics IA			
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 I (B3&4)			
PHYS 132 General Physics II (B3&4)			
PHYS 133 General Physics III (B3&4)			
PHYS 141 General Physics IA			
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>✓</b>	<b>✓</b>	<b>✓</b>
<b>CLA students: (Select one from B1-B5)</b>	<b>0</b>	<b>4</b>	<b>0</b>
<b>B5 elective (GE option for College of Liberal Arts students only)</b>	<b>--</b>	<b>--</b>	<b>--</b>
BIO 112 Conservation Biology & Environmental Science			
BIO 302 Human Genetics			
BIO 305 Biology of Cancer			
FNR 319 Natural Resource Ecology, Theories & Applications			
FSN 210 Nutrition			
GEO 203 Fossils and History of Life			
MATH 326 Mathematics and Visual Art			
PSC 201 Intro to Physical Oceanography			
PSY 340 Biopsychology			
SS 121 Intro to Soil Science			
	<b>Most Majors</b>	<b>CLA only</b>	<b>ENGR only</b>
<b>B6 Upper-division Area B (ENGR only)</b>	<b>0</b>	<b>0</b>	<b>4</b>
CHEM 305 Physical Chemistry for Engineers			
CSC 341 Numerical Engineering Analysis			
GEO 305 Fundamentals Seismology			
MATH 304 Vector Analysis			

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>	<b>0</b>	<b>0</b>	<b>8</b>
<b>AREA C: ARTS AND HUMANITIES</b>	<b>20</b>	<b>16</b>	<b>16</b>
<b>C1 Literature</b>	<b>4</b>	<b>4</b>	<b>4</b>
ENGL 230 Masterworks British Literature through 18 <sup>th</sup> Century			
ENGL 231 Masterworks British Lit: Late 18th 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>	<b>4</b>	<b>4</b>	<b>4</b>
HNRS 231 Philosophical Classics: Social & Political Philosophy			
PHIL 230 Philosophical Classics: Metaphysics & Epistemology			
PHIL 231 Philosophical Classics: Social & Political Philosophy			
<b>C3 Fine and Performing Arts</b>	<b>4</b>	<b>4</b>	<b>4</b>
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 (USCP)			
MU 229 Music of the 60's: War and Peace (USCP)			
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 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 336 Ethics, Gender and Society (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 306 Hinduism			
RELS 307 Buddhism			
RELS 309 Monotheism: The Bible and the Quran			
RELS 310 Christianity			
RELS 311 Islam			
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)			
TH 360 Theatre in the United States			
TH 390 World Drama			
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 General Psychology			
PSY 202 General 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)			
ES 335 Filipina/o 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 316 Modern East Asia			
HIST 320 Colonial & Revolutionary America			
HIST 321 Civil War America			
HIST 322 Modern America			
HIST 323 Versions of the Past: Novels, Comics and Movies			
HIST 324 The Historical Novel in the U.S., '60's to Present			
HIST 336 Britain at War: 1939-1945			
HNRS 303 Econ of Poverty Discrimination Immigration (USCP)			
HUM 316 London: From Roman Colony to World Capitol			
KINE 323 Sport and Gender (USCP)			
KINE 324 Sport, Media & American Popular Culture (USCP)			
POLS 325 Global Political Issues			
POLS 338 Critical Issues American Politics			
POLS 339 Comparative Political Regimes			
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			
WS 340 Sexuality Studies			

<b>AREA F: TECHNOLOGY ELECTIVE (upper division)</b>	<b>4</b>	<b>4</b>	<b>0</b>
AERO 310 Air and Space			
AG 315 Organic Agriculture			
AG 330 Cal Poly Land: Nature, Technology & Society			
AG 350 The Global Environment			

AG 360 Holistic Management			
BIO 307 World Aquaculture: Applics, 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			
CRP 338 Digital Cities			
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/Customer			
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>

## 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 Econ Poverty/Discrim/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 335 The Filipina/o American Experience (4) D5\*  
 ES 350 Asian Amer. & African Amer. Environments (3)  
 ES 360 Ethnicity and the Land (4) C4\*  
 ES 380 Critical Race Theory (4)  
 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 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 Econ Poverty/Discrim/Immigration (4) D5\*  
 HUM 312 Chicano/a Culture (4) C4\*  
 KINE 255 Personal Health: Multicultural Approach (4) D4\*  
 KINE 323 Sport and Gender (4) D5\*

KINE 324 Sport/Media/American Popular Culture (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\*  
 PHIL 336 Ethics, Gender and Society (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 Elementary Hispanic Language & Culture (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 350 Gender, Race, Science and Technology (4)  
 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). 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 POWER system has been confirmed. **Students are strongly advised to 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 8<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 all students is 22 quarter units including audited courses and concurrent work at other colleges. 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 POWER initial registration cycles until the end of the 8<sup>th</sup> day 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 an ePermit 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 POWER.

## Dropping

Students have until the end of the 8<sup>th</sup> day of instruction to drop a class through 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.

5. 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:**

1. 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.
2. 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.
3. The application for Educational Leave must be initiated and approved before the leave begins and will not be granted retroactively.
4. Application forms and information concerning Leaves of Absence may be obtained from the Office of Academic Records.

#### **Medical Leaves:**

1. 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.
2. 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.
3. 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 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 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 Health Services 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. Non-matriculated 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 non-matriculated 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 re-enroll in the course to

complete course requirements. If the student does re-enroll, the original grade of I will be counted as an F (or NC) and the re-enrollment 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 POWER all the way through the add/drop period, until the end of the 8<sup>th</sup> day 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 Dean of Students Office (756-0327) is available to any campus community member to assist with identifying and clarifying appropriate campus policies and procedures for addressing student grievances or concerns.

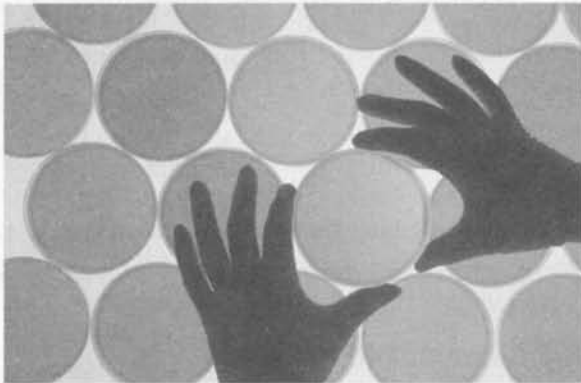
For general questions about grievances, contact the Dean of Students Office, 756-0327. The following list contains the offices or programs designated to address the more common student grievances at the University:

- Grade Grievances** – The Fairness Board: Contact the Academic Senate Office, 756-1258 (See page 20 for more detail on the functions of this Board)
- Student or Student Club Misconduct** – Judicial Affairs, 756-2794 (See page 42 for more detail on the functions of this Office)

## 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.

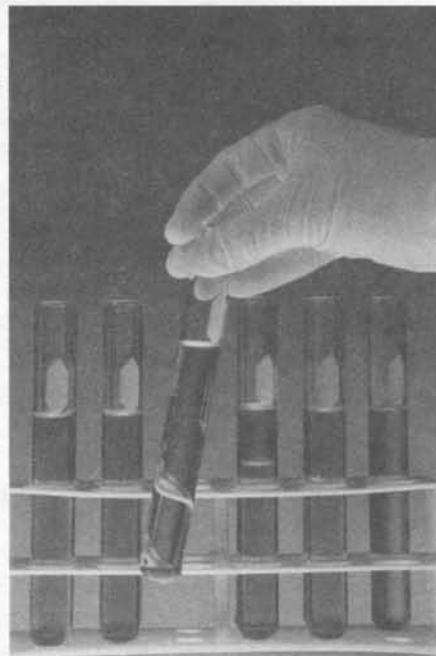


## **CALIFORNIA CENTRAL COAST RESEARCH PARTNERSHIP**

Through the California Central Coast Research Partnership (C<sup>3</sup>RP), Cal Poly offers numerous opportunities for innovative university-business collaboration.

The mission of the California Central Coast Research Partnership is to facilitate collaboration between Cal Poly and business/industry by acting as the interface between the university and interested collaborators. One of the major initiatives to support this mission is the establishment of a technology park on campus.

Collaborative projects with industry are an important source of research opportunities for graduate students.



# *Graduate Programs*

*Photos courtesy of the California Central Coast Research Partnership*

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# 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
- Irrigation Specialization
- Plant Protection Science Specialization
- Recreation, Parks, and Tourism Management Specialization
- Soil Science Specialization

Architecture, MS

Biological Sciences, MS

Business Administration, MBA

- Agribusiness Specialization
- General Management Specialization
- Graphic Communication Document Systems Management 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 Leadership and 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

History, MA (pending final approval)

Industrial and Technical Studies, MS

Industrial Engineering, MS \*

Kinesiology, MS

Mathematics, MS

Mechanical Engineering, MS\*

Polymers and Coatings Science, MS

Psychology, MS

Public Policy, MPP

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 89.

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.

#### GENERAL 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 Education</i>	April 1
Fall	July 1 May 1: Computer Science, Civil and Environmental Engineering May 15: Biological Sciences <i>Applications taken only for Fall:</i> MS Psychology - Feb. 1 MA Education - March 1	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. 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.

- **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 526.

**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 77 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 by obtaining a Post-baccalaureate Change of Objective form, available in the Graduate Programs Office or at [www.calpoly.edu/~rgp](http://www.calpoly.edu/~rgp).

### 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 65.

### **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.

## Graduation with Distinction

Some, but not all, graduate programs choose to confer the honor, "graduation with distinction," on outstanding students. To be eligible for this recognition, students must have a GPA of 3.75 or better and meet specific program criteria.

## 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 General Education website, [www.ge.calpoly.edu](http://www.ge.calpoly.edu).

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 76.

## 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 POWER registration and payment of fees are 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 will be over 7 years old at the proposed time of graduation, and what evidence is offered to support claims of currency in that coursework.

### **Mission Statement**

The College of Agriculture uses a “Learn by Doing” approach to prepare leaders in agriculture, food systems, natural resources, and life sciences who are equipped to address the diverse needs of society.

*Photos courtesy of the College of Agriculture*



Animal Science student, Ronya Shatilla, uses a micromanipulator to perform an embryo biopsy for DNA analysis in ASCI 406 Applied Embryology. Instructor Debbie Beckett teaches the students basic embryo handling techniques, as well as hands on micro-manipulation procedures such as embryo splitting, cloning, and embryonic stem cell production.



Two students in BRAE 439 Vineyard Water Management learn the techniques of evaluating a drip irrigation system on one of Cal Poly's vineyards, under the guidance of Professor Charles Burt.

College of  
*Agriculture*

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# College of *Agriculture*

**David J. Wehner, Dean**  
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## 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 Engineering Specialization .....	<i>MS</i>
Water Science .....	<i>Minor</i>
Wine and Viticulture .....	<i>BS, Minor</i>

The College of Agriculture offers programs reflecting the growing diversity of choices available and skills required in modern agriculture, life sciences, and 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 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 their 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 training and show arenas, vineyards, irrigated and non-irrigated fields for various crops, citrus groves, avocado and deciduous orchards, an arboretum, wholesale and retail nurseries, putting greens, turf research plots, and greenhouses.

### Labs and Special Facilities

Special facilities include several microcomputer laboratories, a market news information facility, an irrigation demonstration field, reservoirs, an agroforestry demonstration plot, laboratories with modern equipment for soil-plant-water testing, engineering testing and manufacturing shops, complete food processing units for dairy products, meats, fruit and vegetables, and two biotechnology and embryology laboratories.

### Swanton Pacific Ranch

The 3,800 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, watershed management, cattle and crop production activities.



## COURSES

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

**Major.** The major courses include a 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.** The support courses draw from courses in agriculture, life sciences, 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 from electives 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, livestock, orchards, nurseries, and vineyards 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, as well as meat processing and marketing. The stock utilized by our students represents the best genetics in the nation.

The beef program includes registered herds of 100 cows and commercial cow/calf operation of 160 cows, a Bull

Testing Facility for 300 head and a 200-head feedlot. Extensive artificial insemination and embryo transfer are widely used for herd improvement. These cattle are managed in a variety of settings from environmentally controlled confinement to our 3,500 acre range operation where animals are grazed under intensive management using electric fencing and improved conservation practices. 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, artificial insemination, calving, show cattle operations and performance testing.

The sheep enterprises are conducted with the approximately 120 crossbred ewes and 30 Registered Suffolk ewes. All sheep operations are located at the Cheda Ranch with its approximately 90 acres of non-irrigated pastures and 15 acres of irrigated pastures. Sheep enterprise projects include the ewe project, wherein students conduct the management of the crossbred flock for the entire production year, and the ram project, which sells range rams to the commercial sheep industry of California.

The swine herd consists of two major breeds—Yorkshires and Hampshires. The facilities include a 10-unit farrowing house, nursery, grower, and two finish facilities. Approximately 750 market hogs are produced each year.

The Foundation Horse program is made up of the Quarter Horse and Thoroughbred breeds. There are approximately 100 broodmares, foals, yearlings, two-year olds and riding horses. Typically, about five private and University owned stallions stand at stud each year. Emphasis is placed on basic horse handling and training procedures and equine reproduction technologies. Horses raised in the program are marketed by the students, giving them first-hand exposure to the industry and professional horse people. Artificial insemination and embryo transfer technologies are employed by veterinarians and students to breed over 125 mares each year.

The poultry unit houses about 12,000 layer hens and 7,000 broilers for use with student enterprises. Student projects involve broiler production, started pullet production, and egg production. The poultry facilities and equipment are some of the most modern in the country. 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.

Meat processing facilities provide students with the opportunities to develop, process, and market specialty meat items at the local market. Products such as smoked hams and specialty sausages are popular products produced by student enterprises.

The modern dairy facility includes the Dairy Cattle Instructional Building, containing the milking parlor, meeting rooms and classrooms, a nutrition and physiology lab, a microbiology lab, and a computer lab dedicated to

dairy management and application software. The dairy complex also includes the Dairy Products Technology Building, which houses production-scale facilities for teaching, research, and technology transfer, a conference room, and state-of-the-art analytical laboratories. The University-owned dairy herd consists of 110 milking-age registered Holsteins and 110 milking-age registered Jerseys. Both herds are recognized for their high production and outstanding type.

The Food Science and Nutrition Department is equipped with a food processing pilot plant and culinary lab. The laboratories offer hands-on experience with many types of pilot scale commercial processing equipment. Students process foods under faculty supervision. Some examples are jams, condiments, baked goods and specialty products. In addition, Cal Poly Chocolates is an active student enterprise. All food products manufactured by student enterprise projects and class work are marketed in the Campus Store.

The Natural Resources Management Department has a number of outdoor field sites where faculty and student learn-by-doing projects are conducted. Facilities sited at the Cal Poly campus include a Forestry Skills Center, a tree farm, computer labs, GIS laboratories, and several well-equipped greenhouses. Most importantly, the NRM Department plays a lead role in administering the Swanton Pacific Ranch and School Forest near Santa Cruz, California. The Swanton site provides hands-on learning of active forest, ranch, and watershed management activities.

The Environmental Horticultural Science Program provides facilities consisting of fifteen greenhouses, six shade houses, extensive growing grounds, a sales area, a large plant biotechnology lab, extensive turf plots, two disease and pest labs, 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 many of the types of machinery found on mechanized farms in California including post-harvest facilities. All of the crop production and marketing operations are carried out under the supervision of the Horticulture and 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 erosion control facility provides opportunity to assess practices that improve water quality.

## 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 Horticulture 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
<b>Emphasis areas</b> (select one).....	15
<i>Environmental Information Emphasis</i>	
BRAE 447 Advanced Surveying with GIS Applications (4)	
FNR 418 Applied GIS (3) or BRAE/LA/HCS 470 Selected Adv. Topics (3)	
FNR 306 Natural Res Ecology/Habitat Mgt (4) or BIO 325 General Ecology (4)	
FNR 416 Environmental Impact Analysis (4)	
<i>Precision Agriculture Emphasis</i>	
CRSC 244 Precision Farming (4)	
FNR 418 Applied GIS (3) or BRAE/LA/HCS 470 Selected Adv. Topics (3)	
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):

BOT 238, 333; EHS 381

*Soils area* (select one course):

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;

EHS382; FNR/GEOG/LA 318;

FNR 307, 308, 408, 419, 420;

HCS 124; 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.*

<i>Range Resource Area</i> .....	8
ASCI 329 and AG 360	
<i>Related Animal Area. Select one course from:</i> .....	3-4
ASCI 221; ASCI 223; ASCI 311	
<i>Related Agricultural Business Area.</i>	
<i>Select one course from:</i> .....	4
AGB 212/321/326/457	
<i>Related Plant Area. Select one course from:</i> .....	4
BIO 435; BOT 313; BOT 326; BOT 333; CRSC 123; CRSC 330; PPSC 321	
<i>Related Resource Management Area.</i>	
<i>Select one course from:</i> .....	3-4
BIO 325; BIO 419; BIO 427; FNR 306; FNR 408; GEOG/LA/FNR 318	
<i>Related Soil Science Area: Select one course from:</i>	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)*

Select 13 units from the following:

- BRAE 237 or 239
- BRAE 331, 405, 435, 438, 439, 440, 532

*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 knowledge of viticulture, enology, and market-ing with skill areas of growing practices, winemaking and wine marketing. The minor is a cooperative effort between the Agribusiness, Food Science and Nutrition, and Horticulture 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 I.....	4
FRSC 331 Viticulture II .....	4
FSN 341 Wines and Fermented Foods .....	4

**Advisor approved electives**..... 8

Select 8 units from the following:

- AGB 405, 406; BRAE 340/440; FRSC 415; FSN 270; HCS 339; PPSC 321, 414; SS 121, 221.

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# Wine and Viticulture

*An Interdisciplinary Curriculum in Enology, Viticulture and Wine Business*

**College Coordinator, Mary Pedersen**  
College of Agriculture, Bldg. 11, Room 211  
805-756-2161

**Program Advisor, Phillip Doub**  
College of Agriculture  
Bldg. 22, Room 202 (805) 756-5026

## ACADEMIC PROGRAM

### BS Wine and Viticulture

The major, based on fundamental and applied sciences, modern agribusiness principles, and appropriate social sciences, encompasses grape cultivation, enology, and wine business – creating both an interesting and diverse undergraduate opportunity. The proposed curriculum fosters an academic alliance among production agriculture, food science, and agricultural business interests and provides an academic understanding of the “vine to glass” opportunity. Students will gain extensive hands-on experience in all aspects of the wine industry.

Courses in the major expose students to an overall breadth of the industry. Topics include diverse courses such as sensory evaluation, irrigation, soil science, financial accounting, human resources, and one or two courses from each concentration.

The Wine the Viticulture Major offers three multidisciplinary concentrations: Enology, Viticulture, and Wine Business. Students taking advantage of the diverse course offerings including internships will enter industry well prepared to succeed. To further enhance their education, students can also participate in associated extracurricular activities such as student clubs, student enterprise projects, industry interactions, applied research projects, internships, and trade association or professional society meetings.

Cal Poly’s College of Agriculture currently offers a diverse faculty and nearly 9,000 acres of farmland, including a 100-acre state-of-the-art commercial vineyard. This vineyard provides our students an excellent opportunity to practice Cal Poly’s trademark “learn-by-doing” method of education. Graduates of the Wine and Viticulture Major will be uniquely qualified to enter the wine industry.

### CONCENTRATIONS

**Enology.** The enology concentration emphasizes the chemical and physical characteristics of wine. The microbiological and biochemical aspects of wine sensory quality are emphasized, as is packaging, plant sanitation, federal and state regulations, and the Alcohol and Tobacco Tax and Trade Bureau (TTB) methods for wine analysis. A

research winery and well-equipped teaching lab to maintain Cal Poly’s “learn-by-doing” philosophy is under development.

**Viticulture.** Professional positions within the grape and wine industry are now multi-dimensional, with winemakers and grape growers working together. To develop successful strategies, management teams must understand all aspects of wine. The viticulture concentration provides unique cross-training for our students, combining an understanding of vineyards, winemaking, and marketing, thus preparing them for upper echelon management. Students receive intensive training in all aspects of quality wine grape production. Topics include but are not limited to site evaluation and development, pest management, and state-of-the-art cultural practices.

**Wine Business.** The wine business concentration focuses on specific issues unique to this industry. The wine industry requires substantial long-term capital commitments and is controlled by many levels of government. This concentration educates Wine and Viticulture students in operational and strategic management, while providing knowledge of marketing and regulatory constraints.

### BS WINE and VITICULTURE

For course prerequisites, please refer to the “Course Descriptions” section of this catalog. In scheduling courses each quarter, students must consult with their academic advisor.

- 60 units upper division       GWR  
 2.0 GPA                               USCP  
\* = Satisfies General Education requirement

### MAJOR COURSES

WVIT 102 Grapes and Wines of the World.....	4
WVIT/FSN 341 Wine and Fermented Foods.....	4
WVIT/FSN 342 Sensory Evaluation of Wine.....	4
WVIT 463 Issues and Trends in Wine .....	2
AGB/HCS/FSN 339 Internship .....	4
AGB 401 Managing Cultural Diversity in Agricultural Labor Relations (USCP).....	4
AGB 443 Branded Wine Marketing.....	4
AGB 460/461/HCS/FSN 461/462 Senior Project	2,2
BRAE 340 Irrigation Water Management (F)* .....	4

BUS 212 Financial Accounting Nonbus Majors.....	4
CHEM 111 Survey of Chemistry (B3)*.....	5
FRSC 231 Viticulture.....	4
FRSC 331 Advanced Viticulture.....	4
SS 121 Introductory Soil Science.....	4
Concentration courses (see below).....	45-49
Advisor-approved electives.....	20

**120-124****GENERAL EDUCATION (GE)**

72 units required; 24 units are in Major/Concentrations.

→See page 69 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 & Mathematics (no additional units req'd)**

B1 Math/Statistics * 8 units in Concentrations ...	0
B2 Life Science * 4 units in Concentrations.....	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 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 Concen. ....	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 .....** **8-12****180****CONCENTRATIONS (select one)****Enology Concentration**

CHEM 312 Survey of Organic Chemistry.....	5
ECON 201 Survey of Economics (D2)* .....	4
FSN 264 Survey of Food Chemistry .....	4
FSN 270 Food and Wine Plant Sanitation.....	4
FSN 354 Packaging Function in Food Processing ..	4
FSN 374 Food Laws and Regulations .....	4
FSN 464 Wine Chemistry and Analysis.....	4
FSN 470 Selected Advanced Topics .....	4
MATH 118 Pre-Calculus Algebra <i>or</i>	
MATH 161 Calculus for Life Sciences I (B1)*...	4
MCRO 221 Microbiology (B2)* .....	4
STAT 218 Appld Stats for the Life Sciences (B1)*	4
	<b>45</b>

**Viticulture Concentration**

BIO 303 Survey of Genetics.....	3
BOT 121 General Botany (B2)* .....	4
BRAE 439 Vineyard Water Management.....	4
ECON 201 Survey of Economics (D2)* .....	4
FRSC 210 Viticultural Practices.....	2
FRSC 415 Vine Physiology.....	4
MATH 118 Pre-Calculus Algebra <i>or</i>	
MATH 161 Calculus for Life Sciences I (B1)*...	4
PPSC 311 Agricultural Entomology.....	4
PPSC 321 Weed Ecology .....	4
PPSC 414 Grape Pest Management.....	4
SS 221 Fertilizers and Plant Nutrition.....	4
STAT 218 Appld Stats for the Life Sciences (B1)*	4
	<b>45</b>

**Wine Business Concentration**

AGB 202 Sales, Communication and Leadership in Agribusiness .....	4
AGB 212 Agricultural Economics .....	4
AGB 301 Food and Fiber Marketing.....	4
AGB 310 Agribusiness Credit and Finance .....	4
AGB 323 Agribusiness Managerial Accounting .....	4
AGB 422 Logistics in Global Agribusiness .....	4
AGB 444 Wine Compliance and Market Analysis..	4
AGB 450 Agribusiness Strategy Formulation.....	4
BIO 111 General Biology (B2)* .....	4
ECON 222 Macroeconomics (D2) .....	4
MATH 118 Pre-Calculus Algebra <i>or</i>	
MATH 221 Calculus Business/Economics (B1)*	4
STAT 221 Intro Probability and Statistics (B1)* .....	5
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# Graduate Programs in Agriculture

**MS Agribusiness** – see page 107

**MS Forestry Sciences** – see page 142

**MS Agriculture with Specializations in:**

- Agricultural Education
- Agricultural Engineering Technology
- Animal Science
- Crop Science
- Dairy Products Technology
- Environmental Horticultural Science
- Food Science and Nutrition
- Irrigation
- Plant Protection Science
- 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 86 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 85). 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.

**Programs of Study**

There are three MS degrees in the College of Agriculture: MS in Agribusiness (see page 107), MS in Forestry Sciences (see page 142), and the MS in Agriculture. The MS Agriculture program includes the following specializations: Agricultural Education, Agricultural Engineering Technology, Animal Science, Crop Science, Dairy Products Technology, Environmental Horticultural Science, Food Science and Nutrition, Irrigation, Plant Protection Science, Recreation, Parks, and Tourism Management, and Soil 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**

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.

**Formal Study Plan**

Graduate students must file the formal study plan for the degree with the Graduate 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 23 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. 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 91. All students 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

Students have the opportunity to focus their program on the application of engineering technologies and management to solve agriculturally related problems.

#### 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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### 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)	
ASCI 503 Adv. Molecular Techniques in Animal Science (4)	
VS 438 Systemic Animal Physiology (4)	
VS 540, 541 Adv. Immunology and Diseases of Animals, Lab (4) (1)	
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

An applied program for students who desire to use their academic preparation in food science and nutrition, dairy science, microbiology, chemistry, engineering, biochemistry and related fields to address applied research questions of impact to the field of dairy science and technology. The program requires the demonstration of strong analytical thinking, effective oral and written communication, and project management. Coursework and thesis experience are designed with flexibility to enhance and increase proficiency in scientific methods while enriching students' overall preparation to enter the workforce. Graduates enter research and development positions with major food companies, leadership positions in dairy food processing and other allied areas, or further graduate study for the Ph.D. Students have opportunity to work on funded research projects of the Dairy Products Technology Center and interact with multidisciplinary teams of scientists from throughout the world. International students are encouraged to apply.

#### 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 Appl. Exper. Design/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 511 Ecological Biometrics.....	4
HCS 570/571 Selected Topics/Lab .....	3
SS 501 Research Planning .....	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

For students with undergraduate preparation in food science, nutrition, or other science-based curricula. A thesis is required. Research areas vary with faculty expertise and interest; refer to Food Science and Nutrition Department and College of Agriculture web pages for more information on faculty research. Graduates are prepared for further study in doctoral programs or for responsible positions in nutrition and food industries.

#### Required Courses

FNS 581 Graduate Seminar .....	3
FNS 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 (400-500 level courses)</b> .....	28-30
	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 <i>or</i> BRAE 414 Hydrology.....	3/4
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> .....	12/13
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 PLANT PROTECTION SCIENCE**

Provides research experience at the graduate level; provides the opportunity to conduct field and/or laboratory research programs with corporate stakeholders for career enhancement; allows students to develop more diverse or specialized skill sets for post-graduation employment; provides opportunity to obtain required coursework for state licensing.

**Required Courses**

HCS 581 or AG 581 Graduate Seminar .....	3
HCS 511 Ecological Biometrics.....	4
PPSC 599 Thesis .....	6
SS 501 Research Planning .....	4
PPSC 521 Plant-Pest Interactions .....	4
<b>Select 8 units from the following</b> .....	<b>8</b>
PPSC 405 Advanced Weed Science (4)	
PPSC 414 Grape Pest Management (4)	
PPSC 427 Disease and Pest Control Systems for Ornamental Plants (4)	
PPSC 431 Insect Pest Management (4)	
PPSC 441 Biological Control of Insects (4)	
<b>Electives</b> .....	<b>16</b>
400-500 level courses approved by the graduate committee (a minimum of 23 of the total units must be at the 500 level).	
	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> .....	<b>25</b>
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 Environmental Assessment for 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> .....	<b>23</b>
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 177, 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	Eivis Qenani-Petrela
Renny J. Avey	Bradley J. Rickard
Phillip M. Doub	David J. Schaffner
Lynn L. Hamilton	David S. Shaw
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.

## BS AGRICULTURAL BUSINESS

- |  |                               |
|--|-------------------------------|
| <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

## 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

**64**

**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
Any ASCI, PM <i>or</i> DSCI course.....	4
SS 121 Introductory Soil Science.....	4
Any FRSC, CRSC, HCS, PPSC <i>or</i> VGSC course ...	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 AGC, AGED, REC, MSC and ERSC (except if crosslisted with SS). No AG prefixes except AG 315, AG 360 and AG 450. No more than a combined total of 4 units in enterprise projects, special problems, internship and AG 243.	

57

**GENERAL EDUCATION (GE)**

72 units required; 24 units are in Support.

→See page 69 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>11</b>
	<b>180</b>

**CONCENTRATIONS or  
INDIVIDUALIZED COURSE OF STUDY (select one)****Agribusiness Finance and Appraisal Concentration**

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 <i>or</i> 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 <i>or</i> AGB 435 Linear Programming .....	4
AGB 370 World Food Economy .....	4
AGB 412 Advanced Agricultural Policy .....	4
AGB 421 Agribusiness Operations Analysis <i>or</i> 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
	<u>28</u>

**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 <i>or</i> 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	
	<u>28</u>

**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 <i>or</i> 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.	<u>8</u>
	<u>28</u>

**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>	<u>3/4</u>
	<u>47-50</u> <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  
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 that 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, 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.

Student teaching is a vital part of the graduate program for the agriculture 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 a foundation 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 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 and Communication .....	2	
AGED 404 Agricultural Leadership .....	3	
AGC 426 Presentation Methods in Agricultural Communication or EDUC 412 Schooling in a Democratic Society.....	4	
AGED 460 Research Methodology in Agricultural Education and Communication .....	1	
AGED/AGC 461 Senior Project .....	1	
AGED/AGC 462 Senior Project .....	1	
AG 360 Holistic Management or ASCI 476 Issues in Animal Agriculture.....	4/3	
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 112 Principles of Animal Science .....	4	
ASCI 232 General Animal Science Laboratory .....	1	
BRAE 121 Agricultural Mechanics .....	2	
BRAE 141 Agricultural Machinery Safety .....	3	
DSCI 230 General Dairy Husbandry .....	4	
DSCI 231 General Dairy Manufacturing or FSN 230 Elements of Food Processing .....	4	
EHS 230 Environmental Horticulture .....	4	
FRSC 230 California Fruit Growing or VGSC 230 Introduction to Vegetable Science .....	4	
HCS 120 Principles Horticulture and Crop Science .....	4	
PM 225 Introduction to Poultry Management.....	4	
SS 121 Introductory Soil Science.....	4	
Concentration courses (see below).....	22	
	<b>87-88</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 or 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	
12-20 units must be 300-400 level depending on concentration. Career area programs may be selected from teaching agriculture, or agricultural communication.		
	<b>42</b>	

**GENERAL EDUCATION (GE)**

72 units required; 16 units are in Support.  
 →See page 69 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>	

<b>ELECTIVES</b> .....		<b>6-7</b>
		<b>192</b>

**CONCENTRATIONS (select one)**

**Agricultural Mechanics**

BRAE 133 Engineering Design Graphics.....	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 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	
	<b>22</b>	

**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
	22

**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
	22

**Forestry and Natural Resources**

BIO 227 Wildlife Conservation Biology .....	4
FNR 202 Environmental Management.....	3
FNR 208 Dendrology.....	4
FNR 306 Natural Resource Ecology and Habitat Management .....	4
FNR electives (300–400 level).....	7
	22

**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
	22



# Animal Science

**Department Office**  
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## Department Head, Andrew J. Thulin

Jonathon L. Beckett	Daniel G. Peterson
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M. Steven Daugherty	Robert T. Rutherford
Robert J. Delmore	Dale A. Smith
Michael H. Hall	Robert Spiller
Elizabeth Koutsos	Rudy A. Wooten
Jaymie J. Noland	

## Affiliate Faculty:

Brent G. Hallock, Soil Scientist  
Stanley L. Henderson, Dairy Scientist  
Edwin H. Jaster, Dairy Scientist

## ACADEMIC PROGRAMS

**BS Animal Science**  
**Equine Science Minor**  
**Meat Science and Processing Minor**  
**Poultry Management Minor**  
**Rangeland Resources 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: pre-veterinary medicine/graduate school, animal biotechnology, livestock production, poultry management, meat science and processing, rangeland resource management, zoo and exotic animal management, agribusiness, and teaching agriculture.

In addition, the department offers a wide assortment of extra- and co-curricular activities including five different student clubs and nationally competitive livestock 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. 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 112 Principles of Animal Science (B2)*.....	4
ASCI 211 Meat Science.....	4
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
ASCI 224 Equine Science.....	4
ASCI 304 Animal Breeding.....	3
ASCI 320/CHEM 313/CHEM 371 .....	3-5
ASCI 351 Reproductive Physiology .....	4
ASCI 461 Senior Project.....	1
ASCI 462 Senior Project.....	2
ASCI 463 Undergraduate Seminar .....	2
ASCI 476 Issues in Animal Agriculture .....	3
PM 225 Introduction to Poultry Management .....	4
VS 223 Anatomy and Physiology of Farm Animals	4
<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; VS 340, VS 438.....	3-5
<i>Technology (select two)</i>	
AG 360/AG 450; ASCI 311, 329, 384, 403, 415, 450; PM 325, 330; VS 312	6-9
Advisor approved electives.....	20-28

**96**

**SUPPORT COURSES**

BIO 161 Introduction to Biology <i>or</i>	
BIO 111 General Biology (B2 & B4)*.....	4
BIO 302 Human Genetics <i>or</i> BIO 303 Genetics.....	4
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

**21-22****GENERAL EDUCATION (GE)**

72 units required; 12 units are in Support.

→See page 69 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**

<b>ELECTIVES</b> .....	<b>2-3</b>
------------------------	------------

**180****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 161; VS 223 is recommended for ASCI 315 but not required.

**Required courses**

ASCI 112 Principles of Animal Science (B2).....	4
ASCI 220 Intro to Nutrition.....	4
ASCI 224 Equine Science.....	4
ASCI 315 Equine Biomechanics.....	4
ASCI 346 Equine Nutrition .....	3
ASCI 333 Equine Reproduction <i>or</i> ASCI 347	
Equine Exercise Physiology .....	5/3

**Selected courses** ..... 6-8

Select 6-8 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 Meat Science.....	4
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** ..... 12-15

6 units must be at upper-division level:

ASCI 112/231, 226, 290/490, 339, 450, 476;
FSN 125/230, 270, 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

ASCI 350 Applied Nonruminant Nutrition .....	4
PM 225 Introduction to Poultry Management .....	4
PM 325 Egg Production, Processing & Distrib. ....	4
PM 330 Poultry Production Management .....	4
PM 345 Poultry Business Management .....	4
VS 340 Immunology and Diseases .....	4
<b>Electives</b> .....	4

To be chosen from:

AGB 310; ASCI 339, 415; BUS 212, 346;  
ENGL 310; FSN 270, 275, 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 98 for additional information.

# BioResource & Agricultural Engineering

## Department Office

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

## Department Head (Interim), Richard A. Cavaletto

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Samantha J. Gill	James B. Zetzsche, Jr.
M. Stephen Kaminaka	Mark A. Zohns
Shaun F. Kelly	

## 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
- 2.0 GPA
- GWR
- 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.....	2
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 237 or BRAE 239 Engineering Surveying...	2/4
BRAE 301 Hydraulic/Mechanical Power Systems..	4
BRAE 321 Agricultural Safety .....	3
BRAE 324 Principles Agricultural Electrification...	4
BRAE 340 Irrigation Water Management .....	4
BRAE 342 Agricultural Materials .....	4
BRAE 343 Mechanical Systems Analysis .....	4
BRAE 348 Energy for a Sustainable Society (Area F)* .....	4
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 I.....	2
BRAE 462 Senior Project II .....	2
Advisor approved electives .....	16
Selected from: plant production, livestock pro- duction, food processing, environment information management, water/irrigation, agricultural waste management, process and manufacturing, or teaching agriculture	

**81/83**

**SUPPORT 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 .....	4
BUS 212 Financial Accounting for Nonbusiness Majors or AGB 321 Farm Records.....	4
CHEM 110 World of Chemistry - Essentials or CHEM 111 Survey of Chemistry (B3 & B4)* ....	4/5
CSC 110/CSC 113/CSC 232/AG 250 .....	3
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 I.....	4
SS 121 Introductory Soil Science.....	4
Animal or plant production course.....	3

**50/51**

**GENERAL EDUCATION (GE)**

72 units required; 20 units are in Major/Support.  
 →See page 69 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 in Major .....	0
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**52**

**ELECTIVES .....**

**183**

**BS BIORESOURCE AND AGRICULTURAL ENGINEERING**

- 60 units upper division
- 2.0 GPA
- GWR
- 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.....	2
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 239 Engineering Surveying.....	4
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 421, 422 Equipment Engineering.....	3,4
BRAE 433 Agricultural Structures Design.....	4
BRAE 460 Senior Project Organization .....	1
BRAE 461, 462 Senior Project I, II .....	2,2
Advisor approved electives.....	10

**75**

**SUPPORT COURSES**

BIO 213 and ENGR/BRAE 213 or MCRO 221 Microbiology (B2)* .....	4
CE 201 Mechanics of Materials (6) or CE 204 and CE 207 Mechanics of Materials I, II (3)(3).....	6
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 231/CSC 232/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 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 and PHYS 256 Electrical Measurements Lab or EE 321 Electronics & EE 361 Electronics Lab...	3,1
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 69 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 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****192**

# Dairy Science

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William T. Gillis	Phillip S. Tong
Stanley L. Henderson	

## 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 I .....	2
DSCI 462 Senior Project II.....	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 161 Introduction to Cell and Molecular Biology.....	5/4
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, pre-veterinary, agricultural communications, agricultural education, pre-graduate studies in dairy products technology or pre-graduate studies in dairy production.	
<hr/> 57/59	

**GENERAL EDUCATION (GE)**

72 units required; 12 units are in Support.

→See page 69 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

<b>ELECTIVES</b> .....	<b>3/5</b>
	<b>180</b>

**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

food processing and marketing, quality and regulatory control and processing plant management. Specific programs will be designed to reflect the individual student's 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** .....

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)	

# Earth and Soil Sciences

**Department Office**  
**Science Bldg. (52), Room C-43**  
**(805) 756-2261 FAX (805) 756-5412**

## Department Chair, Brent G. Hallock

Christopher S. Appel	Thomas A Ruehr
Delmar D. Dingus	Terry L. Smith
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Thomas J. Rice, Jr.

## Affiliate Faculty:

David W. Chipping	James R. Keese
Antonio F. Garcia	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 Earth, Soil, and Water Conservation Club, 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, 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, manage, 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.

#### Environmental Interpretation and Assessment.

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 Plant Relationships (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, Anthropology-Geography, Geology, and Land Rehabilitation. Please see page 97 or 273 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 Plant Relationships .....	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 I.....	1
SS 462 Senior Project II.....	3
SS 463 Undergraduate Soils Seminar .....	2
Concentration courses (see below).....	28
<b>81</b>	

**SUPPORT COURSES**

BOT 121 General Botany (B2 & B4)* .....	4
BRAE 340 Irrigation Water Management (Area F)* .....	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 .....	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/PHYS 141.....	4
STAT 218 Appl Statistics-Life Sciences.....	4
<b>47</b>	

**GENERAL EDUCATION (GE)**

- 72 units required; 20 units are in Support.
- See page 69 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 in Support.....	0
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**52**

**ELECTIVES .....**

**0**

**180**

**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
<i>Select from:</i> FNR 202, 306, 311, 416, 425; PHIL 340, REC 302.....	8
<i>Select from:</i> 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
<i>Select from:</i> CHEM 218/318, 231/331, 319, 341, 342, 385, 481.....	8
<i>Select from:</i> ENVE 325, 330, 434, 439; SS 442.....	6
STAT 313 Applied Experimental Design and Regression Models.....	4
<b>28</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 or PHYS 141.

**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
BOT 121 General Botany (B2 & B4)* .....	4
BOT 326 Plant Ecology or FNR 306 Natural Resource Ecology and Habitat Management.....	4
BOT 333 Field Botany .....	4
BRAE 237 Engineering Surveying I.....	2
CHEM 127, 128 General Chemistry (B3 & B4)* ....	4,4
ERSC 144 Introduction to Earth Systems .....	4
ERSC/GEOG 250 Physical Geography .....	4
ERSC/GEOG 333 Human Impact on the Earth .....	4
ERSC/GEOG 414 Climatology .....	4
ERSC/SS 110 Orientation to Soil Science .....	1
ERSC/SS 223 Rocks and Minerals .....	4
ERSC/SS 321 Soil Morphology .....	4
ERSC/SS 323 Geomorphology .....	4
ERSC/SS 461, 462 Senior Project I, II.....	1,3
ERSC/SS 463 Undergraduate Seminar .....	2
FNR/GEOG/LA 318 Applications in GIS .....	3
GEOG 328 Geographic Apps. in Remote Sensing	4
GEOL 201 Physical Geology .....	3
GEOL 241 Physical Geology Lab.....	1
GEOL/ERSC 401 Field – Geology Methods .....	4
SS 121 Introductory Soil Science.....	4
STAT 218 Applied Statistics/Life Sciences (B1)*...	4
Concentration courses (see below; 4 units B1)* .....	40
<b>124</b>	

**GENERAL EDUCATION (GE)**

- 72 units required; 20 units are in Major.
- See page 69 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 (PSY 352 recommended for Environmental Interpretation and Assessment Concentration)....	4
<b>Area F Technology Elective (upper division)</b> * 4 units in Major .....	0
<b>52</b>	
<b>ELECTIVES</b> .....	<b>4</b>
<b>180</b>	

**CONCENTRATIONS (select one):**

**Environmental Interpretation and Assessment Concentration**

ERSC/GEOG 325 Climate and Humanity .....	4
FNR 416 Environmental Impact Analysis/Mgt .....	4
GEOG 301 Geography of Resource Utilization .....	4
MATH 118 Pre-Calculus Algebra (B1)* .....	4
MATH 119 Pre-Calculus Trigonometry .....	4
PHYS 121 College Physics I .....	4
Select 16 units from the following:.....	16
GEOG 150, GEOG 340, ERSC/SS 202, CRP 420, FNR/CRP 404, FNR/CRP 408, FNR 425, SS 433	
<b>40</b>	

**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 131/141, 132 General Physics .....	4,4
Select 16 units from the following.....	16
ANT 309, ANT 310, ERSC/SS 202, FNR 419, GEOL/ERSC 402, SS/BIO/FNR 421, SS 431, SS 432	
<b>40</b>	

**Individualized Course of Study**

MATH 118 Pre-Calculus Algebra (B1)* .....	4
MATH 119 Pre-Calculus Trigonometry .....	4
PHYS 121 College Physics I .....	4
Restricted electives (minimum 18 units at 300- 400 level).....	28
<b>40</b>	

# Food Science and Nutrition

Department Office  
Agricultural Sciences Bldg. (11), Room 244  
(805) 756-2660  
[www.calpoly.edu/~fsn](http://www.calpoly.edu/~fsn)

## Department Head, Doris Derelian

Louise A. Berner	Tom Neuhaus
Brian C. Hampson	Lisa M. Nicholson
Susan N. Hawk	Ammar A. Olabi
Hany M. Khalil	Scott Reaves
Joseph Montecalvo, Jr.	Madoka Watabe-Belzel

## 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.

## BS Food Science

The program is designed to prepare students for employment in the food industry and for graduate study. Principal areas of instruction are food processing, food safety and sanitation, quality assurance, food chemistry and analysis, product development, and sensory evaluation. Employment opportunities are strong in each of these areas. Students follow one of two concentrations.

### Concentrations

**Basic Food Science** is the curriculum approved by the Institute of Food Technologists (IFT), the key international professional society for food scientists. Students are strongly advised to follow this concentration if they anticipate graduate study following completion of the BS, as many graduate programs in food science require the advanced chemistry and math coursework included in this concentration. In addition, students must follow this concentration to be eligible for IFT scholarships.

**Applied Food Technology** allows students to select coursework focused in a commodity or other area where they have career interest. For example, with proper selection of advisor-approved electives and concentration area courses, students can earn minors in meat science, wine and viticulture, or packaging within the 186-unit requirement. Course selections could also focus in dairy products, culinary science, or business.

## 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.

### 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).

### 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.

### 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 204 Food Processing Operations .....	4
FSN 210 Nutrition.....	4
FSN 250 Food/Nutrition: Customs/Culture (D4)* ...	4
FSN 270 Food and Wine Plant Sanitation .....	4
FSN 275 Principles of Food Safety & Hazard Anly	4

FSN 311 Sensory Evaluation of Food .....	4
FSN 330 Intro to Principles of Food Engineering ...	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 444 Engineering Concepts in Food Processing	4
FSN 461 Senior Project I.....	3
FSN 462 Senior Project II.....	3
FSN 463 Undergraduate Seminar .....	1
FSN 474 Advanced Food Processing .....	4
Concentration courses (see below) .....	20-21
	<b>91-92</b>

### SUPPORT COURSES

BIO 111 General Biology (B2 & B4)* .....	4
CHEM 312 Survey of Organic Chemistry <i>or</i> CHEM 316 Organic Chemistry I.....	5
CHEM 313 Survey of Biochemistry and Biotechnology .....	5
ENGL 148 Reasoning, Argumentation and Professional Writing (A3)* .....	4
MATH 118 Pre-Calculus Algebra (B1)* .....	4
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.....	9-10
	<b>47-48</b>

### GENERAL EDUCATION (GE)

72 units required; 24 units are in Support.

→See page 69 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 (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 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 (16 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
<b>Area F Technology Elective (upper division) (4 units)</b>	<b>4</b>
	<b>48</b>
<b>ELECTIVES</b> .....	<b>0</b>
	<b>186</b>

**CONCENTRATIONS (select one)**

**Basic Food Science Concentration**

BIO 303 Survey of Genetics .....	4
CHEM 127 General Chemistry .....	4
CHEM 128 General Chemistry .....	4
MATH 161 Calculus for Life Sciences I.....	4
MATH 162 Calculus for Life Sciences II .....	4
	<b>20</b>

**Applied Food Technology Concentration**

CHEM 111 Survey of Chemistry .....	5
FSN 410 Nutritional Implications of Food Industry Practices.....	4
Commodity courses.....	11-12
<i>Choose 3 from the following:</i>	
ASCI 209, ASCI 384, ASCI 415;	
DSCI 231, DSCI 223, DSCI 434;	
FSN 244, FSN 341;	
FRSC 230, FRSC 231, FRSC 331;	
PM 325, PM 330;	
VGSC 230	
	<b>20-21</b>

**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 I, II.....	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 (B1)*.....	4
STAT 218 Applied Statistics Life Sciences (B1)* ..	4
<sup>1</sup> BIO 111 General Biology <i>or</i> BIO 161 Intro to Cell and Molecular Biology.....	4
Concentration courses (see below) .....	56-61
	<b>136-142</b>

**GENERAL EDUCATION (GE)**

72 units required; 28 units are in Major.  
 →See page 69 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 (12 units)**

D1 The American Experience (40404) .....	4
D2 Political Economy * 4 units in Major.....	0
D3 Comp. Social Institutions .....	4
D4 Self Dev. (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>44</b>

<b>ELECTIVES</b> .....	<b>0-6</b>
	<b>186</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.



**CONCENTRATIONS (select one)****Applied Nutrition Concentration**

FSN 263 Prof. 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 420 Critical Evaluation of Nutrition Research	2
FSN 426 Food Systems Management .....	4
FSN 429, 430 Clinical Nutrition I, II.....	4,4
BIO 302 Human Genetics <i>or</i> BIO 303 Survey of Genetics.....	4
BUS 212 Financial Actg for Nonbusiness Majors...	4
MCRO 421 Food Microbiology.....	4
PSY 201/202 General Psychology.....	4
ZOO 331, 332 Human Anatomy/Physiology I, II....	5,5
	<u>60</u>

**Culinary Science and Management in Nutrition Concentration**

FSN 304 Adv. Culinary Principles and Practice .....	4
FSN 311 Sensory Evaluation of Food.....	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 426 Food Systems Management .....	4
AGB 301 Food and Fiber Marketing .....	4
BUS 212 Accounting .....	4
BUS 384 Human Resources Management .....	4
MCRO 421 Food Microbiology.....	4
PSY 201/202 General Psychology .....	4
Advisor approved electives .....	11
	<u>61</u>

**Nutrition and Food Industries Concentration**

FSN 275 Principles of Food Safety and Hazard Analysis.....	4
FSN 311 Sensory Evaluation of Food .....	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 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, 341; DSCI 231 .....	3-4
Select one from: ASCI 231, CRSC 230, DSCI 230, FRSC 230, VGSC 230 .....	3-4
Select a minimum of 16 units from one of the emphasis areas below:.....	16
<sup>1</sup> <i>Food Processing emphasis</i> ASCI 209, 211, 384, 415; DSCI 231; FSN 204, 244, 270, 285, 304, 330, 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; PSY 201/202; SCOM 301	
	<u>56-58</u>

**Nutrition Science Concentration**

FSN 416 Community Nutrition.....	4
FSN 429 Clinical Nutrition I.....	4
FSN 430 Clinical Nutrition II .....	4
BIO 302/BIO 351/BIO 303.....	4/5
PHYS 121 College Physics I .....	4
ZOO 331, 332 Human Anatomy/Physiology I, II....	5,5
Advisor approved electives.....	30
	<u>60-61</u>

<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.

**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, 415;  
 FSN 244, 311, 330, 341, 354, 364, 368, 374, 408,  
 410, 444, 474;  
 DSCI 231; MCRO 421

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**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;  
 SCOM 418; SOC 323.

*Culinary Science*

FSN 121, 304, 343, and 344

Plus select one of the following:

FSN 250, 311, 408, 410, 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

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# Horticulture and Crop Science

## Department Office

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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 a concentration in landscape horticulture; nursery and floriculture production; turfgrass management; 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. Three and a half acres 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 horticulture 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 concentrations students can choose coursework to meet their individual needs. Students may also choose to complete a minor in Agribusiness, Agricultural Communication, Crop Science, Fruit Science, Land Rehabilitation, Plant Protection, Soil Science, Water Science, or Wine and Viticulture.

### Concentrations

**Landscape Horticulture.** Prepares students for careers in the rapidly growing areas of landscape sales, design, implementation, construction, and maintenance. Students take courses giving them a broad background in the landscape industry, and then they may focus on one of these areas.

**Nursery and Floriculture Production.** Prepares students to own or manage wholesale floriculture or nursery operations. Students receive a broad background in plant production including hands-on experience from an enterprise project or internship, after which they may focus in a more narrow aspect of plant production.

**Turfgrass Management.** Prepares students for careers in the construction, management, and maintenance of golf courses and athletic fields, or careers in professional lawn care and commercial grounds maintenance. Students are required to get hands-on experience through at least one internship.

**Individualized Course of Study.** Students may pursue an academic minor or create a program, with the approval of their advisor and department head, based on their interests and career goals. Courses will be selected, and contracts signed, before students have completed 145 units of coursework toward their degree. The coursework may be specifically tailored for a career in industry, education, government, or as preparation for graduate school.

### 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 127/128	HCS 124
HCS 120	EHS 123	EHS 126
BOT 121		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 218
SPAN 111	ECON 201	
3rd Year		
Fall	Winter	Spring
PPSC 311	HCS 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 industries. 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/Crop Science	2
HCS 120 Principles of Horticulture/Crop Science...	4
CRSC 132 California Field Crops <i>or</i> VGSC 190 California Vegetable Production.....	4
CRSC 202 <i>or</i> VGSC 202 Enterprise Project .....	2
PPSC 321 Weed Ecology .....	4

**Restricted elective courses** ..... 16

Select any **four** courses from the following:  
BRAE 340, HCS 421, HCS 425, any CRSC/PPSC/VGSC  
300-400 level courses

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**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 industries. 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
HCS 120 Principles of Horticulture/Crop Science...	4
FRSC 132 Pomology.....	4
FRSC 133 Pomology <i>or</i> FRSC 231 Viticulture I.....	4
FRSC 342 Citrus and Avocado Fruit Production ....	4
FRSC 202 Enterprise Project .....	2
FRSC 402 Enterprise Project Management .....	2

**Restricted elective courses** ..... 8

Select from the following:  
BRAE 340; BOT 323; CRSC 445; FRSC 331, 422;  
HCS 421/425, HCS 124; 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
HCS 120 Principles of Horticulture/Crop Science...	4
HCS 124 Plant Propagation .....	4
EHS 245 Horticulture Applications .....	3
EHS 201/210/310 Enterprise Project/Field Studies	1

<b>Electives</b> Chosen from:.....	16
EHS 231/232, 324, 340, 341, 342, 424, 425, HCS 327	
	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 <i>or</i> BOT 324 Ornamental and Forest Pathology .....	4
PPSC 311 Agricultural Entomology .....	4
PPSC 321 Weed Ecology .....	4

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

*Students elect Emphasis I or Emphasis II based on their major.*

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

*Plant production majors: Crop Science, Fruit Science, Forestry and Natural Resources (Forestry Concentration) and Environmental Horticultural Science.*

Select 16 units from: BIO 435; BOT 325, 431;  
HCS 410; FNR 306; PPSC 327, 405, 414, 421, 427,  
431, 441; ZOO 335

**II. Emphasis for Non-Plant Production Majors (16 units)**

<sup>1</sup> Select 12 units of agriculture production courses

<sup>1</sup> Select one course from Emphasis I (4 units)

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**Interdisciplinary Minors**

The department participates in offering interdisciplinary minors in Geographic Information Systems for Agriculture, Land Rehabilitation, 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, Environmental Horticultural Science, and Plant Protection Science, among others. Please refer to the MS Agriculture section of the College of Agriculture.

**BS CROP SCIENCE**

- 60 units upper division
- 2.0 GPA
- GWR
- USCP

\* = Satisfies General Education requirement

**MAJOR COURSES**

HCS 110 Orientation to Horticulture/Crop Science	2
HCS 120 Principles of Hort. & Crop Science.....	4
CRSC 132 California Field Crops .....	4

<sup>1</sup> Approval of minor advisor required.

VGSC 190 California Vegetable Production .....	4
CRSC 202/VGSC 202 Enterprise Project .....	3
FRSC 230 California Fruit Growing .....	4
CRSC 231 Commercial Seed Production .....	4
CRSC 244 Precision Farming .....	4
HCS 304 Plant Breeding .....	4
PPSC 311 Agricultural Entomology .....	4
PPSC 321 Weed Ecology .....	4
HCS 410 Applied Plant Ecophysiology or BIO 435 Plant Physiology .....	4
CRSC 411 Experimental Techniques and Analysis .....	4
HCS 461, 462 Senior Project I, II .....	2,2
HCS 463 Undergraduate Seminar .....	1
CRSC/FRSC/HCS/PPSC/VGSC 300-400 level electives .....	8
	<b>62</b>

**SUPPORT COURSES**

BIO 303 Survey of Genetics .....	4
BOT 121 General Botany (B2 & B4)* .....	4
BOT 323 Plant Pathology .....	4
BRAE 340 Irrigation Water Mgmt (Area F)* .....	4
CHEM 111 Survey of Chemistry (B3&B4)* .....	5
CHEM 312 Survey of Organic Chemistry .....	5
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 .....	25/26
<i>10-16 units must be 300-400 level. Suggested areas include applied biotechnology, crop ecology, production mgt., post-harvest tech/marketing, crop/veg. science. May not include Enterprise Project/Mgt.</i>	
	<b>63-64</b>

**GENERAL EDUCATION (GE)**

72 units required; 20 units are in Support.  
 →See page 69 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 in Support .....	0
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**52**

**ELECTIVES .....**

**2-3**

**180**

**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
HCS 120 Principles of Horticulture/Crop Science .....	4
EHS 123 Landscape Installation and Maintenance .....	4
HCS 124 Plant Propagation .....	4
EHS 126 Environmental Horticulture Construction .....	2
EHS 231, EHS 232 Plant Materials I, II .....	4,4
HCS 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 I .....	2
HCS 462 Senior Project II .....	2
HCS 463 Senior Seminar .....	1
Concentration courses .....	39
	<b>79</b>

**SUPPORT COURSES**

BIO 435 Plant Physiology or HCS 410 Applied Plant Ecophysiology .....	4
BOT 121 General Botany (B2 & B4)* .....	4
BOT 323 Plant Pathology or BOT 324 Ornamental and Forest Pathology .....	4
BUS 201/207 Business Law Survey .....	3
BUS 212 Financial Acctg for Nonbusiness Majors .....	4
CHEM 111 Survey of Chemistry (B3&B4)* .....	5
CHEM 312 Survey of Organic Chemistry (transfer equivalent CHEM 212) .....	5
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
PPSC 321 Weed Ecology .....	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

**61**

**GENERAL EDUCATION (GE)**

72 units required; 24 units are in Support.  
 →See page 69 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 (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
	<b>48</b>

<b>ELECTIVES</b> .....	<b>0</b>
	<b>188</b>

**CONCENTRATIONS (select one)****Landscape Horticulture Concentration**

EHS 127 Introduction to Landscape Graphics .....	4
EHS 301 Principles of Landscape Design.....	4
EHS 331 Landscape Contracting .....	4
EHS 343 Turfgrass Management .....	4
EHS 421 Arboriculture .....	4
EHS 434 Landscape Management .....	4
BRAE 337 Landscape Irrigation .....	3
Advisor approved electives .....	12
	<b>39</b>

**Nursery and Floriculture Production Concentration**

EHS 128 Principles of Horticultural Design .....	4
EHS 245 Horticulture Applications .....	3
EHS 340 Principles of Greenhouse Environment....	4
EHS 342 Potted Plant Production .....	4
EHS 424 Nursery Crop Production .....	4
EHS 210/EHS 310/HCS 339 Enterprise Project/ Internship.....	4
Advisor approved electives .....	16
	<b>39</b>

**Turfgrass Management Concentration**

BRAE 337 Landscape Irrigation .....	3
BUS 384 Human Resource Management.....	4
EHS 128 Principles of Horticultural Design .....	4
EHS 343 Turfgrass Management .....	4
EHS 433 Advanced Turfgrass Science .....	4
EHS 434 Landscape Management .....	4
HCS 339 Internship.....	3
Advisor approved electives .....	13
	<b>39</b>

**Individualized Course of Study**

EHS 128 Principles of Horticultural Design.....	4
35 units, 16 of which must be upper division EHS	35
Course selection must be made before the student has finished 145 units toward the degree, and must be with the concurrence of the student's advisor and department head.	
	<b>39</b>

**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
HCS 120 Principles of Horticulture/Crop Science...	4
HCS 124 Plant Propagation .....	4
PPSC 311 Agricultural Entomology .....	4
PPSC 321 Weed Ecology.....	4
HCS 410 Applied Plant Ecophysiology.....	4
CRSC 411 Experimental Techniques/Analysis .....	4
FRSC 422 Tropical/Subtropical Crop & Fruit Prod.	4
HCS 461, 462 Senior Project I, II.....	2,2
HCS 463 Undergraduate Seminar.....	1
FRSC 132, 133 Pomology .....	4,4
FRSC 202/402 Enterprise Project Management .....	6
FRSC 231 Viticulture I.....	4
FRSC 331 Viticulture II.....	4
FRSC 342 Citrus and Avocado Fruit Production....	4
HCS 421 Postharvest Tech. Horticultural Crops .....	3
HCS 425 Postharvest Tech. Hort. Crops Lab .....	1
	<b>65</b>

**SUPPORT COURSES**

BIO 303 Survey of Genetics.....	3
BOT 121 General Botany (B2 & B4)* .....	4
BOT 323 Plant Pathology .....	4
BRAE 340 Irrigation Water Management (Area F)* .....	4
CHEM 111 Survey of Chemistry (B3&B4)* .....	5
CRSC 230 or VGSC 230 .....	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
BIO/BOT/CHEM 300-400 level elective.....	4
Advisor-approved electives .....	22
	<b>62</b>

**GENERAL EDUCATION (GE)**

72 units required; 20 units are in Support.

→See page 69 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

<b>Area B Science and Mathematics (no additional units are required)</b>	
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	
<b>Area C Arts and Humanities (20 units)</b>	
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
<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 in Support .....	0
	<b>52</b>
<b>ELECTIVES</b> .....	<b>1</b>
	<b>180</b>

**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
HCS 120 Principles of Horticulture/Crop Science...	4
CRSC/FRSC/VGSC 202 Enterprise Project .....	3
PPSC 311 Agricultural Entomology .....	4
PPSC 321 Weed Ecology .....	4
PPSC 327/PPSC 414/PPSC 421/HCS 327.....	3/4
PPSC 405 Advanced Weed Science.....	4
HCS 410 Applied Plant Ecophysiology <i>or</i> BIO 435 Plant Physiology .....	4
CRSC 411 Experimental Techniques/Analysis .....	4
PPSC 427 Disease and Pest Control Systems for Ornamental Plants .....	4
PPSC 431 Insect Pest Management.....	4
PPSC 441 Biological Control of Insects .....	4
HCS 461, 462 Senior Project I, II .....	2,2
HCS 463 Undergraduate Seminar .....	1
<sup>1</sup> Select advisor approved production courses in CRSC/EHS/FRSC/HCS/VGSC .....	18
	<b>67-68</b>

**SUPPORT COURSES**

BIO 303 Survey of Genetics .....	4
BIO 325 General Ecology .....	4
BOT 121 General Botany (B2 & B4)* .....	4
BOT 324 Ornament and Forest 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
SS 221 Fertilizers and Plant Nutrition .....	4
STAT 218 Applied Statistics/Life Sciences (B1)* ..	4
Advisor approved electives.....	10
	<b>57</b>

**GENERAL EDUCATION (GE)**

72 units required; 16 units are in Support.  
 →See page 69 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)**

	<b>4</b>
	<b>56</b>

<b>ELECTIVES</b> .....	<b>0</b>
	<b>180</b>

<sup>1</sup> Advisor approval required.



# Military Science

**Department Office**  
**Dexter Bldg. (34), Room 115**  
**(805) 756-7682**

**Department Head,**  
**Major Russell Clark**

Major Loren Weeks  
 Captain Richard Wellman

## 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 Leader's Training Course (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 Leadership Development and Assessment Course (6)

### Senior

- MSL 401 Leadership and Management I (3)
- MSL 402 Leadership and Management II (3)
- MSL 403 Officership (3)

<sup>1</sup> LTC is an optional 6-week summer training course (1-7 units) at Fort Knox, Kentucky.

<sup>2</sup> LDAC 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)

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# Natural Resources Management

Department Office  
Agricultural Sciences Bldg. (11), Room 217  
(805) 756-2702  
www.nrm.calpoly.edu

## Department Head, Douglas D. Piirto

Christopher A. Dicus	Jeffrey A. Jacobs
Brian C. Dietterick	Walter R. Mark
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Marni Goldenberg	Carolyn B. Shank
John H. Harris	Richard P. Thompson
William W. Hendricks	James R. Vilkitis

## ACADEMIC PROGRAMS

**BS Environmental Management and Protection**

**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, forest and environmental practices, wildlife biology, or an individualized course of study.

Graduates qualify for such positions as: forester, environmental planner and assessor, natural resource manager, urban forester, park administrator, watershed manager, hydrologist, fire and fuels manager, and many other related environmental career areas.

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 the forest resources of 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.

Most students are required to complete an internship equivalent to 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 (OPM) 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 Planning and Assessment.** Prepares students for employment as professionals in the environmental management subdisciplines of environmental planning, impact assessment, analysis and monitoring. Graduates from this concentration are academically qualified for Cal EPA's Registered Environmental Assessor I and II.

**Forest and Environmental Practices.** Specialized areas of study are available through this concentration. Students integrate real-world management practices with environmental concerns and balance both views in their profession. The program has a strong industry connection and professional career orientation. Offered at Swanton Pacific Ranch in Santa Cruz County and only available by application and acceptance. Open to students majoring in FNR and ENVM.

**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. Students taking this concentration are eligible for two scholarships of \$2000 and \$1000.

**Watershed Management and Hydrology.** Provides students a focused and encompassing program in watershed management 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. Students pursuing specific coursework can qualify as hydrologists under U.S. Government OPM guidelines.

**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 technologies, issues and policies in managing fire, using fire as an ecosystem management tool and social and economic impacts of fire.

**Other Concentrations Available.** The Field and 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.

**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.

## 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.

## BS FORESTRY AND NATURAL RESOURCES

- 60 units upper division       GWR  
 2.0 GPA                               USCP

\* = Satisfies General Education requirement

### MAJOR COURSES

FNR 140 Careers in Forestry and Environ. Mgmt. ..	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 & Sampling in Forested Env.	4

FNR/LA/GEOG 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 <i>or</i> FNR 461 Sr. Project I .....	3
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 .....	31-33
	<b>97-99</b>

### SUPPORT

AGB 212 Agricultural Economics .....	4
ASCI 329 Principles of Range Mgmt. <i>or</i> BIO 427 Wildlife Management.....	3-4
BOT 121 General Botany (B2&B4)* .....	4
BRAE/FNR 247 Forest Surveying.....	2
BRAE 345 Aerial Photogram. & Remote Sensing ..	3
CHEM 111 Survey of Chemistry (B3)* .....	5
MATH 161 <i>or</i> MATH 221 Calculus (B1)* .....	4
SS 121 Introductory Soil Science .....	4
STAT 217 <i>or</i> STAT 218 Statistics (B1)* .....	4

Advisor approved science course

BOT 313, CHEM 312, <i>or</i> PHYS 121 .....	4-5
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*Note: If Support Courses total 37 (39) units, then take 33 (31) units in concentration*

**37-39**

### GENERAL EDUCATION (GE)

72 units required; 16 units are in Support.

→See page 69 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

<b>Area F Technology Elective (upper division) (4 units)</b>	<b>4</b>
	<b>56</b>
<b>ELECTIVES</b> .....	<b>0-2</b>
	<b>192</b>

**CONCENTRATIONS (Select one)**

**Environmental Planning and Assessment 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 .....	10-12
	31-33

**Forest and Environmental Practices Concentration**

FNR 339 Internship .....	6
FNR 475 Forest and Environmental Practices.....	15
Restricted electives, advisor's prior written approval .....	10-12
	31-33

**Natural Resources Recreation Concentration**

FNR 311 Environmental Interpretation .....	4
FNR 339 Internship .....	6
FNR 350 Urban Forestry .....	3
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 .....	8-10
	31-33

**Urban Forestry Concentration**

CRP 212 Introduction to Urban Planning.....	4
EHS 421 Arboriculture.....	4
EHS 422 Adv. Arboriculture <i>or</i> FNR 311 Environmental Interpretation .....	2/4
FNR 339 Internship .....	6
FNR 350 Urban Forestry .....	3
FNR 450 Community Forestry .....	3
Restricted electives, advisor's prior written approval .....	9-11
	31-33

**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 .....	19-21
	31-33

**Wildland Fire and Fuels Management Concentration**

FNR 204 Wildland Fire Control.....	3
FNR 339 Internship.....	6
FNR 340 Resource Fire Management.....	2
FNR 455 Wildland-Urban Interface Fire Protection ...	3
Restricted electives, advisor's prior written approval .....	17-19
	31-33

**Individualized Course of Study**

4 units of FNR coursework plus 6 units in FNR 339. Advisor and department head pre-approval required..... 31-33

**BS ENVIRONMENTAL MANAGEMENT AND PROTECTION**

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 that, when properly integrated, can guide consumptive uses of resources in a sustainable manner.

The purpose of environmental management and protection is the sustainable management of environmental resources to balance uses and values for current and future generations. Because environmental problems arise from human demands on the environment, solutions must focus on the human dimension of the ecosystem. Thus, environmental management is the management of both people and resources to attain human goals while protecting environmental values in order to sustain natural systems.

Students are prepared for a broad range of professional careers in environmental science and management. Graduates are educated in environmental assessment, impact analysis, project management and impact mitigation monitoring. Knowledge of the legal and regulatory environment is balanced with study of other theories and practices to solving social conflicts over the environment.

The Environmental Management and Protection (ENVM) major is endorsed by the California Association of Environmental Professionals (AEP). The AEP is a professional association representing the full range of environmental professions, both private and public sector. The AEP has partnered with the NRM Department to provide students in the ENVM major with several paid internships in major environmental consulting companies each year, and a \$1000 scholarship for new students.

**Curricular Concentrations**

In addition to the required major courses, students select one of the following concentrations or an individual course of study.

**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.

**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.

**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.

## BS Environmental Management and Protection

- 60 units upper division       GWR  
 2.0 GPA                               USCP

\* = Satisfies General Education requirement

### MAJOR COURSES

FNR 140 Careers in Forestry & Env. Mgmt. ....	1
FNR/LA/GEOG 318 Applications in GIS .....	3
FNR 326 Natural Resources Econ. & Valuation .....	4
FNR 335 Conflict Mgmt. in Natural Resources .....	4
FNR 402 Forest Health <i>or</i>	
FNR 419 Watershed Mgmt & Restoration .....	4
FNR/CRP 404 Environmental Law <i>or</i>	
FNR/CRP 408 Water Law .....	3
FNR 412 Forest and Natural Resources Senior	
Assessment Project <i>or</i> FNR 461 Senior Project I	3
FNR 416 Env. Impact Analysis and Mgmt .....	4
FNR 425 Applied Resource Analysis .....	4
FNR 465 Ecosystem Management .....	4
ASCI 329/BIO 263/BIO 427 .....	3-4
BIO 161 Intro to Cell & Molecular Biology <i>or</i>	
BOT 121 General Botany (B2&B4)* .....	4
BIO 162 Intro to Organismal Form & Function <i>or</i>	
FNR 208 Dendrology .....	4-5
BIO 301 Env. Science and Human Ecology .....	4

BIO 325 General Ecology <i>or</i> FNR 306 Ecology of	
Natural Resources & Habitat Mgmt .....	4
BRAE 237 Engineering Surveying I <i>or</i>	
BRAE/FNR 247 Field Surveying .....	2
BRAE 348 Energy for a Sustainable Society <i>or</i>	
ENVE 324 Intro to Air Pollution (Area F)* .....	4
CHEM 111 Survey of Chemistry <i>or</i> CHEM 127	
General Chemistry (B3)*(students in the Biowaste	
Resource Mgt Concentration take CHEM 127) .....	4-5
CHEM 312 Survey of Organic Chemistry .....	5
ENVE 330 Environmental Quality Control .....	4
GEOL 201 Physical Geology .....	3
MATH 161/221 (B1)* .....	4
PHYS 121 College Physics I (B3)* .....	4
PSY 201/202 Introduction to Psychology (D4)* .....	4
SS Introductory Soil Science .....	4
STAT 217/218 Applied Statistics .....	4
Concentration courses (see below) .....	34-37

*Note: If Major Courses, less concentration courses, total 129 (132) units, then take 37 (34) units in concentration*

**129-132**

## GENERAL EDUCATION (GE)

72 units required; 24 units are in Support.

→See page 69 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 (16 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>

**ELECTIVES** .....

**0-3**

**180**

**CONCENTRATIONS (Select one)**

**Bioresource Waste Management Concentration**

CHEM 128 General Chemistry .....	4
BIO 418 Limnology .....	4
BRAE 448 Bioconversion .....	3
CHEM 313 Survey of Biochemistry and Biotech....	5
ENVE 434 Water Quality Measurements .....	2
FNR/CRP 404 Env. Law <i>or</i> FNR/CRP 408 Water Resource Law and Policy .....	3
MCRO 221 Microbiology .....	4
MCRO 342 Sanitary Microbiology <i>or</i> SS 442 Soil Vadose Zone Remediation.....	4
Restricted electives, advisor's prior written approval .....	5-8
	34-37

**Environmental Policy and Management Concentration**

CRP 212 Introduction to Urban Planning .....	4
CRP 420 Land Use Law.....	4
ECON 431 Environmental Economics.....	4
ENVE 465 Environmental Management and Urban Systems.....	2
FNR 435 Natural Resources Policy Analysis.....	4
FNR/CRP 404 Env. Law <i>or</i> FNR/CRP 408 Water Law (4) .....	3
FNR/REC 417, FNR 418 <i>or</i> SS 433 .....	3-4
POLS 316 Political Parties and Interest Groups <i>or</i> POLS 318 Political Behavior .....	4
LA 451 Regional Landscape Assessment <i>or</i> FNR 339 Internship in Forest & Natural Resources .....	5-6
Restricted electives, advisor's prior written approval .....	1-2
	34-37

**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 .....	22-25
	34-37

**Individualized Course of Study**

Courses are selected by the student subject to approval by the student's academic advisor and department head..... 34-37

**MS FORESTRY SCIENCES**

The Master of Science degree program in Forestry Sciences has the following objectives:

- To provide the forestry and environmental profession in California and the West with graduates educated in the subdisciplines of these sciences :
  - ecosystem management in the oak woodland, chaparral, Sierran and Pacific Coastal forest types;
  - economics and valuation in the urban interface forest;
  - forest management using an integrated ecosystem approach;

watershed hydrology and restoration;  
fire ecology and management;  
environmental economics and policy; 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 a related B.S. degree area such as environmental sciences 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 26 units in the required core;
- b) a minimum of 19 units of restricted electives approved by the student's major professor and department head;
- c) completion of a thesis or scholarly project, 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) or equivalent	
FNR 530 Social Sys/Natural Resources Mgmt (3)	
FNR 532 Apps in Biometrics & Econometrics (4)	
FNR 534 Forest Ecosystem Modeling (3)	
FNR 581 Graduate Sem. in Forestry & Env. Sci. (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).	

**45**

For more information, contact Dr. Douglas Piirto, Department Head.



## BS RECREATION, PARKS, AND TOURISM ADMINISTRATION

The Recreation, Parks, and Tourism Administration program is dedicated to excellence in teaching, developing professionals, and fostering dynamic and effective leaders. Recreation, parks, and tourism are mainstays 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 tourism planning and management or natural resources recreation. In addition, students may select a course of study in special events management, outdoor recreation management, adventure and eco-tourism, 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, outdoor and adventure leaders, private recreation club managers, employee services and recreation specialists, adventure program planners, 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 program'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

**Tourism Planning and Management.** Emphasizes preparation for employment in organizations that provide leisure products or services for national and international tourists. Students may choose to emphasize in areas such as: tourism planning, tourism marketing, resort management, and business opportunities.

**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/eco-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 Management. 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
		MATH 118
2nd Year		
Fall	Winter	Spring
REC 210	REC 252	REC 205
BUS 212	STAT 217	REC Elective
3rd Year		
Fall	Winter	Spring
REC 350	REC 342	REC 360
ENGL 310		REC 413/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 Rec, Parks & Tourism	1
REC 127 Leisure Behavior .....	4
REC 205 Leadership in Rec., Parks, and Tourism...	4
REC 210 Introduction to Program Design .....	4
REC 252 Recreation and Special Populations .....	4
REC 342 Legal Aspects of Rec, Parks, & Tourism	4
REC 350 Recreation Areas and Facilities Mgt.....	4
REC 360 Assessment/Eval of Rec Parks & Tourism	4
REC 405 Recreation, Parks, and Tourism Mgt .....	4
REC 413/FNR 410/EHS 337/LA 363 .....	4/3
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
Concentration courses (see below) or advisor approved electives .....	28
	<b>85/86</b>

**SUPPORT COURSES**

BUS 212 Financial Actg for Nonbusiness Majors ...	4
BUS 346 Principles of Marketing .....	4
ENGL 310 Corporate Communications .....	4
JOUR 312 Introduction to Public Relations.....	3
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>23</b>

**GENERAL EDUCATION (GE)**

72 units required; 8 units are in Support.

→See page 69 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 .....****6-7****180****CONCENTRATION OR ADVISOR APPROVED ELECTIVES**

Select either a concentration or advisor approved electives.

**Tourism Planning and 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

**28****Natural Resources Recreation Concentration**

REC 302 Environmental and Wilderness Education	4
REC 313 Sustainable Tourism.....	4
REC 314/REC 415/FNR/REC 417 .....	4/3
REC 325 Outdoor and Adventure Leadership <i>or</i> REC 311 Environmental Interpretation.....	4
Restricted electives .....	12/13

**28****Advisor Approved Electives .....****28**

### Community Involvement

The students and faculty in the College of Architecture and Environmental Design (CAED) have a long-standing tradition in assisting local communities.

This interaction provides the opportunity to apply practical, problem-solving skills. City and regional planning students and their faculty advisor, Professor Zeljka Pavlovich Howard, received two prestigious awards from the American Planning Association for their class projects that created a community plan and vision for San Miguel in cooperation with the local residents and advisory committee. The plan will be used as a guide for future development in the community and revitalization of the downtown.

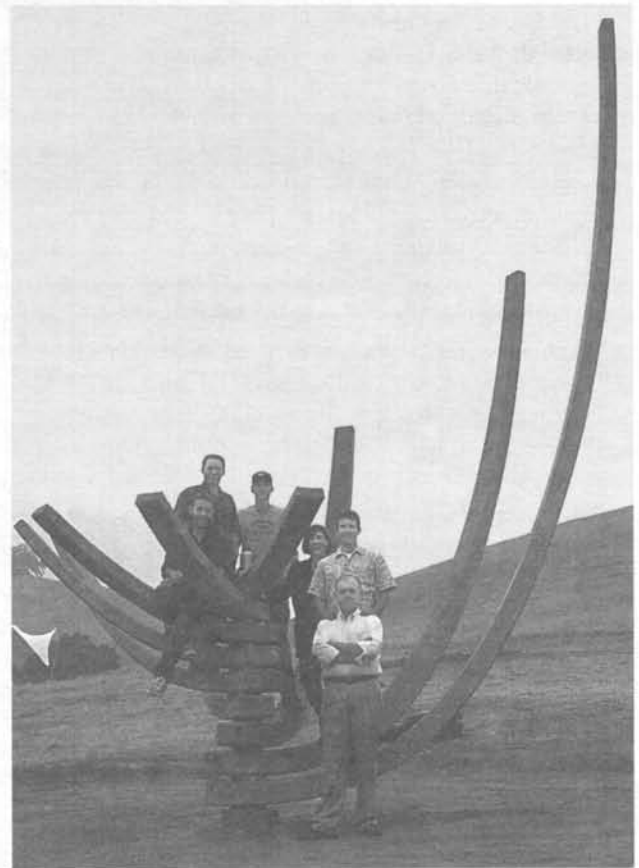
The study was designed to emulate the process of preparing a community plan and expose students to state-of-the-art technology, methods, and techniques used in "real-world" planning situations.

Realistic projects such as this have earned Cal Poly's CAED programs numerous awards, commendations and national recognition by practicing professionals.



### Poly Canyon Celebration

The College of Architecture and Environmental Design (CAED) is celebrating more than 40 years of building experimental structures in Poly Canyon. The alumni who designed and built the canyon's first concrete sculpture returned to campus recently to mentor and support current students who rebuilt a new version of it in this same outdoor laboratory. The interdisciplinary team's advisor Nick Watry (in front of students on structure) is also an alum who is now sharing his knowledge as a member of the Construction Management Department. Connections such as these between the generations have greatly enriched the educational experience of our students.



*Photos courtesy of CAED Archives*

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**

**R. Thomas Jones, Dean  
K. Richard Zweifel, 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 130 Landscape Interpretation.....	4
<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 341, 318, 320, 330, 342, 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 offered by the Construction Management 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
CM/EDES 430 Collaborative Process .....	3
CM/EDES 431 Integrated Project Services .....	3
CM 432 Design-Build Project Management.....	3
IT 454 Facilities Development.....	4

**Advisor approved electives** .....

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 Construction Jobsite Management (3)
- CM 452 Project Controls (3)
- CM 454 Construction Estimating (3)

*Non-CAED students* must complete:

- 9 units of advisor approved design and/or CM courses

30

**REAL PROPERTY DEVELOPMENT MINOR**

This minor is designed for students who are interested in the built environment, and want to deepen their knowledge of how projects get initiated, move through the development process, and then how they are managed after construction.

The program is designed to prepare students for entry-level employment with professionals engaged in real property development. Courses include aspects of practitioners' real world experiences and knowledge of state-of-the-art practices, techniques, and challenges.

Students learn about the economic, design, environmental, and regulatory factors that influence housing, office, industrial, and commercial projects. They gain a clearer understanding of how these factors impact green development, urban sprawl, place-making, and transit oriented development.

Interested students should contact the City and Regional Planning Department for individual advisement.

<b>Required courses</b>	<i>Units</i>
CM 475 Real Property Development Principles .....	4
CRP 315 Fiscal and Project Feasibility .....	4
CRP 446 Development Review and Entitlement.....	4
<b>Select two or more courses from the following:</b> .....	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, 442, 447, 520	
CM 485-495 or CRP 409 (4 units maximum);	
CM 470-471 or CRP 470-471 (4 units maximum);	
BUS 434, 435 or CRP 400	
<b>Planning/Design</b> .....	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.

<b>Required courses</b>	<i>Units</i>
EDES 406 Sustainable Environments .....	4
EDES 408 Implementing Sustainable Principles ..	3
<b>Electives</b> .....	17
Select 17 units from the following courses:	
AG 450; ANT 201, 360; ARCH 413, 445, 472, 531; BIO 112, 301, 325; BOT 238; BRAE 348; CRP 211, 212, 214, 215, 336, 342, 334, 436, 438; ECON 303; EDES 350, 410, 420; ENGL 380; FNR 306, FNR/GEOG/LA 318; GEOG 150, 333; HUM 303, 330; LA 321, 451, 482; PHIL 340; PHYS 310; POLS 326, 455, 484; PSY 311; SOC 313	

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# Architectural Engineering

**Department Office**  
**Engineering West (21), Room 110**  
**(805) 756-1314**

## Department Chair, Abraham C. Lynn

Graham Archer	Ansgar Neuenhofer
Craig Baltimore	Brent Nuttall
Pamalee Brady	Clayton Pharaoh
Kevin Dong	Satwant S. Rihal
James Mwangi	

## 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 students 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 211 Structures I .....	3
ARCE 212 Structures II .....	3
ARCE 223 Mechanics of Structural Members .....	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 .....	4
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 483 Seismic Analysis and Design .....	4
Advanced structural electives .....	6
Approved professional electives .....	4
	<b>76</b>

### SUPPORT COURSES

ARCH 105 Professional Practice 1 .....	1
ARCH 106 Materials of Construction .....	2
ARCH 121, 122, 123 Design and Drawing 1.1, 1.2, and 1.3 .....	3,3,3
ARCH 221 Architectural Design Fundamentals .....	3
CM 211 Construction Contract Documents .....	4
ARCH 217/ARCH 218/ARCH 219 (C3)* .....	4
BRAE 237 Engineering Surveying I .....	2
CHEM 124 General Chem/Engr Discipline (B3/B4)* .....	4

CM 433 Economic Analysis for Engineers <i>or</i> IME 314 Engineering Economics (3).....	2
CSC 231 Fortran for Engineering Students <i>or</i> CSC 234 C and UNIX (3).....	2
CSC 341 Numerical Engineering Analysis <i>or</i> approved equivalent (B6)*.....	4
EDES 101 Introduction to Architecture and Environmental Design.....	2
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
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
	<u>83</u>

**GENERAL EDUCATION (GE)**

72 units required; 28 units are in Support.

→See page 69 for complete GE course listing.

→Minimum of 8 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

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<b>ELECTIVES</b> .....	<u>0</u>
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# Architecture

## Department Office

Arch. & Environmental Design Bldg. (05), Rm 212  
(805) 756-1316 FAX (805) 756-1500

### Interim Department Head, William R. Benedict

Joseph C. Amanzio	Brian B. Kesner
Sharad D. Atre	Sandra D. Lakeman
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David A. Brodie	Karen F. Lange
Arthur J. Chapman	Michael A. Lucas
Don H. Choi	Sandra D. Miller
Allan R. Cooper	Margot K. McDonald
Thomas L. Disanto	Daniel L. Panetta
Donna P. Duerk	Robert B. Peña
Thomas Fowler, IV	Jens G. Pohl
Bruno Giberti	Jonathan Reich
Terry C. Hargrave	Sandra Stannard
Martin J. Harms	Don E. Swearingen
Patrick D. Hill	Howard Weisenthal
Laura E. Joines-Novotny	Christopher L. Yip

### 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 six-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

Off-campus study opportunities for fourth year Architecture students are offered in a variety of formats and locations. Programs from one quarter to a full year are available abroad and in the United States. There is a third year student general information session each fall quarter to present the department-sponsored programs offered for the following year. Applications from third year students for all programs are due in the winter quarter.

**CSU International Programs.** There are two CSU-sponsored 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.

**London and Thailand Study Programs.** The Architecture Department participates in the 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 and 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.

**Washington Alexandria Architecture Consortium.** The Consortium, comprised of several universities including Cal Poly, 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. The Consortium seeks to explore and expand design pedagogues and processes and establish collaboration with national and international institutions.

**Exchange Programs.** The Architecture Department offers a variety of exchange programs with universities

throughout the world. Contact the Architecture Department for current information.

**Cooperative Education (Co-op).** In addition to traditional classroom study experiences and instructor-led field trips, students have the opportunity to work for professional architecture firms and receive professional elective credits. To find out more about Cooperative Education opportunities, visit the Architecture Department or Career Services. Applications and opportunities for Co-op credit are available year-round.

**BACHELOR OF ARCHITECTURE**

- 60 units upper division       GWR
- 2.0 GPA                               USCP

\* = Satisfies General Education requirement

**MAJOR COURSES**

ARCH 105 Architectural Practice 1.....	1
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 1.....	4
ARCH 217 History of Architecture (C3)* .....	4
ARCH 218 History of Architecture (Area C)* .....	4
ARCH 219 History of Architecture .....	4
ARCH 241, 242 Architectural Practice 2.1, 2.2.....	4,4
ARCH 251, 252, 253 Arch. Design 2.1, 2.2., 2.3 .....	5,5,5
ARCH 307 Environmental Control Systems 2.....	4
ARCH 341, 342 Architectural Practice 3.1, 3.2.....	4,4
ARCH 351, 352, 353 Arch. Design 3.1, 3.2, 3.3 ....	5,5,5
ARCH 420/320 Seminar in Architectural History ...	4
ARCH 443 Professional Practice .....	4
ARCH 451, 452, 453 Arch. Design 4.1, 4.2, 4.3 ....	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>120-121</b>

**SUPPORT COURSES**

ARCE 211 Structures I.....	3
ARCE 212 Structures II .....	3
ARCE 226 Structural Systems for Architects .....	3
ARCE 315 Small Scale Buildings.....	4
ARCE 316 Large Scale Buildings.....	4
EDES 101 Intro to Architecture and Env Design ....	2
MATH 141 Calculus I (B1)* .....	4
MATH 182 Calculus for Architecture and Construction Management (B1)* .....	4
<sup>2</sup> PHYS 121/PHYS 131/PHYS 141 (B3)* .....	4
PHYS 122 College Physics II or PHYS 132 General Physics II.....	4

Professional Electives .....	20
<i>May include:</i>	
<i>Any EDES, ARCH, ARCE, CM, CRP LA or ART course.</i>	
<i>Any course included in any College of Architecture and Environmental Design minor, or the ART minor.</i>	
<i>Any MBA, Architecture Management Tract course.</i>	

**55**

**GENERAL EDUCATION (GE)**

72 units required; 20 units are in Major and Support.  
 →See page 69 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
<sup>2</sup> B2 Life Science.....	4
B3 Physical Science * 4 units in Support.....	0
<sup>2</sup> B4 One lab taken in either PHYS 121/131 (see Support) or a B2 course with lab component	

**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)**

<b>(4 units)</b> .....	4
	<b>52</b>

**ELECTIVES .....** **0**

**227-228**

<sup>1</sup> Option for students intending to pursue a graduate degree.

<sup>2</sup> PHYS 121 and PHYS 131 have a lab (B4). If PHYS 141 is taken, then take a B2 Life Science course with a lab (B4).

**MBA – Architectural Management Track**

This program is available only to those students who are enrolled in Cal Poly's Bachelor of Architecture (BArch) program. During the fifth/final year of the architecture program, students may request permission to enroll in MBA courses. The request, along with all supporting documents, must be submitted to the Orfalea College of Business – Graduate Programs Office. Permission to participate in the courses is competitive and based upon the student's previous academic performance and GMAT/GRE results.

Upon completion of the BArch degree, students are eligible to formally apply to the University for admission to the MBA program. Students who fulfill all the requirements first receive the BArch and then the MBA.

**MBA Common Required Courses (36)**

GSB 511 Accounting for Managers .....	4
GSB 512 Quantitative Analysis .....	4
GSB 513 Organization Behavior.....	4
GSB 523 Managerial Economics .....	4
GSB 524 Marketing Management.....	4
GSB 531 Managerial Finance .....	4
GSB 533 Aggregate Economic Analysis & Policy ..	4
GSB 534 Production and Operations Mgmt.....	4
GSB 562 Seminar in General Mgmt & Strategy or GSB 567 Adv Sem International Business Mgmt or other approved culminating experience .....	4
<b>Advisor approved electives .....</b>	<b>24</b>
<i>One elective must satisfy the Orfalea College of Business' international course requirement</i>	

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**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 for graduate student status in the MCRP program. Students who fulfill all the requirements will first receive the BArch and then the MCRP. 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.

\* *Facilities 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. Facilities 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, etc.

### **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.	

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For further information contact the Graduate Program Coordinator, Architecture Department, 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 R. Boswell	Vicente del Rio
W. David Conn	D. Gregg Doyle
Linda C. Dalton	David T. Dubbink
	Paul Wack

## ACADEMIC PROGRAMS

**BS City and Regional Planning**  
**MCRP Master of City and Regional Planning**  
**MCRP/MS Engineering with Specialization in  
Transportation Planning**  
**City and Regional Planning Minor**

The profession of city and regional planning is 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, work and play. 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: urban development and design 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 Urban Design Studio I .....	4
CRP 203 Urban Design Studio II .....	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 .....	2
CRP 314 Planning Theory.....	3
CRP 315 Fiscal and Project Feasibility .....	4
CRP 336 Intro to Environmental Planning.....	4
CRP 341 Community Design Laboratory.....	4
CRP 342 Environmental Planning Methods.....	4
CRP 409 Planning Internship .....	2
CRP 410, 411 Community Planning Lab I, II .....	5,5
CRP 412 Plan 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 I, II .....	2,2
Advisor approved electives .....	12
	<b>93</b>

### SUPPORT COURSES

EDES 101 Intro to Arch and Env Design.....	2
FNR 306/FNR 319/BIO 112 .....	4
GEOL 102 (B3)*/GEOL 205 (B3*)/CHEM 110 (B3&B4)* .....	4
LA 213 Site and Terrain Analysis <i>or</i> LA 220 Landscape Ecology: Concepts, Issues and Interrelationships .....	4
MATH 118 Pre-Calculus Algebra (B1)* .....	4
POLS 375/471/516 .....	4
STAT 221 Intro to Probability & Statistics (B1)*...	5
	<b>27</b>

### GENERAL EDUCATION (GE)

72 units required; 12 units are in Support.  
→See page 69 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

<b>Area B Science and Mathematics (4 units)</b>	
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	
<b>Area C Arts and Humanities (20 units)</b>	
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
<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
D5 Upper-division elective .....	4
<b>Area F Technology Elective (upper division)</b>	
(4 units).....	4
	<b>60</b>
<b>ELECTIVES .....</b>	<b>0</b>
	<b>180</b>

<b>Electives .....</b>	<b>11/12</b>
Select three courses from the following:	
CRP 215, 310, 314, 315, 334, 338, 375, 402, 404, 408, 410, 411, 412, 420, 427, 430, 435, 436, 438, 442, 444, 446, 447, 453, 457, 470, 472, 483; EDES 406, 408, 410	
	<u>27/28</u>

**Additional Minors**

The department also participates in offering interdisciplinary minors in Environmental Design, Real Property Development, and Sustainable Environments. Please see pages 147-48 for additional information.

**MCRP ADVISING TRACK (5+1) FOR BLA & BARCH STUDENTS**

Students may pursue an accelerated route to a graduate professional degree through enrollment in MCRP courses during their fourth and fifth years of undergraduate study and an additional year of graduate study after completion of their undergraduate degree. Contact the Graduate Coordinator, City and Regional Planning Department, for additional information.

**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.

<b>Required courses</b>	<i>Units</i>
CRP 212 Introduction to Urban Planning .....	4
CRP 213 Population, Housing and Economic Applications <i>or</i> CRP 214 Land Use and Transportation Studies.....	4
<b>Select two courses from the following:</b> .....	<b>8</b>
CRP 203 Intermediate Environmental Design (4) <i>or</i> appropriate equivalent	
CRP 336 Regional & Environ. Planning Found. (4)	
CRP 341 Community Design Laboratory (4)	
CRP 342 Regional and Environmental Planning (4)	

**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. Contact the Graduate Coordinator, City and Regional Planning Department, for additional information.

**MASTER OF CITY & REGIONAL PLANNING**

**General Characteristics**

The Master of City and Regional Planning degree (MCRP) is an applied, comprehensive, and professionally-based program. 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 to function in a general context of city planning, as well as in an area of special emphasis. The core courses cover planning theory, methods, law, and formulation and implementation of plans and policies.

Two principal areas of study are emphasized:

- urban development and design, focused on comprehensive physical planning, housing, and community development, and
- environmental planning, focused on natural systems and development impacts.

In addition, skill 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 158).

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, business, 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 community planning studio (CRP 556) plus a comprehensive exam.

Students have 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 have 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. Provide the CRP Department with the results of the Graduate Record Examination Aptitude Test in cases of borderline grade point average,
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 500 words) demonstrating an understanding of, and areas of interest in, city and regional planning, career and 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** ..... 55/57

**First Year**

- CRP 501 Foundations of Cities and Planning (4)
- CRP 510 Planning Theory (4)
- CRP 512 Intro to Visual Communication and GIS (4)
- CRP 513 Planning Research Methods (4)
- CRP 516 Methods of Data Analysis (4)
- CRP 525 Plan Implementation (4)
- CRP 553 Project Planning Lab (4)

**Second Year**

- CRP 409 Planning Internship (4)
- CRP 518 Public Policy Analysis (4)
- CRP 530 Planning Agency Management (3)
- CRP 535 Land Use and Planning Law (4)
- CRP 552 Community and Regional Planning Studio I (4)
- CRP 554 Community and Regional Planning Studio II (4)
- CRP 596 Prof Project (2)(2)(2) *or*  
 CRP 599 Thesis/Project (2)(2)(2) *or*  
 CRP 556 Community and Regional Planning Studio III (4)

**Emphasis Area (select one)** ..... 11

*Urban Development and Design*

- CRP 520 Feasibility Studies in Planning (4)
- CRP 548 Principles of Urban Development and Design (4)
- Advisor approved urban electives (3)

*Environmental Planning*

- CRP 545 Principles of Env Planning (4)
- Advisor approved environmental electives (7)

**Advisor approved electives**..... 6/4  
 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 MCRP and the MS in Engineering, each with a Specialization in Transportation Planning.

The major objectives of this joint program are to:

- (a) 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) 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) 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 500 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.

<b>Core Courses</b> .....	64
CE 523 Transportation System Planning (4)	
CE 528 Transportation Analysis <i>or</i> CE 525 Airport Planning and Design (4)	
CE 591 Graduate Seminar (1)	
CE 599 Design Project (Thesis) (2,2,2) <i>or</i> CRP 599 Thesis (2)(2)(2) <i>or</i> CRP 596 Professional Project (2)(2)(2)	
CRP 409 Planning Internship (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 516 Methods of Data Analysis (4)	
CRP 518 Policy Analysis for Planners(4)	
CRP 525 Plan Implementation (4)	
CRP 530 Planning Agency Management (3)	
CRP 535 Land Use and Planning Law (4)	
CRP 552, 554 Community and Regional Planning Studio I, II (4) (4)	
CSC, MATH, STAT or other approved quantitative methods course (3)	
<b>Emphasis Area (select one of the following)</b> .....	11
<i>Urban Development and Design Emphasis</i>	
CRP 520 Feasibility Studies in Planning (4)	
CRP 548 Principles of Urban Dev. and Design (4)	
Urban Development and Design elective (3)	
<i>Environmental Planning Emphasis</i>	
CRP 545 Principles of Env. Planning (4)	
Environmental Planning electives (7)	
<b>Approved CE/ENVE electives:</b> .....	15
Select from: CE 421, 422, 424, 522, 525, 528, 529, 573, 574, ENVE 411, 465, or other advisor approved CE/ENVE courses	



# Construction Management

**Department Office**  
**Engineering West (21), Room 116-A**  
**(805) 756-1323**

## Department Head, Allan Hauck

William C. Epstein                      Hal Johnston  
 Barbara Jackson                      Paul Weber  
 Barry Jones

## 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 offers a Construction Management Minor for students in other programs and 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 Drawings and Specifications	4
CM 212 Fundamentals of Construction Mgt.....	3
CM 221 Concrete Technology .....	3
CM 331 Construction Accounting.....	3
CM 332 Evaluation of Cost Alternatives .....	3
CM 333 Construction Contracts and Law .....	3
CM 341 Residential Construction Practices .....	3
CM 342 Commercial Construction Practices .....	3
CM 343 Heavy Civil Construction Practices.....	3
CM 352 Electrical Systems for Buildings .....	3
CM 353 Mechanical Systems for Buildings.....	3
CM 364 Construction Jobsite Management .....	3
CM/EDES 431 Integrated Project Services.....	3
CM 443 Management of the Construction Firm.....	3
CM 444 Concrete Formwork and Other Temporary Structures .....	3
CM 452 Project Controls.....	3
CM 454 Construction Estimating .....	3
CM 463 Senior Project: Professional Practice for Constructors .....	3
Advisor approved technical electives .....	8
(maximum 6 units in Co-op)	

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### SUPPORT COURSES

ARCE 211 Structures I.....	3
ARCE 212 Structures II.....	3
ARCE 226 Structural Systems for Architects .....	3
ARCE 315 Small Scale Buildings .....	4
ARCE 316 Large Scale Buildings .....	4
ARCE 421 Soil Mechanics.....	3
ARCH 105 Professional Practice 1 .....	1
ARCH 106 Materials of Construction .....	2
BRAE 239 Engineering Surveying .....	4
BUS 201 Business Law Survey.....	3
BUS 212 Financial Acctg for Nonbusiness Majors	4
ECON 221 Microeconomics .....	4
ECON 222 Macroeconomics (D2)* .....	4
EDES 101 Intro to Architecture and Env Design....	2
ENGL 310 Corporate Communication <i>or</i> ENGL 318 Advanced Professional Writing .....	4
GEOL 201 Physical Geology .....	3
MATH 141 Calculus I (B1)*.....	4

MATH 142 Calculus II <i>or</i> MATH 182 Calculus for Architecture and Construction Management.....	4
PHYS 131/141 General Physics.....	4
PHYS 132/CHEM 124/CHEM 127 (B3 & B4)* .....	4
STAT 251 Statistical Inference for Mgmt I (B1)* ...	4
BUS 215 Managerial Accounting .....	4
BUS 300–400 level advisor approved elective .....	4
	<u>79</u>
<b>GENERAL EDUCATION (GE)</b>	
72 units required; 16 units are in Support.	
→See page 69 for complete GE course listing.	
→Minimum of 12 units required at the 300–400 level.	
<b>Area A Communication (12 units)</b>	
A1 Expository Writing .....	4
A2 Oral Communication .....	4
A3 Reasoning, Argumentation, and Writing.....	4
<b>Area B Science and Mathematics (4 units)</b>	
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	
<b>Area C Arts and Humanities (20 units)</b>	
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
<b>Area D/E Society and the Individual (16 units)</b>	
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
<b>Area F Technology Elective (upper division)</b>	
(4 units).....	4
	<u>56</u>
<b>ELECTIVES</b> .....	<u>0</u>
	<u>198</u>

**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. Contact the department for more information.

**Core courses**

CM 212 Fundamentals of Construction Mgmt.....	3
CM 364 Construction Jobsite Management .....	3
CM 452 Project Controls.....	3
CM 454 Construction Estimating .....	3

**Methods courses**..... 6

*Select two of the following six courses:*

CM 341 Residential Construction Practices (3)	
CM 342 Commercial Construction Practices (3)	
CM 343 Heavy Civil Construction Practices (3)	
CM 352 Electrical Systems for Buildings (3)	
CM 353 Mechanical Systems for Buildings (3)	
CM 444 Concrete Formwork and Other Temporary Structures (3)	

**Management courses**..... 6

*Select two of the following four courses:*

CM 331 Construction Accounting (3)	
CM 332 Evaluation of Cost Alternatives (3)	
CM 333 Construction Contracts and Law (3)	
CM 443 Management of the Construction Firm (3)	

**Project-Based courses**..... 3

*Select one of the following two courses:*

CM 431 Integrated Project Services (3)	
CM 463 Senior Project: Professional Practice for Constructors (3)	

# Landscape Architecture

Department Office  
Dexter Bldg.(34), Room 213  
(805) 756-1319

## Department Head (Interim), Walter D. Bremer

Gary R. Clay	William P. MacElroy
Beth Diamond	Joseph J. Ragsdale
Gary C. Dwyer	Dale A. Sutliff
Omar Faruque	

### 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.

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.

## BACHELOR OF LANDSCAPE ARCHITECTURE

60 units upper division       GWR  
 2.0 GPA       USCP

\* = Satisfies General Education requirement

### MAJOR COURSES

LA 101 Introduction to Landscape Architecture.....	4
LA 130 Landscape Interpretation.....	4
LA 170 Principles of Design Communication .....	4
LA 202 Design Fundamentals I .....	4
LA 203 Design Fundamentals II .....	4

LA 204 Design Fundamentals III .....	4
LA 220 Landscape Ecology: Concepts, Issues and Interrelationships .....	4
LA 221 California Plants and Plant Communities...	4
LA 241 Site Engineering Techniques & Apps .....	4
LA 242 Implementation Strategies .....	4
LA 243 Materials and Techniques of Landscape Construction.....	4
LA 320 Design Theory for Landscape Architecture	4
LA 330 Cultural Landscapes: People, Places and Ethical Decisions .....	4
LA 341 History of Landscape Architecture .....	4
LA 342 History of 20 <sup>th</sup> Century Landscape Arch....	4
LA 370 Professional Practice .....	4
LA 371 Internship .....	3
LA 402 Design Theory & Exploration Focus Studio	4
LA 403 Natural Envmnts Design Focus Studio .....	4
LA 404 Cultural Envmnts Design Focus Studio .....	4
LA 405 Project Design and Implementation Focus Studio.....	4
<i>Select one course from:</i>	
LA 402, LA 403, LA 404, or LA 405.....	4
<i>Select five (5) courses from the following</i>	
<i>Integrated Learning Courses (ILC) .....</i>	20
LA 431 CAD & Digital Media Communications (ILC)(4)	
LA 432 Landscape Ecology Applications (ILC)(4)	
LA 433 Cultural Environments (ILC)(4)	
LA 434 Project Design and Implementation (ILC) (4)	
LA 435 Professional Practice (ILC) (4)	
LA 436 Traditional/Digital Design Communications (ILC) (4)	
LA 437 3D Digital Design Communications (ILC)(4)	
LA 438 GIS Application to Design Projects (ILC) (4)	
LA 461 Senior Design Project Focus Studio.....	4,4
Upper division LA or advisor approved electives ...	8
	<b>123</b>

**SUPPORT COURSES**

ARCH 217/218/219 History of Architecture (C3)*	4
BOT 121 General Botany (B2 & B4)*	4
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 (B1)*	4
Advisor approved electives	8
<i>Choose 8 units from the following:</i>	
SS 121 Introductory Soil Science (4)	
BIO 227 Wildlife Conservation Biology (4)	
BRAE 337 Landscape Irrigation (3)	
STAT 217 Intro to Stat Concepts and Methods (4)	
or STAT 218 Applied Stat for Life Sciences (4)	

**38**

**GENERAL EDUCATION (GE)**

72 units required; 16 units are in Support.  
 →See page 69 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
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**56**

**ELECTIVES**

**8**  
**225**

**MBA – Landscape Architecture Management Track**

This program is available only to those students who are currently enrolled in Cal Poly's Bachelor of Landscape Architecture (BLA) program. During the fifth/final year of the landscape architecture program, students may request permission to enroll in MBA courses. The request, along with all supporting documents, must be submitted to the Orfalea College of Business – Graduate Programs Office. Permission to participate in the courses is competitive and based upon the student's previous academic performance and GMAT/GRE results.

Upon completion of the BLA degree, students are eligible to formally apply to the University for admission to the MBA program. Students who fulfill all the requirements first receive the BLA and then the MBA.

**MBA Common Required Courses (36)**

GSB 511 Accounting for Managers	4
GSB 512 Quantitative Analysis	4
GSB 513 Organization Behavior	4
GSB 523 Managerial Economics	4
GSB 524 Marketing Management	4
GSB 531 Managerial Finance	4
GSB 533 Aggregate Economic Analysis & Policy	4
GSB 534 Production and Operations Mgmt	4
GSB 562 Seminar in General Mgmt & Strategy or	
GSB 567 Adv Sem International Business Mgmt	
or other approved culminating experience	4

**Advisor approved electives**..... 24

*One elective must satisfy the Orfalea College of Business' international course requirement*

**60**

**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.

*Photos 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*

# Orfalea College of *Business*

David P. Christy, Dean  
Chris A. Carr, Associate Dean  
Douglas C. Cerf, Associate Dean  
Pamela H. McClure, Director of Advancement  
Leslie A. McKinley, Director of 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
Finance .....	Financial Management
Management .....	Information Systems
	Managing People and Technology
Marketing.....	Marketing Management
Interdisciplinary....	Entrepreneurship & Small Business
Studies	International Business
Associate Dean .....	Independent Course of Study
Economics .....	Economics, BS
Industrial .....	Industrial Technology, BS
Technology	
<b><u>Area/Contact</u></b>	<b><u>Minors:</u></b>
Advising .....	Business
Center	
Economics .....	Economics
Industrial.....	Industrial Technology
Technology	Packaging
<b><u>Area/Contact</u></b>	<b><u>Graduate Programs:</u></b>
Graduate .....	Business Administration, MBA
Management	General Management
Programs	Specialization
	Agribusiness Specialization
	Graphic Communication Document
	Systems Management
	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.

### **Business Honor Society**

Beta Gamma Sigma is the honor society serving business programs accredited by AACSB International – The Association to Advance Collegiate Schools of Business. Membership in Beta Gamma Sigma is the highest recognition a business student anywhere in the world can receive in a business program accredited by AACSB International. Only 7% of the junior class and 10% of the senior class are invited to join. The mission of Beta Gamma Sigma is to encourage and honor academic achievement in the study of business and to foster personal and professional excellence among its members. For further information, please contact the Dean's Office, 805 756-2705.

### **Advising Center**

**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 pursuing minors in Business, Economics, Industrial Technology, or Packaging 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 the 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 quarters.

# Bachelor of Science Degree Programs

**BS Business Administration**  
**BS Economics**  
**BS Industrial Technology**

## BS BUSINESS ADMINISTRATION

The undergraduate business program provides students with the knowledge and the analytical skills essential for employment in all sectors of business, industry, governmental and non-profit organizations. Graduates of the business program:

- will understand the fundamentals of how a successful enterprise operates, and
- will have sufficient depth in an area of study to begin a successful career by providing immediate value to an organization.

*Listed below are some ways that the business administration degree program is aligned with the mission statement:*

...challenges highly motivated students:

- The program requires a clear understanding of each of the functional disciplines of business administration.
- The program requires students to understand how strategic decisions must be made within the context of changing technological, social, economic and political environments.
- The program trains students to engage in abstract logical thinking and critical analysis.
- The program demonstrates how knowledge from various functional disciplines must be integrated in a cross-disciplinary and holistic fashion to reach managerial solutions.
- The program requires students to present, discuss, and defend views effectively through written and oral means.

...to become tomorrow's socially responsible business leaders:

- The program helps students achieve maximum personal development, to prepare for entry into the business world, and to foster citizenship, leadership, ethical decision-making and constructive community living.
- The program requires students to explore the responsibilities that businesses should undertake to address cultural, social and environmental values.
- The program develops respect for different cultures and business practices in international environments.
- The program encourages students to make positive contributions to society and to minimize negative social impacts from business operations.

...through a learn-by-doing, technology-oriented education:

- The program requires students to understand current and emerging technologies in all business disciplines, and to recognize their impact on the organization and society.
- The program focuses attention on the operations of technology-oriented business.
- The program enlists maximum student involvement in the learning process through case analysis, senior projects, computer simulations, business plans and other learn-by-doing exercises.
- The program trains students to locate, obtain, organize and report information from human, print and electronic sources.
- The program encourages learning outside the classroom through internships and student club activities.

Opportunities for specialization are provided for students preparing for careers in accounting, financial management, managing people and technology, information systems, marketing management, entrepreneurship and small business, and international business.

The Business Administration degree program consists of five components: Major, Concentration, Support, General Education, and Electives.

- 60 units upper division
- 2.0 GPA
- GWR
- USCP

\* = Satisfies General Education requirement

Note: No major, support or concentration courses may be taken as credit/no credit.

### MAJOR COURSES

BUS 207 Legal Responsibilities of Business .....	4
BUS 214 Financial Accounting .....	4
BUS 215 Managerial Accounting.....	4
BUS 342 Fundamentals of Corporate Finance .....	4
BUS 346 Principles of Marketing .....	4
BUS 387 Organizational Behavior.....	4
BUS 391 Information Systems .....	4
BUS 401 Seminar in General Mgmt and Strategy	4
BUS 404 Governmental and Social Influences .....	4
IT 371 Production Operations and Project Mgmt ...	4
International business. <i>Select one:</i>	
BUS 302, 303, 402, 407, 410, 427, 433, 446;	
ECON 401. ....	4
Senior Project. <i>Select:</i>	
BUS 461 and BUS 462, or BUS 463 or BUS	
464 .....	4
Concentration courses ( <i>see following pages</i> ) .....	24-28

72-76



**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

**25**

**GENERAL EDUCATION (GE)**

72 units required; 12 units are in Support.  
 →See page 69 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
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**60**

**ELECTIVES ..... 19-23**

**180**

# Accounting

**Business Bldg. (03), Room 403  
 805 756-1384**

**Area Chair, Charles R. (Tad) Miller**

James A. Anderson	Jap Efendi
Dan Bertozzi, Jr.	Garo Kalfayan
Lee B. Burgunder	Earl C. Keller
Chris Carr	Kathryn A. S. Lancaster
Janice L. Carr	Eddie Quijana
Douglas C. Cerf	Arline Savage

Accounting is known as the “language of business” and is fundamental to understanding the operations of organizations. It provides information for making sound and informed business decisions. The Accounting Concentration prepares students for careers in public accounting (tax and audit), industry, government, and not-for-profit organizations. The Accounting Area works closely with the accounting profession to help ensure curriculum relevancy and technical competency.

**ACCOUNTING CONCENTRATION**

The Accounting Concentration prepares students for careers in public accounting (tax and audit), private industry, government, and not-for-profit organizations.

BUS 320 Taxation of Business Entities.....	4
BUS 321 Intermediate Accounting I.....	4
BUS 322 Intermediate Accounting II .....	4
BUS 420 Advanced Financial Reporting or BUS 425 Auditing .....	4
BUS 429 Accounting Process Analysis.....	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	Cyrus Ramezani
Larry R. Gorman	Luc Soenen
Bing Han	Alan M. Weatherford
Yang Liu	

The Finance Area's mission is threefold: First, to provide all Business students with an understanding of the financial principles which are essential to their success in the business world. Second, to provide students concentrating in Finance a rigorous, coherent, real-world-based, and up-to-date curriculum which prepares them for rewarding careers in Finance. Third, the Finance Area provides coursework in support of other majors and concentrations both within and outside the Orfalea College of Business.

Many of the classes are taught in the **Financial Analysis Resource Center**, a special-purpose classroom with Bloomberg and Reuters data terminals, scrolling ticker tape and DataWall display of prices of selected stocks. Each workstation is equipped with software which permits students to work on real-world problems, individually and in teams.

### FINANCIAL MANAGEMENT CONCENTRATION

This concentration has four required courses, which provide Finance students with fundamentals of asset valuation, and applies these principles to securities as well as business assets. These principles are applied in courses focused on financial markets and institutions, and on corporate finance. Within the Finance curriculum, students can further specialize in one of three tracks, depending upon their career goals: the Financial Services track, including insurance, retirement, and estate planning; the Corporate Finance track; or the Financial Analyst track, working for investment banks, brokerage industry, or the asset management industry. The following are the required course that should be taken in sequence:

BUS 431 Security Analysis and Portfolio Mgmt.....	4
BUS 438 Advanced Corporate Finance.....	4
BUS 439 Fixed Income Securities and Markets.....	4
BUS 443 Case Studies in Finance .....	4
Advisor approved electives .....	12

—  
28

## Management

Business Bldg. (03), Room 405  
805 756-2012

### Area Chair, A. B. (Rami) Shani

Rebecca Ellis	Eldon Y. Li
Barry Floyd	Patricia A. McQuaid
Colette Frayne	David A. Peach
J. Michael Geringer	William Pendergast
Kenneth A. Griggs	James Sena
Myleen Leary	Michael W. Stebbins
Kevin Lertwachara	Rosemary Wild

The Management Area offers coursework in human resource management, organization behavior, organization theory and operations management, management science, entrepreneurship, and small business management. The area's 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 two concentrations: Managing People and Technology, and Information Systems.

### MANAGING PEOPLE and TECHNOLOGY CONCENTRATION

This concentration prepares students for management of people and technology positions in both small and large enterprises. The concentration provides students an opportunity to choose an area of emphasis: Program Management (PM) or Human Resource Management (HRM) *or* select a course of study tailored to their particular industry interests and occupational goals.

BUS 382 Organizations, People and Technology.....	4
BUS 384 Human Resources Management.....	4
BUS 477 Organization Development Programs .....	4
Select one Emphasis Area.....	8
<i>Program Management</i>	
BUS 478, BUS 483	
<i>Human Resource Management</i>	
BUS 471, BUS 475	
Advisor approved elective .....	4
Select one course from the following:	
BUS 407, 451, 472, 473, 476, 486, 488, 494	

—  
24

**INFORMATION SYSTEMS CONCENTRATION**

The Information Systems Concentration is an interdisciplinary program for students who want to design and implement technology-based solutions for business and industry. With a focus on teamwork and turning theory into practice, the program ensures that students acquire a strong understanding of information systems and the functional areas of business while developing effective interpersonal skills. Students have numerous opportunities to tailor the program to fit their particular interests, including earning a minor in Computer Science. Graduates enjoy exciting career opportunities in business and industry as business analysts, consultants, network administrators, database designers, web developers, and programmers, among many others.

CSC/CPE 101 Fundamentals of Computer Science I or CSC/CPE 237 Intro to Computer Science Applications I.....	4
BUS 390 Business Data Structures.....	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
Select two courses from the following:	
BUS 491, 493, 494, 496, 498, 499	

28

*Marketing*

**Business Bldg. (03), Room 407  
805 756-1413**

**Area Chair, Norm A. Borin**

Jeffrey Danes	Teresa (Terri) Swartz
R. Krishnan	Brian Tietje
Lynn E. Metcalf	M. J. Xavier
John Rogers	

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 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 and market place needs.

**MARKETING MANAGEMENT CONCENTRATION**

The Marketing Management Concentration provides students with a rigorous, analytical understanding of marketing decision-making. Students learn to generate, analyze, interpret, and present the information that organizations need to satisfy and retain customers; build brand equity and maximize return on investment; and develop innovative products and services.

The marketing concentration provides students with knowledge of a wide range of tools and techniques from fields as diverse as sociology, psychology, anthropology, information technology, engineering, and economics. Students learn to leverage information, technology, and knowledge to support innovation in virtually all areas of business, non-profit enterprises, and government.

As a discipline with broad applications, the Marketing Management Concentration offers flexible career paths and work styles. Graduates are in demand for positions in marketing intelligence, product development, product management, advertising, sales, and purchasing.

BUS 418 Listening to the Customer .....	4
BUS 419 Strategic Marketing Measurement .....	4
BUS 451 Product Development and Launch .....	4
BUS 452 Product Management.....	4
BUS 454 Developing/Presenting Marketing Projects	4
BUS 455 Marketing Strategy.....	4

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## *Interdisciplinary Studies*

**Business Bldg. (03), Room 405  
805 756-2012**

**Area Chair, A. B. (Rami) Shani**

### **ENTREPRENEURSHIP and SMALL BUSINESS CONCENTRATION**

This interdisciplinary concentration provides an environment in which students foster their entrepreneurial spirit and acquire the knowledge and skills to launch new ventures in start-up and existing organizations, domestic and international environments, and in for-profit and non-profit contexts.

BUS 310 Introduction to Entrepreneurship .....	4
BUS 436 Entrepreneurial Finance .....	4
BUS 451 Product Development and Launch .....	4
BUS 488 Planning and Managing New Ventures .....	4
Electives selected from: .....	12
BUS 308, 311, 402, 430, 470, 478, 494	

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### **INTERNATIONAL BUSINESS CONCENTRATION**

This interdisciplinary concentration provides the student the opportunity to develop proficiency in the subject matter basic to an occupational goal in business of international/multinational operations. It provides cultural understanding, business knowledge and analytical skill central to international business contexts.

BUS 302 International and Cross Cultural Mgmt. ....	4
BUS 402 International Business Management .....	4
BUS 403 Adv. Seminar in International Mgmt. ....	4
Electives selected from the following courses:.....	16
BUS 303, 311, 405, 406, 407, 410, 433, 446;	
ECON 303, 304, 325, 401,	

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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. Students planning to go to law school generally select the independent course of study.

# Economics

**Business Bldg. (03), Room 407  
805 756-2783**

**Area Chair: Michael L. Marlow**

George L. Beardsley, Jr.	Panagiotis Papakyriazis
Phillip Fanchon	Daniel J. Villegas
Steve Hamilton	Daniel P. Williamson
Timothy W. Kersten	

The mission of the economics program is to provide students with the tools they need to analyze and solve problems in a variety of settings. The degree program:

- trains students to compete successfully in the business world,
- equips students for successful government-sector careers, and
- provides students with the background necessary to compete at graduate schools.

*Listed below are some ways that the economics degree program is aligned with the OCOB mission statement:*

- The study of cost curves and profit maximization is a large part of microeconomics. The impact of technology on costs and profits is studied in the theory of the firm.
- Economic growth is studied in macroeconomics courses. The importance of technological progress is a large part of economic growth theory.
- Technological changes in the payments system and their effect on the economy are studied in money and banking and macroeconomics.

**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 I, II	4,4
ECON 313, 314 Intermediate Macroeconomics I, II	4,4
ECON 337 Money, Banking and Credit .....	4
ECON 339 Econometrics .....	4
ECON 461 Senior Project I.....	2
ECON 462 Senior Project II .....	2
Restricted electives. At least 2 restricted elective courses must be at the 400 level. Select from: ECON 303, 304, 322, 324, 325, 340, 403, 404, 405, 406, 410, 413, 417, 431, 432, 434.....	20
Advisor approved electives .....	24
	<b>84</b>

**SUPPORT COURSES**

BUS 207 Legal Responsibilities of Business .....	4
BUS 214 Financial Accounting .....	4
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>25</b>

**GENERAL EDUCATION (GE)**

72 units required; 12 units are in Major/Support.  
 →See page 69 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

<b>Area F Technology Elective (upper division) (4 units)</b>	<b>4</b>
	<b>60</b>

<b>ELECTIVES.....</b>	<b>11</b>
	<b>180</b>

**Advisor Approved Electives**

Economics majors may select electives to meet the concentration requirements of another area or discipline.

# Industrial Technology

**Business Bldg. (03), Room 405**  
**805 756-2676**

## Area Chair (Position Vacant)

Fred Abitia	Roger Keep
Clifford S. Barber	Anthony J. Randazzo
Manocheer Djassemi	Eric O. Olsen
Larry W. Gay	Jagjit Singh

Industrial Technology prepares individuals for technical leadership responsibilities within a broad variety of industries, including manufacturing and construction, communications, transportation, and utility services. Graduates in the field function in the mid-ground between the applied aspects of engineering and administration. The program is designed to prepare management-oriented technical professionals. Students are directed toward the application derived from a variety of disciplines including, but not limited to, materials and production processes, electronics, computer science, industrial management, human relations, marketing and communications.

*Listed below are some ways the industrial technology degree program is aligned with the OCOB mission statement:*

- The program provides a broad general education foundation, plus knowledge, understanding and some degree of skill in a number of industrial/technical areas including electricity and electronics, statistics, industrial management, technical management problems and business.
- The program investigates the functions of a technical manager, and management styles, relationships and interactions between departments in an industrial organization; industrial communications, and the language of technical management; and characteristics of various technical management fields including social responsibility and ethical issues.
- The program utilizes techniques and procedures such as work simplification, workforce and corporate profiles, and in-service training, and investigates methods of reducing waste and inefficiency in business and industry by considering hiring practices, ethics, social responsibility, interaction analysis, motivation, discipline, labor processes, products, materials and systems.
- The program covers specific management responsibilities, and evidences appropriate responses both in written form and production quantity and quality – developing a “company” structure, designing and producing a moderately complex product using metal as the primary material.

- The program’s students exhibit a positive attitude and the ability to work in a group; develop proficiency in developing media for use in a technical presentation including individual and team presentations, camcorder use and videotape production and editing; and exhibit the strong ability to present technical material to a group and to skillfully use various media forms.

## BS INDUSTRIAL TECHNOLOGY

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

IT 137 Electronic Systems.....	4
IT 150 Mechanical Systems .....	4
IT 233 Decision Making/Prob Solving using CAD	4
IT 260 Manufacturing Processes .....	4
IT 302 Technical Presentations .....	4
IT 303 Industrial Quality Assurance .....	4
IT 326 Product Evaluation.....	4
IT 329 Industrial Materials .....	4
IT 330 Fundamentals of Packaging .....	4
IT 332 Electrical Power Systems .....	4
IT 341 Plastics Processes and Applications (F)*.....	4
IT 402 Technical Presentations .....	4
IT 406 Industrial Sales.....	4
IT 407 Applied Industrial Operations.....	4
IT 410 Industrial Planning.....	4
IT 411 Industrial Safety and Health .....	4
IT 428 Industrial Strategies .....	4
IT 461 Senior Project .....	3
Advisor approved electives .....	16
	<b>87</b>

### SUPPORT COURSES

BUS 212 Financial Actg for Non Business Majors	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 I, II .....	4,4
STAT 217 Intro to Statistical Concepts and Methods or STAT 218 Appl. Statistics-Life Sciences (B1)* .....	4
	<b>32/33</b>

### GENERAL EDUCATION (GE)

72 units required; 20 units are in Major and Support.

→See page 69 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

<b>Area B Science and Mathematics (4 units)</b>	
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	
<b>Area C Arts and Humanities (20 units)</b>	
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
<b>Area D/E Society and the Individual (16 units)</b>	
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
<b>Area F Technology Elective (upper division)</b>	
(4 units) * 4 units in Major .....	0
	<b>52</b>
<b>ELECTIVES .....</b>	<b>8/9</b>
	<b>180</b>

# Academic Minors

**Business  
Economics**

**Industrial 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 Legal Responsibilities of Business (4)
- BUS 214 Financial Accounting (4)
- ECON 221 Microeconomics (4)
- ECON 222 Macroeconomics (D2) (4)
- MATH 221 Calculus for Business and Economics (B1) (4)
- STAT 251 Statistical Inference for Management I (B1) (4)
- STAT 252 Statistical Inference for Management II (B1) (5)

<b>Required courses</b>	<i>Units</i>
BUS 215 Managerial Accounting .....	4
BUS 342 Fundamentals of Corporate Finance .....	4
BUS 346 Principles of Marketing .....	4
IT 371 Production Operations and Project Mgmt ....	4
BUS 387 Organizational Behavior .....	4
BUS 391 Management Information Systems .....	4
	24

## *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.

	<i>Units</i>
<b>Required courses</b> .....	8
ECON 221 Microeconomics (4)	
ECON 222 Macroeconomics (4) (D2)	
<b>Electives</b> .....	16
16 units of upper division economics courses, 8 units of which must be at the 400 level.	
	24

## *Environmental Studies Minor*

Please see the College of Science and Mathematics for more information on this interdisciplinary minor.



## Industrial 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 Issues (Required courses)</b> .....	8
IT 301 Manufacturing Technologies and Society (4)	
BUS 311 Managing Technology in the International Legal Environment (4)	
<b>Materials and Processes electives (select three)</b> .....	12
IT 137 Electronic Systems (4)	
IT 150 Mechanical Systems (4)	
IT 233 Decision Making and Problem Solving Using CAD (4)	
IT 260 Manufacturing Processes (4)	
IT 329 Industrial Materials (4)	
IT 330 Fundamentals of Packaging (4)	
IT 336 Textiles Technology (4) (Area F)	
IT 341 Plastics Processes and Applications (4) (Area F)	
IT 411 Industrial Safety and Health (4)	
<b>Management and IT elective (select one)</b> .....	4
IT 371 Production Operations/Project Mgmt (4)	
BUS 387 Organizational Behavior (4)	
IT 303 Industrial Quality Assurance (4)	
IT 410 Industrial Planning (4)	
IT 428 Industrial Strategies (4)	
<b>Humanities and Social Issues (select one)</b> .....	3-4
HUM 303 Values and Technology (4) (C4)	
IME 319 Human Factors Engineering (3)	
IME 320 Human Factors and Technology (4) (Area F)	

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## Packaging Minor

**Industrial Technology**  
**Business Bldg. (03), Room 405**  
**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> .....	15-17
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 Corrogated Protective Packaging (4)	
PHYS 104 Introductory Physics (B3) (4) or PHYS 121 College Physics I (B3&B4) (4)	

**Advisor approved electives**..... 10-12  
*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.*

FSN 335 Food Quality Assurance (4)
FSN 354 Packaging Function in Food Processing (3)
GRC 211 Substrates, Inks and Toners (4)
GRC 337 Consumer Packaging (3)
IT 327 Plastics Technology (4)
IT 330 Fundamentals of 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

**Chris Carr, Associate Dean of Graduate Programs and Faculty Development**  
**Business Bldg. (03), Room 409**  
**805 756-2637**  
*mba@calpoly.edu*  
<http://cob.calpoly.edu/gradProgram>

### Programs of Study/Specializations Available

- MBA – General Management Specialization
- MBA – Agribusiness Specialization
- MBA – Graphic Communication Document Systems Management Specialization
- MBA – Architectural Management Track
- MBA – Landscape Architectural Management Track

### 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. Cal Poly's MBA programs are 60 to 64 units in length, depending on specialization, and consist of required courses and advanced elective courses.

The primary objectives of the MBA programs are to:

- provide students with a broad-based understanding of fundamental concepts, principles and practices in multiple business disciplines
- instill in students an understanding of business dynamics for effective responses to the changing global business environment
- help students acquire skills in formulating, analyzing and implementing significant business decisions
- develop in students the skills that are necessary to work with other people in effective domestic and/or multinational organizations in an ethical and socially responsible manner

### Prerequisites

Students are required to possess a bachelor's degree from an accredited program. The MBA program is specifically designed to provide the essential business knowledge to students without prior business background. Therefore, no specific prerequisite courses are required.

### Admission/Acceptance Requirements

Admission to the MBA programs is based upon:

- successful completion of an accredited undergraduate program of study
- prior academic performance with particular emphasis placed on the last 90 quarter units (60 semester units)
- achievement on the Graduate Management Admission Test (GMAT)
- prior work experience (desirable).

### Culminating Experience

In order to satisfy the culminating experience requirement, students must satisfactorily complete a comprehensive examination at the end of GSB 562 or GSB 567. Other courses and/or options may be available, but must be approved in advance by the Associate Dean of Graduate Programs.

## PROGRAMS OF STUDY

### The MBA – General Management

This program allows students to take electives of particular interest that fit their specific needs or career objectives. The program consists of 36-quarter-units of required courses with the remaining elective units selected from a focused group of advanced courses.

### MBA Common Required Courses (36)

GSB 511 Accounting for Managers .....	4
GSB 512 Quantitative Analysis.....	4
GSB 513 Organization Behavior.....	4
GSB 523 Managerial Economics .....	4
GSB 524 Marketing Management.....	4
GSB 531 Managerial Finance.....	4
GSB 533 Aggregate Economic Analysis & Policy	4
GSB 534 Production and Operations Mgmt.....	4
GSB 562 Seminar in General Mgmt & Strategy or	
GSB 567 Adv Sem International Business Mgmt	
or other approved culminating experience .....	4
<b>Advisor approved electives.....</b>	<b>24</b>

*One elective must satisfy the Orfalea College of Business' international course requirement*

**MBA – Agribusiness Specialization**

This specialization is offered in conjunction with the Agribusiness Department in the College of Agriculture. The program 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.

**MBA Common Required Courses (36)**

GSB 511 Accounting for Managers.....	4
GSB 512 Quantitative Analysis .....	4
GSB 513 Organization Behavior.....	4
GSB 523 Managerial Economics .....	4
GSB 524 Marketing Management.....	4
GSB 531 Managerial Finance .....	4
GSB 533 Aggregate Economic Analysis & Policy ..	4
GSB 534 Production and Operations Mgmt.....	4
GSB 562 Seminar in General Mgmt & Strategy or GSB 567 Adv Sem International Business Mgmt or other approved culminating experience .....	4

**Specialization Required Courses (20)**

AGB 514 Agribusiness Managerial Leadership.....	4
AGB 539 Graduate Internship in Agriculture .....	4
AGB 543 Agribusiness Policy/Program Analysis....	4
AGB 554 Food System Marketing .....	4
AGB 555 Technological and Economic Change in Agribusiness .....	4

**Advisor approved electives .....**

*One elective must satisfy the Orfalea College of Business' international course requirement*

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**MBA – Graphic Communication Document Systems Management Specialization**

This specialization is offered in conjunction with the Graphic Communication Department in the College of Liberal Arts, and is designed for those interested in graphic communication-related management careers. The program, focused on document systems management, contains a strong research component, including research assignments relevant to an individual company and the document industry as a whole. Students participate in research and development projects for the Graphic Communication Institute at Cal Poly.

**MBA Common Required Courses (36)**

GSB 511 Accounting for Managers.....	4
GSB 512 Quantitative Analysis .....	4
GSB 513 Organization Behavior.....	4
GSB 523 Managerial Economics .....	4
GSB 524 Marketing Management.....	4
GSB 531 Managerial Finance .....	4
GSB 533 Aggregate Economic Analysis & Policy ..	4
GSB 534 Production and Operations Mgmt.....	4

GSB 562 Seminar in General Mgmt & Strategy or GSB 567 Adv Sem International Business Mgmt or other approved culminating experience .....	4
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**Specialization Required Courses (16)**

GRC 595 Internship/Co-Op Experiential Education	8
GRC 500 Special Problems in GRC.....	8

**Advisor approved electives.....**

*One elective must satisfy the Orfalea College of Business' international course requirement*

64

**MBA – Architectural Management Track**

This program is available only to those students who are enrolled in Cal Poly's Bachelor of Architecture (BArch) program. During the fifth/final year of the architecture program, students may request permission to enroll in MBA courses. The request, along with all supporting documents, must be submitted to the Orfalea College of Business – Graduate Programs Office. Permission to participate in the courses is competitive and based upon the student's previous academic performance and GMAT results.

Upon completion of the BArch degree, students are eligible to formally apply to the University for admission to the MBA program. Students who fulfill all the requirements first receive the BArch and then the MBA.

**MBA Common Required Courses (36)**

GSB 511 Accounting for Managers .....	4
GSB 512 Quantitative Analysis.....	4
GSB 513 Organization Behavior.....	4
GSB 523 Managerial Economics .....	4
GSB 524 Marketing Management.....	4
GSB 531 Managerial Finance.....	4
GSB 533 Aggregate Economic Analysis & Policy	4
GSB 534 Production and Operations Mgmt.....	4
GSB 562 Seminar in General Mgmt & Strategy or GSB 567 Adv Sem International Business Mgmt or other approved culminating experience .....	4

**Advisor approved electives.....**

*One elective must satisfy the Orfalea College of Business' international course requirement*

60

**MBA – Landscape Architecture Management Track**

This program is available only to those students who are currently enrolled in Cal Poly's Bachelor of Landscape Architecture (BLA) program. During the fifth/final year of the landscape architecture program, students may request permission to enroll in MBA courses. The request, along with all supporting documents, must be submitted to the Orfalea College of Business – Graduate Programs Office. Permission to participate in the courses is competitive and based upon the student's previous academic performance and GMAT/GRE results.

Upon completion of the BLA degree, students are eligible to formally apply to the University for admission to the MBA program. Students who fulfill all the requirements first receive the BLA and then the MBA.

#### MBA Common Required Courses (36)

GSB 511 Accounting for Managers .....	4
GSB 512 Quantitative Analysis .....	4
GSB 513 Organization Behavior.....	4
GSB 523 Managerial Economics .....	4
GSB 524 Marketing Management.....	4
GSB 531 Managerial Finance .....	4
GSB 533 Aggregate Economic Analysis & Policy ..	4
GSB 534 Production and Operations Mgmt.....	4
GSB 562 Seminar in General Mgmt & Strategy or GSB 567 Adv Sem International Business Mgmt or other approved culminating experience .....	4
<b>Advisor approved electives .....</b>	<b>24</b>
<i>One elective must satisfy the Orfalea College of Business' international course requirement</i>	
	60

#### Option to Concurrently Pursue MBA & Another Master's Degree

The Orfalea College of Business will permit students to develop an individualized program of study that incorporates the required elements of two distinct Cal Poly graduate degree programs. 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.

To participate in this option, students must apply to, meet the qualifications for, and be accepted into each program separately. Students must first apply for formal admission to one specific Cal Poly graduate program such as the MBA program. After enrollment in a specific graduate program, the student must apply to, meet the qualifications for, and be accepted into the second program. The two degrees must be awarded in different quarters.

Depending upon the combination of degrees pursued, students may be permitted to substitute courses in the other graduate degree program for similar courses in the MBA program, thereby reducing the overall number of units. Such substitutions must be approved in advance by the OCOB Associate Dean of Graduate Programs and generally are limited to a maximum of three courses.

## Engineering Management Program, MBA & MS Engineering

**Chris Carr, Associate Dean of Graduate Programs  
and Faculty Development**

**Business Bldg. (03), Room 409**

**805 756-2637**

*mba@calpoly.edu*

*http://cob.calpoly.edu/gradProgram*

The dual-degree Engineering Management Program (EMP) is an interdisciplinary program linking the MBA and MS in Engineering degree programs. It is a cooperative effort between the Orfalea College of Business and the Cal Poly College of Engineering (Industrial and Manufacturing Engineering Department). Students are required to have a prerequisite degree in engineering, computer science, or equivalent 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. Successful participants will be awarded both MBA and MS in Engineering degrees, each with a specialization in Engineering Management.

The mission of the EMP is to develop high quality industry-ready graduates who will be facilitators of change and integrators of engineering, business, and people issues.

The three major objectives of this program are to:

- 1) integrate knowledge and skills from engineering and business disciplines for effective responses to rapidly changing technological and business environments;
- 2) prepare engineers for effective participation in the management of technology, management of technology-based organizations, and management of technological change; and
- 3) take advantage of the unique background of program participants and the unique strengths of Cal Poly.

#### Prerequisites

Students are required to possess a bachelor's degree, from an accredited program in engineering, computer science, or equivalent technical degree.

#### Admission/Acceptance Requirements

Admission to the EMP is based upon:

- successful completion of an accredited undergraduate program of study
- prior academic performance with particular emphasis placed on the last 90 quarter units (60 semester units)
- achievement on the Graduate Management Admission Test (GMAT) and the Graduate Record Examination Test (GRE)
- prior work experience (desirable).

#### Culminating Experience

In order to satisfy the culminating experience requirement, students must satisfactorily complete a comprehensive

examination at the end of GSB 562 or GSB 567 and satisfactorily complete a comprehensive project, IME 596 or design project/thesis, IME 599. Other courses and/or options may be available, but must be approved in advance by the Orfalea College of Business Associate Dean of Graduate Programs and by the College of Engineering, Engineering Management Program Advisor.

#### Required courses (62)

GSB 511 Accounting for Managers .....	4
GSB 513 Organization Behavior.....	4
GSB 523 Managerial Economics .....	4
GSB 524 Marketing Management.....	4
GSB 531 Managerial Finance .....	4
GSB 533 Aggregate Economic Analysis & Policy ..	4
GSB 562 Seminar in General Mgmt & Strategy <i>or</i> GSB 567 Adv Sem International Business Mgmt <i>or other approved culminating experience</i> .....	4
IME 503 Applied Statistical Methods in Engrg .....	4
IME 507 Graduate Seminar.....	4
IME 545 Advanced Simulation.....	4
IME 556 Technological Project Management.....	4
IME 558 Executive Seminars.....	4
IME 580 Manufacturing Systems.....	4
IME 596 Internship/Team Project (10) <i>or</i> IME 599 Design Project (Thesis) (9).....	9/10
<b>College of Engineering approved electives</b> .....	12-13
<b>Other advisor approved electives</b> .....	16
<i>One elective must satisfy the Orfalea College of Business' international course requirement</i>	
90	

**Formal Study Plan.** The Formal Study Plan for this dual degree program must be approved in advance by both the Orfalea College of Business – Associate Dean of Graduate Programs and by the College of Engineering – Engineering Management Program Advisor.

## *MS Industrial & Technical Studies*

**Chris Carr, Associate Dean of Graduate Programs  
and Faculty Development**

**Business Bldg. (03), Room 409**

**805 756-2637**

**[mba@calpoly.edu](mailto:mba@calpoly.edu)**

**<http://cob.calpoly.edu/gradProgram>**

#### General Characteristics

The Master of Science in Industrial and Technical Studies (MS I&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.

#### Prerequisites

Students are required to possess a bachelor's degree, from an accredited program in industrial technology, engineering or similar technical degree or background.

#### Admission Requirements

Admission to the MSI&TS program is based upon:

- Successful completion of an accredited undergraduate program of study;
- Prior academic performance, with particular emphasis placed on performance in the last 90 quarter units (60 semester units);
- Achievement on the General Test of the Graduate Record Examination (GRE) or the Graduate Management Admission Test (GMAT); and
- Prior work experience (desirable).

#### Program of Study

The program requires 45-quarter-units with 29 units of core courses and 16 units of electives. These courses collectively provide students with background information and training to:

- utilize business 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
- deal with the human and cultural issues that arise in technically focused industrial settings.

#### Culminating Experience

In order to satisfy the culminating experience requirement, students must satisfactorily complete a comprehensive project at the end of IT 598. Other courses and/or options may be available, but must be approved in advance by the Associate Dean of Graduate Programs.

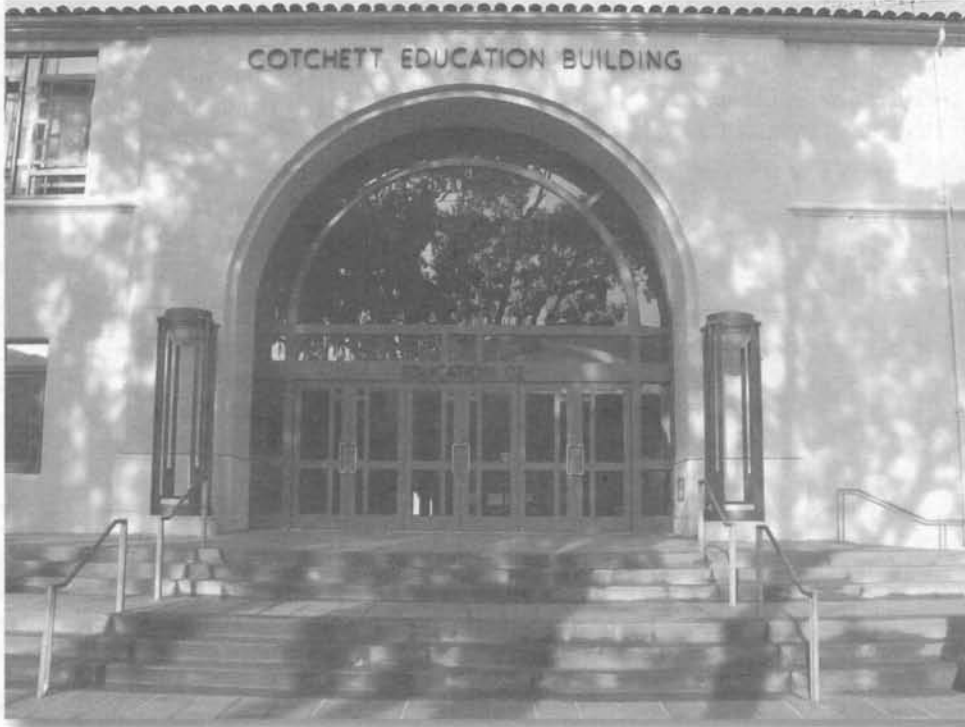
#### Required courses (29)

IT 510 Impact of Science and Technology.....	4
IT 512 Improving Productivity through Technology	4
IT 514 Commercializing Tech. Developments.....	4
IT 520 Management of Technology .....	4
IT 527 Trends and Issues in Technology .....	4
IT 598 Industrial and Technical Studies Project <i>or</i> <i>other approved culminating experience</i> .....	5
<i>One course from the following</i> .....	4
GSB 512, 523, 525, 531, 534	

#### Advisor approved electives..... 16

Selected from the following list of courses:

IME 555, IME 575, IME 580; IT 521, IT 522, IT 523; GSB 514, GSB 526, GSB 527, GSB 533, GSB 569, GSB 571, GSB 574, GSB 577, GSB 578, GSB 587 (admission into GSB courses is subject to space availability; students in an MBA program receive priority)



A \$2-million gift from alumnus Joseph Cotchett (ENGR '60) and his wife, Victoria, provides the College of Education with funding for an endowed professorship in science and mathematics education, endowed scholarships, renovation of a teaching lab and other science and math teacher education initiatives. In honor of their gift, Cal Poly and the CSU Board of Trustees named the Cotchett Education Building in 2004.

*(l-r): Dean Phil Bailey (CSM), Victoria Cotchett, Joseph Cotchett, Dean Bonnie Konopak (COE), President Warren J. Baker.*



College of

*Education*

*Photos courtesy of the College of Education*

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# College of *Education*

**Dean, Bonnie Konopak**  
**Associate Dean/Director, Teacher Education**  
**Carl R. V. Brown**  
**Chair, Graduate Studies, Roberta Herter**  
**Education Bldg. (02), Room 120**  
**(805) 756-2126**

## Faculty

Elaine Y. Chin	Rita M. King
Leonard Davidman	Donald K. Maas
Patricia Davidman	Shirley J. Magnusson
David Duran	Susan L. McBride
James L. Gentilucci	Patricia A. Mulligan
Kathleen C. Harris	Dennis M. Nulman
Anita C. Hernandez	George J. Petersen
Roberta J. Herter	Michael B. Ruef
Jodi D. Jaques	

## Affiliated Faculty

The following faculty participate with the College of Education and hold academic rank in a department outside the College of Education:

John Battenburg	Alan W. Holz
Michael W. Black	William C. Kellogg
C. Andrea Brown	Heather J. McCarty
Carl R.V. Brown	Elsa Medina
Glen R. Casey	Jeannine Richison
Susan Duffy	Kate J. Riley
Gwen Fisher	Johanna Rubba
Robert A. Flores	Michael A. Sutliff
Kathleen D. Friend	Kevin Taylor
Todd A. Grundmeier	Scott Vernon
Chance Hoellwarth	Raymond F. Zeuschner

## ACADEMIC PROGRAMS

Education .....	<i>MA</i>
Counseling and Guidance .....	<i>Specialization</i>
Curriculum and Instruction .....	<i>Specialization</i>
Educational Leadership/Administration .....	<i>Specialization</i>
Literacy and Reading .....	<i>Specialization</i>
Special Education .....	<i>Specialization</i>
Educational Leadership .....	<i>Ed.D.</i>

## MISSION AND PROGRAMS

The College of Education promotes an all-university approach toward education. Its mission is to prepare *Educational Leaders* who create environments, practices, and policies to support the development of every learner; who strive for equity in schools and society; and who are committed to professional growth in the field education.

The College 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 College 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 College seeks talented, creative students who are committed to a long-term career in education and to the improvement of educational processes and institutions.

The College 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 College offers a **Master of Arts in Education** degree with specializations in: Counseling and Guidance; Curriculum and Instruction; Educational Leadership and Administration; Literacy and Reading; and Special Education.

A **Doctor of Education degree (Ed.D.)** in Educational Leadership for working professionals is offered by the College 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 in K-16 settings.

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, the College 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 subject to change. 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 or [gcasey@calpoly.edu](mailto:gcasey@calpoly.edu)).

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 College of 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.coe.calpoly.edu](http://www.coe.calpoly.edu). Program requirements may be updated according to state law or policy. Applicants should keep in touch with their program advisor.

## 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, the advisement handbook, or at [www.coe.calpoly.edu](http://www.coe.calpoly.edu).

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 PRELIMINARY CREDENTIAL PROGRAM

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, the credential handbook, and [www.coe.calpoly.edu](http://www.coe.calpoly.edu) 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 and [www.coe.calpoly.edu](http://www.coe.calpoly.edu) 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.

Note: Students are reminded of their responsibility to register for the appropriate student teaching class and accompanying seminar. While the College of Education assigns student teaching placements, it does not handle registration of classes for student teachers.

### STEP III - APPLICATION FOR PRELIMINARY 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. 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 College of 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.

#### Clear Credential – Fifth Year of Study

California Senate Bill 2042 reforms transferred the granting of clear (advanced) multiple subject and single subject teaching credential recommendations to school district based Induction Programs, or to Fifth Year of Study Programs conducted with California Commission on Teacher Credentialing approved school district-university initiatives. At this writing, Cal Poly does not sponsor a Fifth Year of Study option; Cal Poly does, however, partner with the San Luis Obispo County Induction Program. Graduates obtaining their preliminary credential from Cal Poly should consult the school district employing them, whether in San Luis Obispo County or elsewhere in California, for information about the Induction Program and obtaining the clear credential.

## Specialist Education Credentials

### Education Specialist

Preliminary Level I

#### Pupil Personnel Services: School Counseling

#### Agriculture Specialist

#### Administrative Services

Administrative Intern

Preliminary (Tier I)

**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. In addition, Cal Poly prepares Education Specialists to work in inclusive settings.

Cal Poly is authorized to offer programs in the specializations for mild/moderate 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.

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 orientation meeting;
- meet personal and professional standards during an interview;
- personal interest questionnaire;
- two letters of recommendation; and
- provisions and principles of the U.S. Constitution.

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.

### Pupil Personnel Services: School Counseling

The Pupil Personnel Services (PPS): School Counseling credential program is designed to prepare students for school counseling positions in public schools in grades K-12. This program stresses applied theory and practical, direct experiences to prepare candidates. A low student-advisor ratio allows for personalized attention. The PPS: School Counseling credential program has excellent fieldwork placements in K-12 public schools in the surrounding area.

The PPS: School Counseling credential requires 72 quarter units, which are applicable to the MA in Education with a Specialization in School Counseling.

For more information regarding this program, contact the Coordinator, Counseling and Guidance, College of 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 two credential programs: one leading to recommendation for the Preliminary Administrative Services Credential, and a second, the Administrative Intern Credential, for those persons earning their Preliminary Administrative Services Credential and who concurrently serve in an administrative position.

### 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

<sup>1</sup> Credential requirements may change during 2005-2008. Check with the program advisor.

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.

For more information regarding this program, contact the Coordinator, Educational Leadership and Administration Program, College of Education.

## Master of Arts in Education

### MA Education

#### with Specializations in:

- Counseling and Guidance
- Curriculum and Instruction
- Educational Leadership and 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/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 40 units of 500-level Education (EDUC) courses. Courses taken in these programs may also be applied toward related credentials.

Candidates must maintain a grade point average of 3.0 (B) or better in all coursework and stay in good professional standing within their specialization. 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 graduate 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 as school counselors or careers working as counselors in higher education. Admission to the program, which occurs **only** in spring quarter, requires references, an autobiographical statement, and an interview. Students enrolling in the specialization area of school counseling are also pursuing the Pupil Personnel Services (PPS): School Counseling credential and must meet the specific requirements of the State of California.

EDUC 590 and successful completion of the written comprehensive examination *or* completion of EDUC 599 is required for degree completion. Students who have career

goals of working in clinical counseling in agency settings or in private practice should refer to the Master of Science degree program in Psychology.

### Education Core

EDUC 586 Introduction to Inquiry in Education .....	4
EDUC 587 Educ Foundations & Current Issues .....	4
EDUC 588 Education, Culture and Learning .....	4
EDUC 589 Educational Research Methods .....	4
EDUC 590 Research Applications in Education and comprehensive exam (4) or	
EDUC 599 Thesis/Project (3) (3) .....	4/6

### 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 & Assessment (4)	
EDUC 561 Group Counseling (4)	
EDUC 564 Legal & Ethical Issues in Counseling (4)	
EDUC 565 Measurement & Assess. Counseling (4)	
EDUC 566 Leadership & Consultation Counsel (4)	
EDUC 568 Counseling Techniques (4)	
EDUC 573 Field Experience—Counseling (12)	

### Select one area of emphasis with advisor's approval .....

<i>School Counseling Emphasis (12):</i>	
EDUC 558 Elementary School Counseling (4)	
EDUC 559 Secondary School Counseling (4)	
EDUC 563 Violence Prevention in Schools (4)	

### *Higher Education Counseling Emphasis (4)*

EDUC 562 Student Dev-Higher Education (4)	
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## MA Education, Specialization in CURRICULUM AND INSTRUCTION

The Curriculum and Instruction Specialization aims at expanding the student'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. Students select an emphasis in either Social Science and Language Arts or Science, Math, Technology and Research-based Teaching. Applicants for the Social Science and Language Arts emphasis must have successfully completed student teaching or the equivalent prior to entering the program.

Applicants for Science, Math, Technology and Research-based Teaching should have at least three years of teaching experience before applying. This emphasis is designed to be completed in three summers.

### Education Core

EDUC 586 Introduction to Inquiry in Education ....	4
EDUC 587 Educ Foundations & Current Issues .....	4
EDUC 588 Education, Culture and Learning .....	4
EDUC 589 Educational Research Methods.....	4
EDUC 590 Research Applications in Education and comprehensive exam (4) or	
EDUC 599 Thesis/Project (3) (3) .....	4/6

### Required in Area of Specialization

EDUC 501 ApplPractices Curriculum Develop .....	4
EDUC 504 Seminar in Science and Mathematics Curriculum and Methods .....	4
EDUC 506 Models of Instruction .....	4
EDUC 532 Adv. Field Experiences in Education ..	3

### Select one area of emphasis with advisor's approval 14

#### *Social Studies & Language Arts Emphasis*

EDUC 503 Sem Language Arts Curric & Meth (4)	
EDUC 505 Sem Social Studies Curric & Meth (4)	
Electives to be selected with advisor's approval (6)	

#### *Science, Math, Technology & Research-based*

<i>Teaching Emphasis</i>	
EDUC 507 Instructional Materials & Tech (4)	
Electives in science, math, technology to be selected with advisor's approval (10)	

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49/51

## MA Education, Specialization in EDUCATIONAL LEADERSHIP and ADMINISTRATION

This program is designed for individuals who wish to assume leadership positions in educational organizations. It emphasizes comprehensive knowledge of applied theories of educational leadership, mastery of practical skills required for effective school administration, and competence in research methods necessary for understanding and assessing learning organizations. While designed primarily for K-12 leaders, the program can be beneficial for leaders from other fields. Coursework in this program may be applicable to the California Administrative Services Credential.

### Education Core

EDUC 586 Introduction to Inquiry in Education ....	4
EDUC 587 Educ Foundations & Current Issues .....	4
EDUC 588 Education, Culture and Learning .....	4
EDUC 589 Educational Research Methods.....	4
EDUC 590 Research Applications in Education and comprehensive exam (4) or	
EDUC 599 Thesis/Project (3) (3) .....	4/6

### Required in the Area of Specialization

EDUC 510 Educational Finance and Resource Allocation .....	4
EDUC 511 Educational Law and Governance .....	4
EDUC 512 Educational Organization & Mgmt .....	4

EDUC 513 Educ. Planning & Decision Making .....	4
EDUC 516 Educ. Personnel Supervision & Eval ....	4
<b>Electives</b> (selected with advisor approval).....	8
Possible electives: EDUC 514, 515, 518.	
	48/50

**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.

**Education Core**

EDUC 586 Introduction to Inquiry in Education .....	4
EDUC 587 Educ Foundations & Current Issues .....	4
EDUC 588 Education, Culture and Learning .....	4
EDUC 589 Educational Research Methods .....	4
EDUC 590 Research Applications in Education <i>and comprehensive exam (4) or</i>	
EDUC 599 Thesis/Project (3) (3) .....	4/6

**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

**Electives** (to be selected with advisor's approval)..... 8/10  
Suggested electives: EDUC 527, 529, 531.

45

**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 Preliminary Level I 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 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 ....	4
EDUC 587 Educ Foundations & Current Issues .....	4
EDUC 588 Education, Culture and Learning .....	4
EDUC 589 Educational Research Methods.....	4
EDUC 590 Research Applications in Education <i>and comprehensive exam (4).....</i>	4

**Required in Area of Specialization**

EDUC 544 Adv Collaboration and Consultation for Teachers of Pupils with Special Needs .....	4
EDUC 545 Characteristics and Instruction of Pupils with Mild/Moderate Disabilities .....	4
EDUC 550 Assessment Strategies for Special Education .....	4

**Electives** (to be selected with advisor's approval) ..... 11/13  
45

## *Doctor of Education in Educational Leadership (Ed.D.)*

The College of Education at California Polytechnic State University, San Luis Obispo and the Gevirtz Graduate School of Education at the University of California, Santa Barbara offer a field-based Ed.D. in Educational Leadership for working professionals. The program is designed to prepare and support exemplary educational leaders who will demonstrate the abilities to:

- Engage in scholarly research and effectively use extant data to make sound, information-driven decisions;
- Critically examine current educational practices and policies from a variety of relevant theoretical perspectives;
- Formulate and implement effective leadership, managerial, and instructional practices that will improve student achievement and organizational productivity; and
- Engage in reflective praxis to assess personal and professional leadership effectiveness.

Graduates will typically pursue employment in leadership and administrative roles in K-12 schools, community colleges, universities, government agencies, and other allied organizations.

The program takes advantage of the unique strengths of each institution (research and field-based practice) to provide innovative programmatic features including a focus on non-urban schools, an accelerated time to degree, research in K-14 Professional Development Districts (PDDs), the inclusion of reflective praxis in all elements of the program, and annual dissemination of student research findings at summer institutes. The program is built upon a tripartite relationship among universities, local K-12 school districts, and community colleges. For additional information, please contact Dr. Jim Gentilucci and visit our web site: [www.education.ucsb.edu/program/jointdoc](http://www.education.ucsb.edu/program/jointdoc)

### **ADMISSION CRITERIA**

Prospective students must meet UCSB admission criteria. Information about these requirements can be found at [www.graddiv.ucsb.edu/academic/handbook/admissions](http://www.graddiv.ucsb.edu/academic/handbook/admissions). Faculty will admit only those applicants who possess the highest potential for successful graduate study and who, with the benefit of doctoral education, will contribute substantially to their academic or professional field through teaching, research, and professional practice. Successful applicants must have:

- Received a master's degree or its equivalent from a regionally accredited university prior to the quarter for which they seek admission;
- Maintained an upper-division grade point average of 3.0 or above;

- Earned Graduate Record Exam (GRE) scores that indicate sufficient ability for successful doctoral study;
- Shared research and/or practice goals with program faculty;
- References indicating their ability to work productively with others; and
- Writing and speaking ability appropriate for doctoral study.

### **PROGRAM OF STUDY**

The program consists of 72 quarter units (minimum) of coursework, field-based research, practicums, 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 after admission. The curriculum is divided into five parts:

- 1) Three core courses that ground students in the theoretical and empirical work that defines the field;
- 2) Four methods courses that teach students how to frame research questions and seek answers using a variety of methodological tools;
- 3) Five specialized seminars and practicums that focus on the application of theory to problems of educational practice;
- 4) Two summer institutes that provide opportunity for independent study and the presentation of research during the institutes; and
- 5) A dissertation that is concerned with the application and development of research-based knowledge in the field of educational leadership.

### **FEES AND RESIDENCY REQUIREMENTS**

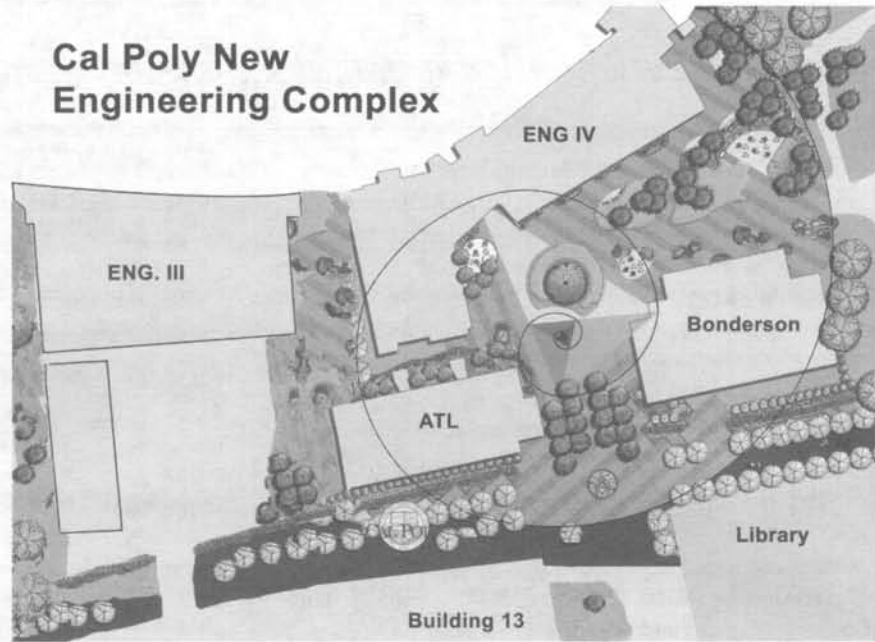
Students are considered UC students for the purposes of academic residency and fee requirements and must pay UC graduate fees for the duration of the program. They must also complete three consecutive quarters of residency in regular session at UCSB before they will be permitted to advance to candidacy for the degree. *Note:* The residency requirement can be satisfied by enrolling as a part-time (8 units) graduate student. Students can remain fully employed *and* meet the UC residency requirement.

### **DISSERTATION**

Students are required to research and write a dissertation that integrates theory with practice. Unlike the Ph.D. dissertation that is largely theoretical in nature, the goal of the applied dissertation is to improve educational practice within students' professional work environment and normally represents the culmination of their prior field-based research in PDDs.

## Cal Poly New Engineering Complex

The College of Engineering has big plans underway. The Engineering III building is scheduled to open fall 2005, while groundbreaking on the state-funded Engineering IV and the privately-financed Bonderson Student Projects Center was slated for the spring. Tying all of the facilities together at the heart of the new complex on the northwest sector of the University is the Engineering Plaza.



### Cal Poly's SWE Wins Outstanding Student Section in the Nation Award

Cal Poly's Society of Women Engineers (SWE) chapter was all smiles after winning the Outstanding Student Section in the Nation award at the 2004 SWE National Conference. It was the third straight year Cal Poly SWE won the award. The chapter also took home first-place awards for the Best Multicultural Program, Best Membership Program and Best Career Guidance Audio Visual Presentation.

*Images courtesy of the College of Engineering*

College of  
*Engineering*

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# College of Engineering

**Peter Y. Lee, Dean**  
**Unny Menon, Interim Associate Dean**  
**Daniel W. Walsh, Associate Dean**

**Engineering Bldg. (13), Room 266**  
**(805) 756-2131**

## ACADEMIC PROGRAMS

Aerospace Engineering .....	BS*, MS
BioResource & Agricultural Engineering ... (College of Agriculture)	BS*
Civil and Environmental Engineering.....	MS
Civil Engineering .....	BS*
Computer Engineering .....	BS*
Computer Science .....	BS**, MS, Minor
Electrical Engineering.....	BS*, MS
Engineering .....	MS
Engineering Management .....	MBA/MS
Environmental Engineering .....	BS*
General Engineering .....	BS
Industrial Engineering.....	BS*, MS
Manufacturing Engineering .....	BS*
Materials Engineering .....	BS*
Mechanical Engineering.....	BS*, MS
Multidisciplinary Design.....	Minor
Software Engineering.....	BS
Transportation Planning .....	MCRP/MS

\* 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, Executive Director**  
**Engineering South (40), Room 115**  
**(805) 756-1461**

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

The College of Engineering Advising Center serves undergraduate students with academic advising issues in conjunction with each student's faculty advisor.

The academic advising staff tracks the academic and administrative progress of each student. 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 are responsible for keeping their U.S. mail and e-mail addresses current.

The executive director administers the academic and administrative probation and disqualification for the college.

#### Academic Expectations

- Students are expected to maintain current, cumulative, higher education, *and* major grade point averages of a 2.0 or higher.
- Students are expected to enroll and complete courses in one attempt.
- Students are expected to graduate from Cal Poly with zero or very few course withdrawals on their transcripts.
- Full-time students are expected to enroll and complete a minimum of six units of major/support coursework each quarter. Students wishing to take an additional

four units outside of their declared degree program may do so. Students wishing to take more than four units outside of their declared degree program must submit a minimum progress waiver form for review.

- Students pursuing their degree on a part-time basis (and they have acceptable reasons for doing so) are expected to meet with the executive director of the Engineering Advising Center to formulate an acceptable part-time agreement.

Students wishing to process course substitution forms, minimum progress waiver forms, withdrawal forms, change of major forms, excess unit forms, special consideration forms, and technical elective forms will typically do so via 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 for all engineering majors and major specific technical elective forms.

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. For most forms, the executive director of the Advising Center has signature authority to sign for the advisor, department chair, and dean with strict adherence to procedures developed with the department chairs and the dean.

### 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) a minimum of 24 units in the field of specialization, with at least 18 units at the 500 level;
- b) a minimum of 9 units from an approved list of mathematics, statistics, computer science, or analytic engineering courses, with at least 3 units at the 500 level;
- c) remaining units taken from a list of approved electives;
- d) at least 23 units of the 45 unit program at the 500 level.

In some specializations, two program options are available: 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 89 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.

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*
<b>Total Units = 237</b>		

<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) <i>or</i> 9 units of approved technical electives <i>and</i> 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 507	
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 507 Graduate Seminar (2)(2)	
IME 545 Advanced Topics in Simulation (4)	
IME 556 Technological Project Management (4)	
IME 558 Executive Seminars (4)	
IME 580 Manufacturing Systems (4)	
IME 596 Team Project/Internship (10) <i>or</i> IME 599 Design Project/Thesis (9)	
Approved electives in specialization (12)	
<b>Approved Electives</b> .....	11/12
	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) <i>or</i> 9 units of approved technical electives <i>and</i> 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) is an interdisciplinary program linking the MBA and MS in Engineering degree programs. It is a cooperative effort between the Orfalea College of Business and the Cal Poly College of Engineering (Industrial and Manufacturing Engineering Department). Students are required to have a prerequisite degree in engineering, computer science, or equivalent 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. Successful participants will be awarded both MBA and MS in Engineering degrees, each with a specialization in Engineering Management.

The mission of the EMP is to develop high quality industry-ready graduates who will be facilitators of change and integrators of engineering, business, and people issues.

The three major objectives of this program are to:

- 1) integrate knowledge and skills from engineering and business disciplines for effective responses to rapidly changing technological and business environments;
- 2) prepare engineers for effective participation in the management of technology, management of technology-based organizations, and management of technological change; and
- 3) take advantage of the unique background of program participants and the unique strengths of Cal Poly.

### Prerequisites

Students are required to possess a bachelor's degree, from an accredited program in engineering, computer science, or equivalent technical degree.

### Admission/Acceptance Requirements

Admission to the EMP is based upon:

- successful completion of an accredited undergraduate program of study
- prior academic performance with particular emphasis placed on the last 90 quarter units (60 semester units)
- achievement on the Graduate Management Admission Test (GMAT) *and* the Graduate Record Examination Test (GRE)
- prior work experience (desirable).

### Culminating Experience

In order to satisfy the culminating experience requirement, students must satisfactorily complete a comprehensive examination at the end of GSB 562 or GSB 567 *and* satisfactorily complete a comprehensive project, IME 596 or design project/thesis, IME 599. Other courses and/or options may be available, but must be approved in advance by the Orfalea College of Business Associate Dean of

Graduate Programs and by the College of Engineering, Engineering Management Program Advisor.

### Required courses (62)

GSB 511 Accounting for Managers .....	4
GSB 513 Organization Behavior .....	4
GSB 523 Managerial Economics .....	4
GSB 524 Marketing Management .....	4
GSB 531 Managerial Finance .....	4
GSB 533 Aggregate Economic Analysis & Policy	4
GSB 562 Seminar in General Mgmt & Strategy <i>or</i>	
GSB 567 Adv Sem International Business Mgmt	
<i>or other approved culminating experience</i> .....	4
IME 503 Applied Statistical Methods in Engrg .....	4
IME 507 Graduate Seminar .....	4
IME 545 Advanced Simulation .....	4
IME 556 Technological Project Management .....	4
IME 558 Executive Seminars .....	4
IME 580 Manufacturing Systems .....	4
IME 596 Internship/Team Project (10) <i>or</i> IME 599	
Design Project (Thesis) (9) .....	9/10
<b>College of Engineering approved electives</b> .....	12-13
<b>Other advisor approved electives</b> .....	16
<i>One elective must satisfy the Orfalea College of Business' international course requirement</i>	
	90

**Formal Study Plan.** The Formal Study Plan for this dual degree program must be approved by both the Orfalea College of Business – Associate Dean of Graduate Programs and by the College of Engineering – Engineering Management Program Advisor.

## 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 to:

- (a) 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) 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) 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 500 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** ..... 64

- 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 Design Project (Thesis) (2,2,2) *or* CRP 599 Thesis (2)(2)(2) *or* CRP 596 Professional Project (2)(2)(2)
- CRP 409 Planning Internship (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 516 Methods of Data Analysis (4)
- CRP 518 Policy Analysis for Planners(4)
- CRP 525 Plan Implementation (4)
- CRP 530 Planning Agency Management (3)
- CRP 535 Land Use Law (4)
- CRP 552 Community and Regional Planning Laboratory I (4)
- CRP 554 Community and Regional Planning Laboratory II (4)
- CSC, MATH, STAT or other approved quantitative methods course (3)

**Emphasis Area (select one of the following)** ..... 11

- Urban Development and Design Emphasis*
- CRP 520 Feasibility Studies in Planning (4)
- CRP 548 Principles of Urban Dev. and Design (4)
- Urban Development and Design elective (3)
- Environmental Planning Emphasis*
- CRP 545 Env. Planning, Policies and Principles (4)
- Environmental Planning electives (7)

**Approved CE/ENVE electives:** ..... 15

- Select from: CE 421, 422, 424, 522, 525, 528, 529, 573, 574, ENVE 411, 465, or other advisor approved CE/ENVE courses



# Aerospace Engineering

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## Department Chair, Jordi Puig-Suari

Daniel J. Biezad	David D. Marshall
Dianne J. DeTurris	Eric A. Mehiel
Faysal A. Kolkailah	Jin Tso

## 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 89 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 and 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 69.

**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
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 II .....	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 Mechanics of Materials I.....	3
CE 207 Mechanics of Materials II .....	3
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 III.....	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, 303 Aerothermodynamics .....	4,4,4
AERO 304 Experimental Aerothermodynamics .....	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.....	4

AERO 446 Introduction to Space Systems.....	4
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.....	4
AERO 433 Aerospace Experimental Stress Anlys..	1
AERO 461, 462 Senior Project I, II <i>or</i>	
AERO 463, 464 Senior Project Laboratory I, II..	2,3
Philosophy elective (C2)* .....	4
Literature, philosophy, arts (300-400 level) (C4)*	4
Courses to complete concentration.....	22
	47
	91

**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, 303 Aerothermodynamics.....	4,4,4
AERO 304 Experimental Aerothermodynamics .....	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 .....	4
AERO 401 Propulsion Systems.....	4
AERO 420 Stability/Control of Aerospace Vehicles	4
AERO 431 Aerospace Structural Analysis II .....	4
AERO 433 Experimental Stress Analysis .....	1
AERO 446 Introduction to Space Systems.....	4
AERO 461, 462 Senior Project I, II <i>or</i>	
AERO 463, 464 Senior Project Laboratory I, II..	2,3
CE 204 Mechanics of Materials I.....	3
CE 207 Mechanics of Materials II.....	3
EE 201, 251 Electric Circuit Theory and Lab .....	3,1
Concentration courses (see below).....	22
	91

**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 II, III .....	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 69 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> .....	0
	<b>196</b>

**CONCENTRATIONS (select one)****Aeronautics Concentration**

AERO 405 Supersonic/Hypersonic Aerodynamics....	4
AERO 443, 444, 445 Aircraft Design I, II, III .....	2,4,4
Aeronautics electives .....	8
	<b>22</b>

**Astronautics Concentration**

AERO 451 Spaceflight Dynamics I.....	4
AERO 447, 448, 449 Spacecraft Design I, II, III .....	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 aerodynamics, 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 may be 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.

**Required Courses:**

*Select an approved aerospace engineering course in four of the following five areas. Other courses may be chosen with approval of instructor: .....* 16

- Aerodynamics  
AERO 520, 521, 525
  - Structures  
AERO 534, 535, 532
  - Propulsion  
AERO 540, 541
  - Stability and Control  
AERO 519, 550, 551, 555, 560
  - Engineering Fundamentals  
AERO 515, 526, 522, 523, 530, 552
- |                                      |   |
|--------------------------------------|---|
| MATH 501 Applied Mathematics I ..... | 4 |
| AERO 599 Thesis (3) (3) (3) .....    | 9 |

**Electives:**

- |   |           |
|---|-----------|
| Math or numerical methods elective..... | 4         |
| Advisor approved electives .....        | 12        |
|   | <b>45</b> |

# Civil and Environmental Engineering

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## 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 89 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 69.*

#### 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 II .....	4
Political economy elective (D2)* .....	4
	<u>49</u>
<b>Sophomore</b>	
CE 201 Mechanics of Materials (6) or CE 204, CE 207 Mechanics of Materials I, II (3)(3) .....	6
CE 221, 222 Fund Transportation Engr and Lab .....	3,2
CE 251 Numerical Methods in Civil Engineering ...	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
PHYS 133 General Physics III .....	4
Literature elective (C1)* .....	4
<sup>1</sup> Advisor approved engineering science elective .....	3
	<u>51</u>
<b>Junior</b>	
CE 336 Water Resources Engineering .....	4
CE 337 Hydraulics Laboratory .....	1
CE 351 Structural Analysis .....	4
CE 355 Reinforced Concrete Design .....	4
CE 356 Structural Steel Design .....	4
CE 381, 382 Geotechnical Engineering and Lab .....	4,1
ENVE 331 Intro to Environmental Engineering .....	4
ME 302 Thermodynamics .....	3
ME 341 Fluid Mechanics I .....	3
STAT 312 Statistical Methods for Engineers (B6)* .....	4
American experience elective (D1)* .....	4
Philosophy elective (C2)* .....	4
BIO 213 and ENGR/BRAE 213 (B2)* .....	2,2
	<u>48</u>
<b>Senior</b>	
CE 461, 462 Senior Project I, II or CE 466, 467 Senior Project Design Lab I, II or CE 468, 469 Community Engr Senior Proj I, II	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
	<u>48</u>
	<b>196</b>

**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 Mechanics of Materials (6) or CE 204, CE 207 Mechanics of Materials I, II (3)(3) .....	6
CE 221, 222 Fund Transportation Engr and Lab .....	3,2
CE 251 Numerical Methods in Civil Engineering .....	2
CE 259 Civil Engineering Materials .....	2
CE 336 Water Resources Engineering .....	4
CE 337 Hydraulics Laboratory .....	1
CE 351 Structural Analysis .....	4
CE 355 Reinforced Concrete Design .....	4
CE 356 Structural Steel Design .....	4
CE 381, 382 Geotechnical Engineering and Lab .....	4,1
CE 461, 462 Senior Project I, II or CE 466, 467 Senior Project Design Lab I, II or CE 468, 469 Community Engr Senior Proj I, II	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
	<u>74</u>

**SUPPORT COURSES**

BIO 213 and 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
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
ME 212 Engineering Dynamics .....	3
ME 302 Thermodynamics .....	3
ME 341 Fluid Mechanics I .....	3

<sup>1</sup> Lower division elective normally to be selected from EE 201 or CSC 234.

<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. Must include at least one of the following: CE 422, CE 440, CE 454, CE 481

<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.

PHYS 131 General Physics (Add'l Area B)* .....	4
PHYS 132, 133 General Physics II, III .....	4,4
STAT 312 Statistical Methods for Engineers (B6)*	4
<sup>1</sup> Advisor approved engineering science elective .....	3
	<b>82</b>

**GENERAL EDUCATION (GE)**

72 units required; 32 units are in Support.

→See page 69 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>0</b>
	<b>196</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 69.

**Freshman**

ENVE 111 Intro to Env. Engineering Profession ....	1
<sup>2</sup> CHEM 127 General Chemistry I (B3/B4)* .....	4
CHEM 128 General Chemistry II .....	4
CHEM 129 General Chemistry III .....	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 II .....	4
ENGL 134 Writing: Exposition (A1)* .....	4
SCOM 101/102 Speech Communication (A2)* .....	4
American experience elective (D1)* .....	4
Political economy elective (D2)* .....	4

**51****Sophomore**

CE 201 Mechanics of Materials (6) or CE 204, 207 Mechanics of Materials I, II (3)(3) .....	6
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 ( <i>transfer equivalent CHEM 212</i> ) .....	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
PHYS 133 General Physics III .....	4
STAT 312 Statistical Methods for Engineers (B6)*	4
	<b>46</b>

**Junior**

CE 336 Water Resources Engineering .....	4
CE 337 Hydraulics Laboratory .....	1
ENVE 304 Thermodynamics of Processes .....	4
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 I .....	3
Literature elective (C1)* .....	4
Philosophy elective (C2)* .....	4
	<b>44</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.....	4
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>3,4</sup> Advisor approved technical electives .....	10
	<b>55</b>
	<b>196</b>

<sup>1</sup> Lower division elective normally to be selected from EE 201 or CSC 234.

<sup>2</sup> CHEM 124, 125 will substitute for CHEM 127, 128.

<sup>3</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>4</sup> No more than 4 units of ENVE 400 or CE 400 can be counted towards technical electives.

**BS ENVIRONMENTAL ENGINEERING**

- ☐ 60 units upper division      ☐ GWR  
 ☐ 2.0 GPA                              ☐ USCP

\* = Satisfies General Education requirement

**MAJOR COURSES**

CE 201 or CE 204, 207 Mechanics of Materials ....	6
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 .....	4
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 .....	4
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.....	10
	<b>81</b>

**SUPPORT COURSES**

<sup>3</sup> CHEM 127 General Chemistry I (B3/B4)* .....	4
CHEM 128 General Chemistry II .....	4
CHEM 129 General Chemistry III .....	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 341 Fluid Mechanics I.....	3
PHYS 131 General Physics (Add'l Area B)* .....	4
PHYS 132, 133 General Physics II, III .....	4,4
STAT 312 Statistical Methods for Engineers (B6)*	4
	<b>75</b>

**GENERAL EDUCATION (GE)**

72 units required; 32 units are in Support.

→See page 69 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

<b>ELECTIVES</b> .....	<b>0</b>
	<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.

<sup>3</sup> CHEM 124, 125 will substitute for CHEM 127, 128.



## 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.

### 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). Not an option for Blended BS/MS.

	<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 within the major</b> (normally to be selected from the following list after consultation with your academic advisor and the CE/ENVE graduate coordinator):.....	20-26
<b>Advisor approved electives outside the major</b> (to be selected after consultation with your academic advisor and the CE/ENVE graduate coordinator).....	<u>9-15</u>
	45

### Analysis and design CE and ENVE electives:

CE 400<sup>1</sup>, 401, 402, 407, 421, 422, 423, 424, 431, 432, 434, 440, 452, 454, 455, 456, 457, 458, 459, 464, 481, 482, 484, 486, 487, 500<sup>1</sup>, 501, 502, 504, 505, 521, 522, 523, 525, 527, 528, 529, 533, 535, 537, 555, 557, 559, 571, 573, 574, 581, 582, 583, 584, 585, 586  
 ENVE 400<sup>1</sup>, 411, 416, 421, 434, 436, 437, 438, 439, 443, 450, 455, 465, 466, 467, 500<sup>1</sup>, 534, 535, 536, 542, 551, 552

<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 (20-1), Room 215**  
**(805) 756-1229    www.cpe.calpoly.edu**

**College of Engineering Advising Center**  
**Engineering South (40), Room 115**  
**(805) 756-1461**

## Director, Leonard D. Myers

David B. Braun	Bryan Mealy
Fred W. DePiero	Phillip L. Nico
Diana M. Franklin	John A. Saghri
Joseph E. Grimes	Richard S. Sandige
James G. Harris	John Seng
Lewis D. Hitchner	Lynne A. Slivovsky
Martin E. Kaliski	Hugh M. Smith
Albert A. Liddicoat	Daniel J. Stearns
C. Arthur MacCarley	

## 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. For a complete list, please visit the technical electives selection at <http://ceng-web.calpoly.edu/frames/advising.html>. Current technical electives include courses in:

- 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 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 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 69.*

### 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
SCOM 101/102 Speech Communication (A2)* .....	4
IME 156 Basic Electronics Manufacturing <i>or</i>	
IME 157 Electronics Manufacturing .....	2
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 112 Electric Circuit Analysis I .....	2
EE 211, 241 Electric Circuit Analysis II and Lab ...	3,1
EE 212, 242 Electric Circuit Analysis III and Lab..	3,1
MATH 241 Calculus IV .....	4
MATH 244 Linear Analysis I.....	4
PHYS 132, 133 General Physics II, III .....	4,4
PHYS 211 Modern Physics I .....	4
Philosophy elective (C2)* .....	4
American experience elective (D1)* .....	4
	<u>50</u>

### Junior

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 357 Systems Programming.....	4
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
	<u>49</u>

### Senior

CPE 450 CPE Capstone Project .....	4
CPE 464 Introduction to Computer Networks .....	4
CPE 461, 462 Senior Project I, II.....	3,2
CSC, EE, Math or Science Elective from approved	
CPE Program List .....	3
BIO 213 <i>and</i> 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
	<u>47</u>
	<b>193</b>

**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 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 357 Systems Programming .....	4
CPE 450 CPE Capstone Project.....	4
CPE 453 Operating Systems I.....	4
CPE 461, 462 Senior Project I, II.....	3,2
CPE 464 Introduction to Computer Networks .....	4
CSC 141 Discrete Structures I .....	4
EE 112 Electric Circuit Analysis I .....	2
EE 211, 241 Electric Circuit Analysis II and Lab....	3,1
EE 212, 242 Electric Circuit Analysis III and Lab...	3,1
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
CSC, EE, Math or Science Elective from approved CPE Program List.....	3
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 II, III .....	4,4
PHYS 211 Modern Physics I .....	4
STAT 350 Probability and Random Processes for Engineers (B6)*.....	4
	<b>60</b>

**GENERAL EDUCATION (GE)**

72 units required; 32 units are in Major/Support.

→See page 69 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>193</b>

# Computer Science

**Department Office**  
**Computer Science Bldg. (14), Room 254**  
**(805) 756-2824**  
**www.csc.calpoly.edu**

**College of Engineering Advising Center**  
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## Department Chair, Timothy J. Kearns

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Gene Fisher	Phillip L. Nico
Diana M. Franklin	Cornel K. Pokorny
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Joseph E. Grimes	Hugh Smith
Michael L. Haungs	Clinton A. Staley
Lewis E. Hitchner	Daniel J. Stearns
John Y. Hsu	Clark S. Turner
Aaron W. Keen	Zoë J. Wood

## 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 that allows students to focus on particular areas of computer science 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, either individually or as members of a team, spanning two academic quarters.

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 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 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 interpersonal management skills.
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 encouraged to complete a co-operative education experience prior to enrollment in these courses.

The software engineering program is designed to be flexible. Although freshmen choose their major when they apply for admission, students can easily switch among software engineering, computer engineering and computer science since the lower division curricula are similar.

The software industry increasingly requires both a software and an 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 any restrictions on the master's thesis where a major design experience is required 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 use 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 courses provide the common knowledge and skills needed by anyone who wishes to advance further in computer science. Each track consists of one or more required courses and several restricted elective courses that enable students to specialize in an area relevant to their goals.

The courses taken in the minor can be counted toward the student's major, support and general education & breadth requirements. Admission to the minor is limited and selection will be made based upon the applicant's performance in the core courses. Students who intend to minor in computer science should consult the College of Engineering Advising Center website for GPA and course grade requirements for admission to the minor. In addition, they should contact the College of Engineering Advising Center for further information *before* planning to enter the minor.

To be admitted students must formally apply by making an appointment with the director of the College of Engineering Advising Center. 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 307 or CSC 308 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**

<b>Recommended Course Sequence</b> (prerequisite courses in parentheses, with *'s for "or concurrent") [GE category in brackets]			
<b>Freshman</b>			
<b>Fall</b>	<b>12 units</b>	<b>Winter</b>	<b>Spring</b>
		<b>16 units</b>	<b>16 units</b>
MATH 141 [B1].....	4	MATH 142 [B1]..... (MATH 141)	[D2]..... 4
CSC/CPE 101.....	4	CSC/CPE 102..... (CSC/CPE 101, MATH 141)	CSC/CPE 103..... (CSC/CPE 102, CSC 141)
ENGL 133/134 <sup>1</sup> [A1].....	4	CSC 141..... (CSC/CPE 102*, MATH 118 & 119 or equiv.)	CPE/EE 129/169..... (CPE/CSC 101)
		SCOM 101/102 [A2].....	[D4]..... 4

<b>Sophomore</b>			
<b>Fall</b>	<b>16 units</b>	<b>Winter</b>	<b>Spring</b>
		<b>16 units</b>	<b>16 units</b>
CPE/EE 229/269..... (CPE/EE 129/169)	4	CSC/CPE 357..... (CSC/CPE 103 and CPE 229/269)	CSC 453..... (CSC/CPE 315, CSC/CPE 357)
STAT 321 [B6]..... (MATH 142)	4	CSC/CPE 315..... (CSC/CPE 103 and CPE 229/269)	BIO 213..... and ENGR /BRAE 213 [B2]
[D1].....	4	PHIL 230/231 [C2]..	CSC 349..... (CSC/CPE 103, MATH 142, STAT 321)
Physical science elective (sequence)...	4	Physical science elective (sequence) ..	4 Physical science elective (sequence) ... 4
<b>Junior</b>			
<b>Fall</b>	<b>16 units</b>	<b>Winter</b>	<b>Spring</b>
		<b>16 units</b>	<b>16 units</b>
CSC/CPE 307 or CSC/CPE 308 (CSC/CPE 357)	4	CSC/CPE 309..... (CSC/CPE 308 or tech elective)	CSC 300..... (CSC/CPE 307 or CSC/CPE 308)
CSC/CPE 430..... (CSC 349 & CSC/CPE 357)	4	CSC 431..... (CSC/CPE 430)	CSC 445..... (CSC/CPE 430)
Math/Stat elec.....	4	Math/Stat elec.....	[D3]..... 4
ENGL 149 [A3].....	4	[C3].....	Approved support elective..... 4
<b>Senior</b>			
<b>Fall</b>	<b>16 units</b>	<b>Winter</b>	<b>Spring</b>
		<b>15 units</b>	<b>15 units</b>
Tech elec <sup>2</sup> .....	4	CSC 491 Sr. Project. 2	CSC 492 Sr. Project. 3
Tech elec <sup>2</sup> .....	4	Tech elec <sup>2</sup> .....	Science elec..... [Add'l Area B]
Tech elec <sup>2</sup> .....	4	[C4] (300-400).....	Approved support elective..... 4
[C1].....	4	Free electives.....	5 Tech elec <sup>2</sup> ..... 4
GWR			USCP

Engineering support, technical elective, and GE courses need not be taken where shown.

<sup>1</sup> ENGL 134 can be taken any quarter in the freshman year.

<sup>2</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
CPE 229, 269 Computer Design and Assembly Language Programming, and Lab .....	3,1
CSC 300 Professional Responsibilities .....	4
CSC 307 Intro to Software Engineering (4) <i>or</i> CSC 308/309* Software Engineering I, II (4)(4) .....	4/8
CSC 315 Computer Architecture .....	4
CSC 349 Design and Analysis of Algorithms .....	4
CSC 357 Systems Programming .....	4
CSC 430 Programming Languages I .....	4
CSC 431 Programming Languages II .....	4
CSC 445 Theory of Computing .....	4
CSC 453 Introduction to Operating Systems .....	4
CSC 491, 492 Senior Project Design Lab I, II .....	2,3
Advisor approved technical electives .....	24/20

\*CSC 309 counts as technical elective.  
Subject to Computer Science Department guidelines; contact the College of Engineering Advising Center ([www.eadvice.calpoly.edu](http://www.eadvice.calpoly.edu)) for additional information and agreement form.  
Technical electives must be approved in advance.

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**SUPPORT COURSES**

BIO 213 <i>and</i> 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>Approved support electives</i> .....	8
(See <a href="http://www.eadvice.calpoly.edu">www.eadvice.calpoly.edu</a> for approved electives)	
<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 (B3/4)* (Add'l Area B)*</i> .....	12
CHEM 124, 125, 129 <i>or</i> PHYS 131, 132, 133	

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**GENERAL EDUCATION (GE)**

72 units required; 32 units are in Support.  
→See page 69 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 a 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..... 5**

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**BS SOFTWARE ENGINEERING**

Recommended Course Sequence (prerequisite courses in parentheses, with *'s for "or concurrent") [GE category in brackets]			
Freshman			
Fall	16 units	Winter	16 units
MATH 141 [B1] .... 4		MATH 142 [B1]..... 4 (MATH 141)	MATH 143 ..... 4 (MATH 142)
CSC/CPE 101..... 4		CSC/CPE 102..... 4 (CSC/CPE 101, MATH 141)	CSC/CPE 103..... 4 (CSC/CPE 102, CSC 141)
ENGL 134 <sup>1</sup> [A1].... 4		CSC 141..... 4 (CSC/CPE 102*, MATH 118 & 119 <i>or</i> <i>equiv.</i> )	PSY 201 or 202 [D4]..... 4
[D1]..... 4		SCOM 101/102 [A2]..... 4	[C3]..... 4
Sophomore			
Fall	16 units	Winter	17 units
CPE 353 ..... 4 (CSC 103)		CSC 453 ..... 4 (CSC/CPE 353)	CSC 349..... 4 (MATH 143)
ENGL 149 [A3] .... 4		IME 314 ..... 3 (MATH 241)	[C2]..... 4
MATH 241 ..... 4 (MATH 143)		MATH 244..... 4 (MATH 143)	STAT 312 [B6]..... 4 (MATH 142)
Take a sequence of either 3 PHYS or 3 CHEM courses:			
PHYS 131 [B3]..... 4 <i>Or</i> CHEM 124 [B3/4]		PHYS 132 [B4]..... 4 <i>Or</i> CHEM 125 [Add'l Area B]	PHYS 133 ..... 4 <i>Or</i> CHEM 129
		Free elective..... 2	

<sup>1</sup> ENGL 134 can be taken any quarter in the freshman year.



Junior			
Fall	16 units	Winter	16 units
Spring	16 units		
CSC/CPE 308 ..... 4 (CSC/CPE 103, CSC/CPE 353)	CSC/CPE 309 ..... 4 (CSC/CPE 308)	CSC/CPE 430 ..... 4 (CSC 349 & CSC/CPE 353)	
CSC/CPE 305 ..... 4 (CSC/CPE 103)	CSC 300 ..... 4 (CSC/CPE 308)	Tech elec <sup>1</sup> ..... 4	
PSY 350 or 351 ..... 4 [D4]	Tech elec <sup>1</sup> ..... 4	IME 430 ..... 4 (STAT 312)	
[C1] ..... 4	[D3] ..... 4	CSC 494 or equiv ..... 4	
Senior			
Fall	16 units	Winter	18 units
Spring	17 units		
CSC/CPE 402 ..... 4 (CSC/CPE 305)	CSC/CPE 405 ..... 4 (CSC/CPE 402)	CSC/CPE 406 ..... 4 (CSC/CPE 405)	
CSC/CPE 484 ..... 4 (CSC/CPE 308)	CSC 491 ..... 2	CSC 492 ..... 3	
Tech elec <sup>1</sup> ..... 4	Tech elec <sup>1</sup> ..... 4	Tech elec <sup>1</sup> ..... 4	
Math elec ..... 4	[C4] (300-400) ..... 4	BIO 213 ..... 4 and ENGR /BRAE 213 [B2]	
GWR	[D2] ..... 4	USCP	
		Free elective ..... 2	

Engineering support, technical elective, and GE courses need not be taken where shown.

## 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 300 Professional Responsibilities .....	4
CSC 305 Individual Software Design & Dev .....	4
CSC 308 Software Engineering I .....	4
CSC 309 Software Engineering II .....	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 430 Programming Languages I .....	4
CSC 453 Intro to Operating Systems .....	4
CSC 484 User-Centered Interface Design & Dev ...	4
CSC 491, 492 Senior Project Design Lab I, II .....	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 or PSY 351 Group Dynamics	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 69 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 a 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 Dev (CSU Area E) * 4 units in Support ...	0

**ELECTIVES**..... **0**

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<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.

## 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 307 Introduction to Software Engineering *or*  
CSC 308 Software Engineering I (4)
- CSC 315 Computer Architecture (4)
- CSC 349 Design and Analysis of Algorithms (4)
- CSC 353 Systems Programming for Software Engineers (4)
- CSC 430 Programming Languages I (4)
- CSC 445 Theory of Computation (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 564 Computer Networks: Research Topics (4)	
CSC 568 Distributed Systems (4)	
CSC 569 Distributed Computing (4)	
CSC 570 Current Topics in Computer Science (2-4)	
<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	Lynne A. Slivovsky
James G. Harris	Cheng Sun
Michael Hawes	Shyama C. Tandon
Xiaomin Jin	Taufik
Martin E. Kaliski	Michael T. Wollman
Albert A. Liddicoat	Xiao-Hua (Helen) Yu
C. Arthur MacCarley	Jane Zhang

## 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 191, 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 89 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 (Prerequisite courses in parentheses; * = or concurrent) [GE Engineering support, technical elective, and GE courses need not be taken where shown.]		
Freshman		
Fall ..... 16 units	Winter ..... 16 units	Spring ..... 16 units
MATH 141 [B1]	MATH 142 [B1] (MATH 141)	MATH 143 [B] (MATH 142)
<sup>1</sup> 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	EE 112	
<sup>2</sup> 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 211/241 (EE 112, PHYS 133, MATH 244*)	EE 212/242 (EE 211/241, MATH 244)	EE 228 (EE 212/242)
PHYS 132 (PHYS 131)	EE 229/269 (EE 129/169)	EE 255/295 (EE 212/242)
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 212/242, 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, EE 229/269)
STAT 350 [B6] (EE 228)	EE 314 (STAT 350)	EE 335 (MATH 241, EE 212/242)
[C3]	[C4]	[D1]

<sup>1</sup> Take prior to EE 211/241.

<sup>2</sup> May be taken any quarter of freshman year.

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 112 Electric Circuit Analysis I	2
EE 129, 169 Digital Design and Lab	3,1
EE 211, 241 Electric Circuit Analysis & Lab II	3,1
EE 212, 242 Electric Circuit Analysis & Lab III	3,1
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 I or EE 463 Senior Project Design Laboratory I	3
EE 462 Senior Project II or EE 464 Senior Project Design Laboratory II	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 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
PHYS 131 General Physics (Add'l Area B)*	4
PHYS 132, 133 General Physics II, III	4,4
PHYS 211 Modern Physics I	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 69 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

40

**ELECTIVES**..... 0

193

**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**

<b>Core Courses</b> .....	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	
<b>Additional Electrical Engineering Graduate Courses</b> .....	12
<i>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</i>	
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)	
<b>Approved Technical Electives (400-500 level)</b> .....	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

Engineering Bldg. (13), Room 266  
(805) 756-2131

College of Engineering Advising Center  
Engineering South (40), Room 115  
(805) 756-1461

### Coordinator, Daniel W. Walsh

#### Associated Faculty:

Robert Crockett                      Yarrow M. Nelson

Lanny Griffin                         Nirupam Pal

#### Adjunct Faculty:

George Becky                         Mark Kroll

Rafael Jimenez-Flores

## 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 field, 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 69.*

### Freshman

<sup>1</sup> 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
<sup>2</sup> 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 II .....	4
	48-49

### Sophomore

CE 204 Mechanics of Materials I .....	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 III .....	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>3</sup> Concentration or individual course of study .....	22
	51

<sup>1</sup> ENGR 270 may be substituted for ENGR 112.

<sup>2</sup> ENGL 134 may be taken any quarter of the freshman year.

<sup>3</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.



**Senior**

ME 341 Fluid Mechanics I.....	3
ENGR 481, 482 Sr. Project Design Lab I, II <i>or</i> Sr. Project-appropriate engineering discipline .....	2,2
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 Mechanics of Materials I.....	3
CSC 234/CSC 101.....	3/4
EE 201 Electric Circuit Theory .....	3
<sup>2</sup> 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 I.....	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
	<u>84-85</u>

**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 Engrg (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
	<u>60</u>

**GENERAL EDUCATION (GE)**

- 72 units required; 32 units are in Support.
- See page 69 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
<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
	<u>40</u>
<b>ELECTIVES.....</b>	<b>9-10</b>
	<u>194</u>

**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
	<u>40</u>

**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
	<u>40</u>

**Individualized Course of Study** ..... 40  
 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.

<sup>2</sup> ENGR 270 may be substituted for ENGR 112.

# Industrial & Manufacturing Engineering

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(805) 756-2341  
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## Department Chair, Donald E. White

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Robert Crockett	Ahmad K. Seifoddini
Tali Freed	Richard A. Strahl
H. Jo Anne Freeman	Daniel J. Waldorf
Roya Javadpour	Tao H. Yang
Jose Macedo	

## 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 191:

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 and hi-tech firms, health care and biomedical industries, aerospace/defense, entertainment, retail chains, farms, airlines, automotive, as well as government, service firms, traditional manufacturing industries, and consulting firms all 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 191:

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 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 in Industrial Engineering or 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 89 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 69.*

**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
CSC 232 Computer Programming for Scientists and Engineers .....	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/> 45

**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 II, III .....	4,4
Political economy elective (D2)* .....	4
Philosophy elective (C2)* .....	4
Literature elective (C1)* .....	4
	<hr/> 56

**Junior**

IME 301 Operations Research I .....	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 Mech Materials I/ME 341 Fluid Mech I.....	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
Advisor approved technical electives .....	8
	<hr/> 46

**Senior**

IME 405, 407 Operations Research II, III .....	4,4
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
Advisor approved technical electives .....	6
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**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 Operations Research I.....	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 405, 407 Operations Research II, III.....	4,4
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
Advisor approved technical electives.....	14
	<b>87</b>

**SUPPORT COURSES**

BIO 213 and ENGR/BRAE 213 (B2)*.....	2,2
CE 204 Mech Materials I/ME 341 Fluid Mech I.....	3
CHEM 124 Gen Chem for Engineering (B3/B4)*.....	4
CSC 232 Computer Programming for Scientists and Engineers.....	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 II, III.....	4,4
STAT 312 Stat. Methods for Engineers (B6)*.....	4
	<b>69</b>

**GENERAL EDUCATION (GE)**

72 units required; 32 units are in Support.

→See page 69 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 addl units reqd)**

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>196</b>

**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 69.*

**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 232 Computer Programming for Scientists and Engineers .....	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
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**Sophomore**

IME 241 Process Design I.....	4
CE 204 Mechanics of Materials I.....	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 II, III .....	4,4
STAT 312 Statistical Methods for Engineers (B6)*	4
Fine and performing arts elective (C3)* .....	4
Political economy elective (D2)* .....	4
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**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
Advisor approved technical electives.....	8
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	52

**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
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	40
	<hr/>
	196

**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
Advisor approved technical electives.....	16
	<b>78</b>

**SUPPORT COURSES**

BIO 213 and ENGR/BRAE 213 (B2)* .....	2,2
CE 204 Mechanics of Materials I .....	3
CHEM 124 Gen Chem for Engineering (B3/B4)* .....	4
CHEM 125 Gen Chem for Engineering .....	4
CSC 232 Computer Programming for Scientists and Engineers .....	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 II, III .....	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 69 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**

**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 16 units
- a comprehensive written examination (non-thesis option) or an oral defense examination (theses option)
- a minimum of 20 units of advisor approved electives

**Curriculum for MS Industrial Engineering**

<b>Core Courses</b> .....	25
IME 507 Graduate Seminar (2)(2)	
Select 3 courses from the following:	
IME 503 Applied Statistical Methods in Engineering (4)	
IME 541 Advanced Operations Research (4)	
IME 545 Advanced Topics in Simulation (4)	
IME 556 Technological Project Management (4)	
IME 580 Manufacturing Systems (4)	
IME 599 Design Project (Thesis) (9) <i>or</i> additional 9 units of advisor approved electives (non-thesis option) and Comprehensive Examination	
<b>Advisor approved electives</b> .....	20
<i>Potential electives include:</i>	
IME 409 Economic Decision Systems (3)	
IME 411 Production Systems Analysis (3)	
IME 417 Supply Chain and Logistics Management (4)	
IME 418 Product-Process Design (4)	
IME 427 Process Optimization through Designed Experiments (4)	
IME 430 Quality Engineering (4)	
IME 431 Supplier Quality Engineering (4)	
IME 500 Individual Study (1-4) <i>(up to a maximum of 6 units)</i>	
IME 503 Applied Statistical Methods in Engineering (4)	
IME 516 Mechatronics Systems Analysis (4)	
IME 520 Advanced Information Systems for Operations (4)	
IME 526 Advanced Topics in Manufacturing System Design (4)	
IME 541 Advanced Operations Research (4)	
IME 542 Reliability Engineering II (4)	
IME 543 Advanced Human Factors (4)	
IME 544 Advanced Topics in Engineering Economy (4)	
IME 545 Advanced Topics in Simulation (4)	
IME 555 Computer-Integrated Manufacturing (4)	
IME 556 Technological Project Management (4)	
IME 558 Executive Seminars (4)	
IME 559 Engineering Research and Development (4)	
IME 560 Quality Engineering (4)	
IME 570 Selected Advanced Topics (1-3)	
IME 577 Engineering Entrepreneurship (4)	
IME 580 Manufacturing Systems (4)	



# Materials Engineering

**Department Office**  
**Air Conditioning Engrg Bldg. (12), Rm 107-H**  
**(805) 756-2568 FAX: (805) 756-2299**  
**www.mate.calpoly.edu**  
**email: matedept@calpoly.edu**

**College of Engineering Advising Center**  
**Engineering South (40), Room 115**  
**(805) 756-1461**

## Department Chair, Linda Vanasupa

Katherine C. Chen	Paul E. Rainey
Lanny Griffin	Richard Savage
Blair London	Daniel W. Walsh
David Niebuhr	

## 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. Some 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 69.

**Freshman**

MATE 110 Introduction to Materials Engineering ..	1
MATE 120 Intro to Materials Engineering Practice	1
CHEM 127 General Chemistry (B3/B4)* .....	4
CHEM 128 General Chemistry .....	4
CSC 101 (or CSC 234 or CSC 231).....	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 II .....	4
<sup>1</sup> Engr Drawing/Manufacturing processes electives ...	4
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**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 Mechanics of Materials I.....	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
PHYS 133 General Physics III.....	4
STAT 312 Statistical Methods for Engineers (B6)*	4
American experience elective (D1)* .....	4
Philosophy elective (C2)* .....	4
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**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
ME 343 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
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**Senior**

Select at least one course from each of 3 areas: .....	17
<i>Analysis:</i> MATE 425/450/510/515/520/525/565	
<i>Materials Processing:</i> MATE 430/435/440/445	
<i>Special Topics:</i> MATE 446/460/504/510/515/ 518/520/525/530/540/545/570/580	
MATE 482, 483, 484 Senior Project I, II, III.....	1,2,2

MATE 482, 483, 484 Senior Project I, II, III .....	1,2,2
MATE 481 Corporate Culture.....	1
BIO 213 and ENGR/BRAE 213 (B2)* .....	2,2
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
Approved electives .....	8
See listing of approved electives on department website, <a href="http://mate.calpoly.edu">http://mate.calpoly.edu</a>	

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194**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 481 Corporate Culture.....	1
MATE 482, 483, 484 Senior Project I, II, III .....	1,2,2
Select at least one course from each area: .....	17
<i>Analysis:</i> MATE 425/450/510/515/520/525/565	
<i>Materials Processing:</i> MATE 430/435/440/445	
<i>Special Topics:</i> MATE 446/460/504/510/515/518/ 520/525/530/540/545/570/580	
Approved electives .....	8
See listing of approved electives on department website, <a href="http://mate.calpoly.edu">http://mate.calpoly.edu</a>	

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76**SUPPORT COURSES**

BIO 213 and ENGR/BRAE 213 (B2)* .....	2,2
CE 204 Mechanics of Materials I.....	3
CHEM 127 General Chemistry (B3/B4)* .....	4
CHEM 128 General Chemistry .....	4
CHEM 305 Physical Chemistry.....	4
CSC 101 (or CSC 234 or CSC 231).....	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 343 Heat Transfer <i>or</i> ME 302 Thermodyn. ....	3
PHYS 131 General Physics (Add'l Area B)* .....	4
PHYS 132, 133 General Physics II, III .....	4,4
<sup>1</sup> Engineering Drawing and Manufacturing elective...	4
STAT 312 Statistical Methods for Engineers (B6)*	4
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**GENERAL EDUCATION (GE)**

72 units required; 32 units are in Support.

→See page 69 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

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**ELECTIVES** ..... 0

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<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

Department Office  
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## Department Chair, James M. Meagher

Charles B. Birdsong	Ronald S. Mullisen
Thomas W. Carpenter	William R. Murray
Andrew I. Davol	Saeed B. Niku
George Delagrammatikas	Franklin C. Owen
Raymond G. Gordon	Christopher C. Pascual
Brian S. Higgins	James Scott Patton
Ngozi Kamalu	John R. Ridgely
Andrew J. Kean	Peter J. Schuster
Stephen M. Klisch	Ramesh T. Shah
James G. LoCascio	Kim A. Shollenberger
Jesse Maddren	Glen E. Thorncroft
Mason Medizade	James M. Widmann
Joseph D. Mello	Yuen Cjen Yong

## 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 and 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. A \$6 million endowment to fund three professorships supports the center.

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. The **HVAC&R Concentration** prepares students for careers in the heating, ventilating, air-conditioning and refrigeration (HVAC&R) industry, with a focus on the design of mechanical systems for commercial and industrial buildings.

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 89 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 69.*

### Freshman

ME 134 Introduction to Mechanical Engineering ...	1
ME 151, 152 Engr Design Communication I, II .....	2,2
ME 153 Introduction to Solid Modeling .....	1
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 II .....	4
IME 141 or IT 327 or IT 341 Mfg Processes .....	1
Literature elective (C1)* .....	4
	51

### Sophomore

ME 211 Engineering Statics .....	3
ME 212 Engineering Dynamics .....	3
ME 234 Philosophy of Design .....	3
ME 236 Thermal Measurements .....	3
CE 204 Mechanics of Materials I .....	3
CE 207 Mechanics of Materials II .....	3
MATE 210, 215 Materials Engineering and Lab ....	3,1
PHYS 133 General Physics III .....	4
CSC 231 Programming 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
Philosophy elective (C2)* .....	4
American experience elective (D1)* .....	4
	52

### Junior

ME 302 Thermodynamics .....	3
ME 318 Mechanical Vibrations.....	4
ME 326 Intermediate Dynamics.....	4
ME 328 Introduction to Design .....	4
ME 329 Intermediate Design.....	4
ME 341, 347 Fluid Mechanics I, II .....	3,4
ME 343 Heat Transfer .....	4
ME 303, 346 Thermal Engrg/Thermal Science Lab	3,1
EE 201, 251 Electric Circuit Theory and Lab .....	3,1
EE 321, 361 Electronics and Lab .....	3,1
Fine and performing arts elective (C3)* .....	4
Political economy elective (D2)* .....	4
	50

**Senior**

ME 422 Mechanical Control Systems.....	4
ME 440 Thermal System Design.....	4
ME 481 Senior Project Laboratory I.....	2
ME 463 Undergraduate Seminar.....	1
BIO 213 Life Science for Engineers <i>and</i> ENGR/ BRAE 213 Bioengineering Fundamentals (B2)*	2,2
Literature, philosophy, arts (300-400 level) (C4)*.....	4
Comparative social institutions elective (D3)*.....	4
Self development elective (CSU Area E) (D4)*.....	4
Concentration (see below).....	19/20
	<u>46/47</u>
	<b>199</b>

**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 153 Introduction to Solid Modeling.....	1
ME 134 Introduction to Mechanical Engineering ...	1
ME 211 Engineering Statics.....	3
ME 212 Engineering Dynamics.....	3
ME 234 Philosophy of Design.....	3
ME 236 Thermal Measurements.....	3
ME 302 Thermodynamics.....	3
ME 303 Thermal Engineering.....	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 I.....	3
ME 343 Heat Transfer.....	4
ME 346 Thermal Science Laboratory.....	1
ME 347 Fluid Mechanics II.....	4
ME 422 Mechanical Control Systems.....	4
ME 440 Thermal System Design.....	4
ME 481 Senior Project Laboratory I.....	2
ME 463 Undergraduate Seminar.....	1
Concentration (see below).....	19/20
	<u>82/83</u>

**SUPPORT COURSES**

BIO 213 Life Science for Engineers <i>and</i> ENGR/ BRAE 213 Bioengineering Fundamentals (B2)*	4
CE 204 Mechanics of Materials I.....	3
CE 207 Mechanics of Materials II.....	3
CHEM 124 Gen Chem for Engineering I (B3/B4)*	4
CHEM 125 Gen Chem for Engineering II.....	4
CSC 231 Programming 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

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 II, III.....	4,4
Manufacturing Processes elective.....	1
(IME 141 or IT 327 or IT 341)	

**77-78****GENERAL EDUCATION (GE)**

72 units required; 32 units are in Support.  
 →See page 69 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**  
**199**

**CONCENTRATIONS (select one)****General Concentration**

ME 428 Senior Design.....	3
EE 255 Energy Conversion Electromagnetics .....	3
EE 295 Energy Conversion Electromag Lab .....	1
Technical electives selected from emphasis area.....	12
	<u>19</u>

**Heating, Ventilating, Air-Conditioning and Refrigerating Concentration (HVAC&R)**

ME 359 Fundamentals of HVAC Systems.....	4
ME 456 HVAC Air and Water Distribution System Design.....	4
ME 457 Refrigeration Principles and Design.....	4
ME 458 Building Heating and Cooling Loads.....	4
ME 459 HVAC System Design.....	3
	<u>19</u>

**Mechatronics Concentration**

ME 305 Introduction to Mechatronics.....	4
ME 405 Mechatronics .....	4
ME 406 Mechatronics Design .....	4
ME 423 Robotics: Fundamentals and Applications	4
<sup>1</sup> CPE 336/IME 157/IME 356/ME 506 .....	4
	<u>20</u>

**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 interests 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 Programs of this catalog.

**MS MECHANICAL ENGINEERING****Core Courses**

ME 599 Design Project (Thesis) (2)(2)(5) or 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 501 Continuum Mechanics and Linear Elasticity (4)	
ME 502 Finite Element Analysis (4)	
ME 503 Inelastic Stress Analysis (4)	
ME 506 System Dynamics (4)	
ME 507 Mechanical Control System Design (4)	
ME 517 Advanced Vibrations (4)	
ME 518 Machinery Vibration and Rotor Dynamics (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)	

<b>Approved technical electives</b> .....	16
(400 or 500-level ME or non-ME courses; maximum of 12 units of 400-level courses allowed)	

45<sup>1</sup> Elective based on interests of students.



### **Osiyo**

*Osiyo* (Cherokee for “hello”) is an annual publication of student papers from various Ethnic Studies classes taught each year. The papers are a mixture of research projects and personal reflections indicative of the level of work and insight encouraged in the Ethnic Studies minor courses.

*Image courtesy of the College of Liberal Arts*

College of

*Liberal Arts*

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# College of *Liberal Arts*

Linda H. Halisky, (Interim) Dean  
Susan Currier, Associate Dean  
Debra Valencia-Laver, Associate Dean

Faculty Office Bldg. (47), Room 31  
805 756-2359

## ACADEMIC PROGRAMS

Agricultural Communication.....	<i>Minor</i>
Anthropology & Geography.....	<i>Minor</i>
Art and Design .....	<i>BS</i>
Art .....	<i>Minor</i>
Child Development .....	<i>BS, Minor</i>
Communication Studies .....	<i>BA, Minor</i>
Dance .....	<i>Minor</i>
English .....	<i>BA, MA, Minor</i>
Ethnic Studies .....	<i>Minor</i>
French .....	<i>Minor</i>
German.....	<i>Minor</i>
Gerontology .....	<i>Minor</i>
Graphic Communication .....	<i>BS, Minor</i>
History.....	<i>BA, Minor</i>
International Relations .....	<i>Minor</i>
Journalism .....	<i>BS</i>
Liberal Studies .....	<i>BA, BS</i>
Linguistics.....	<i>Minor</i>
Law and Society.....	<i>Minor</i>
Modern Languages & Literatures...	<i>BA</i>
Music.....	<i>BA, Minor</i>
Philosophy.....	<i>BA, Minor</i>
Political Science.....	<i>BA</i>
Psychology .....	<i>BS, MS, Minor</i>
Religious Studies.....	<i>Minor</i>
Social Sciences.....	<i>BS</i>
Sociology .....	<i>Minor</i>
Spanish.....	<i>Minor</i>
Theatre Arts.....	<i>BA, Minor</i>
Values, Technology and Society....	<i>Minor</i>
Western Intellectual Tradition.....	<i>Minor</i>
Women's Studies .....	<i>Minor</i>

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 96 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	Kathryn McCormick
Robert Howell	Michael Barton Miller
Charles W. Jennings	Jean Wetzel

## ACADEMIC PROGRAMS

### BFA Art and Design

#### Art Minor

The Bachelor of Fine Arts degree program in Art and Design offers a major with concentrations in graphic design, photography and digital imagery, and studio art. The BFA 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, digital image making, and

photographic history. Creative problem solving is stressed within the context of a variety of expressive projects, including studio and location lighting, traditional photographic processes, 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.

**BFA 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).....	55
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	<b>118</b>

**GENERAL EDUCATION (GE)**

- 72 units required; 4 units are in Major.  
 →See page 69 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)**

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**68****ELECTIVES**..... **0**

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**186****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 24 units from: any Art courses not already required in the major core, GRC 101, 337 .....	24
	<hr/>
	<b>55</b>

**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 18 units from: Any ART course not already required in the major core, GRC 101, 202, TH 330 .....	18
	<hr/>
	<b>55</b>

**Studio Art Concentration**

ART 133 Color and Design.....	3
ART 209 Beginning Painting.....	3
ART 241 Glass Fusing and Forming.....	3
ART 245 Ceramics.....	3
ART 255 Jewelry Design.....	3
ART 301 Advanced Drawing.....	3
ART 302 Life Drawing.....	3
ART 309 Intermediate Painting.....	3
ART 348 Intermediate Sculpture.....	3
ART 353 Intermedia/Art.....	4
<i>Select 24 units from: Any ART course not already required in the major core (See course descriptions for repeatable units).....</i>	<i>24</i>
	<hr/> 55

**ART MINOR**

The Art and Design Department offers a minor consisting of a required core and advisor approved electives. The electives include courses in 2D, 3D studio, and art history. Students, working with an advisor, select their area(s) of interest. Advisors are: Clarissa Hewitt, George Jercich, Michael Barton Miller 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.....	4

**ART advisor approved electives**

<i>Complete a minimum of 3 units from: .....</i>	<i>3</i>
ART 201 Intermediate Drawing (3)	
ART 203 Art Theory and Practice (3)	
ART 209 Beginning Painting (3)	
ART 211 Art History – Ancient to Renaissance (4)	
ART 212 Art History – Renaissance through Baroque (4)	
ART 241 Glass Fusing and Forming (3)	
ART 245 Ceramics I (3)	
ART 255 Jewelry Design (3)	
<i>Complete a minimum of 10 units from: .....</i>	<i>10</i>
<i>(see course descriptions for repeatable units)</i>	
ART 301 Advanced Drawing (3)	
ART 302 Life Drawing I (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 341 Introduction to Glassblowing (4)	
ART 345 Ceramics II (3)	
ART 348 Intermediate Sculpture (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 406 Advanced Selected Topics in Painting (3)	
ART 409 Advanced Painting (3)	
ART 440 Advanced Selected Topics in Glass (4)	
ART 448 Advanced Topics in Sculpture (3)	

# Communication Studies

Department Office  
Faculty Office Bldg. (47), Room 33  
805 756-2553

## Department Chair, James R. Conway

Jessica R. Abrams	Lorraine D. Jackson
Marilyn E. DeLaure	Steven T. McDermott
Bernard K. Duffy	Terrence C. Winebrenner
Michael L. Fahs	Raymond F. Zeuschner

## ACADEMIC PROGRAMS

### BA Communication Studies Communication Studies 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 communication studies, always one that required a knowledge of many cognate fields like psychology and logic, is still interdisciplinary in nature. Faculty in communication studies 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 communication studies 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 communication studies 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

## COMMUNICATION STUDIES MINOR

A 28-unit minor is available for students who desire documented competency in Communication Studies. 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 Communication Studies 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 Contemporary Rhetoric .....	4
<b>Electives</b> .....	12
12 units of Communication Studies of which at least 8 units must be 300–400 level.	
	28

**BA COMMUNICATION STUDIES**

- ☐ 60 units upper division      ☐ GWR  
 ☐ 2.0 GPA                      ☐ USCP

\* = Satisfies General Education requirement

**MAJOR COURSES**

Take one of the following courses: .....	4
SCOM 201 Advanced Public Speaking	
SCOM 208 Performance of Literature	
SCOM 226 Applied Argumentation	
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 Contemporary Rhetoric <i>or</i>	
SCOM 435 American Political Rhetoric .....	4
SCOM 332 Rhetorical Criticism .....	4
SCOM 350 Advanced Forensic Activity.....	2
SCOM 385 Media Criticism <i>or</i> SCOM 419 Media	
Effects.....	4
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</i>	
<i>SCOM 400, SCOM 450, and SCOM 485, may be</i>	
<i>counted here.</i>	

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68**SUPPORT COURSES**

Upper division writing intensive class .....	4
Choose from the following:	
ENGL 302, 310, 386, or JOUR 407	
Foreign language (121 or 122) or demonstration of	
comparable level of proficiency .....	4
HIST 110 Western Civilization: Ancient to	
Renaissance .....	4
HIST 111 Western Civilization: Reformation to	
Twentieth Century .....	5
PSY 201 <i>or</i> PSY 202 General Psychology (D4)* ....	4
STAT 217 Intro to Statistical Concepts and	
Methods (B1)* .....	4

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25**GENERAL EDUCATION (GE)**

72 units required; 8 units are in Support.

→See page 69 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
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

**Area F Technology Elective (upper division)**

(4 units) .....	4
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<b>ELECTIVES</b> .....	<b>23</b>
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180

# English

**Department Office**  
**Faculty Office Bldg. (47), Room 32-E**  
**805 756-2596**

## Department Chair, David J. Kann

Mary A. Armstrong	Carol MacCurdy
Alex Bain	Steven R. Marx
John Battenburg	Matthew S. Novak
Kevin Clark	Michael P. Orth
Susan Currier	Jeannine Richison
William Fitzhenry	Johanna E. Rubba
David Gillette	Kathryn Rummell
Linda H. Halisky	Debora Schwartz
John C. Hampsey	Richard K. Simon
John F. Harrington	Evelyn M. Torres
Brenda Helmbrecht	Patricia Troxel
Robert L. Inchausti	Robert Webber
Douglas Keesey	Michael J. Wenzl
Nancy Lucas	

## 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 College of 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 College of 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 300-level electives .....	8
ENGL 400-level electives (minimum 12 units in literature).....	20

Students may select a creative writing emphasis with their 28 upper division ENGL units:

### Fiction Writing Emphasis:

- ENGL 387 Fiction Writing (4)
- ENGL 487 Adv. Creative Writing: Fiction (4) (4)
- One 400-level modern or contemporary ENGL literature course in fiction (4)
- ENGL 300-level elective (4)
- ENGL 400-level literature electives (8)
- Senior project in a work or works of fiction

### Poetry Writing Emphasis:

- ENGL 388 Poetry Writing (4)
- ENGL 488 Adv. Creative Writing: Poetry (4) (4)
- One 400-level modern or contemporary ENGL literature course in poetry (4)
- ENGL 300-level elective (4)
- ENGL 400-level literature electives (8)
- Senior project in a work or works of poetry

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## SUPPORT COURSES

Foreign language (121 or 122) or demonstration of a comparable level of proficiency .....	4
	4

**GENERAL EDUCATION (GE)**

72 units required; 4 units are in Major.  
 →See page 69 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 (not ENGL) ..... 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

**ELECTIVES** ..... 47

(minimum 7 units must be 300-400 level)

**180**

**Recommended Sequence for Major Courses**

Freshman Year		
Fall	Winter	Spring
ENGL 134	SCOM 101/102	ENGL 145
		ENGL 251
Sophomore Year		
Fall	Winter	Spring
ENGL 203	ENGL 204	ENGL 205
	ENGL 290	
Junior Year		
Fall	Winter	Spring
ENGL 303	ENGL 304	ENGL 305
ENGL 300-level elective	ENGL 300-level elective	ENGL 400-level elective
Senior Year		
Fall	Winter	Spring
ENGL 400-level elective	ENGL 400-level elective	ENGL 400-level elective
ENGL 400-level elective		Senior Project

**ENGLISH MINOR**

**Required Courses**

- |  | Units |
|--|-------|
| ENGL 253 Great Books III.....  | 4     |
| ENGL 302 Writing: Advanced Composition <i>or</i><br>ENGL 326 Literary Criticism .....                    | 4     |
| ENGL 339 Introduction to Shakespeare .....   | 4     |
| ENGL 390 Linguistic Structure of Modern English<br><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, 346, 347 (C4)*  |       |
| <i>Select one of the following courses</i> .....   | 4     |
| ENGL 350, 351, 352 The Modern Novel, Poetry<br><i>or</i> Drama (C4)*                                     |       |

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**LINGUISTICS MINOR**

**Required Courses.**

- |  | Units |
|--|-------|
| ENGL 290 Introduction to Linguistics .....                 | 4     |
| ENGL 391 Topics in Applied Linguistics .....               | 4     |
| ENGL 495 Topics in Applied Language Study .....            | 4     |
| <b>Advisor Approved Electives.</b> May include: .....      | 16    |
| ENGL 390 Linguistic Structure of Modern<br>English (4)     |       |
| ENGL 392 English Grammar for Writers and<br>Teachers (4)   |       |
| ENGL 395 History of the English Language (4)               |       |
| ENGL 497 Theories of Language Learning and<br>Teaching (4) |       |
| SCOM 416 Intercultural Communication (4)<br>(USCP)         |       |

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**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, 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.



**Technical Communication.** Commercial, academic and governmental organizations employ technical communicators as writers, editors, public relations experts, information designers, documentation and project managers, and as mixed media creators. The technical communicator is, first and foremost, an accomplished writer who produces clear, precise, timely, and effective prose. However, technical communicators also are adept at integrating texts and images into cohesive creations that exist equally well on paper and on the computer screen. Technical communicators write online and print computer documentation, create and manage complex sets of technical specifications, write overviews of scientific and technical processes, and produce a diverse range of documents that are used both by the expert and by the layperson. Technical communicators often serve as translators, interpreting the continually changing language of advanced technology into a language we can all easily understand.

The technical communication program is designed for women and men who desire careers in writing, editing, information design, publications management, and media development. The certificate program is available to Cal Poly students who are enrolled in an undergraduate or graduate degree program and is also available through Open University, offered by Cal Poly Continuing Education. This program requires the completion of approximately 30 units of work – roughly the same number of credits required for most minors. A current course list and more information about our program are available in the English Department office and at the Technical Communications Program website: <http://www.cla.calpoly.edu/techcomm>.

## MASTER OF ARTS DEGREE IN ENGLISH

### General Characteristics

This program includes the study of literary criticism, linguistics, 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 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

Students admitted to the English MA Program must have a major or minor 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). Students without an English major or minor may apply and be admitted conditionally, requiring them to take certain prerequisites prior to taking English graduate classes.

### Program of Study

- 48 units of graduate work approved by the English Graduate Coordinator 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.

All other requirements must be satisfied before the comprehensive examination is taken. Students will elect an emphasis within the Master of Arts program: literature, linguistics, or composition.

### Application

Application 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

	<i>Units</i>
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

**English Electives** ..... 12

Additional ENGL 400-and 500-level courses, to be selected from one of three emphasis areas: literature, composition or linguistics.

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# Ethnic Studies

**Department Office**  
**Math and Science Bldg. (38), Room 136**  
**805 756-1707**

**Chair, Robert Ji-Song Ku**

Charise Cheney  
 Colleen O'Neill

Victor Valle  
 Maliha Zulfacar

**ACADEMIC PROGRAMS**  
**Ethnic Studies Minor**

The Ethnic Studies Department uses inter- and multi-disciplinary approaches to study the lives of Indigenous, African, Latino/a, and Asian peoples in the United States within a global and postcolonial context. The Ethnic Studies curriculum provides students with unique forms of critical inquiry that advance their analysis of race, ethnicity, and cultural difference in an increasingly heterogeneous and complex world. Courses in Ethnic Studies examine how social hierarchies frame access to political power, allocate economic resources, and influence cultural expression. By critically exploring such issues, students develop not only a greater understanding of the legacy of racism, discrimination, and injustices in the United States, but also a greater appreciation for new and emerging knowledge about diverse American peoples and their global and transnational connections.

Housed in the College of Liberal Arts, the Ethnic Studies Department at Cal Poly encourages critical dialogue about race, ethnicity, postcoloniality, and transnationalism across the entire university curriculum, with special focus on concepts that integrate the arts, humanities, and social sciences, as well as the sciences and technology. The department offers a number of courses that fulfill both general education and United States Cultural Pluralism requirements. A minor in Ethnic Studies is open to all majors and provides a useful complement to the differing types of inquiry used in the wide variety of disciplines throughout the University.

**ETHNIC STUDIES MINOR**

An Ethnic Studies minor provides students with special competence in the histories and experiences of diverse communities and the critical skills with which to understand complex social issues. Students majoring in subjects across the university curriculum will find Ethnic Studies useful, particularly when their interests require a deeper understanding of race, ethnicity, and diversity in the United States and beyond. The minor prepares students for careers in education, government, and community organizations; for entrance to professional schools in areas such as law, social work, and health; and for graduate studies in all areas of the arts and sciences.

	<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> .....	12
Electives will reinforce and enhance student understanding of issues of culture, race, and gender. A minimum of 8 units must be 300-400 level.	
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# Graphic Communication

**Department Office**  
**Graphic Arts Bldg. (26), Room 207**  
**805 756-1108, FAX 805 756-7118**

## Department Head, Harvey Robert Levenson

Michael L. Blum	Kenneth L. Macro
Kevin Cooper	Penny K. Osmond
Lorraine D. Donegan	Philip K. Ruggles
Henry J. Heesch	
Malcolm G. Keif	

## 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, electronic imaging, publishing, document systems, 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 and imaging 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 BS in Graphic Communication is accredited by the Accreditation Council for Collegiate Graphic Communications, Inc. (ACCGC). ACCGC is an independent body dedicated to the improvement and recognition of collegiate level curricula 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.

**Graphics for Packaging.** Emphasis on digital file creation, technology and printing. This concentration is designed for students who desire a career in the growing field of package graphics and printing. This program provides students with the opportunity to learn all components of package graphics and print reproduction while also providing aspects of structural design and food packaging. Consumer and industrial print packaging is addressed.

**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.

## MBA, Graphic Communication Document Systems Management Specialization

In cooperation with the Orfalea College of Business, a student can earn an MBA with a graphic communication emphasis in document systems management. This program is designed to prepare professionals having diverse

backgrounds with a strong and advanced business orientation along with a grounding in graphic communication.

**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 316 Flexographic Printing Technology.....	3
GRC 320 Implementing Quality Systems in the Graphic Arts .....	4
GRC 324 Binding, Finishing and Distribution Processes.....	3
GRC 328 Sheetfed Printing and Platemaking .....	4
GRC 329 Press Methods and Procedures for Web Offset and Gravure .....	3
GRC 338 Digital Content Management and Variable Data Printing .....	4
GRC 361 Mktg/Sales for Print/Digital Media.....	4
GRC 402 Digital Printing and Emerging Technologies in Graphic Communication .....	3
GRC 403 Estimating for Print/Digital Media.....	4
GRC 411 Pricing, Costing & Web Print 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
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**SUPPORT COURSES**

PSC 101/PHYS 104/PHYS 121 (B3)* .....	4
CHEM 110 World of Chemistry <i>or</i> CHEM 111 Survey of Chemistry (B3&B4)*.....	4/5
<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

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**GENERAL EDUCATION (GE)**

- 72 units required; 16 units are in Support.
- See page 69 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)**

56  
5-6  
180

**ELECTIVES.....**

**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 Tech...	4
<sup>2</sup> Select 6 units from the following.....	6
GRC 322 Advanced Digital Typography (3)	
GRC 429 Digital Media (3)	
ENGL 411 New Media Arts I (4)	
ENGL 412 New Media Arts II (4)	

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<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 B1.

<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 New Media Arts I .....	4
GRC 331 Color Management & Quality Analysis ...	4
GRC 339 Digital Design and Production for Multiple Media .....	3
GRC 429 Digital Media .....	3
Advisor approved electives .....	4
	<hr/>
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**Graphics for Packaging Concentration**

GRC 331 Color Management & Quality Analysis ...	4
GRC 337 Consumer Packaging.....	3
GRC 357 Specialty Printing Technologies.....	3
IT 330 Fundamentals of Packaging.....	4
FSN 230 Elements of Food Processing .....	4
FSN 354 Packaging Function in Food Processing ...	3
Advisor approved electives .....	8
	<hr/>
	29

**Printing and Imaging Management Concentration**

BUS 207 Legal Responsibilities of Business .....	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 Management and Quality Analysis (4)	
IT 381 Industrial Management (4)	
BUS 382 Organizations, People and Technology (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

**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.

**Core Courses**

	<i>Units</i>
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 325 Binding and Finishing Processes: Theory	2
GRC 328 Sheetfed Printing and Platemaking.....	4
GRC 377 Web and Print Publishing (Area F) .....	4

**Approved Electives** .....

	3
<i>(Approved by minor coordinator)</i>	
<i>Select 3 units from the following:</i>	
GRC 337 Consumer Packaging (3)	
GRC 357 Specialty Printing Technologies (3)	
GRC 361 Marketing and Sales for Print and Digital Media (4)	
GRC 470 Selected Advanced Topics (3)	
GRC 472 Applied Graphic Communication Practices (2) (repeatable)	
	<hr/>
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<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	Daniel E. Krieger
George Cotkin	Heather J. McCarty
Manzar Foroohar	Andrew D. Morris
Craig Harlan	Max E. Riedlsperger
Paul Hiltpold	John Snetsinger
Lynn M. Hudson	Tom R. Trice

**ACADEMIC PROGRAMS**

**BA, MA History (MA pending approval)**  
**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.

A degree 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	<u>30</u>

**BA HISTORY**

- 60 units upper division  GWR
- 2.0 GPA  USCP
- \* = Satisfies General Education requirement

**MAJOR COURSES**

HIST 110 Western Civ: Ancient to Renaissance.....	4
HIST 111 W. Civ: Reformation to 20th Century.....	5
HIST 206 American Cultures <i>or</i> HIST 207 Freedom and Equality in American History (D1)* (USCP)	4
HIST 213 Mod Political Econ <i>or</i> HIST 214 Political Econ of Latin America & Middle East (D2)* .....	4
HIST 215 Comparative World History (D3)* .....	4
HIST 303 Research and Writing Seminar in History	5
HIST 304 Historiography .....	4
HIST 460 Senior Project I .....	2
HIST 461 Senior Project II .....	2
History electives (any 300-400 level HIST courses)	12
Non-U.S./European HIST electives (300-400 level)	12
Select 12 units from the following list:	
HIST 308, 309, 310, 314, 316, 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**

<sup>1</sup> Electives (300-400, including History) .....	24
	<u>24</u>

**GENERAL EDUCATION (GE)**

- 72 units required; 12 units are in Major.
- See page 69 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

<sup>1</sup> If upper-division GE courses are used to satisfy Major or Support requirements, additional units may be required to complete the 180 total unit requirement.

<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 (8 units)</b>	
D1 The American Experience (40404) * 4 in Major	0
D2 Political Economy * 4 in Major.....	0
D3 Comparative Social Institutions * 4 in Major.....	0
D4 Self Development (CSU Area E) .....	4
D5 Upper-division elective (Not HIST courses) .....	4
<b>Area F Technology Elective (upper division) (4 units)</b>	4
<b>ELECTIVES</b> .....	<b>34</b>

<sup>1</sup> Upper division GE courses taken for a letter grade will satisfy support course requirements which would cause electives to become 46 rather than 34 units. Consult college advisor for additional information.

60

180

## MASTER OF ARTS DEGREE IN HISTORY (pending final approval)

### General Characteristics

The program in history emphasizes concentrated study in area specialties, with students gaining a thorough grounding in the latest historiography. In addition, the program maintains that historical study must be predicated upon sustained research, engagement with historical problems, and written communication. Completion of the MA program in history will allow students the following options:

- Teach history at the elementary, secondary, or community college level.
- Give students the critical skills and knowledge to enter into the worldwide information economy.
- Allow community members to expand their historical knowledge.
- Prepare students for transfer to Ph.D. programs at other universities.

### Prerequisites

Admission to the MA program will require:

1. Possession of an undergraduate degree from an accredited college or university.
2. An overall grade point average of 3.0 for the last 90 units of their undergraduate work.
3. Submission of a writing sample, in the form of a senior project or upper division paper.
4. Related undergraduate coursework. Students without an undergraduate degree in history will be required to demonstrate adequate preparation for graduate study in history, as determined by the Graduate Coordinator.

### Program of Study

- 48 units of graduate work in areas specified (49 units for those students writing a MA Thesis).
- a grade point average of at least 3.0 after 12 units of graduate coursework.
- MA Thesis or Comprehensive Examinations in two distinct areas of study.

### Foreign Language Study

Students are encouraged to learn and use foreign languages in the MA program. Students who plan further graduate study in history are particularly encouraged in this direction since proficiency in two foreign languages is usually required in doctoral programs.

### Applications

Applications for admission and requests for further information should be directed to the Admissions Office or the Graduate Coordinator of the MA History program. All applications should include a writing sample (preferably an extended research paper), undergraduate transcripts, and two letters of recommendation.

### MA HISTORY

There are two options for the MA degree in History, Comprehensive Exam or Thesis.

	<i>Units</i>
HIST 504 Graduate Study in History .....	4
History Seminars .....	20
<i>Select 5 courses from the following. Each is repeatable up to 12 units.</i>	
HIST 505 Seminar in U.S. History (4-12)	
HIST 506 Sem. in Modern European History (4-12)	
HIST 507 Sem. in East Asian History (4-12)	
HIST 508 Sem. in Latin American History (4-12)	
HIST 509 Seminar in African History (4-12)	
400-500 level HIST electives .....	16
<i>400-level courses will include extra work for graduate students. (All courses must be taken after student has been awarded an undergraduate degree and may not repeat undergraduate courses or their equivalent.)</i>	
<b>Comprehensive Exam Option (total 48 units)</b>	
HIST 512 Supervised Reading for Comprehensive Exams (2) (2).....	4
4 additional units of 400-500 HIST electives .....	4
<b>Thesis Option (total 49 units)</b>	
HIST 599 Thesis (3) (3) (3).....	9
	48/49

<sup>1</sup> If upper-division GE courses are used to satisfy Major or Support requirements, additional units may be required to complete the 180 total unit requirement.

# 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.

<b>Required Courses</b>	<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
<b>Elective Courses:</b> .....	<b>12</b>
Select 12 units, at least one from each category	
<i>Technology:</i>	
AERO 310 Air and Space (4) (F)	
BRAE 348 Energy for a Sustainable Society (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)	
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)	
<i>Society:</i>	
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)	
<i>Philosophy and Values:</i>	
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, George Ramos

Teresa Allen                      Randall L. Murray  
 Nishan R. Havandjian        John Soares  
 Patrick Munroe

## 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 sequence of courses selected from an identified track and a list of restricted electives from which they must choose in consultation with an academic advisor.

Of the 180 units required for a bachelor's degree, 120 quarter units must be taken in courses outside the major area of journalism/mass communication/communication. Each student is strongly encouraged to take a foreign language to satisfy his or her elective units. For media-related courses offered outside the major, students are required to consult with their academic advisor before enrolling in these classes.

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, in addition to applying acquired skills and developing professional abilities in an approved media internship. The department sponsors student chapters of the Society of Professional Journalists, Radio-Television News Directors Association, and the Public Relations Student Society of America.

### BS JOURNALISM

- 60 units upper division             GWR  
 2.0 GPA                                     USCP

\* = Satisfies General Education requirement

### MAJOR COURSES

JOUR 203 Writing for the Media.....	4
JOUR 219 Mass Media in a Multicultural Society...	4
JOUR 302 Mass Media Law .....	4
JOUR 390 Visual Communication for Mass Media.	4
JOUR 401 Global Communication .....	4
JOUR 402 Journalism Ethics .....	4
JOUR 444 Media Internship.....	3
JOUR 460 Senior Project .....	3
Follow one of the following tracks .....	18
<i>Broadcast Track (18)</i>	
JOUR 333, 346, 348, 351 or 353	

### News Editorial Track (18)

JOUR 233, 304, 352, 407

### Public Relations Track (18)

JOUR 312, 333 or 304, 342, 413, 415

Journalism Dept. electives. 8 units must be 300-400 level. To be selected from:

JOUR 201, 205, 331, 385, 410, 470.....	12
	<b>60</b>

### SUPPORT COURSES

Students are strongly encouraged to take foreign language courses as part of their non-journalism electives. These can be in any acceptable language discipline. No journalism or mass communication..... 24

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 chair.

**48**

### GENERAL EDUCATION (GE)

72 units required.

→See page 69 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)

	72
<b>ELECTIVES.....</b>	<b>0</b>

**180**

# *Liberal Studies,* *an Interdisciplinary Program*

**Department Office**  
**Science North (Bldg. 53), Room 211**  
**805 756-2935 Fax: 805-756-2967**  
**Advisor: 805-756-7452**  
<http://cla.calpoly.edu/lis>

## **Department Chair, Susan Duffy**

Kathleen D. Friend

### **ACADEMIC PROGRAMS** **BA, BS Liberal Studies**

**Liberal Studies** is a pre-professional Subject Matter Teacher Preparation Program leading to enrollment in a Multiple Subject Credential Program. The mission of Liberal Studies is to ensure that students graduate with a strong liberal arts background and the necessary experience and content to prepare them for a teaching career. Successful completion of the major fulfills requirements for Elementary Teacher Subject Matter Preparation designated by the California Commission on Teacher Credentialing. This major is designed for individuals who plan on pursuing a Multi-Subject teaching credential (K-8). The Liberal Studies major is specifically designed to provide an exciting and rigorously challenging interdisciplinary course of study that integrates coursework in disciplines in eight subject matter areas: language arts, mathematics, science, history/social sciences, visual and performing arts, health, physical education, and human development. The Liberal Studies major provides the educational experience best suited for the prospective elementary teacher.

### **BA Liberal Studies with Elementary Education Concentration**

The Bachelor of Arts degree offers a broad-based interdisciplinary course of studies that upon successful completion will allow students to apply for admission to one of the accredited credential programs offered by institutions of higher education in California. Students must complete an Area of Emphasis (16 units) that provides a depth of study in a disciplinary area useful to their teaching careers. Students may opt to apply to the credential program at Cal Poly, to programs at other UC or CSU campuses or other institutions offering credentials. The credential is completed as part of a post-baccalaureate program.

**Note:** *All entering freshmen begin their Liberal Studies course of study in the BA program. They change their degree objective to BS in their junior year if they decide to pursue the "Blended" program.*

### **Blended BS Liberal Studies/Multiple Subject Credential or Special Education Credential Program**

This course of study allows students to "blend" into a multiple-subject credential program in the College of Education in their junior year. Students begin to take their educational methods classes as part of the requirements for this degree; complete their first student teaching experience, and then upon completion of the undergraduate degree requirements, may complete their credential and second student teaching experience in the College of Education. The difference between this course of study and the BA is that students in the "blended" program are simultaneously completing their undergraduate degree and moving towards completion of their multi-subject teaching credential through the College of Education. Upon completion they have both a bachelor of science degree and a teaching credential

### **Emphasis Areas**

Liberal Studies students choose emphasis areas in art, art education, child development, language arts, life science, mathematics, music, performing arts, kinesiology, special education, physical science, social science or Spanish, or 16 advisor approved electives that constitute an individually-constructed depth of study. Students may obtain current emphasis area guidelines from the Liberal Studies Department office.

**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
<sup>1</sup> LS 230 Field Experience I.....	2
LS 250 Field Experience II .....	2
LS 270 Intro to Visual and Performing Arts Standards in the Elementary Classroom .....	4
LS 310 Storytelling: The Oral Tradition .....	4
LS 311 Visual Arts in the Elementary Classroom....	4
LS 461 Senior Project Seminar .....	4
BIO 113 Animal Diversity & Ecology (B2&B4; transfer or any GE B2 life science course)* .....	4
BIO 114 Plant Diversity & Ecology (B2&B4; transfer or any GE B2 life science course)* .....	4
BIO 115 Animal/Human Structure & Function (Transfer or any anatomy course).....	4
CD/EDUC 207 Intro. to Learner's Development, Culture, Language and Identity .....	5
ENGL 391 Topics in Applied Linguistics.....	4
KINE 310 Concepts in Elementary Physical Ed. ....	2
MATH 118 Pre-Calculus Algebra (B1)*.....	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
STAT 130 Introduction to Statistical Reasoning <i>or</i> STAT 217 Introduction to Statistical Concepts and Methods (B1)* .....	4
PSC 101 The Physical Environment: Matter and Energy (B3&B4; transfer of any GE B3 PHYS course)* .....	4
PSC 102 Physical Environ: Atoms & Molecules (Transfer any chemistry course).....	4
PSC 103 Physical Environ: Earth & Universe (Transfer or any GEOL or ASTR course) .....	4
PSY 201/202 General Psychology (D4)* .....	4
Select 16 units (four courses) from one of the following approved emphasis areas. 8 units must be 300-400 level.....	16
<i>Art, Art Education, Child Development, Language Arts, Life Science, Mathematics, Music, Performing Arts, Kinesiology, Special Education, Physical Science, Social Science, Spanish</i>	

**SUPPORT COURSES**

EDUC 310 Effective Teaching and Classroom Mgt with Multicultural Perspective in K-3/4-8 Setting	4
EDUC 440 Educating Individuals with Exceptional Needs .....	4
EDUC 480 Computer Based Curriculum .....	3
ENGL 360 Literature for Adolescents.....	4
KINE 250 Healthy Living (D4).....	4
LS 312 Adv. Visual Arts in the Elem. Classroom ...	4
PSY 456/PSY 458/PSY 460 .....	4
	<b>27</b>

**GENERAL EDUCATION (GE)**

72 units required; 24 units are in Major.

→See page 69 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 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 (16 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts .....	4
C4 Upper-division elective **see note below.....	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 units in Major .....	0
D5 Upper-division elective ( <i>GEOG 308 recommended</i> ) .....	4

**Area F Technology Elective (upper division) .....**

**48**

**ELECTIVES .....**

**1**

**180**

<sup>1</sup> Students pursuing the Special Education credential should take EDUC 304 instead of LS 230. Field experience requires travel to schools in San Luis Obispo County.

\*\* Note: Some ENGL classes in this category meet the GWR requirement for students with junior standing. Students must complete appropriate paperwork with course instructor to receive GWR credit. Otherwise a test is available quarterly that students may take. ENGL 345-347, 349, 381 meet the USCP requirement.

**BS LIBERAL STUDIES**

- 60 units upper division
- 2.0 GPA
- GWR
- USCP

Student must be admitted to the College of 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**

*See BA Liberal Studies* ..... 104

**SUPPORT COURSES for the Blended Multiple Subject Credential**

EDUC 310 Effective Teaching and Classroom Mgt with Multicultural Perspective in K-3/4-8 Setting	4
EDUC 430 Teaching Reading and Language Arts with a Multicultural Perspective .....	6
EDUC 431 Teaching Soc. Studies and the Arts .....	4
EDUC 432 Teaching Science and Math.....	4
EDUC 440 Educating Individuals with Exceptional Needs .....	4
EDUC 454 Student Teaching I.....	7
EDUC 455 Student Teaching Seminar I.....	2
EDUC 480 Computer Based Curriculum .....	3
KINE 250 Health Education .....	4
	<b>38</b>

**OR**

**SUPPORT COURSES for the Special Education Credential**

*Note: Students pursuing this credential should take EDUC 304 instead of LS 230*

EDUC 310 Effective Teaching and Classroom Mgt with Multicultural Perspective in K-3/4-8 Setting	4
EDUC 440 Educating Individuals with Exceptional Needs .....	4
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
KINE 250 Health Education (D4) .....	4
Electives .....	2
	<b>39</b>

**GENERAL EDUCATION (GE)**

72 units required; 24 units are in Major.  
 →See page 69 for complete GE course listing.  
 →Minimum of 12 units required at the 300-400 level.

*See BA Liberal Studies* ..... 48

**ELECTIVES** ..... 0

**190**

EDUC 456 Multiple Subject Student Teaching II 12

EDUC 457 Multiple Subject Student Teaching Seminar II ..... 2

And acceptance into Step B

Total for BS Liberal Studies and Credential **204**

# Modern Languages & Literatures

Department Office  
Faculty Office Bldg. (47), Room 28  
805 756-1205

## Department Chair, William Martínez, Jr.

Odile Ayral-Clause                      John J. Thompson  
Hernán Castellano-Girón              Gloria Velásquez  
Bianca Rosenthal

## 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 C.U.L.T.U.R.E, 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)	

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 (Spain, Mexico or Latin America) (4) (C4)	
HUM 312 Chicano/a Culture (4)	

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 I .....	4
SPAN 122 Fundamentals of Spanish II <i>or</i>	
SPAN 123 Spanish for Heritage Speakers.....	4
SPAN 124 Composition in Spanish .....	4
SPAN 205 Introduction to Spanish Linguistics .....	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 210 Intro. to Research Methods .....	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

**88**

**GENERAL EDUCATION (GE)**

72 units required; 4 units are in Major.  
 →See page 69 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) .....**

**68**

**<sup>2</sup> ELECTIVES .....**

*(minimum 8 units must be 300-400 level)*

**24**

**180**

<sup>1</sup> Not repeatable as elective units.

<sup>2</sup> If upper-division GE courses are used to satisfy Major or Support requirements, additional upper division coursework may be required to satisfy University 60-unit upper division requirement.

# Music

**Department Office**  
**Davidson Music Center (45), Room 129**  
**805 756-2406 FAX 805 756-7464**  
**<http://www.music.calpoly.edu>**  
**email: [music@calpoly.edu](mailto:music@calpoly.edu)**

## Department Chair (Interim), William T. Spiller

David Arrivé  
 Antonio G. Barata  
 Meredith Brammeier  
 Thomas H. Davies

William V. Johnson  
 Alyson McLamore  
 Paul Rinzler  
 Craig H. Russell

## 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: Diatonic Materials .....	4
MU 104 Musicianship I .....	2
MU 106 Musicianship II .....	2
MU 121 Introduction to Non-Western Music .....	4
MU 207 Music Theory II: Chromatic Materials .....	4
MU 208 Musicianship III .....	2
MU 308 Sound Design: Technologies .....	4
MU 309 Music Theory III: Adv. Chromaticism .....	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 Music Theory IV: Contemporary Practices	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

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**GENERAL EDUCATION (GE)**

72 units required.

→See page 69 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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<b>ELECTIVES</b> .....	21
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180

**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: Diatonic Materials .....	4
MU 104 Musicianship I (2) and one quarter of Vocal or Instrumental Study [class piano, voice, guitar; instrumental and vocal ensembles] (1) or 3 quarters of Vocal or Instrumental Study [class piano, voice, guitar; instrumental and vocal ensembles (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: Chromatic Materials	
MU 221 Jazz Styles (C3) (USCP)	
MU 229 Music of the 60s: War and Peace (C3), (USCP)	
MU 120 Music Appreciation .....	4

**Upper division electives** .....

Chosen from 300–400 level Music courses (or in some cases, specific courses offered by other departments); see NOTE below

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NOTE: Each applicant for the Music Minor is expected to demonstrate his/her musical competency by way of a recital, original composition, concert review project, recording project, or other means as approved by the Music faculty.



# Philosophy

Department Office  
Faculty Office Bldg. (47), Room 37-B  
805 756-2041

## Department Chair, Tai Scriven

Stephen W. Ball	Russell A. Lascola
A. C. W. Bethel	Todd Long
Linda Bomstad	Joseph Lynch
Francisco Flores	Paul S. Miklowitz
Charles T. Hagen	Frederick J. O'Toole
Laurence D. Houlgate	Kendrick W. Walker

## 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: .....

<i>Select two of the following:</i>	16
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*

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## 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

<i>Select four of the following</i> .....	16
RELS 304 Judaism (4) (C4)	
RELS 306 Hinduism (4) (C4)	
RELS 307 Buddhism (4) (C4)	
RELS 309 Monotheism: The Bible and the Quran (4) (C4)	
RELS 310 Christianity (4) (C4)	
RELS 311 Islam (4) (C4)	

<i>Select one of the following</i> .....	4
PHIL 320 Asian Philosophy (4) (C4)	
PHIL 342 Philosophy of Religion (4) (C4)	

<i>Select one of the following</i> .....	4
PSY 339 Psychology of Religion (4)	
SOC 377 Sociology of Religion (4) (D5)	

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**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 I .....	2
PHIL 461 Senior Project II .....	2
Concentration (see below) or 300–400 level PHIL electives .....	20
	<hr/>
	<b>68</b>

**GENERAL EDUCATION (GE)**

72 units required; 4 units are in Major.  
 →See page 69 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 (not in PHIL) .....	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 (Not PHIL courses).....	4

**Area F Technology Elective (upper division)**

(4 units) .....	4
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**ELECTIVES..... 44**

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**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 336 Ethics, Gender and Society (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, Dianne N. Long

Craig Arceneaux	Carl E. Lutrin
Alesha E. Doan	Carroll R. McKibbin
Philip L. Fetzer	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**

**Master of Public Policy (MPP)**

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 Countries .....	4
*POLS 420 Contemporary U.S. Foreign Policy or POLS 382 Comparative Foreign Policy .....	4
*POLS 427 Politics of the Global Economy or *POLS 426 International Organizations and Law (*POLS 308 will substitute)	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 Govt (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 I, II .....	4
Political science electives (300–400 level).....	12
Concentration courses <i>or</i> individualized course of study .....	28
	<hr/>
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**SUPPORT COURSES**

HIST 110/111 Western Civilization .....	4-5
Geography/Anthropology/Sociology elective (300– 400 level) .....	4
ENGL 302, ENGL 310 or English GE C4 course....	4
STAT 221 Introduction to Probability and Statistics (B1)* .....	5
	<hr/>
	17-18

**GENERAL EDUCATION (GE)**

- 72 units required; 8 units are in Support.  
 →See page 69 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 (Not POLS courses) .....	4

**Area F Technology Elective (upper division)**

(4 units) .....	4
	<hr/>
	64

<b>ELECTIVES</b> .....	<b>29-30</b>
	<hr/>
	180

**CONCENTRATIONS (select one)**

Select a concentration or individualized course of study.

**American Politics Concentration**

POLS 315 The American Presidency .....	4
POLS 319 United States Congress .....	4
POLS 337 American Political Thought .....	4
POLS 351 Public Administration .....	4
POLS 471 Urban Politics .....	4
Electives .....	8
	<hr/>
	28

**International Affairs Concentration**

POLS 308 Collective Violence and Conflict Resolution <i>or</i> POLS 381 Peace and War.....	4
POLS 324 International Relations Theory.....	4
POLS 328 Politics of Developing Countries .....	4
POLS 420 Contemporary U.S. Foreign Policy <i>or</i> POLS 382 Comparative Foreign Policy .....	4
POLS 427 Politics of the Global Economy <i>or</i> POLS 426 International Organizations and Law	4
Advisor approved electives.....	8
	<hr/>
	28

**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
	<hr/>
	28

## MASTER OF PUBLIC POLICY

### General Characteristics

The Master of Public Policy degree program (MPP) is professionally oriented, and open to students who wish to pursue analytic careers in government and nonprofit organizations or in organizations related to public policy regulations. The program is structured to prepare graduates with competence to function in a general context of policy, as well as in analysis. The core courses cover statistics, public policy, public policy analysis, quantitative methods, public finance, policy internship, and graduate seminar.

The MPP program is designed to meet the needs of those who have earned baccalaureate degrees in a variety of disciplines, including, but not limited to, economics, history, political science, social sciences, psychology, city and regional planning, business administration, education, environmental studies, and natural resource management.

The program is two years in duration for students taking 8 or more units per term. It consists of 55 approved units (not including courses necessary to compensate for deficiencies). Because of the sequencing of courses, students admitted to the program are expected to begin study in the fall quarter. The degree culminates in the second year with a two-term seminar (POLS 590) where analytical projects will be undertaken. Both group reports and individual papers will be developed, presented, and discussed. The program offers students opportunities to develop close working relationships with faculty. Self-directed study, tailored to student interest and needs, is encouraged.

### Prerequisites

Students entering the program are expected to bring with them backgrounds in certain basic subject areas or to make up deficiencies in these areas after admission. These include the following Cal Poly course or its equivalent: STAT 221 Introduction to Probability and Statistics (4 units).

### Admission Requirements

1. Possession of a baccalaureate degree from an accredited college or university;
2. A grade point average of not less than 2.75 in all undergraduate coursework or not less than 3.00 in all upper division coursework;
3. Related undergraduate coursework or work experience;
4. The quality of previous educational and professional experiences measured by:
  - a. Biographical and career data (resumes, examples of reports, letters of recommendation, etc.), and

b. Professional training in fields such as budgeting, management, and supervision in the public, health, or nonprofit sectors.

5. For applicants whose preparatory education is principally in a language other than English, a TOEFL score of 550 or higher (or 213 on the new conversation scale for the computer-based TOEFL exam).

### 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 twelfth unit of approved courses is completed. The formal program of study must include a minimum of 55 units (at least 43 of which must be at the 500 level).

### Required Courses

	<i>Units</i>
STAT 512 Statistical Methods.....	4
POLS 515 Public Policy.....	4
POLS 516 Public Finance.....	4
POLS 518 Public Policy Analysis.....	4
POLS 560 Quantitative Methods.....	5
POLS 586 Policy Internship.....	8
POLS 590 Graduate Seminar.....	8

### Electives ..... 18

Additional 400 and 500-level courses, to be selected with graduate advisor's approval.  
*At least 6 units must be at the 500 level.*

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# Psychology & Child Development

Department Office  
Faculty Office Bldg. (47), Room 24  
805 756-2033

## Department Chair, Donald H. Ryujiin

Margaret M. Berrio	Daniel J. Levi
Robert L. Blodget	J. Kelly Moreno
Shawn M. Burn	Linden L. Nelson
Harry J. Busselen	Jennifer Teramoto Pedrotti
Denise H. Daniels	Kathleen A. Ryan
Patrice L. Engle	Ned W. Schultz
David L. Englund	Michael J. Selby
Basil A. Fiorito	Charles M. Slem
Laura A. Freberg	Lisa I. Sweatt
Laura M. King	Bette J. Tryon
Gary D. Laver	Debra Valencia-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. 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
CD 210, PSY/CD 306, PSY 419, 420, 421, 456, 460	

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## 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: ANT 344; BIO 302, 305; 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.	

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## 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)	
<i>(Only one of PSY 252, 254 or 256 can be counted in the minor)</i>	
PSY 305 Personality (4)	
PSY 340 Biopsychology (4) (B5)	
PSY 405 Abnormal Psychology (4)	
<b>PSY elective courses (300-400 level) .....</b>	<b>12</b>
	<b>28-29</b>

## 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.....	1
CD 128 Nurturing Relationships for Infants & Toddlers .....	3
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 210 Middle 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
CD 312 Learning, Development, and Technology: Preschool Applications.....	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
	<b>72</b>

### 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 305/340/456/460.....	4
STAT 217 Intro to Statistical Concepts and Methods (B1)* .....	4
Advisor approved electives .....	16
	<b>36</b>

### GENERAL EDUCATION (GE)

72 units required; 12 units are in Support.

→See page 69 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 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 units in Support.....	0
D5 Upper-division elective (not PSY courses) .....	4

**Area F Technology Elective (upper division)**

(4 units) .....	4
	<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 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 <i>or</i>	
PSY 366 Experimental Psychology .....	4
PSY 405 Abnormal Psychology .....	4
<i>Supervised Fieldwork and/or Research Internship.</i>	
Select two courses from the following:	
PSY 448, 449, 453, 454 .....	5,5
PSY 457 Memory and Cognition .....	4
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/STAT 251/STAT 252 (B1)* .....	4
	<b>8</b>

**GENERAL EDUCATION (GE)**

- 72 units required; 12 units are in Major/Support.  
 →See page 69 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 (Not PSY courses).....	4
<b>Area F Technology Elective (upper division)</b>	
(4 units).....	4
	<b>60</b>
<b>ELECTIVES .....</b>	<b>12</b>
	<b>180</b>

### CONCENTRATIONS OR ELECTIVES (select one)

<b>Applied Social Psychology Concentration</b>	
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
<b>Counseling and Family Psychology Concentration</b>	
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.

The M.S. in Psychology is accredited in the area of marriage and family counseling/therapy by the Council for Accreditation of Counseling and Related Educational Programs (CACREP), a specialized accrediting body recognized by the Council on Postsecondary Accreditation (COPA).

#### 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
PSY 555 Counseling and Communication .....	4
PSY 556 Multicultural Counseling & Psych .....	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 Traineeship: 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 <i>or</i> approved electives <i>and</i> written comprehensive examination .....	4
	90

<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, Harold R. Kerbo

### Anthropology:

Barbara E. Cook  
 Terry L. Jones  
 Patrick C. McKim

### Geography:

James R. Keese  
 William L. Preston

### 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 301, 325, 333	
<b>Global and Regional Courses (select one)</b> .....	4
ANT 325 (D5), 415, 450; GEOG 300, 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/LA/FNR 318 Applications in GIS (3) <i>or</i> GEOG 328 Geog Apps in Remote Sensing (4) <i>or</i> GEOG 440 Geo-Social Applications in GIS (4)	
	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>	<i>Units</i>
SOC 110 Comparative Societies (D3) .....	4
SOC 111 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 College of 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 College of 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), Managing People or Technology, or International Business Management (Orfalea College of Business).

**BS SOCIAL SCIENCES**

- 60 units upper division
- 2.0 GPA
- GWR
- 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 110 Comparative Societies .....	4
SOC 111 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 I .....	2
SOCS 462 Senior Project II.....	2
Sociology electives (300–400 level).....	4
STAT 217/221 Intro. Statistics (B1)* .....	4/5
Concentration <i>or</i> individualized course of study ...	28

**95/96**

**GENERAL EDUCATION (GE)**

- 72 units required; 12 units are in Major.
- See page 69 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 (Not ANT, GEOG, SOC courses).....	4
<b>Area F Technology Elective (upper division)</b> <b>(4 units)</b> .....	<b>4</b>
	<b>60</b>

**ELECTIVES** ..... **24/25**  
**180**

**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 316, 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 [ <i>or</i> SOC 218 <i>or</i> SOC 315].....	4
<i>Problems and Issues courses to be selected from:</i> .....	<i>8</i>
ANT 325, 344, 401, 415; GEOG 301, 325, 328, 414; SOC 315, 350	
Advisor approved courses.. .....	<b>8</b>
	<b>28</b>

**Environmental Geography Concentration**

GEOG 301 Geography of Resource Utilization .....	4
GEOG/FNR/LA 318 Applications in GIS.....	3
GEOG 325 Climate and Humanity.....	4
GEOG 328 Geographic Applications in Remote Sensing .....	4
GEOG 414 Climatology .....	4
<i>Applications and Issues courses to be selected from:</i>	<i>9</i>
ANT 309, 310, 311, 312, 360; BIO 301; BRAE 237, 345; FNR 202, 300; GEOG 440; LA 321; EHS 121; SS 121, 202, 433	
	<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 Organizations, People and Technology (4)	
BUS 384 Human Resource Management (4)	
BUS 387 Organizational Behavior (4) <i>or</i> PSY 302 Behavior in Organizations (4)	
<i>Advisor approved courses</i> .....	<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).....	<b>8</b>
	<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 Intro. to the Teaching Profession .....	3
Advisor approved courses.....	<b>9</b>
	<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.

# Theatre & Dance

Office Department  
Davidson Music Center (45), Room 104  
805 756-1465

## Department Chair, Timothy J. Dugan

Maria L. Junco  
Joshua T. Machamer  
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 Orchestis 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 290 Script Analysis.....	4
TH 320 Black Theatre (USCP) .....	4
TH 330 Stagecraft.....	8
TH 340 Acting Methods <i>or</i> TH 341 Acting Styles ..	4
TH 350 Seminar in Playwriting .....	4
TH 360 Theatre in the United States <i>or</i> TH 390 World Drama.....	4
TH 380 Children's Drama.....	4
TH 430 Introduction to Stage Design: Scenery .....	4
TH 450 Directing .....	4
TH 460 Senior Project.....	4
ENGL 339 Introduction to Shakespeare (C4)* .....	4
DANC 132 Beginning Modern Dance.....	2
Select 8 units from the following:.....	8
TH 240, 250, 260, 270	
Select 4 units from the following:.....	4
TH 310, 370, 470, 471, 480	
Select 4 units from the following:.....	4
TH 345, 400, 432, 434	
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 (C4), 370 (C4), 389, 431; LS 310; MU 324, 325, 381, 385, 387	

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#### GENERAL EDUCATION (GE)

72 units required; 8 units are in Major.  
→See page 69 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 (8 units)**

C1 Literature .....	4
C2 Philosophy .....	4
C3 Fine/Performing Arts * 4 units in Major.....	0
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 .....	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>64</b>
<b>ELECTIVES</b> .....	<b>30</b>
	<hr/> <b>180</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**

	<i>Units</i>
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

**Elective courses to be selected from:** .....

(at least 3 elective units must be upper division)	8
DANC 130 Pilates/Physicalmind Conditioning Method (2-6)	
DANC 135 International Folk Dance (2-6)	
DANC 139 Beginning Tap (2-6)	
DANC 233 Intermediate Jazz (2-6)	
DANC 234 Intermediate Ballroom Dance (2-6)	
DANC 311 Dance in American Musical Theatre (4) (C4)	
DANC 331 Advanced Ballet and Repertory (2-6)	
DANC 332 Modern Dance Repertory (2-6)	
DANC 345 Choreography (4-12)	
DANC 346 Dance Production (4-12)	
DANC 400 Special Problems for Undergrads (1-8)	
DANC 470 Selected Advanced Topic (1-8)	
DANC 471 Selected Advanced Laboratory (1-8)	

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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**

	<i>Units</i>
TH 210 Introduction to Theatre (C3).....	4
TH 227 Theatre History: Classical (C3) or TH 228 Theatre History: Contemporary (C3).....	4
TH 320 Black Theatre (C4) (USCP) or TH 390 World Drama (C4) .....	4
TH 330 Stagecraft .....	4
TH 340 Acting Methods or TH 341 Acting Styles..	4

**Electives:** Select 8 units from the following:.....

TH 240 Improvisational Theatre (4) or TH 250 Costume and Craft Construction (4) or TH 260 Voice and Diction for the Stage (4) or TH 270 Make-Up for Theatre and Film (4) or TH 290 Script Analysis (4)	8
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 360 Theatre in the United States (4)	
TH 370 Costume History (4)	
TH 380 Children's Drama (4)	
TH 400 Special Problems (1-4)	
TH 430 Introduction to Stage Design: Scenery (4)	
TH 432 Introduction to Stage Design: Costume (4)	
TH 434 Intro. Stage Design: Lighting and Sound (4)	
TH 440 Advanced Acting (4)	
TH 450 Directing (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.

	<i>Units</i>
<b>Group A</b> .....	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)*, 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	Carol MacCurdy
Susann Cokal	Johanna Rubba
Susan Currier	Kathryn Rummell
Linda Halisky	Debora Schwartz
Nancy Lucas	
<b>Ethnic Studies</b>	
Charise Cheney	Colleen O'Neill
<b>History</b>	
Lynn Hudson	Carolyn Stefanco
<b>Kinesiology</b>	Camille O'Bryant
<b>Music</b>	Alyson McLamore
<b>Philosophy</b>	Rachel Fern
<b>Political Science</b>	
Alesha Doan	Jean Williams
<b>Psychology and Child Development</b>	
Shawn Burn	Laura King
<b>Social Sciences</b>	Barbara Mori
<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, inter-disciplinary 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 or WS 340 Sexuality Studies (D5).....	4

WS/RELS 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/ES 350 Gender, Race, Science and Technology (USCP).....	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 449 Significant American Writers: African American Women Writers (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)	
PHIL 336 Ethics, Gender and Society (4)	
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 340 Sexuality Studies (4) (D5)	
WS/ES 350 Gender, Race, Science & 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)	



### Undergraduate Research

Dan Littlefield describes his research to Professor Steve Davis at the third annual College of Science and Mathematics Student Research Conference. Undergraduate research gives students the opportunity to take the knowledge they learn in classes and apply it to real problems. It also gives faculty a chance to really know their students and mentor them as they prepare for their future careers.

### Effects of Noise

While noise is usually seen as a problem in communication systems, in some cases it has a beneficial effect and can actually improve transmission. Professor John Sharpe and student Matt Swaney with the equipment they use to study the effects of noise.



### Habitat Model

Erica Shipley, along with her faculty mentor, Dr. Francis Villablanca, demonstrated that the San Diego desert woodrat, thought to be rare in the San Luis Obispo area, is a common occupant of the ridge tops and rock outcroppings around the city and in the Chorro Valley all the way to Morro Bay. Erica developed a habitat model to predict the local distribution of this species.



College of  
*Science*  
& *Mathematics*

*Photos courtesy of the College of  
Science and Mathematics*

## 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>
Biology .....	<i>Minor</i>
Biotechnology .....	<i>Minor</i>
Chemistry .....	<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 College of 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.

**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 Cheves, Secretary  
Science North (Bldg. 53), Room 219  
(805) 756-2615 or [cjelinek@calpoly.edu](mailto:cjelinek@calpoly.edu)  
[www.calpoly.edu/~cosamac](http://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.

**HEALTH PROFESSIONS ADVISING CENTER**

Kristi Weddige, Advisor  
Science North (Bldg. 53), Room 219  
(805) 756-2840  
[www.calpoly.edu/~cosamac/health](http://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.

### 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.

### 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 Biotechnology Minor Form is available from the Dean's Office or the Advising Center in the College of Science and Mathematics. Final approval of the minor is by the Program Coordinator in the College of Science and Mathematics.

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.

Core courses (15-21)	Units
BIO 161, MCRO 221, MCRO 224, or BOT 121 .....	4-5
BIO 303, BIO 351, or CHEM 373 .....	3-5
CHEM 313 or CHEM 371 .....	5
Laboratory elective: ASCI 403, BIO/CHEM 375, BOT 450 or CHEM 474 .....	2-5
SCM 201 Orientation to Biotechnology .....	1

**Restricted electives** ..... 7-13  
(See below for choices)

#### *Animal Biotechnology:*

- ASCI 403 Applied Biotech in Animal Science (5)
- ASCI 406 Applied Animal Embryology (5)
- DSCI 330 Artificial Insemination and Embryo Biotech (4)
- VS 340 Immunology and Diseases (4)

#### *Bioinformatics:*

- BIO 447 Bioinformatics Applications (4)
- CSC 448 Bioinformatics Algorithms (4)

#### *Cell and Molecular Biology/Microbial Biotechnology:*

- BIO 452 Cell Biology (4)
- BIO/CHEM 375 Molecular Biology Lab (2)
- BIO 476 Gene Expression Laboratory (2)
- CHEM 473 Immunochemistry (3)
- CHEM 474 Protein Techniques Laboratory (2)
- MCRO 225 Microbiology II (5)
- MCRO 320 Emerging Infectious Diseases (3)
- <sup>1</sup> MCRO 402 Virology (5)
- <sup>1</sup> MCRO 433 Microbial Biotechnology (3)
- ZOO 426 Immunology and Serology (4)

#### *Engineering-related Biotechnology:*

- BRAE 448 Bioconversion (4)
- ENVE 443 Bioenvironmental Engineering (4)
- ENGR 581, 582, 583 Biochemical Engineering I, II, III (4, 4, 4)

#### *Ethics:*

- PHIL 339 Biomedical Ethics (4)
- SCM 451 Ethics in the Sciences (3)

#### *Pharmaceutical Biotechnology:*

- CHEM 377 Drugs and Poisons (3)
- CHEM 477 Biochemical Pharmacology (3)

#### *Plant Biotechnology:*

- BOT 323 Plant Pathology (4)
- BOT 324 Ornamental and Forest Pathology (4)
- BOT 450 Plant Biotechnology Laboratory (2)

<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 Dean's 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.

<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 (F)*; ENVE 324 (F)*, 330, 331; ME 321 (F)*; PHYS 310; PSC 320 (F)*	
<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)*	

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# 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](http://www.calpoly.edu/~bio)**

## Department Chair, Michael A. Yoshimura

Nikki L. Adams	Anthony E. Knable
Frederick P. Andoli	Charles A. Knight
Michael W. Black	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
Dennis F. Frey	David S. Pilliod
Roger D. Gambs	Matthew K. Ritter
David V. Grady	Scott J. Steinmaus
Michael T. Hanson	Francis X. Villablanca
Kenneth J. Hillers	Larisa K. Vredevoe
V. L. Holland	Dirk R. Walters
Peter T. Jankay	Archie M. Waterbury
David J. Keil	Dean E. Wendt
Christopher L. Kitts	

## ACADEMIC PROGRAMS

**BS, MS Biological Sciences**  
**BS Microbiology**  
**Biology Minor**  
**Microbiology Minor**

The department offers complete undergraduate programs leading to Bachelor of Science degrees in Biological Sciences and Microbiology, and minors in 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 laboratory technology; public health; biotechnology research and manufacturing; 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, cell and molecular biology, 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.

Students majoring in Biological Sciences or Microbiology may take advantage of opportunities to participate in research projects. Special opportunities are available through the Environmental Biotechnology Institute (EBI) that is developing biological tools to address environmental concerns through collaborative interdisciplinary research and education; the Center for Coastal Marine Science (CCMS) that promotes and facilitates basic and applied studies of coastal marine systems for the purposes of addressing environmental concerns and fostering hands-on learning through discovery and outreach; the Undergraduate Biotechnology Laboratory (UBL), which is co-funded by Cal Poly and the National Science Foundation to provide undergraduates with hands-on experience with biotechnology; and Estero Conservation Alliance (ECA), which provides students with opportunities to work with local environmental organizations to enhance the Morro Bay National Estuary and its watershed. In addition, there are many opportunities to work with individual faculty members in areas such as conservation, genetics and biology, behavioral ecology, endangered species, infectious disease mechanisms, developmental biology, and plant pathology, genetics and physiology.

## Biological Sciences Major

With the curricular concentrations described below, this degree offers students a broad education in biology from molecules to ecosystems. It is suitable for preprofessional preparation in the biomedical fields, teaching, technical competency in the concentrations offered, certification as an Associate Ecologist, Fisheries Biologist, or Associate Wildlife Biologist, or as a base for work toward postbaccalaureate studies. Students are strongly encouraged to take BIO 100 Orientation to Biological Sciences (1 unit) their first quarter to help them learn about their chosen degree program, concentration choices, career options, study skills, and other departmental opportunities.

## 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 especially for preprofessional students interested in the health sciences.

**Ecology.** The study of ecology spans a wide breadth of habitats, from terrestrial to marine, and multiple scales of organization, from microbial interactions to global processes. As such, the ecology concentration allows flexibility for students to design a program to fit their interests and career goals within this broad discipline. The concentration emphasizes collection and analysis of data to better understand the factors that affect the distribution and abundance of organisms. In many contexts, these results are used to identify and solve environmental problems. Graduates may pursue careers in education, ecological consulting, planning or coordination, habitat restoration, or environmental law. A graduate may be academically qualified for professional certification as an Associate Ecologist by the Ecological Society of America.

**Field and Wildlife Biology.** Field and Wildlife biologists understand the factors that affect the distribution and abundance of terrestrial plants and animals. Emphasis is on identification of organisms in the field with the intent of developing a conceptual understanding of community structure and wildlife habitats. By appropriate selection of electives, students in the Wildlife Biology emphasis will be academically prepared to apply for professional certification as an Associate Wildlife Biologist by the Wildlife Society. The emphasis also includes management of both game and non-game wildlife species. The Field Biology emphasis educates students to have an intimate understanding of biological diversity, and provides students with a broader training of plants and animals and their ecological interrelationships in the field. The Field and Wildlife Biology concentration prepares students for graduate training or for professional employment in public or private agencies dealing with field inventories of biological diversity. Graduates may pursue careers as field biologists, outdoor educators, park naturalists, biological resource scientists, biology teachers, environmental consultants, or wildlife conservation biologists.

**General Biology.** Gives the student a broad training in biology and provides a background for various careers in biology, graduate study, or a single-subject teaching credential in biological sciences.

**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.

**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.

**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.

### Microbiology Major

Cal Poly is one of the few California State University or University of California universities offering a laboratory-intensive Bachelor of Science degree in Microbiology. The Microbiology major consists of a core of freshman courses that provide students with a basic foundation in key biological principles and includes an introduction to organismal, cellular, and molecular biology, as well as evolution, ecology and biodiversity. In the sophomore year, majors are provided with a solid training in the manipulation of microorganisms, as well as an understanding of microbial cell structure and function, metabolism, genetics, and ecology.

In the junior and senior years, majors take specialized courses in medical microbiology, immunology, microbial physiology, genetics, virology, and cell biology. During this time students also choose elective courses related to individual student interests and career goals in close consultation with their faculty advisor. Such goals may include graduate school, professional studies or post-baccalaureate employment in applied areas such as industrial microbiology, food and dairy microbiology, and biotechnology, as well as in public health microbiology, epidemiology, or medical laboratory technology.

### Biotechnology Minor

For information regarding the Biotechnology Minor, please see College of Science and Mathematics Section.

**BIOLOGY MINOR**

The purpose of the minor is to help students from other disciplines acquire increased factual and conceptual knowledge in biology, an increased understanding of scientific methods and techniques used to study biology, and an increased ability to analyze biological topics in the news or in various jobs. Biological issues are important throughout modern life and particularly relevant in many careers, including those in health-related businesses, agriculture, several engineering disciplines, city planning, teaching K-12 students, journalism, political science, psychology, and statistics. Students in more closely related majors such as biochemistry or kinesiology may also be interested in strengthening their biology background. In addition, an enhanced biology background will help students become better educated citizens regarding a variety of controversial issues (e.g., genetically-modified organisms in agriculture, human cloning, genetic discrimination, the pressures of population growth). Students may choose courses in environmental biology or in human biology and biotechnology, or may choose to take courses in several areas.

**Required Courses.** *Units*

Choose 1 of the following combinations of courses 12-13

BIO 160 Diversity and the History of Life (4)

BIO 161 Introduction to Cell and Molecular Biology (4) (B2&B4)

BIO 162 Intro to Organismal Form and Function (5) or BIO 263 Intro Ecology and Evolution (4)

OR

BIO 113 Animal Diversity and Ecology (4) (B2&B4)

BIO 114 Plant Diversity and Ecology (4) (B2&B4) or BOT 121 General Botany (4) (B2&B4)

BIO 115 Animal/Human Structure and Function (4) or BIO 111 General Biology (4) (B2&B4) or MCRO 221 Microbiology (4) (B2&B4)

The first combination (BIO 160, BIO 161, BIO 162 or BIO 263) is recommended and provides the prerequisites for many courses offered in the department. Other introductory courses may be substituted with approval by the Biology Minor Coordinator.

**Advisor Approved Electives.....** 15-16

*Students must obtain prior approval from the Biology Minor Coordinator.*

Choose a minimum of 15-16 units from 300-400 level courses in BIO, BOT, MCRO or ZOO to create a cohesive set of courses that reflect a particular focus in biology, for a total of at least 28 units. All courses in the Biological Sciences department (BIO, BOT, MCRO and ZOO course prefixes) are available if the appropriate prerequisite requirements are met. Lists of suggested combinations of courses in particular areas and issues in biology are available in the department.

**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 can 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 (B2&B4) or

MCRO 224 General Microbiology (B2&B4)..... 4/5

MCRO 225 General Microbiology II ..... 5

MCRO 423 Medical Microbiology (for Medical/Health Science emphasis area) or

MCRO 424 Microbial Physiology (for Applied and Environmental emphasis area) ..... 5

**Emphasis area courses.....** 11-12

Select courses from one of the following emphasis areas:

*Medical/Health Sciences*

MCRO 320, 342, 402, 424,

ZOO 425, 426, 428

*Applied and Environmental Sciences*

MCRO 342, 421, 423, 433, 436, SS 422

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**BS BIOLOGICAL SCIENCES**

- ☐ 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 160 Diversity & the History of Life .....	4
BIO 161 Intro to Cell & Molecular Biology (B2&B4)* .....	4
BIO 162 Intro to Organismal Form & Function.....	5
BIO 263 Introductory Ecology and Evolution .....	4
BIO 351 Principles of Genetics.....	5
BIO 414 Evolution .....	4
BIO 461 Senior Project I.....	3
Biodiversity: .....	4
BIO 328, BIO 415, BOT 313, BOT 323, BOT 334, BOT 433, BOT 437, MCRO 224, MCRO 402, ZOO 321, ZOO 322, ZOO 323, ZOO 329, ZOO 335, ZOO 336, ZOO 341, ZOO 425	
<sup>1</sup> Ecology: BIO 325, BOT 326, MCRO 436 .....	4
<sup>2</sup> Physiology: BIO 361, BIO 434, BIO 435 .....	4
Concentration .....	39
	<b>80</b>

**SUPPORT COURSES**

CHEM 127 General Chemistry (B3&B4)* .....	4
CHEM 128, 129 General Chemistry .....	4, 4
<sup>3</sup> CHEM 312 Survey of Organic Chemistry or CHEM 316 Organic Chemistry I .....	5
MATH 161 Calculus Life Sciences (B1)* .....	4
PHYS 121, 122, 123 College Physics I, II, III....	4, 4, 4
STAT 218 Appl Statistics-Life Sciences (B1)* ....	4
	<b>37</b>

**GENERAL EDUCATION (GE)**

72 units required; 16 units are in Major/Support.

→See page 69 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
<b>Area F Technology Elective (upper division)(4 units)</b>	<b>4</b>
	<b>56</b>
<b>ELECTIVES.....</b>	<b>5-7</b>
	<b>180</b>

**Concentrations (select one)****Anatomy and Physiology Concentration**

BIO 432 Vertebrate/Human Anatomy & Phys I	5
BIO 433 Vertebrate/Human Anatomy & Phys II	5
BIO 452 Cell Biology.....	4
CHEM 371 Biochemical Principles or CHEM 313 Survey of Biochemistry and Biotechnology .....	5
Advisor approved electives .....	20
	<b>39</b>

**Ecology Concentration**

<i>Ecology (Choose 4 courses)</i> .....	15-17
BIO 328, BIO 415, BIO 434, BIO 444, BOT 326, MCRO 436, ZOO 423, ZOO 437	
<i>Methodology (Choose 3 courses)</i> .....	10-12
BIO/CHEM 375, BIO 419, FNR/GEOG/LA 318, FNR 416, STAT 313, STAT 419	
Advisor approved electives .....	10-14
	<b>39</b>

**Field and Wildlife Biology Concentration**

BOT 313 Taxonomy of Vascular Plants.....	4
BOT 433 Field Botany .....	4
ZOO 321 Mammalogy.....	4
ZOO 323 Ornithology .....	4
Emphasis Area (choose one) .....	23
<i>Field Biology Emphasis</i>	
ZOO 335 General Entomology (4)	
ZOO 341 Herpetology (4)	
ZOO 437 Animal Behavior (4)	
BIO 418/ZOO 322/ZOO 423 (4)	
Advisor approved electives (7)	
<i>Wildlife Biology Emphasis</i>	
BIO 327 Wildlife Biology Methods (5)	
BIO 427 Wildlife Management (4)	
BIO 444 Population Ecology (3)	
FNR 416 Environmental Impact Analysis/Mgmt (4)	
FNR 203 Resource Law Enforcement (3)	
STAT 313 Applied Experimental Design & Regression Models (4)	
	<b>39</b>

<sup>1</sup> Students in the Ecology concentration should take BIO 325 to fulfill this Ecology requirement.

<sup>2</sup> Students in the Ecology concentration should take BIO 435 to fulfill this Physiology requirement.

<sup>3</sup> Students in the Molecular and Cellular Biology concentration should take CHEM 316 to fulfill this requirement.

**General Biology Concentration**

BIO 452 Cell Biology .....	4
CHEM 313 Survey of Biochem and Biotech .....	5
<i>Anatomy/Physiology</i> .....	4
BIO 432, BIO 433, BIO 434, BIO 435, BOT 335, MCRO 424	
<i>Botany</i> .....	4
BOT 313, BOT 323, BOT 334, BOT 335, BOT 433, BOT 437	
<i>Microbiology</i> .....	3-5
MCRO 224, MCRO 225, MCRO 320, MCRO 342, MCRO 402, MCRO 421, MCRO 433, MCRO 436, ZOO 426, ZOO 428	
<i>Zoology</i> .....	4
BIO 328, BIO 418, ZOO 321, ZOO 322, ZOO 323, ZOO 329, ZOO 335, ZOO 336, ZOO 341, ZOO 425	
Advisor approved electives .....	13-15
	39

**Marine Biology and Fisheries Concentration**

BIO 328 Marine Biology.....	5
BIO/CHEM 375 Molecular Biology Laboratory ....	2
BOT 437 Phycology.....	4
STAT 313 Applied Experimental Design and Regression Models .....	4
ZOO 322 Ichthyology .....	4
ZOO 336 Invertebrate Zoology.....	4
Advisor approved electives .....	16
	39

**Molecular and Cellular Biology Concentration**

BIO/CHEM 375 Molecular Biology Laboratory ....	2
BIO 452 Cell Biology .....	4
CHEM 317 Organic Chemistry II .....	5
CHEM 371 Biochemistry.....	5
CHEM 372 Metabolism .....	3
CHEM 474 Protein Techniques Laboratory <i>or</i> BIO/CHEM 476 Gene Expression Laboratory	2
Choose 8 units from the following.....	8
BIO 405, BIO 447, BOT 450, CHEM 473 <i>or</i> ZOO 426, MCRO 402, MCRO 433, SCM 201	
Advisor approved electives .....	10
	39

**Systematics and Biodiversity Concentration**

BIO 343 Principles of Systematic Biology .....	4
BIO/CHEM 375 Molecular Biology Laboratory ....	2
BIO 415 Biogeography .....	4
BIO 447 Bioinformatics Applications.....	4
STAT 313 Applied Experimental Design and Regression Models .....	4
STAT 419 Applied Multivariate Statistics.....	4
Advisor approved electives .....	17
	39

**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 160 Diversity & the History of Life .....	4
BIO 161 Introduction to Cell & Molecular Biology (B2&B4)* .....	4
BIO 263 Introductory Ecology and Evolution .....	4
BIO 351 Principles of Genetics .....	5
BIO 452 Cell Biology.....	4
MCRO 224 General Microbiology I .....	5
MCRO 225 General Microbiology II .....	5
MCRO 402 General Virology .....	4
MCRO 423 Medical Microbiology .....	5
MCRO 424 Microbial Physiology.....	5
ZOO 426 Immunology and Serology .....	4
MCRO 461 Senior Project.....	2
Advisor approved electives .....	18
	69

**<sup>1</sup> SUPPORT COURSES**

CHEM 127 General Chemistry (B3&B4)* .....	4
CHEM 128, 129 General Chemistry I, II .....	4, 4
CHEM 316 Organic Chemistry I.....	5
CHEM 317 Organic Chemistry II .....	5
<sup>2</sup> CHEM 371 Biochemical Principles.....	5
MATH 161 Calculus for the Life Sciences I (B1)*	4
PHYS 121, 122, 123 College Physics I, II, III .....	4, 4, 4
STAT 218 Applied Statistics-Life Sciences (B1)*	4
	47

**GENERAL EDUCATION (GE)**

72 units required; 16 units are in Major/Support.

→See page 69 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	

<sup>1</sup> Students planning to attend graduate or professional schools are strongly advised to meet with their advisors to ensure that they meet necessary prerequisites for entry into these programs. Additional courses in math and chemistry may be necessary.

<sup>2</sup> CHEM 313 may be substituted, with advisor approval, for students not planning to pursue graduate school, or a health professions career.

<b>Area C Arts and Humanities (20 units)</b>	
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
<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) (4 units)</b> .....	<b>4</b>
	<b>56</b>
<b>ELECTIVES</b> .....	<b>8</b>
	<b>180</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 that 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
	<u>45</u>	<u>45</u>

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

## Department Chair, Christina A. Bailey

Philip S. Bailey	David L. Keeling
Albert C. Censullo	Martin A. Kellerman
Robert S. Cichowski	Kevin B. Kingsbury
Lee C. Coombs	Lisa M. Lindert
Leland S. Endres	John F. Marlier
Raymond Fernando	John C. Maxwell
Thomas G. Frey	Margaret (Peggy) S. Rice
John W. F. Goers	Mary (Sam) N. Rigler
Derek E. Gragson	Rod W. Schoonover
John P. Hagen	Michael G. Silvestri
Chad E. Immoos	Jan W. Simek
Ralph A. Jacobson	Lisa M. Stevenson
Dane R. Jones	Russell L. Tice
Eric J. Kantorowski	Nanine A. Van Draanen

## 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 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, toxicology, 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 .....	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
CHEM 461 Senior Project Report.....	1
CHEM 481 Inorganic Chemistry .....	3
CHEM 484 Inorganic Chemistry Lab .....	2
<sup>2</sup> Advanced advisor approved chemistry electives to complete major, or concentration.....	18
	<b>80</b>

#### SUPPORT COURSES

*Life Sciences:* (B2)\* Select one course from:

BIO 111, 115, 161; 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 131/141 General Physics.....	4
PHYS 132 General Physics .....	4
PHYS 133 General Physics.....	4
Physics elective (200-level and above except PHYS 215) .....	3

**39-40**

### GENERAL EDUCATION (GE)

72 units required; 16 units are in Major/Support.

→See page 69 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

**56**

#### ELECTIVES.....

**4-5**

**180**

#### 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 during their second year.

<sup>2</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](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 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	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:	
<sup>2</sup> CHEM 375 Molecular Biology Laboratory, or CHEM 474 Protein Techniques Laboratory	2
Select one course from:	
CHEM 375, 439 <sup>3</sup> , 474 <sup>2</sup> ; BIO 361 <sup>3</sup> , 476	2
CHEM 459 Undergraduate Seminar	2
CHEM 461 Senior Project Report	1
<sup>4</sup> Advanced advisor approved chemistry electives to complete major, or concentration	7-23

**68-84****SUPPORT COURSES**

BIO 161 Intro to Cell & Molecular Biology (B2)*	4
MATH 141, 142, 143 Calculus I, II, III (B1)*	4,4,4
PHYS 121, 122, 123 College Physics or PHYS 131/141, 132, 133 General Physics	4,4,4
<sup>2</sup> MCRO 224 General Microbiology I or BIO 452 Cell Biology	4-5

**32-33****GENERAL EDUCATION (GE)**

72 units required; 16 units are in Major/Support.

→See page 69 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 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

**56**

**ELECTIVES**..... **7-24**

**180****Concentrations (select one)****Molecular Biology Concentration**

CHEM 377 Drugs and Poisons	3
BIO 447 Bioinformatics Applications	4
BIO 452 Cell Biology	4
SCM 201 Orientation to Biotechnology	1
Advisor approved electives	11
(select at least 11 units from the following)	
CHEM 472 Plant Biochemistry (3)	
CHEM 473 Immunochemistry (3)	
CHEM 477 Biochemical Pharmacology (3)	
BOT 450 Plant Biotechnology (2)	
MCRO 225 General Microbiology II (5)	
MCRO 320 Emerging Infectious Diseases (3)	
MCRO 402 Virology (4)	
MCRO 424 Microbial Physiology (5)	
MCRO 433 Microbial Technology (3)	
MCRO 436 Microbial Diversity & Ecology (5)	
CPE/CSC 448 Bioinformatics Algorithms (4)	
ENGR 581/582/583 Biochemical Engineering (4)(4)(4)	
SCM 451 Ethics in the Sciences (3)	

**23****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

**18**

<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> 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)	
<b>Restricted Electives</b> .....	12
12 units approved electives (400-500 level) chosen from: CHEM, MATE, Bioengineering, STAT 512 <i>or</i> 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**  
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**[www.calpoly.edu/~pek/](http://www.calpoly.edu/~pek/)**

## **Department Chair, Gerald E. DeMers**

Steven C. Davis	Camille P. O'Bryant
Sonja S. Glassmeyer	Andrew J. Proctor
Kellie Green Hall	Susan M. Puhl
Joanne Hunter	Michael A. Sutliff
Kristine Z. Jankovitz	J. Kevin Taylor
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. Due to its 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. The Kinesiology Department also has shared interest in the Recreation Center that 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**

**Exercise Science and Health Promotion.** Incorporates the scientific and clinical knowledge of exercise science, health education and nutrition as applied in preventive, clinical and commercial health promotion settings. Graduates work in a wide range of enterprises which include worksite health promotion, clinical exercise physiology, cardiac rehabilitation, commercial fitness facilities, public, private and non-profit health agencies. The concentration provides three tracks that will prepare students to take external national certification examinations.

**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 and to apply for the credential program, students must take specific courses. Please see an advisor for specific requirements.

**Individualized Course of Study.** Students may choose coursework that relates to a specific career goal within the field of kinesiology that is substantially different from other concentrations. This Individualized Course of Study (ICS) requires 36 advisor-approved units in addition to other required courses. Only 12 units of previous coursework may be included in an ICS program. Those individuals who come to Cal Poly intending to apply to graduate school in one of the health profession areas, e.g., nursing, will need to take extra courses in addition to their specific major and concentration.

### **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.



**BS KINESIOLOGY**

- 60 units upper division       GWR  
 2.0 GPA                               USCP

\* = Satisfies General Education requirement

Course sequencing: See flowcharts at  
[www.calpoly.edu/~cosamc](http://www.calpoly.edu/~cosamc)

**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 Functional 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 (1) <i>or</i> KINE 462 Honors Senior Project (2-4) .....	1-4
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 231, 232) .....	5,5
Concentration courses (see below) (B2)* (B3 & B4)* .....	46-53
	<b>112-122</b>

**GENERAL EDUCATION (GE)**

72 units required; 20 units are in Major/Support.

→See page 69 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

**Area F Technology Elective (upper division) (4 units)**

	<b>52</b>
<b>ELECTIVES</b> .....	<b>6-16</b>

**180**

**CONCENTRATIONS (select one)****Exercise Science and Health Promotion Concentration****Required courses (20)**

KINE 218 Aquatics .....	2
KINE 304 Pathophysiology and Exercise.....	3
KINE 408 Exercise and Health Promotion for Senior Adults.....	4
KINE 434 Planning Health Promotion Programs: Theory and Practice.....	4
KINE 463 Clinical and Worksite Health Promotion Field Work.....	3
BIO 111 General Biology <i>or</i> BIO 115 Animal/Human Structure and Function (B2/B4)	4

**Students select one of the following tracks..... 28-32***Clinical Exercise Science Track (30)*

KINE 445, 446, 452; CHEM 111, 312, 313; PHYS 104 <i>or</i> 121 (B3)	
--	--

*Worksite Commercial Health and Fitness Track (28)*

KINE 354, 445, 450, 452; BUS 387; CHEM 110 (B3/B4); JOUR 312; SCOM 301	
---	--

*Health Education Specialist Track (30-32)*

KINE 305, 354, 405, 443, 450; FSN 210, FSN 310 <i>or</i> FSN 315 <i>or</i> PSY 205; MCRO 221; CHEM 110 <i>or</i> 111 (B3/B4)	
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**48-52**

**Teaching Concentration**

KINE 300 Planning Techniques in PE .....	5
KINE 308 Motor Development.....	3
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 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

**Individualized Course of Study**

KINE 218 Aquatics .....	2
BIO 111 General Biology <i>or</i> BIO 161 Intro to Cell and Molecular Biology (B2)* .....	4
CHEM 110/CHEM 111/CHEM 127 (B3 & B4)* ...	4/5
Advisor approved electives .....	36
	<hr/> 46-47

## 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***

This emphasis is an extension of the Exercise Science and Health Promotion Concentration under the BS degree program in Kinesiology. It 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

**Required courses**..... 24-26

KINE 510 Communication and Health Behavior Change (3)

KINE 517 Research Methods in Kinesiology (3)

KINE 501 Evaluation of Current Studies (3)

KINE 522 Advanced Biomechanics (3)

KINE 525 Adv Motor Learning & Control (3)

KINE 530 Adv Physiology of Exercise (4)

KINE 581 Grad Seminar in Kinesiology (1-3)

STAT 513 Applied Experimental Design and Regression Models (4)

**Area of Emphasis or course of study**..... 12-16

Choose one of the following:

*Exercise and Health Promotion (16)*

KINE 503 Seminar in Adult Wellness (3)

KINE 504 Advanced Pathophysiology and Exercise (3)

KINE 511 Management and Administration in Kinesiology Settings (3)

KINE 514 Health Education Planning (3)

KINE 536 Advanced Electrocardiography (4)

*Physical Education and Sport Studies (15)*

KINE 502 Current Trends and Issues in Physical Education and Sport (3)

KINE 511 Management and Administration in Kinesiology Settings (3)

KINE 526 Sport in American Society (3)

KINE 539 Observation and Analysis of Teaching Physical Education and Coaching Sports (3)

*Individual Course of Study (16)*

Advisor and graduate coordinator approved electives

**Advisor approved electives or thesis** ..... 6-7

45

For more detailed information or advisement, contact the Coordinator of Graduate Studies for Kinesiology.

# Mathematics

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H. Arthur DeKleine	James R. Mueller
James E. Delany	Linda J. Patton
Gwen L. Fisher	Don P. Rawlings
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Stuart Goldenberg	Benjamin P. Richert
Harvey C. Greenwald	Kate J. Riley
Todd A. Grundmeier	Marian E. Robbins
Caixing Gu	Jonathan E. Shapiro
Donald G. Hartig	Mark Stankus
Alan W. Holz	Lawrence Sze
J. Myron Hood	Raymond D. Terry
Goro C. Kato	Todor Todorov
Anton Kaul	John Van Eps
Colleen M. Kirk	Matthew E. White
George M. Lewis	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 course-work 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 career teaching mathematics in middle or senior high school should choose

the concentration in teaching. The courses in the concentration, coupled with the other required courses in the major, fulfill the prerequisites for the California Commission on Teacher Credentialing.

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<br>Linear Analysis I (4)  |    |
| MATH 248 Methods of Proof in Mathematics (4)   |    |
| <b>II. Complete two tracks</b> .....   | 16 |
| A track consists of two courses from one of the groups A-J. Completion of all four courses in either group I or J is considered two tracks. Some tracks have additional mathematics prerequisites. |    |
| A. MATH 306 Linear Algebra II (4)<br>MATH 406 Linear Algebra III (4)   |    |
| B. MATH 333 Numerical Analysis I (4)<br>MATH 433 Numerical Analysis II (4)   |    |
| C. MATH 335 Graph Theory (4)<br>MATH 336 Combinatorial Mathematics (4)<br>MATH 437 Game Theory (4)   |    |
| D. MATH 408 Complex Analysis I (4)<br>MATH 409 Complex Analysis II (4)   |    |
| E. MATH 412 Introduction to Analysis I (4)<br>MATH 413 Introduction to Analysis II (4)   |    |
| F. MATH 431 Mathematical Optimization I (4)<br>MATH 432 Mathematical Optimization II (4)   |    |
| G. MATH 440 Topology I (4)<br>MATH 441 Topology II (4)   |    |
| H. MATH 442 Euclidean Geometry (4)<br>MATH 443 Modern Geometries (4)   |    |
| I. MATH 341 Theory of Numbers (4)<br>MATH 419 Intro. to History of Mathematics (4)<br>MATH 481 Abstract Algebra I (4)<br>MATH 482 Abstract Algebra II (4)  |    |

J. MATH 304 Vector Analysis (4)	
MATH 344 Linear Analysis II (4)	
MATH 417 Intro to Dynamical Systems (4)	
MATH 418 Partial Differential Equations (4)	
<b>III. Mathematics electives</b> .....	<u>6</u>
	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 206 Linear Algebra I.....	4
MATH 241 Calculus IV .....	4
MATH 242 Differential Equations.....	4
MATH 248 Methods of Proof in Mathematics.....	4
MATH 306 Linear Algebra II .....	4
MATH 336 Combinatorial Mathematics.....	4
MATH 412 Introduction to Analysis I.....	4
MATH 459 Senior Seminar.....	4
MATH 461 Senior Project I .....	2
MATH 462 Senior Project II.....	2
MATH 481 Abstract Algebra I.....	4
Advanced Work in Major or Concentration.....	32
	<u>85</u>

**SUPPORT COURSES**

Choose one of the following tracks: .....	8
CSC/CPE 101 and CSC/CPE 102 OR	
CSC/CPE 235 and CSC/CPE 236	
PHYS 131 or PHYS 141 General Physics .....	4
PHYS 132 General Physics (B3 & B4)* .....	4
PHYS 133 General Physics .....	4
STAT 321 Probability and Statistics for Engineers and Scientists .....	4
STAT 322 Statistical Analysis for Engineers & Scientists .....	4
	<u>28</u>

**GENERAL EDUCATION (GE)**

72 units required; 12 units are in Major/Support.

→See page 69 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/Stat * 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
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**60**

**ELECTIVES**..... 7

**180**

**Advanced Work In Major**

**1. Complete either of the following courses**..... 4

CSC/CPE 103 Fundamentals of Computer Science  
III (4) Or

MATH 350 Mathematical Software (4)

**2. Complete two tracks from the following four  
subject areas.** ..... 16

A track consists of two paired courses  
representing depth of study with a particular  
focus. Each track chosen must belong to a  
different subject area A-D.

**A.** MATH 341 Theory of Numbers (4) and MATH  
482 Abstract Algebra II (4)  
MATH 406 Linear Algebra III (4) and MATH  
482 Abstract Algebra II (4)  
MATH 335 Graph Theory (4) and MATH 437  
Game Theory (4)

**B.** MATH 413 and MATH 414 Introduction to  
Analysis II, III (4)(4)  
MATH 408 and MATH 409 Complex Analysis  
I, II (4)(4)  
MATH 408 Complex Analysis I (4) and MATH  
413 Introduction to Analysis II (4)

**C.** MATH 440 and MATH 441 Topology I, II  
(4)(4)  
MATH 304 Vector Analysis (4) and MATH  
404 Differential Geometry (4)  
MATH 344 Linear Analysis II (4) and MATH  
417 Introduction to Dynamical Systems (4)  
MATH 442 Euclidean Geometry (4) and  
MATH 443 Modern Geometries (4)

**D.** MATH 304 Vector Analysis (4) and MATH 418  
Partial Differential Equations (4)  
MATH 333 and MATH 433 Numerical  
Analysis I, II (4)(4)  
MATH 431 and MATH 432 Mathematical  
Optimization I, II (4)(4)

- 3. Complete 12 additional units from the following courses**..... 12  
 MATH 304, 333, 335, 341, 344,  
 MATH 404, 406, 408, 409, 413, 414, 417, 418, 419,  
 431, 432, 433, 437, 440, 441, 442, 443, 470, 482,  
 CSC 349, 361,  
 IME 301,  
 PHYS 301, 302, 323, 405, 408,  
 STAT 425, 426, 427

- 4. Advanced Work must include at least two of the following courses:**  
 MATH 341, 344, 413, 414, 406, 440, 441, 482

**Mathematics Teaching Concentration**

MATH 300 Technology in Mathematics Education	4
MATH 341 Theory of Numbers.....	4
MATH 419 Intro to the History of Mathematics.....	4
MATH 423 Advanced Mathematics for Teaching...	4
MATH 442 Euclidean Geometry .....	4
MATH 443 Modern Geometries .....	4
MATH 482 Abstract Algebra II .....	4
Select 4 units from the following: .....	4
MATH 304, 333, 335, 344,	
MATH 406, 408, 413, 417, 431, 437, 440, 470,	
IME 301,	
PHYS 301, 302, 323, 405,	
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.

**BLENDED BS+MS MATHEMATICS**

The blended program provides motivated students with an efficient way to complete both a BS and MS in mathematics with both degrees being conferred simultaneously. Students are provided with ample advising so that there is a seamless transition from undergraduate to graduate status.

**Eligibility**

Students majoring in mathematics may apply for the blended program as early as their junior year after completing at least two upper-division mathematics classes and before they have completed 180 units. The Graduate Committee evaluates each applicant individually. Acceptance into the program is based on prior academic performance and the applicant's promise to successfully complete the master's program. See page 89 for additional eligibility criteria.

**Program of Study**

Students must complete the requirements of both the undergraduate and master's program of study for a total of 225 units. However, they are advised to take the undergraduate courses most suitable as preparation for the master's program. They should take the graduate preliminary written examinations at the time they complete the appropriate courses, even possibly before they have graduate status. Finally, the senior project, if sufficiently complex, may be extended into a graduate thesis. This last option is particularly attractive to students participating in one of the many undergraduate summer research programs available at either Cal Poly or other universities, since the research can then be used as a basis for the senior project and master's thesis.

**CURRICULUM FOR MS MATHEMATICS** *Units*

<b>Required courses</b> .....	32
MATH 520 & MATH 521 Applied Analysis I, II (4)(4)	
MATH 530 & MATH 531 Discrete Math with Applications I, II (4)(4)	
MATH 540 & MATH 541 Topology I, II (4)(4)	
MATH 550 Real Analysis (4)	
MATH 560 Field Theory (4)	
<b>Electives</b> .....	13
Select additional units at the 400 or 500 level as approved by the Graduate Committee.	
<b>Satisfactory completion of the comprehensive examinations.</b>	

45

# Physics

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Antonio F. Garcia	Willem L. van Wyngaarden
Chance Hoellwarth	Leonard W. Wall
Kenneth A. Hoffman	Ronald E. Zammit

**Affiliated Faculty:** 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 241 Physical Geology Laboratory .....	1
GEOL 305 Fundamentals of Seismology .....	4
GEOL 415 Structural Geology .....	4
GEOL/ERSC 401 Field-Geology Methods .....	4
GEOL/ERSC 402 Geologic mapping .....	4
SS/ERSC 223 Rocks and Minerals.....	4
SS/ERSC 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.	Units
PHYS 133 General Physics.....	4
(Prerequisite: PHYS 131 or PHYS 141, and MATH 142)	
PHYS 211 Modern Physics I.....	4
<b>Physics/Astronomy electives:</b> .....	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 I (4)	
PHYS 323 Optics (5)	
PHYS 405 Quantum Mechanics I (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 or PHYS 141 General Physics.....	4
PHYS 132 General Physics (B3 & B4)*.....	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.....	4
PHYS 323 Optics.....	5
PHYS 405 Quantum Mechanics I or PHYS 412 Solid State Physics.....	3-4
PHYS 461 Senior Project I or PHYS 463 Senior Project - Lab Research I.....	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/GEOL electives (300-400 level) ....	15

95-97

**GENERAL EDUCATION (GE)**

72 units required; 16 units are in Major.  
 →See page 69 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 units).....	4
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60

**ELECTIVES**..... 23-25<sup>†</sup>

180

<sup>†</sup> Care must be taken when selecting electives 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**MAJOR COURSES**

PHYS 131 or PHYS 141 General Physics .....	4
PHYS 132 General Physics (B3 & B4)* .....	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 .....	4
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 405 Quantum Mechanics I .....	4
PHYS 408 Electromagnetic Fields and Waves I .....	4
PHYS 461 Senior Project I or PHYS 463 Senior Project - Lab Research I .....	2
PHYS 462 Senior Project II or PHYS 464 Senior Project - Lab Research II .....	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
	<b>112</b>

**GENERAL EDUCATION (GE)**

72 units required; 12 units are in Major.

→See page 69 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
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**60****ELECTIVES** .....**8****180****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, GEOL, MATH, STAT or CSC (but not CSC 302 nor CSC 310). 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 303, 401, 406, 409, 424, and MATH 408 are suggested electives. In addition, PHYS 357 is suggested for students who anticipate becoming experimental physicists.**19**

**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 228 Continuous-Time Signals and Systems.....	4
EE 302 Classical Control Systems.....	3
EE 328 Discrete Time Signals and Systems.....	3
EE 342 Control Systems Laboratory.....	1
EE 368 Signals and Systems Laboratory.....	1
EE 336 Microprocessor System Design or EE 306 and EE 346 Semiconductor Device Electronics and Laboratory.....	4
	<hr/> 19

**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 228 Continuous-Time Signals and Systems.....	4
EE 403 Fiber Optics Communication.....	3
EE 418 Photonic Engineering.....	3
EE 443 Fiber Optics Laboratory.....	1
EE 458 Photonic Engineering Laboratory.....	1
	<hr/> 19

**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 Physical Chemistry I.....	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 and Biotechnology 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 131/141, 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 69 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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	<hr/> 60
<b>ELECTIVES</b> .....	<hr/> 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 on the department website.

<sup>†</sup> Care must be taken when selecting electives 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
Jimmy A. Doi	Robert K. Smidt
Ulric J. Lund	Kent D. Smith
Karen J. McGaughey	John H. Walker
Roxy L. Peck	

**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 312 Statistical Methods for Engineers (4) *and* STAT 323 Design and Analysis of Experiments (4)
  - STAT 321 Probability and Statistics for Engineers and Scientists (4) *and* STAT 322 Statistical Analysis for Engineers and Scientists (4)
- <sup>1</sup> **Select two from the following**..... 8
- STAT 323 Design and Analysis of Experiments (4)
  - STAT 324 Applied Regression Analysis (4)
  - STAT 330 Statistical Computing I: SAS (4)
- STAT 400-level electives**..... 8  
 (excluding STAT 400, STAT 465, STAT 470, STAT 485, STAT 495)
- Select one course** from outside the Statistics Department, with the approval of the Statistics Department Minor Coordinator, that has substantial statistical applicability..... 3-4

27-29

<sup>1</sup> Students entering the minor who take STAT 312 as their initial course must take STAT 324 and STAT 330 in this category.

**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 I	1
STAT 462 Senior Project I	2
STAT 465 Statistical Communication and Consulting	4
<sup>1</sup> CSC, MATH, STAT electives	11-12
Statistics electives (400 level)	12
	<u>86-87</u>

**SUPPORT COURSES**

<sup>2</sup> CSC/CPE 235 Fundamentals of Computer Science for Scientists and Engineers	4
MATH 248 Methods of Proof in Mathematics	4
Advisor approved technical electives	12
	<u>20</u>

**GENERAL EDUCATION (GE)**

72 units required; 8 units are in Major.

→See page 69 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
	<u>64</u>

**ELECTIVES**..... 9-10

180

<sup>1</sup> Selected from the following: CSC/CPE 101, 102, 236; CSC 342; MATH 242, 306, 333, 335, 336, 406, 412, 431, 437; STAT 400 level courses.

<sup>2</sup> CSC 235 should be first CSC course taken.



### **Jespersen Hall**

Jespersen Hall is home to Cal Poly Continuing Education. Community members can visit here to enroll in non-credit courses such as Wine Appreciation, Paralegal Studies and the Osher Lifelong Learning Institute, as well as credit courses through Open University. In addition, staff members are available to answer any questions students might have regarding the recently approved Adult Degree Program, which offers a Cal Poly B.A. in Interdisciplinary Studies.

*Photo courtesy of Margo Camilleri*

*Continuing Education  
and University Outreach*

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# Continuing Education and University Outreach

**Dennis Parks, Dean**  
**Jespersen Hall (116), Room 101**  
**(805) 756-2053**  
*continuing-ed@calpoly.edu*  
*www.adultdegreeprogram.calpoly.edu*

## ACADEMIC PROGRAM

### BA Interdisciplinary Studies

The Adult Degree Program (ADP) offers the Bachelor of Arts degree in Interdisciplinary Studies. The program offers a challenging and intellectually stimulating curriculum in a format structured for working adults who are balancing careers, family responsibilities, and civic obligations. The intended audience is individuals who have completed high school at least six years prior to entering the program, have the motivation and intellectual skills to succeed in a part-time college degree program, and whose personal educational goals will be achieved through an interdisciplinary studies program. The program utilizes a cohort model and classes are offered weekday evenings.

The BA Interdisciplinary Studies is offered by Continuing Education and University Outreach as a Special Session degree program. As such, the program carries a separate fee schedule. Contact the Adult Degree Program for current fee information.

The BA Interdisciplinary Studies curriculum consists of three major parts: interdisciplinary studies courses; major courses from other academic departments; and 12 units of upper-division General Education courses. Students must complete a total of at least 180 units, of which a minimum of 60 units must be taken through the Adult Degree Program at Cal Poly.

### Admissions

Students seeking admission to the program must

- 1) have completed at least 90 quarter units (60 semester hours), be CSU eligible, and be CSU General Education or IGETC Certified;
- 2) write a personal, lifelong learning goals statement, not exceeding 1,200 words, documenting how the program will help them achieve their personal, professional, and long-term educational goals (not to exceed five pages);
- 3) provide at least three letters of reference from individuals who can attest to their ability to be successful in a part-time, structured, undergraduate degree program;
- 4) meet with the ADP director or delegate to discuss educational goals and objectives; and
- 5) be out of high school at least six years prior to entering the program.

Admissions are on a rolling admissions basis. Deadlines for the submission of application materials are posted on the Adult Degree Program web site.

### University Requirements

Students must meet the general graduation requirements as described on page 66 of the catalog, including the Graduation Writing Requirement, U. S. Cultural Pluralism requirement, 2.0 GPA and academic residence requirements.

### BA INTERDISCIPLINARY STUDIES

- 60 units upper division       GWR
- 2.0 GPA                               USCP

#### Major Courses

IS 101 Orientation to GS and the University.....	3
IS 301 Critical Issues Seminar.....	4,4
IS 302 Analytical Skills Seminar.....	4
IS 450 Adv. Investigation Seminar.....	5
IS 460 Capstone Project .....	6
Select one course from the following eight areas:...	32
<i>Applied technology (4)</i>	
<i>Business (4)</i>	
<i>Communications/English (4)</i>	
<i>Ethnic studies/US Cultural Pluralism (4)</i>	
<i>Fine and performing arts (4)</i>	
<i>Philosophy/religion (4)</i>	
<i>Science or nutrition (4)</i>	
<i>Social science (4)</i>	
Five additional courses selected by the Faculty Program Committee .....	20
	<b>78</b>

#### Upper-Division General Education Courses

→See page 69 for complete GE course listing.

Arts and humanities (C4) .....	4
Society/Individual (D5) .....	4
Technology (Area F) .....	4
	<b>12</b>
<b>Transferred Units.....</b>	<b>90</b>
	<b>180</b>

# 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 EDUCATION

Education .....	EDUC
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## 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
Communication Studies .....	SCOM
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
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 .....	KINE, PE
Mathematics .....	MATH
Physics .....	ASTR, GEOL, PHYS, PSC
Statistics .....	STAT

## ATHLETICS .....

PEM, PEW

## CONTINUING EDUCATION .....

IS

## UNIVERSITY HONORS .....

HNRS

## UNIVERSITY LIBRARY .....

LIB

# 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	FSN	Food Science and Nutrition
AG	Agriculture	GEOG	Geography
AGB	Agribusiness	GEOG	Geology
AGC	Agricultural Communication	GER	German
AGED	Agricultural Education	GRC	Graphic Communication
ANT	Anthropology	GSB	Graduate Studies–Business
ARCE	Architectural Engineering	HCS	Horticulture and Crop Science
ARCH	Architecture	HIST	History
ART	Art	HNRS	Honors
ASCI	Animal Science	HUM	Humanities
ASTR	Astronomy and Astrophysics	IME	Industrial and Manufacturing Engineering
BIO	Biology	IS	Interdisciplinary Studies
BOT	Botany	IT	Industrial Technology
BRAE	BioResource and Agricultural Engineering	ITAL	Italian
BUS	Business	JPNS	Japanese
CD	Child Development	JOUR	Journalism
CE	Civil Engineering	KINE	Kinesiology
CHEM	Chemistry	LA	Landscape Architecture
CM	Construction Management	LIB	Library
CPE	Computer Engineering	LS	Liberal Studies
CRP	City and Regional Planning	MATE	Materials Engineering
CRSC	Crop Science	MATH	Mathematics
CSC	Computer Science	MCRO	Microbiology
DANC	Dance	ME	Mechanical Engineering
DSCI	Dairy Science	MSL	Military Science Leadership
ECON	Economics	MU	Music
EDES	Environmental Design	PE	Physical Education
EDUC	Education	PEM	Physical Education Men
EE	Electrical Engineering	PEW	Physical Education Women
EHS	Environmental Horticultural Science	PHIL	Philosophy
ENGL	English	PHYS	Physics
ENGR	Engineering	PM	Poultry Management
ENVE	Environmental Engineering	POLS	Political Science
ERSC	Earth Sciences	PPSC	Plant Protection Science
ES	Ethnic Studies	PSC	Physical Science
FNR	Forestry and Natural Resources	PSY	Psychology
FORL	Foreign Language	REC	Recreation Administration
FR	French	RELS	Religious Studies
FRSC	Fruit Science	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, ME 211. Corequisite: MATH 244.

### AERO 301, 302, 303 Aerothermodynamics I, II, III (4) (4) (4)

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. 4 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 149. 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 or spacecraft models, and vehicle 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 149.

### 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. 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 (4)

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. 4 lectures. Prerequisite: AERO 300, CE 207.

### 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 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 (4)**

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 (4)**

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. 4 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 I, II, III (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, AERIO 431. Open to students enrolled in the multidisciplinary design minor.

**AERO 446 Introduction to Space Systems (4)**

Basic satellite types and their applications. Major subsystems of a satellite system. Space environment, propulsion system, power system, structural design, spacecraft dynamics and attitude control, orbit mechanics, thermal control, communications, and ground segments. Spacecraft integration and testing. May also be available to offsite locations (Distance Education). 4 lectures. Prerequisite: ME 212, graduate standing or consent of instructor. Prerequisite or concurrent: AERO 320, EE 321.

**AERO 447, 448, 449 Spacecraft Design I, II, III (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 Introduction to 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. Enke and Cowell solution techniques. Restricted 3-body problem. Satellite attitude dynamics, rigid body-symmetric and asymmetric semirigid bodies. Attitude control, spinning/fixed gravity gradient. 4 lectures. Prerequisite: AERO 451.

**AERO 461, 462 Senior Project I, II (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 I, II (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 493 Cooperative Education Experience (2) (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 6 units. Prerequisite: Sophomore standing and consent of instructor.

**AERO 494 Cooperative Education Experience (6) (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 18 units. 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. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. Total credit limited to 24 units. 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 510 Aerospace Systems Engineering I (4)**

Project management. Scheduling and budgeting. Department of Defense acquisition development cycle. Queuing theory. Process control and life-cycle cost analysis. Contracts and negotiation. May also be available to offsite locations (Distance Education). 4 lectures. Prerequisite: AERO 450. Graduate standing or consent of instructor.

**AERO 511 Aerospace Systems Engineering II (4)**

Risk management. Design strategies to meet system/mission requirements. Design for supportability, manufacturability, reliability, etc. Quality function development and quality control concepts. Quality requirements in the aerospace industry. May also be available to offsite locations (Distance Education). 4 lectures. Prerequisite: AERO 450. Graduate standing or consent of instructor.

**AERO 512 Aerospace Vehicle Software Applications (4)**

Computer system requirements for aerospace vehicles. Typical aerospace vehicle computer architectures. Software testing, verification and validation. Vehicle automatic systems. Risks and benefits of vehicle autonomous operations. Integration of software with vehicle subsystems. Software development cost/schedule estimation. May also be available to offsite locations (Distance Education). 4 lectures. Prerequisite: AERO 450, AERO 446. Graduate standing or consent of instructor.

**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 519 Fundamentals of Vehicle Dynamics and Control (4)**

Fundamentals of particle and rigid body dynamics as they apply to aerospace vehicles. Kinematic variables and coordinate transformations. Attitude dynamics. Fundamentals of feedback control and its application to aerospace systems. Stability analysis. Numerical simulation. May also be available to offsite locations (Distance Education). 4 lectures. Prerequisite: Graduate standing or consent of instructor. Not open to students with credit in AERO 451 and AERO 452.

**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 526 Spacecraft Thermal/Fluid Control (4)**

Satellite thermal/fluid control hardware. Governing equations for flow and heat transfer. Surface tension and liquid/vapor interface. Heat transfer by free convection, forced convection and radiation in low-gravity environment. Heat pipes. Capillary-pumped loops. Cryogenic systems. Fluid management in space. May also be available to offsite locations (Distance Education). 4 lectures. Prerequisite: AERO 301, AERO 302, and AERO 303, or graduate standing.

**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 561 Vehicle Integration and Testing (2)**

Space vehicle integration requirements and procedures. Clean room requirements and operations. Quality control and inspection. Qualification and acceptance testing requirements. Test equipment. Vibration and shock testing. Space environment and thermal-vac testing. Development of test procedures. May also be available to offsite locations (Distance Education). 1 lecture, 1 laboratory. Prerequisite: AERO 446. AERO 450 recommended. Graduate standing or consent of instructor.

**AERO 562 Space Operations (2)**

Launch operations and vehicle integration with launch vehicle. In-orbit operations and maneuvers. Spacecraft tracking. Telemetry and command. Ground systems. Failure detection and identification. Emergency operations. May also be available to offsite locations (Distance Education). 1 lecture, 1 laboratory. Prerequisite: AERO 446. AERO 450 recommended. 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 566 Advanced Topics in Spacecraft Design (4)**

Application of advanced engineering tools to the design of space vehicles. System architecture and mission design. Concept of operations. Requirements development and flow down. System and subsystems trade studies and preliminary design. May also be available to offsite locations (Distance Education). 4 lectures. Prerequisite: AERO 450, AERO 446, graduate standing or consent of instructor.

**AERO 567 Launch Vehicle and Missile Design (4)**

Basic launch vehicle/missile types. Launch vehicle subsystems and their interactions. Vehicle requirements development and flow down. Payload accommodations. System and subsystems trade studies and preliminary design. May also be available to offsite locations (Distance Education). 4 lectures. Prerequisite: AERO 401, AERO 450, AERO 446, graduate standing or consent of instructor.

**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 572 Topics in Aircraft Manufacturing and Fabrication (1)**

Selected topics for assembling aircraft and aircraft components, including empennage, wing fuselage, engine, flight controls, avionics, finishing work, and flight testing. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 8 units. 1 laboratory. Prerequisite: Junior standing and consent of instructor.

**AERO 593 Cooperative Education Experience (2) (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.

**AERO 594 Cooperative Education Experience (6) (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.

**AERO 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. A fully-developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. Prerequisite: Graduate standing and 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 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)**

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.

**GE Area F**

**AG 330 Cal Poly Land: Nature, Technology and Society (4)**

(Also listed as HUM 330)

**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.

**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 452 Issues Affecting California Agriculture (4)**

Interactive seminars with speakers from government and industry covering policy and regulations affecting California agriculture. Students develop an understanding of agricultural policy and work in teams to develop a public presentation and position paper on a significant issue. Field trip to Sacramento required. 4 seminars. Prerequisite: Completion of GE Area D2 (ECON 201 or ECON 222 recommended), and junior standing.

**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) (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 3 units. 1 hour 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 105 Economic Calculus Laboratory (1) (CR/NC)**

Facilitated study and discussion of theory, problems and application of calculus in economics. Credit/No Credit grading only. 1 activity. Corequisite: Concurrent enrollment in AGB 313.

**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 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 Rural Property (4)**

Methods of rural appraisal, including farms, ranches and other rural properties, use of county records, appraisal practice on different types of rural properties, 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 (4)**

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 (4)**

Integration of writing, editing, and layout skills in producing agricultural publications. Emphasis on using computer applications in desktop publishing. Total credit limited to 9 units; may be in same term. 2 lectures, 2 activities. Prerequisite: AG 250, CSC 113, or JOUR 205.

**AGC 426 Presentation Methods in Agricultural Communication (4)**

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. 2 lectures, 1 activity. 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 digital technology, TI network systems and software applicable to vocational agriculture. Will be Level I certified, which is 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 (4)**

Principles of specific agricultural teaching methods and developmentally appropriate pedagogy. Daily and unit lesson plans that adopt content, teaching methods, and assessment for English Learners and students with special needs. Class demonstrations in teaching procedures, analysis, assessment and reflection. 2 lectures, 2 activities. Prerequisite: AGED 330, EDUC 412, EDUC 414 and EDUC 416 or consent of instructor.

**AGED 440 Student Teaching in Agricultural Education (6-12) (CR/NC)**

Off-campus assignment to a selected cooperating public school. Participation in all phases of agriculture teacher duties and activities including departmental organization and administration. Prior approval and appointment necessary. Total credit limited to 18 units. Credit/No Credit grading only.

**AGED 441 Student Teaching Practicum (2)**

Problems encountered and practices applied during student teaching. Methods, procedures and materials adapted for use by the teacher concurrent with student teaching. 2 activities. Prerequisite: Consent of instructor.

**AGED 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 I (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 II (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 481 Developing Digital Presentations for Instruction in Agricultural Education (1)**

Directed group study and individualized projects in the design and development of digital presentations in technical agriculture for use in teaching and program public relations. Total credit limited to 3 units. 1 laboratory. Prerequisite: admission to credential program.

**AGED 482 Teaching Resources and Curriculum Design (1)**

Traditional academic and student-centered approaches to gaining resources and curriculum design. Methods of using, and the development of the knowledge and skills related to planning, implementation and assessing the high school agriculture curriculum. Organization and management and their relationship to education effectiveness and productivity. 1 lecture. Prerequisite: student teacher candidate.

**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 530 Developing FFA and Supervised Agricultural Experience Programs in Secondary Education (3)**

Integrating FFA and supervised agricultural experience programs into the curriculum. Career development event implementation; record book usage; officer and committee training; recruitment; retention; retreat and leadership training. Current national and state initiatives and experiential learning opportunities in the workplace and entrepreneurial settings. Prerequisite: senior or graduate standing. Not open to students with credit in AGED 330. 3 lectures.

**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 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 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 211 Structures I (3)**

Introduction to the role of structures in the making of buildings. Introduction to statics and creation of simple three-dimensional structures. Development of skills to analyze structures composed of axial force (truss) members. 2 lectures, 1 activity. Prerequisite: For ARCE majors: PHYS 131, MATH 142; for ARCH and CM majors: PHYS 121 or PHYS 131, MATH 142 or MATH 182.

**ARCE 212 Structures II (3)**

Introduction to the role of structures in the making of buildings. Introduction to shear and moment diagrams using the principles of statics and the application of the diagrams to simple three-dimensional structures. Development of skills, particularly free body diagrams, to analyze structures composed of bending (beams) members. 2 lectures, 1 activity. Prerequisite: ARCE 211.

**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 Introduction to Mechanics of Structural Members (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 (4)**

Advanced topics of stresses in beams: plastic and unsymmetrical bending, combined stresses, stress transformation, buckling, and beam deflections. Material testing laboratory. 3 lectures, 1 laboratory. Prerequisite: ARCE 212 or ARCE 222. Concurrent: ARCE 351.

**ARCE 225 Dynamics (3)**

Dynamics of particles and rigid bodies. 3 lectures. Prerequisite: ARCE 212 or 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 212 or ARCE 222.

**ARCE 227 Structural Analysis I (2)**

Continuation of selected concepts covered in ARCE 211 and ARCE 212. Advanced topics in two-dimensional and three-dimensional equilibrium of structural building systems. 2 lectures. Prerequisite: ARCE 222 or ARCE 212.

**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: ARCH 123, CM 211.

**ARCE 302 Structural Analysis II (4)**

Analysis of statically indeterminate structures using virtual work, slope deflection, and the force method. Analysis of structural systems using approximate methods and influence lines. 4 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 315 Small Scale Structures (4)**

Introduction to structures that use timber and steel as the primary construction material. Introduction to gravity load carrying systems and lateral load resisting systems using steel and timber elements. Development of skills to analyze structures using free body diagrams and the concept of load flow. 4 lectures. Prerequisite: ARCE 226.

**ARCE 316 Large Scale Structures (4)**

Introduction to structures that use steel and concrete as the primary construction material. Introduction to gravity load carrying systems and lateral load resisting systems using steel and concrete elements. Development of skills to analyze structures using free body diagrams and the concept of load flow. 4 lectures. Prerequisite: ARCE 315.

**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 basics and technical reporting. Emphasis on use of spreadsheets as a tool to analyze building elements. 1 laboratory. Prerequisite: ARCE 212 or 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 223, ARCE 351. 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, ARCE 352. Concurrent: ARCE 306.

**ARCE 371 Structural Systems Laboratory (3)**

Studies in the relationship of structural framing to overall building geometry with emphasis on the static stability of structural configurations and load flow. 3 laboratories. Prerequisite: ARCE 223, ARCE 227, and third year standing in Architectural Engineering. 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: 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 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 341 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 212 or 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 448 Seismic Rehabilitation Laboratory (3)**

Overview of the general rehabilitation process and philosophy. Evaluation and analysis of existing structures to determine expected performance due to seismic loads. Development of basic rehabilitation strategies for buildings. 3 laboratories. Prerequisite: ARCE 303, ARCE 304, ARCE 305, ARCE 412, 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: ARCE 257, ARCE 304, ARCE 305, and ARCE 371.

**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: 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 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 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. 2 lectures.

**ARCH 105 Architectural Practice 1 (1)**

Shop safety, machine and tool operation and small-scale design and construction. 1 laboratory. Corequisite: ARCH 121 or ARCH 131.

**ARCH 106 Materials of Construction (2)**

Use and application of construction processes and materials. 2 lectures.

**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 Design and Drawing 1.1 (3)**

An introduction to the issues, concepts, processes and skills pertaining to two- and three-dimensional design and the freehand and constructed representation and visual communication of ideas, objects and environments. 3 laboratories. Corequisite: ARCH 105; concurrent: EDES 101.

**ARCH 122 Design and Drawing 1.2 (3)**

Continuation of ARCH 121 plus the issues, concepts, processes and skills pertaining to color theory and the design and visual communication of architectural space. 3 laboratories. Prerequisite: ARCH 121 or ARCH 131.

**ARCH 123 Design and Drawing 1.3 (3)**

Continuation of ARCH 121 and ARCH 122 plus the issues, concepts, processes and skills pertaining to the analysis and design of architectural form, space and organizations. 3 laboratories. Prerequisite: ARCH 122 or ARCH 132.

**ARCH 131 Design and Visual Communication 1.1 (4)**

An introduction to the issues, concepts, processes and skills pertaining to two- and three-dimensional design and the freehand, constructed and digital representation and visual communication of ideas, objects and environments. Purchase of a laptop computer, software and peripherals is highly recommended to participate in this course. 4 laboratories. Corequisite: ARCH 105; concurrent: EDES 101.

**ARCH 132 Design and Visual Communication 1.2 (4)**

Continuation of ARCH 131 plus the issues, concepts, processes and skills pertaining to color theory and the design and visual communication of architectural space. Purchase of a laptop computer, software and peripherals is highly recommended to participate in this course. 4 laboratories. Prerequisite: ARCH 131.

**ARCH 133 Design and Visual Communication 1.3 (4)**

Continuation of ARCH 131 and ARCH 132 plus the issues, concepts, processes and skills pertaining to the analysis and design of architectural form, space and organizations. Purchase of a laptop computer, software and peripherals is highly recommended 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 1 (4)**

Theory and application of climate, energy use and comfort as determinants of architectural form in small-scale buildings. Emphasis on architectural methods of ventilating, cooling, heating, and lighting for envelope-load dominated buildings. 2 lectures, 2 activities. Prerequisite: PHYS 132 or 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 basin, 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 Architectural Design Fundamentals 2.1 (3)**

Continuation of ARCH 123 or ARCH 133 in terms of materiality, structure and function and the theories, concepts, processes and skills pertaining to the design of architectural form, space and organizations. 3 laboratories. Prerequisite: ARCH 123 or ARCH 133.

**ARCH 222 Architectural Design Fundamentals 2.2 (3)**

Continuation of ARCH 221 plus the theories, concepts, processes and skills pertaining to site, context and climate as determinants that shape the built environment. 3 laboratories. Prerequisite: ARCH 221.

**ARCH 231 Architectural Practice (3)**

Wood construction methods and processes. Construction documents used as communication medium for such methods and processes. 1 lecture, 2 activities. Prerequisite: ARCH 106 plus ARCH 122 or ARCH 132 or ARCH 111. Corequisite: ARCH 252.

**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 241 Architectural Practice 2.1 (4)**

The history, concepts and methods associated with the use and application of construction systems, processes and materials. 2 lectures, 2 activities. Prerequisite: ARCH 123 or ARCH 133. Corequisite: ARCH 251.

**ARCH 242 Architectural Practice 2.2 (4)**

A continuation of ARCH 241 with an emphasis on the concepts, methods, processes, detailing and documentation of wood construction. 2 lectures, 2 activities. Prerequisite: ARCH 241. Corequisite: ARCH 252.

**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 2.1 (5)**

Continuation of ARCH 123 or ARCH 133 in terms of materiality and the theories, concepts, processes and skills pertaining to the analysis and design of architectural form, space and organizations to communicate intended concepts and meanings. 5 laboratories. Prerequisite: ARCH 123 or ARCH 133; corequisite: ARCH 241.

**ARCH 252 Architectural Design 2.2 (5)**

Continuation of ARCH 251 plus the theories, concepts, processes and skills pertaining to light, construction and function as determinants that shape the built environment and support the communication of intended concepts and meanings. 5 laboratories. Prerequisite: ARCH 251; corequisite: ARCH 242.

**ARCH 253 Architectural Design 2.3 (5)**

Continuation of ARCH 251 and ARCH 252 plus the theories, concepts, processes and skills pertaining to context, structure and climate as determinants that shape the built environment and support the communication of intended concepts and meanings. 5 laboratories. Prerequisite: ARCH 252 and ARCH 160; corequisite: 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 Theories of Architectural Design (3)**

Theories of architecture and their application in architectural design. 3 lectures. Prerequisite: ARCH 253.

**ARCH 307 Environmental Control Systems 2 (4)**

Theory and application of climate, energy use and comfort as determinants of architectural form in large-scale buildings. Emphasis on architectural and mechanical methods of ventilating, cooling, heating, lighting, acoustics, and water and waste systems for internal-load dominated buildings. 2 lectures, 2 activities. 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 123 or 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 123 or 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 Architectural Practice 3.1 (4)**

Concepts, methods and processes pertaining to the detailing and construction of masonry, steel, concrete and combination structures. 2 lectures, 2 activities. Prerequisite: ARCH 242 and ARCH 253. Corequisite: ARCH 351.

**ARCH 342 Architectural Practice 3.2 (4)**

Continuation of ARCH 341 content plus the concepts, methods and processes pertaining to the preparation of outline specifications, production of design development drawings, life safety, systems integration and cost estimating. 2 lectures, 2 activities. Prerequisite: ARCH 341. Corequisite: ARCH 353.

**ARCH 351 Architectural Design 3.1 (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 212, ARCH 242, ARCH 253 or consent of department head. Corequisite: ARCH 341.

**ARCH 352 Architectural Design 3.2 (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: ARCH 351. Corequisite: ARCH 307.

**ARCH 353 Architectural Design 3.3 (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: ARCH 352. Corequisite: 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 3 (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. 4 lectures. Prerequisite: ARCH 307.

**ARCH 413 The Built Environment: Issues and Education (3)**

Identification of major issues in the design and creation of the built environment. Strategies for developing instructional units related to critical thinking and problem solving in the K-12 school setting. 1 lecture, 2 activities. Prerequisite: Junior standing.

**ARCH 420 Seminar in Architectural History, 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)**

A critical analysis of the roles and responsibilities of the architect in providing comprehensive services to the client from project acquisition and inception to project delivery and closeout. 3 lectures. Prerequisite: ARCH 342 and ARCH 353.

**ARCH 442 Professional Practice (3)**

Case study of an architectural project that addresses selected professional practice issues presented in ARCH 441. 3 lectures. Prerequisite: ARCH 342 and ARCH 353.

**ARCH 443 Professional Practice (4)**

A critical analysis of the roles and responsibilities of the architect in providing comprehensive services to the client from project acquisition



and inception to project delivery and closeout and the process and requirements for internship development and attaining registration. 2 lectures, 2 activities. Prerequisite: ARCH 342, ARCH 353.

**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 desk-top 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 4.1 (5)**

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: ARCE 316, ARCH 353, or consent of department head.

**ARCH 452 Architectural Design 4.2 (5)**

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: ARCE 316, ARCH 353, or consent of department head.

**ARCH 453 Architectural Design 4.3 (5)**

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: ARCE 316, ARCH 353, or consent of department head.

**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 multi-media 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 (3)**

Selected topics addressing various aspects of Architectural Practice for advanced students in CAED. Topics may include strategic planning, managing quality, ethics, and legal considerations. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units; repeatable in same term. 3 lectures. Prerequisite: ARCH 342 or 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 477 Advanced Topics in Environmental Architecture (4)**

Theory and application of methods used to address energy and ecological issues of integrated building and site design. *Class Schedule* will list topic selected. Total credit limited to 12 units, repeatable in same term. 4 seminars. Prerequisite: ARCH 307.

**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: 5th-year standing or consent of department head.

**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 1, 2 (3) (3)**

Application of systematic, step-by-step procedures to rational and intuitive judgmental tasks. Methods for formulation, idea production, evaluation, and testing applied to planning, testing, design information systems, communication between designer and client, user participation in design, and other current topics. 511 focuses on specific problem area among topics and may be repeated up to 9 units. 3 lectures. Prerequisite: Graduate standing.

**ARCH 513 Natural Architectural Lighting (3)**

Perception and awareness of light; natural light as generator of urban spaces and building forms. Principles of design in lighting fundamentals and techniques. 3 lectures. Prerequisite: ARCH 407 or consent of instructor.

**ARCH 519 Theory of Architecture (3)**

Comparative analysis of the major historic influences which have contributed to the development of architectural design theories. *Class Schedule* will list topic selected. Total credit limited to 9 units. 1 lecture, 2 seminars. Prerequisite: ARCH 319 or graduate standing.

**ARCH 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 The 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)**

Core 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 Adobe InDesign, Adobe Illustrator, and Adobe Photoshop for use in their own creative design or photography. 2 lectures, 1 laboratory. Prerequisite: ART 132 or consent of instructor.

**ART 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of instructor.

**ART 201 Intermediate Drawing (3)**

Development of additional drawing techniques with emphasis on form and composition. 3 activities. Prerequisite or concurrent: ART 134.

**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. Comparison of relevant parallel examples of the art of non-European cultures. 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 film/digital 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. Assignments encourage development of composition and visual communication skills. 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)**

Studio lighting is used to introduce the student to contemporary professional studio photography. Quality developing and printing skills are required. Introduction to current examples of professional studio lighting. 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 241 Introduction to Glass Fusing and Forming (3)**

Studio course in the creative processes of fusing, forming, and assembling glass. Introduction to the use of line, color, and texture related to glass as a transparent or opaque material. Total credit limited to 6 units. 1 lecture, 2 laboratories. Prerequisite: ART 101 and ART 134 or ART 148 or consent of instructor.

**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. Prerequisite: ART 134 or consent of instructor.

**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. Prerequisite: ART 134 or consent of instructor.

**ART 301 Advanced Drawing (3)**

Development of advanced methods and techniques in the study of form, content, and structure. Emphasis on problem-solving. Total credit limited to 9 units. 3 activities. Prerequisite: ART 131, ART 134 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: One lower division art history course 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, Cubism, Expressionism, Dada, Surrealism, and the period of Post-World War II art to that of contemporary twenty-first century art. 4 lectures. Prerequisite: ART 211 or ART 212 or consent of instructor.

**ART 313 Design History (4)**

Survey of design from the Victorian era to the present, including major philosophies and movements, political, social, cultural, and technological trends that influenced designers in the 20<sup>th</sup> century. 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)**

Creation and modification of color images using transparency materials and digital files. 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)**

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.

**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, color transparencies, and high-resolution digital imaging. 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 assignments. 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 134, ART 181, ART 232, or consent of instructor.

**ART 332 Symbology (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 133, 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 341 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 and ART 241; 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 9 units. 3 activities. Prerequisite: ART 148, or ART 134, or ART 245 or consent of instructor.

**ART 348 Intermediate Sculpture (3)**

Intermediate sculpture course in expressive use of form with modeling, casting, carving, and/or assembly. 1 lecture, 2 laboratories. Prerequisite: ART 134 and ART 148, 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 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 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. 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)**

Study of package and graphic design for projects. Projects address research, analysis, designer development and implementation. 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, cane work, mold making, and kiln work. Total credit limited to 12 units. 2 lectures, 2 activities. Prerequisite: ART 241 or ART 341, 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 348.

**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)**

A collaborative visualization and design studio focusing on rendering, animation and modeling. Modeling and animation software for design conceptualization and expression. Collaboration in teams. Total credit limited to 8 units. 2 lectures, 2 activities. Prerequisite: ART 335 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 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. Total credit limited to 6 units. 2 lectures, 1 laboratory. Prerequisite: ART 181 or ART 323 and senior standing.

**ART 488 Advanced Web Design (3)**

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, 1 laboratory. 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 112 Principles of Animal Science (4)****GE B2**

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) (CR/NC)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 3 units per quarter. Credit/No Credit grading only. 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 Meat Science (4)**

Muscle food processing methods and operations. Conversion of muscle to meat. Meat inspection, grading, composition, curing, preservation, food safety and related topics. Carcass beef, pork, and lamb processed into consumer ready products. Credit not allowed for students having completed ASCI 209. 3 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. Prerequisite: ASCI 112.

**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 112 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 112 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 112 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 112 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 265 Equine Behavior and Training (3)**

Training of weanling and yearling horses at halter. Selection of proper attire for the handler and equipment for the horse. Application of safe, behavioral training techniques enabling the horse to accept handling, farrier and health care. 3 activities.

**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 161, 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 and VS 223.

**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) (CR/NC)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 4 units per quarter. Credit/No Credit grading only. Prerequisite: consent of instructor.

**ASCI 403 Applied Biotechnology in Animal Science (5)**

Coverage of current resources, techniques and methodologies used in animal research and biotechnology as well as experimental design, model assessment, and data interpretation with application to an experimental setting in the laboratory. 3 lectures, 2 laboratories. Prerequisite: BIO 161, BIO 162, upper division genetics course or consent of instructor.

**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 325, 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 425 Meat Industry Study Tour (2)**

Study tour of commercial meat businesses. Livestock harvest and carcass fabrication, further meat processing, retail and food service operations. Personnel, processing procedures, regulatory standards, industry specifications and current issues. Travel for 4 days. 2 activities. Prerequisite: ASCI 384 or consent of instructor.

**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 Planning (1)**

Evaluation of project options and expectations. Selection of a project and an appropriate advisor. 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. 1 seminar. Prerequisite: Junior 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 and ASCI 462.

**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 503 Advanced Molecular Techniques in Animal Science (4)**

Advanced molecular laboratory techniques in animal science. Topics include analyses of cellular and metabolic regulation, gene expression, gene activation and regulation, gene construct design, transgenesis, knockout animal models. 2 lectures, 2 laboratories. Prerequisite: ACI 403 or consent of instructor.

**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 112, ASTR 301, ASTR 302, or PHYS 132. ASTR 101 is not a prerequisite. 4 lectures.

**ASTR 112 Introduction to the Stars and Galaxies (4) GE B3 & B4**

Descriptive astronomical properties of the Sun, stars, galaxies and interstellar material. Exploration of cosmological models of an expanding universe. Laboratory activities include real and virtual astronomical viewing and experiments. Not open to students who have completed or are taking ASTR 102, ASTR 301, ASTR 302, or PHYS 132. ASTR 101 is not a prerequisite. 3 lectures, 1 activity.

**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 or BIO 161. 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 or BIO 162. 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 160 Diversity and the History of Life (4)**

Overview of the history, diversity and genetic relatedness of life on Earth; broad-scale evolutionary framework of the organization and expansion of life on Earth. 2 lectures, 2 laboratories.

**BIO 161 Introduction to Cell and Molecular Biology (4) GE B2 & B4**

Fundamentals of cellular biology with an emphasis on the molecular perspective of life: metabolism, photosynthesis, cell structure and reproduction, meiosis, immunology, classical and molecular genetics, gene regulation. 3 lectures, 1 laboratory. Recommended prerequisite: BIO 160 and one college-level introductory chemistry course.

**BIO 162 Introduction to Organismal Form and Function (5)**

Fundamentals of the structure and physiology of cells, tissues, and organs of higher plants and animals: energy acquisition and food distribution, gas exchange and fluid transport, and sensing and responding to the environment. 3 lectures, 2 laboratories. Prerequisite: BIO 161 or consent of instructor. Recommended: One college-level introductory chemistry course.

**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 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 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 course in college biology.

**BIO 263 Introductory Ecology and Evolution (4)**

Basic concepts in ecology and evolution. Relationships among organisms in populations, communities and ecosystems, structures and dynamics of populations, communities and ecosystems, ecosystem inputs and energy flows, nutrient cycling, biogeography, population genetics, evolution, patterns of biodiversity and issues in conservation biology. 3 lectures, 1 laboratory. Prerequisite: BIO 161 or consent of instructor. Recommended: BIO 160 and BIO 162.

**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 160, 162.

**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 (4)**

Principles of heredity and variation, including transmission, population and quantitative genetics; introduction to molecular mechanisms of inheritance. 4 lectures. Prerequisite: One quarter of college biology. Recommended: STAT 218 or equivalent.

**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 in common cancers; conventional chemotherapy and new treatments. Not open for major credit in Biological Sciences, Microbiology or Biochemistry. 4 lectures. 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. Not open for major credit in Biological Sciences (or Ecology and Systematic Biology majors on prior catalogs).

**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.

**BIO 325 General Ecology (4)**

Relationships between organisms and their physical, chemical, and biological environment in terrestrial and aquatic habitats. Laboratory emphasis on field studies. Occasional field experiences may require participation during non-scheduled times. 3 lectures, 1 laboratory. Prerequisite: BIO 160, BIO 162, and BIO 263, or consent of instructor.

**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 325 or equivalent.

**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 160, BIO 162, BIO 263.

**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: BIO 160, BIO 162, BIO 263, 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 161 and CHEM 312 or CHEM 316. Recommended: BIO 263 and STAT 218.

**BIO 361 Principles of Physiology (4)**

Fundamental principles of general and organs systems physiology, including composition and concentration of cellular and other body fluids, categories of movement (e.g., diffusion, membrane transporters), energy (thermodynamics, metabolic), enzymes, and membrane potentials with application to whole organisms. Introduction to physiological measurement techniques. 2 lectures, 2 laboratories. Prerequisite: BIO 162, and CHEM 312 or CHEM 316.

**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: BIO 161, and BIO 351 or CHEM 373.

**BIO 391 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: BIO 160, BIO 162, BIO 263 and BIO 325; corequisite: BIO 392, BIO 393, BIO 400 (2 units).

**BIO 392 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: BIO 160, BIO 162, BIO 263, and BIO 325; 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 433 as well.

**BIO 393 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: BIO 160, BIO 162, BIO 263 and BIO 325; corequisite: BIO 391, BIO 392, BIO 400 (2 units).

**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 405 Developmental Biology (5)**

Events and mechanisms of embryonic development, including fertilization, morphogenesis, cell differentiation, and organogenesis, with emphasis on differential gene expression in model organisms. 3 lectures, 2 laboratories. Prerequisite: BIO 162, and BIO 303 or BIO 351.

**BIO 414 Evolution (4)**

Scientific evaluation of the theories, mechanisms, and patterns of biological evolution. 4 lectures. Prerequisite: BIO 263 or equivalent, and BIO 303 or BIO 351. Recommended: BIO 325 or equivalent.

**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 263.

**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. Recommended: BIO 263, BIO 325 or BOT 326, or consent of instructor.

**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 313, SS 321.

**BIO 424 Organizing and Teaching Life Sciences (4)**

Objectives, content, techniques, material, and recent trends of successful instruction in secondary school biology, including strategies for English language learners (ELL) and special needs students. 4 lectures. Prerequisite: Consent of instructor.

**BIO 427 Wildlife Management (4)**

Important habitats, such as riparian, wetlands, 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 or equivalent.

**BIO 432 Vertebrate/Human Anatomy and Physiology I (5)**

Anatomy and physiology of the skeletal, muscular, nervous (central and peripheral) systems, and sense organs of vertebrates, with an emphasis on human systems. Not open to students with credit in ZOO 331. 3 lectures, 2 laboratories. Prerequisite: BIO 361 or consent of instructor.

**BIO 433 Vertebrate/Human Anatomy and Physiology II (5)**

Anatomy and physiology of the digestive, circulatory, urinary, endocrine, and reproductive systems, with an emphasis on human systems. Not open to students with credit in ZOO 332. 3 lectures, 2 laboratories. Prerequisite: BIO 361 or consent of instructor.

**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 162, CHEM 312 or CHEM 316. Recommended: BIO 325 and BIO 361.

**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 162; recommended: CHEM 312 or CHEM 316.

**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 160, BIO 162, and BIO 263 or consent of instructor.

**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 160, BIO 162, and BIO 263 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 equivalent.

**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: One course in college biology (BIO 111 or BIO 161 recommended). Recommended: BIO 303, BIO 351 or CHEM 373.

**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 312 or CHEM 317. Recommended: Course in biochemistry.

**BIO 461, 462 Senior Project I, II (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 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 476 Gene Expression Laboratory (2) (Also listed as CHEM 476)**

Heterologous gene expression of a recombinant protein in a microbial system: gene cloning, construction of expression plasmid, DNA sequence analysis, transformation of microbial host, selection and analysis of transformed host cells, expression and purification of recombinant protein. 2 laboratories. Prerequisite: BIO/CHEM 375, CHEM 313 or CHEM 371; MCRO 433.

**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 in Biological Sciences 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 in Biological Sciences or consent of instructor.

**BIO 502 Biology of Organisms (4)**

Principles of and current topics in organismal biology, with an emphasis on physiology (including organ systems), behavior, and responses to the environment. 3 lectures, 1 laboratory. Prerequisite: BIO 501 and graduate standing in Biological Sciences, or consent of instructor.

**BIO 503 Population Biology (4)**

Considerations of theory and practice in population ecology, evolutionary biology, and biosystematics. 3 lectures, 1 laboratory. Prerequisite: Graduate standing in Biological Sciences or consent of instructor.

**BIO 511 Trends in Biology (1) (CR/NC)**

Recent trends in the field of biology for graduate students new to the Biological Sciences master's degree program. Overview of current faculty research to help students choose a thesis project and mentor. Credit/No Credit grading only. 1 activity. Prerequisite: Graduate standing in Biological Sciences or consent of instructor.

**BIO 515 History of Biology (3)**

Analysis of historical attempts to solve biological problems. 3 seminars. Prerequisite: Graduate standing in Biological Sciences 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 in Biological Sciences 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 in Biological Sciences 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 in Biological Sciences 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 in Biological Sciences 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 activity. Prerequisite: Graduate standing in Biological Sciences 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 in Biological Sciences 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 in Biological Sciences; 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 California Plants and Plant Communities (4)  
(Also listed as LA 221)**

Introduction to the horticultural characteristics and landscape design potential of California native plants, California plant communities, and associated vernacular plants. Includes experiences in field identification, basic planting design, installation techniques, and maintenance requirements. Required field trips. 2 lectures, 2 laboratories. Prerequisite: BIO 114 or BOT 121 or consent of instructor.

**BOT 238 Native Plant Materials (3)**

Classification, identification, and associations of native plants. Factors that 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 162 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 162 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 162 or BOT 121.

**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 162, or BOT 121.

**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 160, BOT 162 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 162 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 433 Field Botany (4)**

Field studies of California's diverse vegetation and flora. Factors affecting the distribution of plants and plant communities and their ecological relationships. Identification of plants and plant communities in the field. Several field trips required including two weekend trips to California's deserts and mountains. 2 lectures, 2 laboratories. Prerequisite: BOT 313 or consent of instructor.

**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 162.

**BOT 450 Plant Biotechnology Laboratory (2)**

Application of genetic engineering technology to plants; methods of plant tissue culture and transformation. 2 laboratories. Prerequisite: BIO 303 or BIO 351 or CHEM 373.

## 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 (2)**

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. 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 152 3-D Solids Modeling (1)**

Introduction to 3-dimensional solids modeling using state-of-the-art software. Model generation and modification of associative properties, assembly modeling, extrusions and revolutions. 1 laboratory. Prerequisite: BRAE 133, BRAE 151 or equivalent courses.

**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, or MCRO 221.

**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 239, 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: MAPE Score G, prerequisite or concurrent: FNR 215.

#### **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 302 Servo Hydraulics (4)**

Application of microcomputers and programmable logic controllers to hydraulic, pneumatic and mechanical systems. Theory, instrumentation and sensors used in process and control systems used in agricultural equipment. 3 lectures, 1 laboratory. Prerequisite: BRAE 216 or BRAE 324 and BRAE 234 or BRAE 301.

#### **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.

#### **BRAE 342 Agricultural Materials (4)**

Physical properties of agricultural materials and their measurement. Strength of materials, material flow and transport, material deformation, shape and size classification, moisture relationships and biological interactions. Interactions between agricultural materials, the environment and equipment used to handle them. 3 lectures, 1 laboratory. Prerequisite: PHYS 121, CHEM 110 or CHEM 111, SS 121.

#### **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, painting 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.

#### **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 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 or CSC 232.

#### **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 342, BRAE 343.

#### **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 (4)**

Relevant principles of hydrology and porous media flow. Flow nets, wells and ground water, design of simple surface and sub-surface drains. 3 lectures, 1 laboratory. Prerequisite: Junior standing, 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 (4)**

Biological, thermal and physical techniques for converting biomass into useful energy forms for agriculture and industry. Laboratory exercises include experiments with anaerobic digestion of animal wastes into methane, ethanol fermentation of grains and composting of agricultural residues. Technical and economic feasibility of biofuels. 3 lectures, 1 laboratory. Prerequisite: MATH 118 (or MATH 116 and 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: For BRAE majors: ENGL 149; for ASM majors: ENGL 148; junior standing.

#### **BRAE 461, 462 Senior Project I, II (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 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 (1-4)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units. 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 Legal Responsibilities of Business (4)**

Examination of the American legal system and important legal principles for business operations, such as those involved with contracts, torts, agency, business organizations, and employment. Emphasis on how legal principles help define socially responsible conduct. 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 (4)**

Principles of financial accounting for Business majors. The course prepares students to understand and interpret financial statement information. Financial reporting standards are explored to give students an understanding of how financial events are reflected in financial statements. The course explores the importance of social responsibility in accounting through spreadsheet applications and Internet resources. 4 lectures. Prerequisite: Sophomore standing.

**BUS 215 Managerial Accounting (4)**

Applications of accounting for making business decisions. Content includes planning and control issues including cost behavior, budget preparation, performance reporting; addresses social responsibility and employee motivational and behavioral considerations. Preparation of spreadsheet applications useful for decision-making. 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 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 310 Introduction to Entrepreneurship (4)**

Role and impact of entrepreneurship; characteristics and traits of entrepreneurs; social, economic, cultural and policy conditions conducive to entrepreneurship; entrepreneurial thinking; opportunity identification and assessment; the management team; organizational and legal issues; business models; acquiring social and financial capital; managing startup to growth; entrepreneurial behavior in existing organizations; realizing and harvesting value. 4 lectures. Prerequisite: 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 issues. BUS 321 covers financial statements, assets other than investments and intangibles, and liabilities. BUS 322 covers investments, intangibles, equities, revenue recognition and the Cash Flows Statement. 4 lectures. Prerequisite: BUS 321: BUS 214 and junior standing; BUS 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. Some discussion of corporate social responsibility in the context of corporate objective functions. The use of technology in the form of financial calculators and/or spreadsheets. 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 advanced 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)**

Introduction of the marketing process: identifying target markets; developing and launching products or services; and managing pricing, promotion, and distribution strategies. Focus on leveraging technologies that result in innovation and impact marketing practice. Recognition that markets are global. Ethics and social responsibility in marketing decision-making. 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 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) (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 382 Organization, People, and Technology (4)**

Organizations as sociotechnical systems. Examination of macro dimensions of organizations including environment, mission, goals, structure, people, technology, and internal management systems and processes. Case analysis, experiential class activities. Application to technology-oriented business settings. 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 Resource Management (4)**

Introduction to functional areas of the discipline including staffing, compensation, employee development and labor relations. Additional workplace issues addressed include performance and human capital management, employer legal and social responsibility for employee wellbeing, managing a diverse/global workforce, and using human resource information systems. 4 lectures. Prerequisite: Junior standing.

#### **BUS 386 Employee Performance and Knowledge Management (4)**

Needs assessment, including organization, person, and task or competency analysis. Design, delivery and evaluation of employee training and human resource development in knowledge-based organizational settings. Performance management and feedback systems; development of learning organizations; human resource information systems (HRIS) applications in career management and training administration. 4 lectures. Prerequisite: BUS 384.

#### **BUS 387 Organizational Behavior (4)**

Application of behavioral, social and organizational science concepts to management. Exploration of the interactions between individuals and the organizations in which they work and live. Individual, interpersonal, team, intergroup and organizational levels of analysis included in topics such as expectations, perception, communications, creativity, leadership style, cultural and ethical behavior, group dynamics, team effectiveness and work design. 4 lectures. Prerequisite: Junior standing. Recommended: A grade of C- or better in STAT 252.

#### **BUS 390 Data Structures for Business Systems (4)**

The use of 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. Emphasis on the use of data structures from object class libraries in projects and exercises. 4 lectures. Prerequisite: CPE/CSC 101 or CSC 237 (with a grade of C- or better), or consent of instructor.

#### **BUS 391 Information Systems (4)**

Computer applications in business and industry. Information systems and integrated systems concepts, computer hardware and software, strategic uses of information systems, databases, data warehousing, decision support systems and artificial intelligence, network basics, electronic commerce, systems development, ethical use of information, employing technology in a socially responsible manner, and emerging trends and technologies in information systems. 3 lectures, 1 activity. Prerequisite: Junior standing or consent of instructor.

#### **BUS 393 Database Systems in Business (4)**

Design, development, testing, and implementation of databases for business applications. Data modeling with entity relationship diagrams (ERD) and class diagrams (UML). Data normalization, data integrity, the effect of business rules on data normalization. Advanced queries using structured query language (SQL). Database application development

culminating in a database project. 4 lectures. Prerequisite: BUS 391 and BUS 390 or CSC 103, and junior standing or consent of instructor.

#### **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 (grade of C- or better) and junior standing.

#### **BUS 395 Systems Design and Implementation (4)**

Systems design and implementation, with focus on project management and incorporating software quality into the software development process, including software testing. 4 lectures. Prerequisite: BUS 393 and BUS 394 (both with a minimum grade of C- or better).

#### **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, including socially responsible behavior and governance. Case studies, group problem solving. Capstone course of Business core curriculum. 4 seminars. Prerequisite: A grade of C- or better in all 300-level Business core courses, BUS 342, BUS 346, IT 371, BUS 387, 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, agencies and regulatory policy, antitrust law, public policy analysis, business-government relations, and corporate responsibility. 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 418 Listening to the Customer (4)**

A project-oriented introduction to exploratory, secondary, and qualitative methods. Access and use of secondary sources of information that support marketing decision making and lead to a carefully crafted research plan. Emphasis on qualitative marketing research techniques, with the goal of setting the stage for additional data collection. 4 lectures. Prerequisite: BUS 346.

**BUS 419 Strategic Marketing Measurement (4)**

Gathering, analyzing, and reporting information critical for marketing decision making. Focus on primary data collection and analytical techniques including experimental design, descriptive statistics, chi-square analysis, ANOVA, and regression. Advanced methods pertaining to data mining, GIS, and customer relations management (CRM). 4 lectures. Prerequisite: BUS 418.

**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 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 Internship/Cooperative Education (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, junior standing, and a CPSLO cumulative GPA of at least 2.5 without being on academic probation.

**BUS 431 Security Analysis and Portfolio Management (4)**

In-depth analysis of equity market and its instruments. Detailed study of leading stock valuation models. Impact of changes in the firm's fundamentals and in macroeconomic factors on stock prices. Brief introduction to equity and index derivatives. 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 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)**

Analyses of real estate financing techniques and funding sources for development projects. Effects of federal, state, and local taxes on real

estate investments. In-depth investigation and computer analyses of real estate investment projects. 4 lectures. Prerequisite: BUS 342.

**BUS 435 Real Estate Investment (4)**

Intensive investigation and computer analysis of real estate investment opportunities. Problems in real estate and property management. 4 lectures. Prerequisite: BUS 342.

**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 431 and BUS 439.

**BUS 439 Fixed Income Securities and Markets (4)**

Development of analytical skills for properly valuing fixed income securities. Bond pricing, yields, and volatility; interest rate term structure and yield curve; securities, market structure, and analytical techniques; bond portfolio strategies and an introduction to interest rate derivatives. 4 lectures. Prerequisite: BUS 342.

**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.

**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 431, BUS 438, and BUS 439.

**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 445 Ethics and Behavioral Finance (4)**

Contemporary theoretical and empirical issues including agency theory, reputation building, game theory, and financial ethics. Discussion of the

application of ethics theory to financial decisions. May include lectures, case analyses, student presentations, and guest speakers. 4 lectures. Prerequisite: BUS 342.

**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. Building of an understanding of global marketing strategy. 4 lectures. Prerequisite: BUS 346.

**BUS 451 Product Development and Launch (4)**

Building of project-based skills in developing new products and planning for their launch. Major phases of product development: opportunity identification, product design and positioning, pre-market testing and forecasting, and launch marketing. Introduction to data-gathering methods used to design well differentiated and successful products. 4 lectures. Prerequisite: BUS 419.

**BUS 452 Product Management (4)**

Development of project-based skills in managing products in the growth, maturity, and decline stages of their life cycles. Emphasis of the distribution, pricing, and communication strategies required to maintain distinctive product advantages. Product modification, product line strategies, and pruning. 4 lectures. Prerequisite: BUS 419.

**BUS 454 Developing and Presenting Marketing Projects (4)**

Client-based course providing an opportunity to apply marketing abilities. Teams draw upon research, analytical, and strategic marketing skills to develop an actionable plan that addresses a critical marketing challenge faced by an organization. Deliverables include research findings and written and verbal presentation to the organization and instructor. 4 lectures. Prerequisite: BUS 451 and BUS 452.

**BUS 455 Marketing Management (4)**

Integration of key marketing concepts using tools such as computer simulations, readings, and/or case studies. Development and implementation of strategic and tactical decisions for companies and brands. 4 lectures. Prerequisite: BUS 451 and BUS 452.

**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 461, 462 Senior Project I, II (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 Senior Project: 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 464 Applied Senior Project Seminar (4)**

Selection and analysis of business problems and opportunities in directed individual or group-based projects. Problems typical to those which graduates could encounter in their fields of employment. Formal report required. 4 seminars. Prerequisite: Senior standing.

**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 474 Independent Study in Accounting (4)**

Individual investigation, research, study or survey of selected topics in accounting, auditing or taxation. Total credit limited to 8 units, repeatable in the same term. *Class Schedule* will list topic selected. Prerequisite: BUS 322.

**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 477 Organization Development Programs (4)**

Analysis of development programs in organizations. Review of development and trends in the field of organizational development. Application of behavioral and organizational science knowledge and social technology to programs in organizations for the purpose of improving effectiveness and sustainability. 4 seminars. Prerequisite: BUS 387 and BUS 382 or consent of instructor.

**BUS 478 Organization Design Programs (4)**

Impact of changing business environment and strategy on design of organizations. Organization design programs, including design models, redesign processes, and guiding principles. 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 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.

Ethical use of information systems in managing the human resource function. Basic system design decisions. Use of information systems to support traditional human resource functional areas. Exposure to enterprise-wide, integrated software. 4 lectures. Prerequisite: BUS 384 and BUS 391.

**BUS 488 Planning and Managing New Ventures (4)**

The purpose and process of business planning and the challenges of managing a start-up enterprise. Preparation of a complete business plan: management and organization; product or service; marketing; finance; operating and control systems; growth. 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. Ethical use of information systems in managing small businesses. Role of information systems in conducting business in a socially responsible manner. 4 lectures. Prerequisite: BUS 391.

**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, and test management. 4 lectures. Prerequisite: BUS 391 and CPE/CSC 101 or CSC 237 (with a grade of C- or better), or consent of instructor.

**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, CPE/CSC 101 or CSC 237 (with a grade of C- or better), BUS 390, junior standing, or consent of instructor.

**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 Information Systems (4)**

Specialized Information Systems (IS) topic selected from the IS areas of current interest. Intended for advanced IS concentration students who want to learn and acquire in-depth IS knowledge and skills. *Class Schedule* will list topic selected. 4 lectures. Prerequisite: IS concentration students only, and consent 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, 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 (1)**

Introduction to the child development major, self-assessments, career opportunities, university and community resources, and the program at Cal Poly. 1 lecture. Prerequisite: CD majors only or consent of instructor.

**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 (3)**

Creating an environment to meet the needs of the infant and toddler. Establishing communication in an atmosphere of trust and providing activities which enhance the emerging capabilities of the infant and toddler. 1 lecture, 2 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 all aspects of development that influence the teaching-learning process. Special emphasis on multicultural, language, and other diversity issues. Introduction to Multiple Subject Credential Program, and Program Portfolio. Fieldwork activities and other settings. 4 lectures, 1 activity. Prerequisite: PSY 201 or PSY 202.

**CD 209 Early Development (4)**

Human development from conception through early childhood. Discussion and analysis of research and theory regarding physiological, cognitive and psychosocial domains of development, especially as they apply to working with young children and families in educational settings. 4 lectures. Prerequisite: CD 102, PSY 201 or PSY 202, or consent of instructor.

**CD 210 Middle Childhood (4)**

Examination of research and theory regarding physical, cognitive, and psychosocial development in middle and late childhood, and the

implications for work with youth in educational settings. 4 lectures. Prerequisite: CD 209.

**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 232, 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 312 Learning, Development and Technology: Preschool Applications (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. A special multimedia project completed in conjunction with CD 309, CD 310 or CD 311. 4 laboratories. Prerequisite: CD 209, or consent of instructor. Co-requisite: CD 309, CD 310 or CD 311.

**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 130, 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 309, CD 312, 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 (4)**

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. 4 lectures. Prerequisite: CD 102.

**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 Mechanics of Materials (6)**

Stresses, strains, and deformations associated with torsion, axial, shear, moment, and pressure vessel loadings. Combined loadings and principle representations of the states of stress and strain at a point. Basic failure criteria. Introduction to stability including buckling of columns. Equivalent in content to CE 204 and CE 207. 6 lectures. Prerequisite: ME 211.

**CE 204 Mechanics 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 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 equivalent (CE 205 from prior catalogs).

**CE 207 Mechanics of Materials II (3)**

Combined stress states including torsion, axial, shear, moment, and pressure vessel loadings. Principle stress/strain states. Basic failure criteria. Analysis of beam forces, moments, deflections, and rotations. Introduction to stability concepts including column buckling. 3 lectures. Prerequisite: CE 204.

**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 or concurrent: CE 221.

**CE 240 Additional Engineering Laboratory (1-2) (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 done with minimum faculty supervision. Total credit limited to 6 units. Credit/No Credit grading only. 1-2 laboratories.

**CE 251 Numerical Methods in Civil Engineering (2)**

Concepts from numerical analysis and basic programming theory introduced in the context of civil engineering applications. Topics include application of programming constructs, vectors, matrices, linear system solutions, eigenvalues/vectors, plotting, statistics, least squares, approximation, and statistics. 1 lecture, 1 laboratory. Prerequisite: CE 114 and MATH 244.

**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 (4)**

Analysis for member forces and deflections of determinate and indeterminate structures, including trusses, beams, and frames. General theorems, influence diagrams, and energy methods. 3 lectures, 1 laboratory. Prerequisite: CE 251 and either CE 201 or CE 207.



**CE 355 Reinforced Concrete Design (4)**

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, 1 laboratory. Prerequisite: CE 259, CE 351.

**CE 356 Structural Steel Design (4) (formerly CE 453)**

Design and behavior of the elements of steel structures. Design and analysis of bolted, welded and eccentric connections. Proportioning of members and connections. Introduction to plastic design, end plate connection, composite construction, shear connections and design of composite beams. 3 lectures, 1 laboratory. Prerequisite: 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. Concurrent: CE 382 (CE majors only).

**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 351.

**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 423 Intelligent Transportation Systems (4)**

Specification and operation of Intelligent Transportation Systems (ITS). Traffic surveillance and control systems including applications to freeways, urban streets, rural highways, and public transportation. Standards include the National Architecture for ITS. 3 lectures, 1 laboratory. Prerequisite: CE 221, graduate standing, 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 (4)**

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, 1 laboratory. Co-requisite: CE 336.

**CE 452 Advanced Reinforced Concrete Design (4)**

Emphasis placed on reinforced concrete behavior and design applications. Topics include deflection calculations, inelastic behavior of reinforced concrete components and systems, strut-and-tie modeling, seismic detailing, and two way slabs. 3 lectures, 1 laboratory. Prerequisite: CE 355.

**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 356.

**CE 455 Design of Temporary Structures (4)**

Analysis and design of temporary structures with emphasis on timber structures, construction methodology, and material behavior. Topics include: physical and mechanical properties of structural lumber, lateral load paths; diaphragms; formwork design; connections; structural stability; and combined load design. 3 lectures, 1 laboratory. Prerequisite: CE 355 or CE 453.

**CE 456 Seismic Principles for Civil and Environmental Engineers (4)**

Basic principles in seismic analysis and design of civil and environmental systems. Seismological aspects of earthquakes. Simple concepts in structural dynamics. Simplified code-based analysis and design. 4 lectures. Prerequisite: CE 207. Not open to students with credit in CE 557.

**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 356.

**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 I, II (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 presented in formal written reports for reference library and formal oral reports. 2 laboratories. Prerequisite: CE 466.

**CE 468, 469 Community Engineering Senior Projects I, II (2) (2)**

Two-part series. Student teams work in cooperation with a local community organization to complete an integrated civil design project. Projects representative of those encountered in professional practice. Focus on management as well as design issues. Volunteer service required. 2 laboratories (2 units per quarter).

**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)**

Evaluation of shear strength for foundation design. Analysis of bearing capacity for generalized conditions. Design of reinforced concrete spread footings. Stress distributions beneath loaded areas. Immediate settlement, consolidation settlement, rate of consolidation, and creep. 4 lectures. 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 486 Geological Engineering I (4)**

Identification and characterization of consolidated geologic materials for the purpose of civil analysis and design. Interpretation of geologic maps, cross sections, and reports. Interpretation of aerial photographs. Engineering considerations important in dealing with transported soils. 4 lectures. Prerequisite: CE 381, CE 382, GEOL 201.

**CE 487 Geological Engineering II (4)**

Evaluation of the engineering properties of rocks. Rock core description. Slope stability analyses in rock. Discontinuity analysis. Rockfall hazard

assessment and mitigation. Design of shallow foundations on rock. 4 lectures. Prerequisite: CE 486.

**CE 493 Cooperative Education Experience (2) (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 6 units. Prerequisite: Sophomore standing and consent of instructor.

**CE 494 Cooperative Education Experience (6) (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 18 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. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. Total credit limited to 24 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 527 Sustainable Mobility (4)**

Presentation and analysis of concepts and designs for sustainable mobility from a global-to-local, interdisciplinary perspective, including pedestrians, bicyclists, and public transportation. Addresses economy, environment, and equity (social issues) through lectures, panels, excursions and a planning/design project in San Luis Obispo County. 3 lectures, 1 laboratory. Prerequisite: 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 Prestressed Concrete Design (4)**

Advanced analysis, design and behavior of prestressed and precast concrete elements and structures. Origin of code requirements. Detailed design of prestressed concrete components of civil engineering systems for buildings and highway construction. Creep and shrinkage of concrete and relaxation of steel applied to prestressing losses. 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 laboratory strength testing. 3 lectures, 1 laboratory. Prerequisite: CE 481 or graduate standing.

**CE 582 Geotechnical In Situ 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 and ground motion evaluation. Dynamic behavior of soils. Seismic site response analysis. Soil liquefaction evaluation methods and mitigation techniques. Seismic stability of slopes and retaining walls. Computer-aided analysis. 4 lectures. Prerequisite: CE 481, CE 407 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 593 Cooperative Education Experience (2) (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.

**CE 594 Cooperative Education Experience (6) (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.

**CE 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. A fully-developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

**CE 599 Design Project (Thesis) (2) (2) (5)**

Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis. Prerequisite: Graduate standing.

**CHEM-CHEMISTRY****CHEM 106 Introductory Chemistry (3)**

Introductory course in chemistry. Measurement, metric system, properties of matter, chemical symbols, atomic structure, chemical formulas, nomenclature, chemical equations, the mole concept, stoichiometry. Not open to students who have credit in a college chemistry course. 3 lectures.

**CHEM 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: Passing 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 passing score on the ELM examination for MATH 116 eligibility, or an ELM exemption, or MATH 104.

**CHEM 124 General Chemistry for the Engineering Disciplines I (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. Equivalent to 3 lectures, 1 laboratory. Prerequisite: High school chemistry or CHEM 106 or equivalent, and passing score on the ELM examination for MATH 116 eligibility or an ELM exemption or MATH 104.

**CHEM 125 General Chemistry for the Engineering Disciplines II (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 I (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 passing score on the ELM examination for MATH 116 eligibility or an ELM exemption or MATH 104.

**CHEM 128 General Chemistry II (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 III (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. 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 chair.

**CHEM 201 Undergraduate Research (1-3) (CR/NC)**

Laboratory research under faculty supervision. Credit/No Credit grading only. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**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 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: 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 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. 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. 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.

**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 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 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: BIO 161 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. 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 chair.

**CHEM 401 Advanced Undergraduate Research (1-3) (CR/NC)**

Laboratory research under faculty supervision. Credit/No Credit grading only. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**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 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 443 Organic Chemistry Concepts for Materials Engineering (1) (CR/NC)**

Introduction to organic chemistry of polymers and basic methods of polymer analysis. Designed for students with little or no organic chemistry background. Not open to Chemistry or Biochemistry majors. Credit/No

Credit grading only. 1 activity. Prerequisite: CHEM 125 or CHEM 129; corequisite: CHEM 444.

**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 or concurrent enrollment in CHEM 443.

**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 461 Senior Project Report (1)**

Completion of a senior project report under faculty supervision. Minimum 30 hours time commitment. Prerequisite: CHEM 459 and consent of instructor.

**CHEM 463 Honors Research (1)**

Advanced laboratory research. Results are presented in a poster session or other public forum. Prerequisite: CHEM 461 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 (3)**

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. Recommended: CHEM 373 or BIO 351.

**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 371 or consent of instructor.

**CHEM 476 Gene Expression Laboratory (2) (Also listed as BIO 476)**

Heterologous gene expression of a recombinant protein in a microbial system: gene cloning, construction of expression plasmid, DNA sequence analysis, transformation of microbial host, selection and analysis of transformed host cells, expression and purification of recombinant protein. 2 laboratories. Prerequisite: BIO/CHEM 375, CHEM 313 or CHEM 371; MCRO 433.

**CHEM 477 Biochemical Pharmacology (3)**

Consideration of current selected topics in pharmacology considering body systems. 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 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 500 Special Problems for Graduate Students (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: Graduate standing and consent of department chair.

**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.

## COMMUNICATION STUDIES— See Speech Communication

### CM—CONSTRUCTION MANAGEMENT

**CM 211 Construction Drawings and Specifications (4)**

Basic skills and techniques required to produce construction drawings and specifications conforming to current building codes and standards, including using manual drawing techniques and Computer Aided Drafting. Laboratory assignments develop visualization skills in order to examine the integration of construction systems, architectural conventions, organization of working drawings and specifications. 4 laboratories. Prerequisite: Second-year standing and ARCH 105 and ARCH 106.

**CM 212 Fundamentals of Construction Management (3)**

Introduction to the fundamental concepts of construction management. Primary areas of focus are quantity surveying and basic scheduling techniques. Additional topics of study to include work activity durations and sequencing, and computer applications in scheduling. 3 laboratories. Prerequisite: Second-year standing and CM 211.

**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: Second-year standing and 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: Completion of GE Area D2.

**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 Accounting (3)**

Fundamentals of construction accounting principles to include income recognition, job cost control, cash flow analysis and associated cost reports. 3 lectures. Prerequisite: Third-year standing, BUS 215, and either BUS 212 or BUS 214.

**CM 332 Evaluation of Cost Alternatives (3)**

Basic principles of economic evaluations using fundamental concepts of time value of money to compare cost alternatives related to construction, design, and real property development. 3 lectures. Prerequisite: Third-year standing and ECON 222.

**CM 333 Construction Contracts and Law (3)**

Legal and contractual aspects of the construction industry. Topics of study to include the different types of contracts and clauses associated with the various project delivery systems. 3 lectures. Prerequisite: Third-year standing and either BUS 201 or BUS 207.

**CM 341 Residential Construction Practices (3)**

Materials, methods, and techniques associated with residential and light commercial construction operations. Topics of study to include shallow foundation systems, structural framing systems (timber and masonry), roofing systems, and exterior and interior finish systems. 3 laboratories. Prerequisite: Third-year standing and CM 221.

**CM 342 Commercial Construction Practices (3)**

Materials, methods, and techniques associated with large commercial construction operations. Topics of study to include earth retainage and foundation systems, structural framing systems (steel and concrete), roofing and exterior cladding systems, conveyance systems, and interior finish systems. 3 laboratories. Prerequisite: Third-year standing, CM 221 and ARCE 211.

**CM 343 Heavy Civil Construction Practices (3)**

Materials, methods and techniques associated with heavy civil construction operations. Topics of study to include earthwork and associated heavy equipment, roadway work, bridge work, and various other types of heavy civil construction operations. 3 laboratories. Prerequisite: Third-year standing 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 Electrical Systems for Buildings (3)**

Materials, methods and techniques associated with the construction and installation of electrical power systems, lighting systems, and other wiring systems within the building. Additional topics of study to include electrical power generation and distribution to the building. 3 laboratories. Prerequisite: Third-year standing.

**CM 353 Mechanical Systems for Buildings (3)**

Materials, methods and techniques associated with the construction and installation of HVAC (Heating, Ventilating, and Air Conditioning) systems, plumbing systems and fire suppression systems within the building. Additional topics of study to include domestic water supply to the building and drainage systems (storm drains and sewers) from the building. 3 laboratories. Prerequisite: Third-year standing.

**CM 364 Construction Jobsite Management (3)**

Procedures, methods and documentation associated with project level management of the construction process. Administrative roles and managerial relationships among the various members of the project team, primarily constructors, designers and owners. 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 instructor.

**CM 430 Collaborative Process (3) (Also listed as EDES 430)**

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 planning, design, bidding, permitting, construction and management phases. 3 activities. Prerequisite: Third-year standing or consent of instructor.

**CM 431 Integrated Project Services (3) (Also listed as EDES 431)**

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: Fourth-year 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 435 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 443 Management of the Construction Firm (3)**

Applications of strategic management techniques and business strategy for the long-range direction of the construction firm. 3 activities. Prerequisite: Fourth-year standing.

**CM 444 Concrete Formwork and Other Temporary Structures (3)**

Materials, methods and techniques associated with concrete formwork construction. Design and analysis of vertical and horizontal formwork systems. Additional topics of study to include temporary earth retainage systems (large excavations and trenches), dewatering systems, access scaffolding, and various other temporary structures utilized in building construction. 3 activities. Prerequisite: Fourth-year standing and ARCE 226.

**CM 452 Project Controls (3)**

Planning, organization, scheduling, and control of construction projects including cost control and resource control. Use of Critical Path Method (CPM) in planning and scheduling computer applications for CPM. 3 laboratories. Prerequisite: Fourth-year standing.

**CM 453 Project Development (4)**

Methods and procedures used in the development of a residential, commercial, or industrial project. 4 laboratories. Prerequisite: Consent of instructor.

**CM 454 Construction Estimating (3)**

Methods, procedures and computer applications associated with estimating the costs of construction projects. Additional topics of study to include analysis of the bidding process and conceptual estimating. 3 laboratories. Prerequisite: Fourth-year standing.

**CM 461, 462 Senior Project I, II (2) (1-2)**

Selection and completion of a comprehensive project under faculty supervision. Problems to involve the student's technical and creative skills. Student proposal must be submitted and approved by project advisor and department head prior to registration for course. Construction and team projects encouraged. Prerequisite: Fourth-year standing and consent of project advisor and department head. See department for additional guidelines and requirements.

**CM 463 Senior Project: Professional Practice for Constructors (3)**

Practical application of construction management theory and practice solving problems related to the built environment. 3 laboratories. Prerequisite: Fourth-year standing and 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: Third-year standing or consent of instructor.

**CM 485 Cooperative Education Experience (3-6) (CR/NC)**

Full-time work experience in an area directly related to the construction industry for 3 months. Positions are paid and usually require relocation and registration in course for one quarter. Registration in course is required at start of work experience. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. May be repeated for credit. Total credit limited to 16 units. See department for additional requirements. Prerequisite: Second-year standing and consent of instructor.

**CM 495 Cooperative Education Experience (12) (CR/NC)**

Full-time work experience in an area directly related to the construction industry for 6 months. Positions are paid and usually require relocation for two consecutive quarters. Registration in course is required at start of work experience. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. May be repeated for credit. Total credit limited to 16 units. See department for additional requirements. Prerequisite: Second-year 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. Credit not available for students who have taken CSC/CPE 108. 3 lectures, 1 laboratory. Prerequisite: MATH 118 (or equivalent) with a grade of C- or better, and basic computer literacy (CSC 100 or CSC 232 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. Credit not available for students who have taken CSC/CPE 108. 3 lectures, 1 laboratory. Corequisite: CSC 141. 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 108 Accelerated Introduction to Computer Science (4)  
(Also listed as CSC 108)**

Accelerated introduction to basic principles of algorithmic and object-oriented problem solving and programming. Introduction to programming language concepts including control structures, data types, classes, and inheritance. Program design principles. Use and implementation of algorithms (searching, sorting, recursion) and data structures (lists, stacks, and queues). Intended for students with experience in algorithmic problem solving and using basic control structures and data types in a modern programming language (CSC/CPE 101), but who are not ready for CSC/CPE 102. Credit not available for students who have taken CSC/CPE 102. 3 lectures, 1 laboratory. Prerequisite: Math 118 (or equivalent) with a grade of C- or better, significant experience in computer programming, and consent of instructor. Corequisite: CSC 141.

**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 100 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 100 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 instructor.

**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 with a C- grade or better. Concurrent: CPE 269.

**CPE 235 Fundamentals of Computer Science for Scientists and Engineers I (4) (Also listed as CSC 235)**

Introduction to the fundamentals of computer programming with an emphasis on mathematical, scientific and engineering applications: principles of algorithmic problem solving and procedural programming using a modern programming language, data types, elementary data structures, input/output and control structures. Not a substitute for CSC/CPE 101 for CSC/CPE majors or minors. 3 lectures, 1 laboratory. Prerequisite: MATH 141 or MATH 161 with a grade of C- or better, or consent of instructor.

**CPE 236 Fundamentals of Computer Science for Scientists and Engineers II (4) (Also listed as CSC 236)**

Further study of computer program development with an emphasis on mathematical, scientific and engineering applications. Introduction to more complicated data types and structures. Practice of more complicated techniques of procedural programming. Introduction to the principles of object-oriented programming using a modern programming language. Detailed discussion of lists and classic list algorithms, algorithm analysis, multidimensional arrays, records, dynamic data structures, file input/output, classes. Not a substitute for CSC/CPE 102 for CSC/CPE majors or minors. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 235 with a grade of C- or better, or consent of instructor.

**CPE 237 Introduction to Computer Science with Applications I (4)  
(Also listed as CSC 237)**

Introduction to the fundamentals of computer science using a modern programming language. Includes principles of algorithmic problem solving, data types, elementary data structures, input/output, control structures, classes and methods. Not a substitute for CSC/CPE 101 for CSC/CPE majors or minors. 3 lectures, 1 laboratory. Prerequisite: MATH 221 or STAT 252 with a grade of C- or better, or consent of instructor.

**CPE 238 Introduction to Computer Science with Applications II (4)  
(Also listed as CSC 238)**

Continuation of CPE 237. Intermediate study of computer program development using a modern object oriented (OO) programming language. Further study of OO principles including inheritance and interfaces. Introduction to implementation of Graphical User Interfaces, multi-media, streams, database connection, and scripting. Not a substitute for CPE/CSC 102 or for CSC/CPE majors or minors. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 237 with a grade of C- or better.

**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 with a C-grade or better. 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 300 Professional Responsibilities (4) (Also listed as CSC 300)**

The responsibilities of the computer science professional. The ethics of science and the IEEE/ACM Software Engineering Code of Ethics. Quality tradeoffs, software system safety, intellectual property, history of computing and the social implications of computers in the modern world. Applications to ethical dilemmas in computing. Technical presentation methods and practice. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 307 or CSC/CPE 309.

**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 353 or CSC/CPE 357.

**CPE 307 Introduction to Software Engineering (4) (Also listed as CSC 307)**

Requirements, specification, design, implementation, testing and verification of large software systems. Study and use of the software process and software engineering methodologies; working in project teams. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103 with a grade of C- or better, and CSC/CPE 357. Not open to students with credit in CSC/CPE 308.

**CPE 308 Software Engineering I (4) (Also listed as CSC 308) (formerly CPE 205)**

Principles for engineering requirements analysis and design of large complex software systems. Software process models. Methods of project planning, tracking, documentation, communication, and quality assurance. Analysis of engineering tradeoffs. Group laboratory project. Technical oral and written presentations. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103 with a grade of C- or better, and CSC/CPE 357 or CSC/CPE 353.

**CPE 309 Software Engineering II (4) (Also listed as CSC 309) (formerly 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 308.

**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 with a C- grade or better, CPE 229&269 with a C- grade or better.

**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 68HC12 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 129&169 with a C- grade or better.

**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 329 and CPE/CSC 316; either or both may be concurrent.

**CPE 353 Systems Programming for Software Engineers (4) (Also listed as CSC 353)**

Assembly language and C programming; 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 357 Systems Programming (4) (Also listed as CSC 357) (formerly 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, and CPE 229.

**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 instructor.

**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: CSC/CPE 307 or CSC/CPE 309; CSC/CPE 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 409 Current Topics in Software Engineering (4)  
(Also listed as CSC 409)**

Selected topics in software engineering. Topics may include program generation, quality assurance, formal methods, software metrics, design methods, testing, or software development processes. *Class Schedule* will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 309 or CSC/CPE 307.

**CPE 415 Microcomputer Systems (4)**

Recent advances in microcomputer architectures. RISC, parallel processing advances, and component communication. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 315.

**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: CPE 329 with a C- grade or better. Concurrent: CPE 467.

**CPE 430 Programming Languages I (4) (Also listed as CSC 430)**

Theory of formal languages and automata. Regular languages, finite automata, and lexical analysis. Context-free languages, pushdown automata, and syntactic analysis. Type checking and static semantics. Parsing: top-down (LL) and bottom-up (LR). 3 lectures, 1 laboratory. Prerequisite: CSC 349 and CSC/CPE 357.

**CPE 431 Programming Languages II (4) (Also listed as CSC 431)**

Language principles and design issues: bindings, conversion, parameter passing, and dynamic semantics. Language implementation: intermediate code representation, memory management, code optimization, and code generation. Functional programming languages. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 430.

**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 329 with a C- grade or better, 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 449 Current Topics in Algorithms (4) (Also listed as CSC 449)**

Selected aspects of the verification, analysis and design of algorithms. *Class Schedule* will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: CSC 349.

**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 353 or both CSC/CPE 315, CSC/CPE 357.

**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 456 Introduction to Computer Security (4)  
(Also listed as CSC 456)**

Survey of topics in computer system and network security, including protection, access control, distributed access control, operating system security, applied cryptography, network security, firewalls, secure coding practices, and case studies from real-world systems. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 357 and CSC 300.

**CPE 458 Current Topics in Computer Systems (4)  
(Also listed as CSC 458)**

Selected aspects of design, implementation and analysis of networks, advanced operating and distributed systems. Topics may include process management, virtual memory, process communication, context switching, file system designs, persistent objects, process and data migration, load balancing, security and networks. *Class Schedule* will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 453.

**CPE 461, 462 Senior Project I, II (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; prerequisite: CPE 350. 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: STAT 312 or STAT 321 or STAT 350; CSC/CPE 357; Software Engineering majors and graduate students may substitute CSC/CPE 353 for CSC/CPE 357.

**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 329 with a C- grade or better. Concurrent: CPE 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 353 or CSC/CPE 357.

**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 476 Real-Time 3D Computer Graphics Software (4)**  
(Also listed as CSC 476)

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.

**CPE 478 Current Topics in Computer Graphics (4)**  
(Also listed as CSC 478)

Selected aspects of the design, implementation and analysis of computer graphics. Topics may include rendering, modeling, visualization, animation, virtual reality, computer vision, multimedia, and perception issues. *Class Schedule* will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 471.

**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 482 Advanced Topics in Systems for Computer Engineering (4)**

Selected aspects of design, implementation, verification and analysis of advanced computer systems. Topics may include computer systems, embedded systems, robotics, mechatronics, haptics, human computer interfaces, digital control, digital signal processing, wireless computing, real time operating systems, and networks. *Class Schedule* will list topic selected. Total credit limited to 8 units, repeatable in same term. 3 lectures, 1 laboratory. Prerequisite or concurrent: CPE 350, or consent of instructor.

**CPE 483 Current Topics in Human-Computer Interaction (4)**  
(Also listed as CSC 483)

Selected aspects of the field of human-computer interaction. Topics may include dynamic information visualization, universal access, social impact of technology usage, educational technology, human cognition and performance studies, and extended usability evaluation techniques. *Class Schedule* will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 484.

**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 307 or CSC/CPE 308.

**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 489 Current Topics in Artificial Intelligence (4)**  
(Also listed as CSC 489)

Selected aspects of the design, implementation and analysis of advanced systems and concepts in the area of artificial intelligence. Topics may include knowledge representation, reasoning, learning, or planning, and specific techniques like intelligent agents, genetic algorithms, semantic web, or robotics. *Class Schedule* will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 480.

**CPE 493 Cooperative Education Experience (2) (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 6 units. Prerequisite: Sophomore standing and consent of instructor.

**CPE 494 Cooperative Education Experience (6) (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 18 units. Prerequisite: Sophomore standing and consent of instructor.

**CPE 495 Cooperative Education Experience (12) (CR/NC)**

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. Total credit limited to 24 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 569 Distributed Computing (4) (Also listed as CSC 569)**

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. Not open to students with credit in CSC/CPE 369 or CSC/CPE 469. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103 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.

**CPE 581 Computer Support for Knowledge Management (4)  
(Also listed as CSC 581)**

Use methods and techniques that computer-based systems can provide to make the management of knowledge and information in digital form easier for the user. Emphasis on support for knowledge-intensive activities performed by users. 3 lectures, 1 laboratory. Prerequisite: CSC/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 Urban Design Studio I (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 Urban Design Studio II (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 (2)**

Introduction to the use of computer applications for planners. Includes spreadsheets, statistical applications, database, geographic information systems, and graphics. 1 lecture, 1 laboratory.

**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: Completion of GE Area D2.

**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 Introduction to Environmental Planning (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. 4 lectures. Prerequisite: CRP 212.

**CRP 338 Digital Cities (4) GE Area F**

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, or consent of instructor.

**CRP 342 Environmental Planning Methods (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 or consent of instructor.

**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 I, II (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. 2 lectures, 3 laboratories. **CRP 410** prerequisite: CRP 336, CRP 341. **CRP 411** prerequisite: CRP 342, CRP 410.

**CRP 412 Plan 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 212 and third-year standing, 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 graduate standing 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. 4 lectures. 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 I, II (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 512 Introduction to Visual Communication and GIS (4) (CR/NC)**

Introduction to geographic information systems (GIS) as a tool for analyzing and managing spatial information pertinent to planning. Introduction to various drawing media and delineation techniques for planners, including three-dimensional visualization and graphic skills. Integration of visual and digital media in presentations. Credit/No Credit grading only. 4 laboratories. Prerequisite: Graduate standing.

**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 and supervised work. 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' 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 Methods of Data Analysis (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: 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: Graduate standing 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 535 Land Use and Planning Law (4)**

The role of law in the planning and regulation of land use. Constitutional constraints on land use regulation. Legal and policy issues for environmental protection and public administration. Relevant legislation and case law. 4 lectures. Prerequisite: Graduate standing, or consent of instructor.

**CRP 545 Principles of Environmental Planning (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 Urban Development and Design (4)**

Introduction to the philosophy and theory particular to urban development and 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. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

**CRP 552 Community and Regional Planning Studio I (4)**

Application of planning theory and methods to community and regional planning projects. Structured for research, analysis, synthesis, and implementation practice. Interrelationships of natural and built environments, transportation systems, and economic and social conditions at various planning scales. Includes field trips and individual, team and interdisciplinary approaches. 2 seminars, 2 laboratories. Prerequisite: CRP 501, CRP 525.

**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 512.

**CRP 554 Community and Regional Planning Studio II (4)**

Application of planning theory and methods to community and regional planning projects. Structured for research, analysis, synthesis, and implementation practice. Interrelationships of natural and built environments, transportation systems, and economic and social conditions at various planning scales. Includes field trips, and individual, team and interdisciplinary approaches. 2 seminars, 2 laboratories. Prerequisite: CRP 552.

**CRP 556 Community and Regional Planning Studio III (4)**

Application of planning theory and methods to community and regional planning projects. Individual laboratory work leading to the completion of

a professional quality project focused on a real-world planning task. Structured for research, analysis, synthesis and implementation practice. 3 seminars and supervised work. Prerequisite: CRP 554.

**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 (2-4)**

Individual research under the supervision of the faculty, leading to completion of a professional project based on a real world planning task or carefully constructed simulation. Must be taken in all quarters requiring supervision; minimum of 6 units required for degree. Total credit limited to 8 units. Prerequisite: CRP 513, and consent of the graduate program coordinator.

**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 510, CRP 516, CRP 518, CRP 525, CRP 530, CRP 535, CRP 552, CRP 554 and advancement to candidacy.

**CRP 599 Thesis (2-4)**

Individual research under the general supervision of the faculty, leading to a graduate thesis. Must be taken in all quarters requiring supervision; minimum of 6 units required for degree. Total credit limited to 8 units. Prerequisite: CRP 513, and consent of the graduate program coordinator.

**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 132 California Field Crops (4)**

Production, adaptation, distribution, and utilization of five economically significant field crops: alfalfa, corn, cotton, potatoes, and rice. Field trips to production areas. 3 lectures, 1 laboratory. Prerequisite: HCS 120.

**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 231 Commercial Seed Production (4)**

Production 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: HCS 120, CRSC 230 or VGSC 230, EHS 121 or consent of instructor.

**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: HCS 120 or other 100-200 level CRSC/FRSC/HCS/VGSC course.

**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 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 411 Experimental Techniques and Analysis (4)**

Principal experimental designs used in agriculture and methods of statistical analysis of data collected from each. 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. Credit not available for students who have taken CSC/CPE 108. 3 lectures, 1 laboratory. Prerequisite: MATH 118 (or equivalent) with a grade of C- or better, and basic computer literacy (CSC 100 or CSC 232 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. Credit not available for students who have taken CSC/CPE 108. 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. Corequisite: CSC 141

**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 108 Accelerated Introduction to Computer Science (4)**

(Also listed as CPE 108)

Accelerated introduction to basic principles of algorithmic and object-oriented problem solving and programming. Introduction to programming language concepts including control structures, data types, classes, and inheritance. Program design principles. Use and implementation of algorithms (searching, sorting, recursion) and data structures (lists, stacks, and queues). Intended for students with experience in algorithmic problem solving and using basic control structures and data types in a modern programming language (CSC/CPE 101), but who are not ready for CSC/CPE 102. Credit not available for students who have taken CSC/CPE 102. 3 lectures, 1 laboratory. Prerequisite: Math 118 (or equivalent) with a grade of C- or better, significant experience in computer programming, and consent of instructor. Corequisite: CSC 141.

**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 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 231 Programming for Engineering Students (2)**

Programming techniques and procedures with applications to engineering problems. 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 232 Computer Programming for Scientists and Engineers (3) (formerly CSC 111)**

Computer programming, with an emphasis on procedural programming, taught using a language hosted by applications commonly used in science and engineering. Credit not allowed for CSC, CPE or Software Engineering majors. 2 lectures, 1 activity. Prerequisite: MATH 118 or equivalent.

**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 235 Fundamentals of Computer Science for Scientists and Engineers I (4) (Also listed as CPE 235)**

Introduction to the fundamentals of computer programming with an emphasis on mathematical, scientific and engineering applications: principles of algorithmic problem solving and procedural programming using a modern programming language, data types, elementary data structures, input/output and control structures. Not a substitute for CSC/CPE 101 for CSC/CPE majors or minors. 3 lectures, 1 laboratory. Prerequisite: MATH 141 or MATH 161 with a grade of C- or better, or consent of instructor.

**CSC 236 Fundamentals of Computer Science for Scientists and Engineers II (4) (Also listed as CPE 236)**

Further study of computer program development with an emphasis on mathematical, scientific and engineering applications. Introduction to more complicated data types and structures. Practice of more complicated techniques of procedural programming. Introduction to the principles of object-oriented programming using a modern programming language. Detailed discussion of lists and classic list algorithms, algorithm analysis, multidimensional arrays, records, dynamic data structures, file input/output, classes. Not a substitute for CSC/CPE 102 for CSC/CPE majors or minors. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 235 with a grade of C- or better, or consent of instructor.

**CSC 237 Introduction to Computer Science with Applications I (4) (Also listed as CPE 237)**

Introduction to the fundamentals of computer science using a modern programming language. Includes principles of algorithmic problem solving, data types, elementary data structures, input/output, control structures, classes and methods. Not a substitute for CSC/CPE 101 for CSC/CPE majors or minors. 3 lectures, 1 laboratory. Prerequisite: MATH 221 or STAT 252 with a grade of C- or better, or consent of instructor.

**CSC 238 Introduction to Computer Science with Applications II (4) (Also listed as CPE 238)**

Continuation of CSC 237. Intermediate study of computer program development using a modern object oriented (OO) programming language. Further study of OO principles including inheritance and interfaces. Introduction to implementation of Graphical User Interfaces, multi-media, streams, database connection, and scripting. Not a substitute for CSC 102 or for CSC/CPE majors or minors. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 237 with a grade of C- or better.

**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 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) (Also listed as CPE 300)**

The responsibilities of the computer science professional. The ethics of science and the IEEE/ACM Software Engineering Code of Ethics. Quality tradeoffs, software system safety, intellectual property, history of computing and the social implications of computers in the modern world. Applications to ethical dilemmas in computing. Technical presentation methods and practice. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 307 or CSC/CPE 309.

**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. 4 lectures. Prerequisite: Completion of GE Area B, and junior standing.

**CSC 303 Teaching Computer Science (2)**

Practical coverage of educational techniques appropriate for tutoring in CSC/CPE undergraduate courses, including Socratic methods for tutoring of technical topics, design of test questions and grading rubrics, and lecture presentation. Intended for CSC/CPE/SE students interested in tutoring, grading, or a career in teaching computer science. 1 lecture, 1 laboratory. Prerequisite: CSC/CPE 103 or equivalent. Not available for technical elective credit.

**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 353 or CSC/CPE 357.

**CSC 307 Introduction to Software Engineering (4)**  
(Also listed as CPE 307)

Requirements, specification, design, implementation, testing and verification of large software systems. Study and use of the software process and software engineering methodologies; working in project teams. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103 with a grade of C- or better, and CSC/CPE 357. Not open to students with credit in CSC/CPE 308.

**CSC 308 Software Engineering I (4) (Also listed as CPE 308)**  
(formerly CSC 205)

Principles for engineering requirements analysis and design of large complex software systems. Software process models. Methods of project planning, tracking, documentation, communication, and quality assurance. Analysis of engineering tradeoffs. Group laboratory project. Technical oral and written presentations. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 103 with a grade of C- or better, and CSC/CPE 357 or CSC/CPE 353.

**CSC 309 Software Engineering II (4) (Also listed as CPE 309)**  
(formerly 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: CSC/CPE 308.

**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. 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 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, cryptology, dynamic and linear programming, and exhaustive search. 4 lectures. Prerequisite: CSC/CPE 103 and MATH 142 and either STAT 312 or STAT 321.

**CSC 353 Systems Programming for Software Engineers (4)**  
(Also listed as CPE 353)

Assembly language and C programming; 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 357 Systems Programming (4) (Also listed as CPE 357)**  
(formerly 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, and CPE 229.

**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 307 or CSC/CPE 309; 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 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 409 Current Topics in Software Engineering (4)**  
(Also listed as CPE 409)

Selected topics in software engineering. Topics may include program generation, quality assurance, formal methods, software metrics, design methods, testing, or software development processes. *Class Schedule* will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 309 or CSC/CPE 307.

**CSC 430 Programming Languages I (4) (Also listed as CPE 430)**

Theory of formal languages and automata. Regular languages, finite automata, and lexical analysis. Context-free languages, pushdown automata, and syntactic analysis. Type checking and static semantics. Parsing: top-down (LL) and bottom-up (LR). 3 lectures, 1 laboratory. Prerequisite: CSC 349 and CSC/CPE 357.

**CSC 431 Programming Languages II (4) (Also listed as CPE 431)**

Language principles and design issues: bindings, conversion, parameter passing, and dynamic semantics. Language implementation: intermediate code representation, memory management, code optimization, and code generation. Functional programming languages. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 430.

**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 Computation (4)**

Turing machines as a universal model of computation. Theory of decidability and computability. Recursive functions and their role in computability. NP-completeness. 4 lectures. Prerequisite: CSC/CPE 141 and CSC/CPE 430.

**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 449 Current Topics in Algorithms (4) (Also listed as CPE 449)**

Selected aspects of the verification, analysis and design of algorithms. *Class Schedule* will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: CSC 349.

**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 353 or both CSC/CPE 315, CSC/CPE 357.

**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 456 Introduction to Computer Security (4)**  
(Also listed as CPE 456)

Survey of topics in computer system and network security, including protection, access control, distributed access control, operating system security, applied cryptography, network security, firewalls, secure coding practices, and case studies from real-world systems. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 357 and CSC 300.

**CSC 458 Current Topics in Computer Systems (4)**  
(Also listed as CPE 458)

Selected aspects of design, implementation and analysis of networks, advanced operating and distributed systems. Topics may include process management, virtual memory, process communication, context switching, file system designs, persistent objects, process and data migration, load balancing, security and networks. *Class Schedule* will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 453.

**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: STAT 312 or STAT 321 or STAT 350; CSC/CPE 357; Software Engineering majors and graduate students may substitute CSC/CPE 353 for CSC/CPE 357.

**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 353 or CSC/CPE 357.

**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 476 Real-Time 3D Computer Graphics Software (4)**  
(Also listed as CPE 476)

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 478 Current Topics in Computer Graphics (4)**  
(Also listed as CPE 478)

Selected aspects of the design, implementation and analysis of computer graphics. Topics may include rendering, modeling, visualization, animation, virtual reality, computer vision, multimedia, and perception issues. *Class Schedule* will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 471.

**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 483 Current Topics in Human-Computer Interaction (4)**  
(Also listed as CPE 483)

Selected aspects of the field of human-computer interaction. Topics may include dynamic information visualization, universal access, social impact of technology usage, educational technology, human cognition and performance studies, and extended usability evaluation techniques. *Class Schedule* will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 484.

**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 307 or CSC/CPE 308.

**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 489 Current Topics in Artificial Intelligence (4)**  
(Also listed as CPE 489)

Selected aspects of the design, implementation and analysis of advanced systems and concepts in the area of artificial intelligence. Topics may include knowledge representation, reasoning, learning, or planning, and specific techniques like intelligent agents, genetic algorithms, semantic web, or robotics. *Class Schedule* will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 480.

**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 Senior Project Design Laboratory I (2)**

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 may include students from other disciplines. Formulation of outline, literature review, and project schedule. 2 laboratories. Prerequisite: CSC/CPE 307 or CSC/CPE 309 and consent of instructor.

**CSC 492 Senior Project Design Laboratory II (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 may include students from other disciplines. Project results are presented in a formal report. 3 laboratories. Prerequisite: CSC 491 and consent of instructor.

**CSC 493 Cooperative Education Experience (2) (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 6 units. Prerequisite: Sophomore standing and consent of instructor.

**CSC 494 Cooperative Education Experience (6) (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 18 units. 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. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. Total credit limited to 24 units. 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 307 or CSC/CPE 308 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 568 Distributed Systems (4)**

Advanced topics in distributed systems with emphasis on recent and emerging distributed computing paradigms, fault tolerance, and distributed algorithms. 4 seminars. Prerequisite: CSC/CPE 369 or CSC/CPE 569 and graduate standing, or consent of instructor.

**CSC 569 Distributed Computing (4) (Also listed as CPE 569)**

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. Not open to students with credit in CSC/CPE 369 or CSC/CPE 469. 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 581 Computer Support for Knowledge Management (4)  
(Also listed as CPE 581)**

Use methods and techniques that computer-based systems can provide to make the management of knowledge and information in digital form easier for the user. Emphasis on support for knowledge-intensive activities performed by users. 3 lectures, 1 laboratory. Prerequisite: CSC/CPE 481.

**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 593 Cooperative Education Experience (2) (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 594 Cooperative Education Experience (6) (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 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. A fully-developed formal report and evaluation by work supervisor required. 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 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 Orchesis 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. Dairy cattle record keeping systems and their use in dairy herds. Principles of reproduction management, milking and milking machine function. 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 161, 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, STAT 130 or STAT 218.

**DSCI 412 Dairy Farm Consultation (4)**

Student consultation teams of three or four students visit dairies and/or attend management training seminars followed by presenting management recommendations to the dairy owners, consultants, and other industry leaders. 1 seminar and supervised work. Prerequisite: DSCI 121 or DSCI 230, DSCI 330, DSCI 333, junior standing.

**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. 4 lectures. 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)**

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 I, II (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 supervised work. DSCI 462: Supervised work.

**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 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 I, II (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 I, II (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 I, II (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: 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: EDES 406 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 and supervised work. 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) (Also listed as CM 430)**

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 planning, design, bidding, permitting, construction and management phases. 3 activities. Prerequisite: Third-year standing or consent of instructor.

**EDES 431 Integrated Project Services (3) (Also listed as CM 431)**

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: Fourth-year standing.

**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. Introduction to Multiple Subject Credential Program, and Program Portfolio. Fieldwork activities and other settings. 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 public schools. A minimum of forty-five hours of observation and participation. Discussion focuses on instructional practice and subject matter taught in grades observed, as well as the historical, philosophical, and social foundation of American public education. Total credit limited to 6 units. Credit/No Credit grading only. 2 lectures, 1 activity. Prerequisite: Junior standing or consent of instructor.

**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 412 Schooling in a Democratic Society (4) (CR/NC)**

The role and aims of public education for culturally diverse learners. Credit/No Credit grading only. 2 lectures, 1 laboratory, 1 activity. Prerequisite: Admission to the Single Subject Program or senior standing for Agricultural Education candidates. Concurrent: EDUC 414 and EDUC 416 and content methods course (except students enrolled in Agricultural Education Credential Program).

**EDUC 414 Curriculum and Organization in Secondary Schools (4) (CR/NC)**

Principles, methods and practices of organizing and managing secondary schools and classrooms including multiple models of classroom discipline as related to adolescent development, classroom routines, learning environments, introduction to legal requirements for educating English

language learners (ELL) and special needs students, and backward design curriculum development and assessment. Site visits to local schools to allow analysis of routines and policies of local schools. Credit/No Credit grading only. 2 lectures, 1 laboratory, 1 activity. Prerequisite: Admission to the Single Subject Credential Program or senior standing for Agricultural Education candidates. Concurrent: EDUC 412 and EDUC 416 and content methods course (except students enrolled in Agricultural Education Credential Program).

**EDUC 416 Literacy and Learning in Secondary Schools (4) (CR/NC)**

Theories of literacy, learning, assessment and second language acquisition. Observing classrooms, tutoring English language learners, and designing instructional lessons and assessments to address learners' needs across content areas. Developing theories of learning consistent with content teaching standards. Credit/No Credit grading only. 2 lectures, 1 laboratory, 1 activity. Prerequisite: Admission to the Single Subject Credential Program or senior standing for Agricultural Education candidates. Concurrent: EDUC 412 and EDUC 414 and content methods course (except students enrolled in Agricultural Education Credential Program).

**EDUC 418 Advanced Topics in Teaching and Learning (4) (CR/NC)**

Differentiated instruction and further theoretical knowledge and skills needed for successful teaching of linguistically and culturally diverse learners. Credit/No Credit grading only. 2 lectures, 2 activities. Prerequisite: EDUC 412, EDUC 414, EDUC 416 and content methods course. Concurrent: EDUC 420 and EDUC 469, or AGED 438 for students enrolled in Agricultural Education Credential Program.

**EDUC 420 Professional Development and Collaboration (4) (CR/NC)**

Further development in the areas of assessment and teaching special needs students. Knowledge and skills needed for successful collaboration with other education professionals. Credit/No Credit grading only. 2 lectures, 2 activities. Prerequisite: EDUC 412, EDUC 414, EDUC 416 and content methods course. Concurrent: EDUC 418 and EDUC 469 (except students enrolled in Agricultural Education Credential Program).

**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. Limited to students seeking BCLAD certification. Prerequisite: Junior status, Spanish proficiency and/or consent of instructor.

**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 be admitted into the Multiple Subject Credential Program (STEP I or STEP A).

**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 428.

**EDUC 430 Teaching Reading and Language Arts with a Multicultural Perspective (6)**

Development of knowledge and skills for planning, implementing, and evaluating the teaching of a balanced, comprehensive, research-based reading and language arts program in grades K-8 with attention to children of all abilities and backgrounds. State and national trends. Language development. 4 seminars, 2 activities. Prerequisite: Must meet all requirements for admission into the Multiple Subject Credential Program and ENGL 391, ENGL 390, or ENGL 290, and EDUC 310, EDUC/CD 207, and application for Multiple Subject Credential Program.

**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: Must be admitted into the Multiple Subject Credential Program (STEP I or STEP A).

**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: Admission to STEP II or STEP B of the Multiple Subject Credential Program. Taken concurrently with Student Teaching I (EDUC 434 or EDUC 454).

**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 455. Prerequisite: EDUC 430 and EDUC 431, and admission to STEP II or STEP B of the Multiple Subject Credential Program.

**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 Elementary Field Experience in General and Special Education (2-4) (CR/NC)**

Public school classroom experiences in both general education classrooms and special education classrooms at the elementary level. 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 (4)**

Diagnosis and remediation of reading problems. Review of reading programs. General education (K-12) reading instructions. Alternative methods of developing English language reading skills. Field activities required. 3 seminars, 1 activity. Prerequisite: Acceptance into Level I Special Education Credential Program, 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, reading and the arts at the elementary schools including scope and sequence and appropriate methods for English language learners. 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 440.

**EDUC 447 Secondary Field Experience in General and Special Education (2-4) (CR/NC)**

Public school classroom experiences in both general education classrooms and special education classrooms at the secondary level. 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 440. 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 440, EDUC 442, 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 whose behavior impedes either their own learning or the learning of other students. Strategies for facilitating proactive educational, environmental and social-emotional techniques for supporting students with challenging behavior. 3 seminars, 1 activity. Prerequisite: Acceptance into Level I Special Education Credential Program, EDUC 440, EDUC 445, EDUC 446.

**EDUC 451 Special Education Seminar (4) (4) (4)**

First enrollment emphasizes the role of special education in the public school, laws, understanding of field experiences and communication between general and special education. Second enrollment emphasizes collaborative development of behavior management strategies and direction of the activities of paraeducators. and third enrollment emphasizes co-teaching structures and the collaborative development of instructional strategies. Total credit limited to 12 units. 3 seminars, 1 activity. Must be taken concurrently with EDUC 442, EDUC 447, EDUC 449. Prerequisite: Acceptance into Level I Special Education Credential Program.

**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 or STEP B of the Multiple Subject Credential Program.

**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 teaching performance expectations (TPEs) and domains from standards for the teaching profession; student assessment and evaluation and development and assessment of MSCP Program Portfolio; and preparing a job search. 2 seminars. Prerequisite: Senior standing in BS in Liberal Studies and completion of LS 461, acceptance in STEP II or STEP B of the Multiple Subject Credential Program. Taken concurrently with EDUC 434, or EDUC 454, and EDUC 432.

**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, EDUC 455, and LS 461.

**EDUC 457 Multiple Subject Student Teaching Seminar II (3)**

Issues related to teaching, moral responsibilities of educators, 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. Planning, implementation, and evaluation of units of instruction, teaching performance assessments, and multiple subject program portfolio. 2 seminars, 1 activity. Taken concurrently with EDUC 456. Prerequisites: Successful completion of EDUC 454 and EDUC 455, and EDUC 430, 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 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 Applied Practices in Curriculum Development (4)**

Overview of major curriculum trends; planning and development of a comprehensive curriculum project geared toward use of technology in teaching. Emphasis on practicality. 3 seminars, 1 activity. 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 (4)**

Examination of instructional practices using technology. Review and application 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 for improving instruction. 3 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 Supervision 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 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 527 Language and Literacy Models for Second Language Learners (4)**

Theory and models of learning in a second language at the high levels needed for school success. Analysis and synthesis of research in bilingualism and second language acquisition for teachers of second language learners. *Class Schedule* will list topic selected. Total credit limited to 8 units. 3 lectures, 1 activity. Prerequisite: EDUC 423 or EDUC 433 or comparable BCLAD coursework.

**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 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 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 and Consultation for Teachers of Students with Special Needs (4)**

Advanced studies and skills in educational consultation. Emphasis on the collaborative and consultative role of the special educator with a wide range of individuals including school personnel, parents, outside agencies, and paraprofessionals. 3 seminars, 1 activity. Prerequisite: Admission into the Professional Level II Special Education Credential Program or master's degree program.

**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, appropriate methods for English language learners and interaction in the total school environment. 3 seminars, 1 activity. Prerequisite: Acceptance into Level I Special Education Credential Program, EDUC 440.

**EDUC 547 Advanced Curricular and Instructional Adaptations for Students with Special Needs (4)**

Advanced studies and skills in adaptation and modification of curriculum and instructional techniques to meet the needs of students with special needs. Educational implications of current learning theories as applied to individuals with special needs. 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 master's 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 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 Introduction to the Counseling Profession (4)**

Overview of the counseling profession, history, philosophy, theory and ethics. Required activity. 3 seminars, 1 activity. Prerequisite: Admission to MA Education program.

**EDUC 556 Multicultural Counseling (4)**

Initiation of critical analysis of personal beliefs and attitudes regarding counseling in a diverse society. Focus on a variety of approaches to explore the beliefs and attitudes of the student in counseling settings, and examination of strategies considered effective in working with diverse populations. 3 seminars, 1 activity. Prerequisite: Admission to MA Education program.

**EDUC 557 Career Counseling (4)**

Focus on the study and application of career development theories in career counseling. Utilizing appraisal instruments, community referral resources, occupational information, computerized retrieval systems, and personal and social data and required activities. 3 seminars, 1 activity. Prerequisite: Admission to MA Education program.

**EDUC 558 Elementary School Counseling (4)**

Focus on the development of skills for the integration of counseling activities into elementary school curriculum – specifically the role of the counselor in the development of a comprehensive guidance program, classroom guidance, counseling, consultation, program design and evaluation, curriculum and administration of special programs. 3 seminars, 1 activity. Prerequisite: PPS credential candidate, or consent of instructor.

**EDUC 559 Secondary School Counseling (4)**

A basic understanding of the secondary school environment, the role and responsibilities of the counselor within the school environment/community, the components of a secondary school counseling program, the developmental issues of 13-18 year olds, emerging standards for school counselors and the changing nature of student populations. 3 seminars, 1 activity. Prerequisite: PPS credential candidate, or consent of instructor.

**EDUC 560 Counseling Theories (4)**

Theories and practice of counseling with special emphasis on the counseling process. Emphasis of conditions of counseling, counseling techniques, counseling diverse populations and the counselor as a professional helper. 3 seminars, 1 activity. Prerequisite: EDUC 555 and admission to MA Education program.

**EDUC 561 Group Counseling (4)**

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. 3 seminars, 1 activity. Prerequisite: EDUC 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 Violence Prevention in Schools (4)**

Specific counseling strategies and issues related to violence in the schools. Alienation, violence, parenting, as they relate to the factors associated with school violence. Evaluation of effective intervention programs for K-12 schools. 3 seminars, 1 activity. Prerequisite: Admission to MA Education program.

**EDUC 564 Legal and Ethical Issues in Counseling (4)**

Consideration of legal, ethical, cultural and related professional issues as they affect the practice of counseling. 3 seminars, 1 activity. Prerequisite: Admission to MA Education Program or PPS Credential Program.

**EDUC 565 Counseling Measurement and Assessment (4)**

Training and evaluation in the utilization of tests, scales, measures, and other instruments with K-12, and college-age students. An understanding of culturally appropriate tests and measures, collaboration with school personnel, parents, and students in the review and interpretation of test scores and measures. 3 seminars, 1 activity. Prerequisite: Admission to MA Education Program, Counseling and Guidance Specialization, or to PPS Credential Program.

**EDUC 566 Leadership and Consultation in Counseling (4)**

Development of skills in planning, organizing, coordinating, and delivering programs that generate systemic change through establishing collaboration within schools, communities and other stakeholders. Emphasis on social action and its role in the counseling profession. 3 seminars, 1 activity. Prerequisite: Admission to MA Education Program or PPS Credential Program.

**EDUC 568 Individual Counseling Techniques (4)**

Theory and practice of individual counseling, process and termination, and application of theories to specific developmental issues working with K-12 students. Communication and facilitation skills emphasized, working with diverse populations and following legal and ethical guidelines. 3 seminars, 1 activity. Prerequisite: Admission to MA Education Program, Counseling and Guidance Specialization, or to PPS Credential 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 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 (4)**

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. 3 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 (4)**

Introduction to research methodologies, application of inferential and descriptive statistics, critical analysis of research designs and data collection techniques. 3 seminars, 1 activity. Prerequisite: EDUC 586.

**EDUC 590 Research Applications in Education (4)**

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. 2 seminars, 2 activities. Prerequisite: EDUC 589.

**EDUC 599 Thesis or Project (3) (3)**

Completion of a thesis or project pertinent to the field of education. Student must register for each quarter of advisement. 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. Not required for students with transfer credit for EE 211 or EE 241.

**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. Suggested: EE 111/151.

**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 100 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 100 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 with a C- grade or better, PHYS 133. Prerequisite or Concurrent: MATH 244. 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 244, EE 211 with a C- grade or better. Concurrent: EE 242.

**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 212&242 with a C- grade or better. Recommended: 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 with a C- grade or better. 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. Prerequisite: EE 112 with a C- grade or better, PHYS 133. Prerequisite or concurrent: MATH 244. Concurrent: EE 211

**EE 242 Electric Circuit Analysis Laboratory III (1)**

Observation of transient and steady-state phenomena, phase-shift circuits, resonance. Use of phasor diagrams. 1 laboratory. Prerequisite: MATH 244, EE 241 with a C- grade or better 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 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 212&242 with a C- grade or better, 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 with a C- grade or better. 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 212&242 with a C- grade or better 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 368.

### 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 with a C- grade or better.

### 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 212&242 with a C- grade or better, IME 156 or IME 157, 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 129&169 with a C- grade or better, EE 306&346 with a C- grade or better. Concurrent: EE 347, EE 229 (may be taken previously).

### 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 with a C- grade or better, EE 307&347 with a C- grade or better. 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 with a C- grade or better. 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 with a C- grade or better. 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 with a C- grade or better, EE 229&269 with a C- grade or better.

### 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 212&242 with a C- grade or better.

### 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 68HC12 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 with a C- grade or better.

### 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 with a C- grade or better, 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 212&242 with a C- grade or better, IME 156 or IME 157, PHYS 211. Concurrent: EE 306. Suggested: ENGL 134.

### EE 347 Digital Electronics and Integrated Circuits Laboratory (1)

Computer simulation and experimental investigation of the characteristics, applications and interfacing of different logic families. 1 laboratory. Prerequisite: EE 129&169 with a C- grade or better, EE 306&346 with a C- grade or better. Concurrent: EE 307, EE 229 (may be taken previously).

### 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 with a C- grade or better, EE 307&347 with a C- grade or better. Concurrent: EE 308.

### EE 353 Signal Transmission Laboratory (1)

Transmission and reflection measurements. Impedance matching techniques. 1 laboratory. Prerequisite: EE 368 with a C- grade or better. 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 with a C- grade or better. 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 with a C- grade or better. 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 with a C- grade or better 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 with a C- grade or better, EE 335 with a C- grade or better. 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 with a C- grade or better, 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 with a C- grade or better, EE 328&368 with a C- grade or better, EE 329 with a C- grade or better. 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 with a C- grade or better.

**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 with a C- grade or better, EE 328 with a C- grade or better.

**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 with a C- grade or better 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 with a C- grade or better. 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 with a C- grade or better.

**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 with a C- grade or better 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 329 with a C- grade or better. 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 with a C- grade or better, EE 308&348 with a C- grade or better 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 with a C- grade or better, EE 328&368 with a C- grade or better. 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 with a C- grade or better.

**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 with a C- grade or better, 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 with a C- grade or better. 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 with a C- grade or better, EE 335 with a C- grade or better. 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 with a C- grade or better, EE 328&368 with a C- grade or better, EE 329 with a C- grade or better. 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 with a C- grade or better, EE 314 with a C- grade or better.

**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 with a C- grade or better. 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 with a C- grade or better, EE 335 with a C- grade or better. Prerequisite or concurrent: EE 409&449.

**EE 461, 462 Senior Project I, II (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 I, II (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 329 with a C- grade or better. 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 with a C- grade or better, EE 328&368 with a C- grade or better. Concurrent: EE 432.

**EE 493 Cooperative Education Experience (2) (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 6 units. Prerequisite: Sophomore standing and consent of instructor.

**EE 494 Cooperative Education Experience (6) (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 18 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. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. Total credit limited to 24 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 with a C- grade or better 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 with a C- grade or better 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 with a C- grade or better 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 with a C- grade or better 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 with a C- grade or better 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 with a C- grade or better 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 with a C- grade or better 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 with a C- grade or better 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 with a C- grade or better 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 593 Cooperative Education Experience (2) (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.

**EE 594 Cooperative Education Experience (6) (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.

**EE 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. A fully-developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. Prerequisite: Graduate standing and 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 123 Landscape Installation and Maintenance (4)**

Planting and maintenance of trees, shrubs, ground covers, perennial plantings, color beds, specialty plantings, and small turf areas. Site selection, cultural requirements, scheduling of maintenance activities, pruning, landscape renovation and irrigation system repair. Equipment operation, maintenance, and safety. Speakers from industry. 3 lectures, 1 laboratory. Prerequisite: HCS 110, HCS 120.

**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 Landscape and Environmental Horticulture Construction (2)**

Design, construction techniques and materials used in horticulture construction. Material quantity estimating, construction material substitutions, tools and equipment associated with horticulture construction. 1 lecture, 1 laboratory. Prerequisite: HCS 110.

**EHS 127 Introduction to Landscape Graphics (4)**

Aesthetic aspects of environmental horticulture, landscape drafting, introduction to computer aided drafting, presentation techniques and garden history. Field trip required. 2 lectures, 2 laboratories. Prerequisite: HCS 110, HCS 120.

**EHS 128 Principles of Horticultural Design (4)**

Aesthetic aspects of environmental horticulture, including landscape drafting, computer aided design, landscape and floral design and history. Design in the use of and presentation of horticultural products. 2 lectures, 2 laboratories. Prerequisite: HCS 110, HCS 120.

**EHS 201 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: HCS 120.

**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, HCS 120, HCS 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, high style and sympathy 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 I, II (4) (4)**

Identification, habits of growth, cultural requirements, and use of ornamental plants in the landscape. 3 lectures, 1 laboratory. Prerequisite: BOT 121. EHS 231 prerequisite for EHS 232.

**EHS 245 Horticulture Applications (3)**

applied principles of plant growth in relation to the environmental horticulture industry. Emphasis on container media, fertilizing practices, irrigation, plant growth regulators, and miscellaneous growing structures. 2 activities, 1 laboratory. Prerequisite: HCS 120, HCS 124, SS 121, CHEM 111.

**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 127, 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 127.

**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 Interior Plant Management (4)**

Plant materials used in the interior plantscape. Identification, production, utilization, placement. Interior plant specifics and maintenance. 3 lectures, 1 laboratory. Prerequisite: EHS 231 or EHS 232, HCS 120, HCS 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: HCS 120, or consent of instructor.

**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 127, 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 335 Computer Applications for Landscape Horticulture (4)**

Computer assisted design/drafting applications for landscape horticulture. In-depth study and extensive hands on exposure to various media programs essential to digital graphic landscape horticulture; CAD drawing/estimating, material databases, plant database programs and GIS. 2 lectures, 2 laboratories. Prerequisite: EHS 126; EHS 127; EHS 232; EHS 301 or EHS 321 or EHS 331 or consent of instructor.

**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: HCS 120, EHS 245, 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: HCS 120, EHS 123, SS 121.

**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: HCS 124, EHS 381, SS 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: HCS 120, EHS 128, BUS 271. Recommended: BUS 488.



**EHS 421 Arboriculture (4)**

Care and management of large ornamental trees. Selection, planting, establishment and maintenance of specimen trees. Ropes and safety equipment required in tree maintenance. Cavity treatment, bracing and cabling, hazard identification, tree evaluation, and specialty power equipment operation. 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 trips required. 3 lectures, 1 laboratory. Prerequisite: HCS 124, EHS 245, 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: HCS 124 and BIO 435 or HCS 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, SS 221.

**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 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 Graduation 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)**  
(Also listed as HNRS/SCOM 145)  
(formerly ENGL 215) **GE A3**

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)**  
(Also listed as HNRS 148)  
(Non-Engineering replacement for ENGL 218) **GE A3**

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)**  
(Also listed as HNRS 149)  
(Engineering replacement for ENGL 218) **GE A3**

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.

**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 210 New Media Technology (4) (CR/NC)**

An introduction to and application of new media software used for the production of online help, professional live technical presentations, and high-level technical document design, production and distribution. Credit/No Credit grading only. 4 lectures.

**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 Ilych*, *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 lecture. 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 319 Information Design and Production (4)**

Mid-level presentation of the theory and practice involved with the production of technical documents. Focus on history, typography, information design principles, the effective integration of text and graphics, project management, and recent industry trends in software use. 4 lectures. Prerequisite: ENGL 148 or ENGL 149, ENGL 210 and consent of instructor.

**ENGL 326 Literary Criticism (4)**

Theory and practice of current and traditional literary criticism, including writing and revising critical statements based on current models. 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. 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 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 who are 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**  
Modern poetry, 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 365 Complexities of Literacy in Literature and Non-fiction Text (4)**

Cognitive elements of reading and writing processes – decoding and encoding, construction of meaning, recognizing and using text conventions of different genres. Metacognitive strategies for making sense of text. 4 lectures. Prerequisite: Completion of GE Area A and junior standing.

**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)** **GE C4**  
(formerly ENGL 327)  
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)** **GE C4**  
(formerly ENGL 328)  
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 and one course from Area C.

**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 392 English Grammar for Writers and Teachers (4)**

Linguistics-based study of standard English word categories, sentence parts and types, punctuation, and the role of sentence structure in text style and coherence; consideration of grammar standards in social context.

Preparation for professional writing, editing, and teaching standard grammar. 4 lectures. Prerequisite: Completion of GE Areas A1 and A3.

**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 New Media Arts I (4) (Also listed as HNRS 411)**

Advanced-level presentation of new media theory, design and practice. Topics covered include, but are not limited to, interactivity theory, user-centered system design, cognitive psychology, media analysis, and basic web design theory. Total credit limited to 8 units. 4 lectures. Prerequisite: advanced skills in writing and/or graphics, and/or computer programming; upper-division standing, ENGL 148 or ENGL 149 and consent of instructor.

**ENGL 412 New Media Arts II (4) (Also listed as HNRS 412)**

Advanced level of work with the primary technologies and design/critique theories currently at use in the professional creation of new media works. Lectures and readings expand upon material presented in ENGL 411. 4 lectures. Prerequisite: ENGL 411 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 Advanced New Media Projects (2) (CR/NC)**

Supervised independent projects creating new media works for academic, professional, or popular audiences. Students are paired with teachers, business people, service organizations, or others who need new media projects designed for specific uses. Total credit limited to 8 units. Credit/No Credit grading only. Prerequisite: ENGL 411 and consent of instructor.

**ENGL 420 Client-Based Technical Communication (4)**

Capstone course for the technical communication program. Students work for one or more commercial client(s) to produce a set of professional print and/or electronic documents. 4 lectures. Prerequisite: ENGL 317, ENGL 319, 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: 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 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 topic 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 388 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 389 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 and supervised work. 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 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) GE B2  
(Also listed as BRAE 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.

**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 270 Applications of CAD and Rapid Prototyping for  
Biomedical Engineering Design (4)**

Technical communication principles. Project requirements, definition and development of design documents. Description of manufacturing processes. Reliability and quality of engineered products and systems.

Prototyping and production of biomedical implements. 3 lectures, 1 laboratory. Prerequisite: ENGR 110, MATH 141 or consent of instructor.

**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. 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. 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 440 Biomedical Engineering Design I (4)**

The special requirements of materials and manufacturing processes required by biomedical engineering applications. Design, development and production of prototypes of biomedical implements. 3 lectures, 1 laboratory. Prerequisite: ME 212, IME 314, CE 204, CSC 234, GE Area B2 life science and upper-division science course, or consent of instructor.

**ENGR 450 Special Topics in Bioengineering (4)**

Current topics in bioengineering, including medical applications and industrial applications. Total credit limited to 16 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 493 Cooperative Education Experience (2) (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 6 units. Prerequisite: Sophomore standing and consent of instructor.

**ENGR 494 Cooperative Education Experience (6) (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. A formal report and evaluation by work supervisor required. Credit/No Credit grading only. Total credit limited to 18 units. 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. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. Total credit limited to 24 units. 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. Total credit limited to 16 units. See *Class Schedule* for topic selected. 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 593 Cooperative Education Experience (2) (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.

**ENGR 594 Cooperative Education Experience (6) (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.

**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. A fully-developed formal report and evaluation by work supervisor required. 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 240 Additional Engineering Laboratory (1-2) (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 done with minimum faculty supervision. Total credit limited to 6 units. Credit/No Credit grading only. 1-2 laboratories.

**ENVE 304 Process Thermodynamics (4)**

First and second laws of thermodynamics, properties of gases, liquids and mixtures, vapor-liquid equilibria, solubility and absorption, equilibrium in chemical reactions, thermodynamic applications in environmental engineering. 4 lectures. Prerequisite or concurrent: CHEM 125, 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: 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. 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 (4)**

Aquatic environmental chemistry and water quality measurement. 3 lectures, 1 laboratory. Prerequisites: CHEM 129, CHEM 312, 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. Intro-

duction 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 I, II (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 493 Cooperative Education Experience (2) (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 6 units. Prerequisite: Sophomore standing and consent of instructor.

**ENVE 494 Cooperative Education Experience (6) (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 18 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. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. Total credit limited to 24 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 542 Sustainable Environmental Engineering (4)**

Critical analysis of environmental engineering practices such as solid waste management, recycling, and wastewater treatment from the viewpoint of energy efficiency, lifecycle cost, and sustainability. Both laboratory experiments and computer models to assess sustainability. 3 lectures, 1 laboratory. Prerequisite: Graduate or senior 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 552 Environmental Problems of the Semiconductor Industry (4)**

Introduction to the environmental, health, and safety issues of the semiconductor industry. Semiconductor manufacturing processes and their environmental emissions. Engineering and management options for pollution control and prevention. Management of environmental systems in the semiconductor industry. 4 lectures. Prerequisite: 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 593 Cooperative Education Experience (2) (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.

**ENVE 594 Cooperative Education Experience (6) (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.

**ENVE 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. A fully-developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. Prerequisite: Graduate standing and 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 144 Introduction to Earth Systems (4)**

Survey of fundamental processes of Earth sciences. Application of systems thinking to understanding the dynamic interactions among geological, geographic, soils and human factors in shaping the Earth. 3 lectures, 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. Tech-

niques of interpretations for agriculture, forest lands, wetlands, range lands and urban development. 3 lectures, 1 laboratory. Prerequisite: SS 121.

**ERSC 323 Geomorphology (4) (Also listed as SS 323)**

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.

**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 I (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 II (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.

**ERSC 463 Undergraduate Seminar (2) (Also listed as SS 463)**

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.

**ERSC 570 Selected Topics in Earth Science (1-4)**

Directed group study of selected topics for advanced students. *Class Schedule* will list topic selected. Total credit limited to 12 units. 1 to 4 seminars. Prerequisite: Graduate standing or consent of instructor.

## 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 the cultural representations of, and counter-representations by, American racial/ethnic groups in American popular opinion and consciousness, with particular emphasis on African Americans. 4 lectures. Prerequisite: Completion of GE Area A and two courses from Areas D1, D2, D3, D4. Recommended: ES 112 (D1) and/or ES 212 (D3).

**ES 321 Native American Cultural Images (4) GE C4 USCP**

How cultural images of indigenous peoples in the United States reflect the larger social, economic, and political dynamics that have characterized white/Indian relationships in the last 500 years. The social/cultural impact of such representations and how American Indians see themselves and shape their own images and histories. 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 the cultural representations of, and counter-representations by, American racial/ethnic groups in American popular opinion and consciousness, with particular emphasis on Asian-Americans. 4 lectures. Prerequisite: Completion of GE Area A and two courses from Areas D1, D2, D3, D4. Recommended: ES 112(D1) and/or ES 212 (D3).

**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 Sex and Gender in African American Communities (4) USCP**

Gender and sexuality issues that influence the social, political, economic and cultural development of African-America. Special attention given to how racism affects the realization of standard gender conventions within black communities, as well as to myths of black sexuality, black feminism, and queer politics. 4 lectures. Prerequisite: ES 112 or ES 212.

**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 335 The Filipina/o American Experience (4) GE D5 USCP**

An interdisciplinary examination of the historical development of Filipina/o American identities and communities. The social, cultural and political institutions that have influenced Filipina/o immigration, participatory citizenship, activism and cultural practices. 4 lectures. Prerequisite: Completion of Area A and two lower division D courses; ES 112 (D1) and ES 212 (D3) preferred.

**ES 350 Gender, Race, Science and Technology (4) USCP  
(Also listed as WS 350)**

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 or consent of instructor.

**ES 360 Ethnicity and the Land (4) GE C4 USCP  
(Also listed as FNR 360)**

Comparative study of how race and culture shape landscapes, and how social hierarchies allocate the use of natural resources and the burdens of environmental pollution. 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 380 Critical Race Theory (4) USCP**

History and evolution of the critical race theory movement. Defining issues of the field; in particular, the relationship between race, power and the law. 4 lectures. Prerequisite: ES 112, ES 114 or consent of instructor.

**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 chair.

**ES 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: At least one course in Ethnic Studies and consent of instructor.

**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 Careers in Forestry and Environmental Management (1) (CR/NC)**

Analysis and development of career goals in natural resources. Acquainting students with potential career options and preparation of academic plans at Cal Poly. Credit/No Credit grading. 1 activity.

**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 Wildland 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 woody plants in shrub, woodland, and forest ecosystems of the United States. Emphasis on species located in the Pacific Coastal, Sierran, and Cascade ecosystems. 2 lectures, 2 laboratories. Recommended 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: MAPE Score G, prerequisite or concurrent: FNR 215.

**FNR 260 Forest Practices and Environmental Protection (4)**

Relationships between forest ecosystem management, forest practices, harvesting methods, timber harvest planning, components of forest harvesting, harvesting effects; cost analysis of harvesting methods; safety management; value-added forest utilization; environmental protection; and road location. Overnight or weekend field trips required. 3 lectures, 1 laboratory. Prerequisite: FNR 201. Recommended: 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. Use of forestry and natural resource examples. 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 society. Humanity's role as a principal factor of change of the resources in natural systems. 3 lectures, 1 laboratory. Prerequisite: BIO 162 or BOT 121 or equivalent.

**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 on western U.S. forest and shrub ecosystems. 2 lectures, 1 laboratory. Prerequisite: FNR 201; recommended: FNR 204 and FNR 306.

**FNR 308 Fire and Society (4) GE D5  
(Also listed as ES 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 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.

**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: STAT 217/218, BRAE/FNR 247; recommended: MATH 161 or MATH 221 or equivalent.

**FNR 317 The World of Spatial Data and Geographic Information Technology (4) GE Area F  
(Also listed as BIO/GEOG/LA 317)**

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. Not open to students with credit in FNR 318. 3 lectures, 1 activity. Prerequisite: A course in computer science, completion of Area B, and junior standing.

**FNR 318 Applications in GIS (3) (Also listed as GEOG/LA 318)**

ARC/INFO and ArcView Geographic Information System (GIS) computer software to explore environmental, natural resource, social and economic issues using spatial data. Develop and apply data base and software management competencies. 1 lecture, 2 laboratories. Prerequisite: Junior standing, computer literacy or consent of instructor.

**FNR 319 Natural Resource Ecology, Theories and Applications (4) (Also listed as HNRS 319) 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.

**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)**

Theory of efficient use of renewable and nonrenewable natural resources, including methods for attaching value to marketable and non-market natural resources. Environmental economic theories and techniques to address allocation of water, timber, wildlife/fisheries, open space, and recreation. 3 lectures, 1 activity. Prerequisite: MATH 161 or MATH 221 or equivalent, 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: FNR 201; 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 Wildland 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 municipal forests, wildland-urban interface, wildlife habitat, 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 315; recommended: FNR 306.

**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. 3 lectures, 1 laboratory. Prerequisite: FNR 208 or equivalent, FNR 306 or equivalent.

**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 (3)**

Principles and practices of integrated sampling and inventory of natural resource values in terrestrial ecosystems, culminating in a student project report. 2 lectures, 1 laboratory. Prerequisite: FNR 306 or equivalent, and FNR 326.

**FNR 414 Sustainable Forest Management (4)**

Biophysical, 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. Day field trip required. 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 environmental and natural resource management problems and projects. Intent, purpose and history of the laws; differences between laws identified. Request for proposals and preparation of environmental assessment documents covered. 3 lectures, 1 laboratory. Prerequisite: FNR 306 or equivalent, and FNR 335 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 418 Applied GIS (3)**

Acquisition, organization and analysis of spatial data from diverse sources using Geographic Information System (GIS) software. GIS modeling applications and validation techniques used in development and preparation of client-driven projects. 1 lecture, 2 activities. Prerequisite: FNR/GEOG/LA 318.

**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 or equivalent and FNR/GEOG/LA 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 or graduate standing.

**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 313, SS 321.

**FNR 425 Applied Resource Analysis (4)**

Environmental impacts in responses to resource management, projects, programs and activities. Preparation, implementation, and coordination of environmental plans. Criteria for measurements, interpretation, and evaluation. Resource inventories, analysis, synthesis, evaluation, environmental assessment writing and preparation. 3 lectures, 1 laboratory. Prerequisite: FNR 416.

**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 environmental policies. Analysis of major federal and state environmental laws. 4 lectures. 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 removal 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 Wildland-Urban 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 340 or consent of instructor.

**FNR 461, 462 Senior Project I, II (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 465 Ecosystem Management (4)**

Applied integration of biophysical, economic and socio-political sciences. Principles, concepts and techniques designed to utilize resources while sustaining ecosystem health within acceptable limits of change. Ecosystem assessment, planning, management and monitoring project. 3 lectures, 1 laboratory. Prerequisite: FNR 326, FNR 416 and consent of instructor.

**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 475 Forest and Environmental Practices (15) (Also listed as HNRS 475)**

Typical modules: ecosystem sampling and inventory methods, photo interpretation, hydrologic resources, road condition, project impact analysis, best management practices. Topics covered vary from term to term depending on the priority for learning modules. Residency at Swanton Pacific and extended field trips required. 6 lectures, 7 laboratories, 2 activities. Prerequisite: Completion of Area B and 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.

**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 Natural 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 or consent of instructor.

**FNR 532 Applications in Biometrics and Econometrics (4)**

Parametric and semi-parametric statistical methods in modeling biological and economic phenomena. Biometric modeling of stand growth and inventory. Econometric modeling of market and environmental values. 3 lectures, 1 laboratory. Prerequisite: One course in undergraduate statistics, graduate standing, or consent of instructor.

**FNR 534 Forest Ecosystem 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. *Class Schedule* will list topic selected; sections not repeatable. 2 lectures, 1 laboratory. Prerequisite: One course in undergraduate statistics, graduate standing, or 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 or 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 Forestry and Environmental Sciences (3)**

Student study and presentation of selected developments, trends and problems in the field of forest and natural resources. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**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 I, II, III (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 I, II (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 210 Introduction to Research Methods and Literary Criticism (4)**

Methods and techniques of doing research. Critical thinking and library research in languages other than English. Introduction to the most important philosophical and theoretical schools of thought, as seen and applied in academic research. 3 lectures, 1 activity. Prerequisite: GE A1.

**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: FORL 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 I, II, III (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 121, 122 Intermediate French I, II (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 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: HCS 120.

### 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 HCS 120. 3 lectures, 1 laboratory.

### FRSC 231 Viticulture I (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 Viticulture II (4)

Factors influencing vine physiology and winegrape quality. Recent advances in irrigation strategies, canopy management, and pest control. Budgets for profitable operation and mechanized viticulture. 3 lectures, 1 laboratory. Prerequisite: FRSC 231.

### 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: HCS 120 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 415 Grapevine Physiology (4)

Understanding of grapevine physiology, including anatomy, taxonomy, physiological growth processes, growth cycle phenology, bud break, flowering, fruit set, berry ripening. 3 lectures, 1 laboratory. Prerequisite: FRSC 231, FRSC 331 or 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 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 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 or FSN 121 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.

### 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 311 Sensory Evaluation of Food (4)**

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. 3 lectures, 1 laboratory. Prerequisite: STAT 218; FSN 230 for non-majors.

**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.

**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 330 Introduction to Principles of Food Engineering (4)**

Introduction to principles of food engineering and basic calculations needed for food plant operations. Unit conversions, material balance, heat balance, steam heating, psychrometry, vacuum and pressure. Field trip may be required. 3 lectures, 1 laboratory. Prerequisite: FSN 125, MATH 118 or equivalent, and PHYS 104; or consent of instructor.

**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 (4)**

(Also listed as WVIT 341)

Processing, manufacturing, historical and bio-technical applications of fermentation technology for the production of food products focusing on wine. Wines of the world, distilled beverages, beers, fermented dairy, vegetable and meat products important to the post-harvest economy of

California. Field trip may be required. 4 lectures. Prerequisite: Junior standing and completion of GE Area B.

**FSN 342 Sensory Evaluation of Wine (4) (Also listed as WVIT 342)**

Evaluation of wines using the techniques in sensory evaluation. Difference and rating tests; descriptive analysis and pairing of wine and food. 3 lectures, 1 laboratory. Prerequisite: FSN 341, STAT 218 or STAT 221, age 21 or older.

**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 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 (4)**

Principles of successful organization and management with their application to the effective operation of food service. Administrative responsibilities of the food service manager. Management theories and practice. Labor relations. Discipline and performance appraisal. 4 lectures. Prerequisite: FSN 344, or consent of instructor.

**FSN 429 Clinical Nutrition I (4)**

Application of the nutritional care process to physiological disorders which may alter nutritional requirements or require dietary modifications. Nutritional, hematological and immunological assessment. GI disorders, diabetes mellitus, electrolytes, acid-base balance, hydration and enteral and parenteral nutrition. 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 physiological and metabolic disorders which may alter nutritional requirements or require dietary modifications. Respiratory diseases, burns, cancer, inborn errors of metabolism, pregnancy, cardiovascular disease, liver disease, AIDS, renal disease, and bariatric surgery. 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 330, FSN 204; FSN 230 for non-Food Science majors.

**FSN 461, 462 Senior Project I, II (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: ENGL 148 and senior standing; also FSN 329 for Nutrition majors.

**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 444.

**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 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 540 Dietetic Internship Supervised Practice (10) (CR/NC)**

Supervised practice at various nutrition therapy, foodservice management, and community nutrition sites. Total credit limited to 30 units, with a maximum of 10 units per quarter. Credit/No Credit grading only. Prerequisite: Acceptance into the Cal Poly, San Luis Obispo Dietetic Internship, a special session program in Continuing Education.

**FSN 541 Dietetic Internship Seminar (2) (CR/NC)**

A forum for dietetic interns to make presentations and share their experiences in their supervised practice. Total credit limited to 6 units.

Credit/No Credit grading only. 2 seminars. Prerequisite: Acceptance into the Cal Poly, San Luis Obispo Dietetic Internship, a special session program in Continuing Education.

**FSN 542 Dietetic Internship: Current and Emerging Issues (2) (CR/NC)**

Presentation of various hot topics and emerging issues in nutrition therapy, foodservice management and community nutrition for enrichment of the internship experience. Credit/No Credit grading only. 2 lectures. Total credit limited to 6 units, with a maximum of 2 units per quarter. Prerequisite: Acceptance into the Cal Poly, San Luis Obispo Dietetic Internship, a special session program in Continuing Education.

**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. Total credit limited to 6 units with approval of advisor. 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 distribution), 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.

**GEOG 318 Applications in GIS (3) (Also listed as LA/FNR 318)**

ARC/INFO and ArcView Geographic Information System (GIS) computer software to explore environmental, natural resource, social and economic issues using spatial data. Develop and apply data base and software management competencies. 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 328 Geographic Applications in Remote Sensing (4)**

Introduction to the use of satellite imagery to analyze natural and human features on the earth. Geographic applications in geology, water, climate, vegetation, agriculture, and urban land use. Fundamentals of processing digital satellite images. Emphasis on bridging the earth and social sciences. 3 lectures, 1 activity. Prerequisite: GEOG 250 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)**

Geographic analysis of the land and people of California. Patterns of physical environment, natural resources, history, settlement, ethnicity, economy, politics, and urban growth. Current issues in a national and global context. 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. Typically 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 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 440 Geo-Social Applications in GIS (4)**

Applications in Geographic Information Systems (GIS) emphasizing research, methodologies, and career fields to geography, earth sciences, and

the social sciences. 2 lectures, 2 laboratories. Prerequisite: GEOG/FNR/LA 318 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: ERSC/GEOL 401.

#### **GEOL 415 Structural Geology (4)**

Recognition, interpretation, and depiction of geological structures. Understanding rock deformation through the study of faults and folds. 3 lectures, 1 laboratory. Required weekend field trips. Prerequisite: GEOL 201, GEOL 241, ERSC/SS 223.

## **GER-GERMAN**

#### **GER 101, 102, 103 Elementary German I, II, III (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 I, II (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 (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.

## **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)**

Conventional and digital methods of image capture and manipulation for print and electronic media. Digital photography, scanning, photo-retouching, and color proofing. Photographic materials and equipment for graphic communication. Densitometry, light sources, exposure control, and color management systems. 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 316 Flexographic Printing Technology (3)**

Analysis of flexographic printing technology for newspapers, flexible packaging, label printing, folding and corrugated cartons. Applications of computers to the management and technical function of flexographic printing technology. 2 lectures, 1 laboratory. Prerequisite: GRC 211.

**GRC 320 Implementing Quality Systems in the Graphic Arts (4)**

Theory and practices of quality systems in the graphic arts industry. Emphasis on Deming Systems Thinking, Lean Manufacturing, Six Sigma, ISO, and Malcolm Baldrige. Quantifying customer expectations, specifications, standard operating procedures, SPC tools, and employee empowerment in the graphic arts. 3 lectures, 1 laboratory. Prerequisite: GRC 315 or GRC 328, 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 328 Sheetfed Printing and Platemaking (4)**

Theory, practice and application of sheetfed lithographic printing and platemaking technology to commercial, book, advertising, catalog, packaging and reprographic segments of the printing industry. Computerized press controls and color measurement. Planning for lithographic plates. Step and repeat techniques for imposition. 3 lectures, 1 laboratory. Prerequisite: GRC 211.

**GRC 329 Press Methods and Procedures for Web Offset and Gravure (3)**

Introduction to web offset and gravure printing materials and equipment for newspapers, packaging, magazines, books, catalogs and commercial products. Planning and preparation of image carriers for gravure and web lithographic printing. Preparation and use of various lithographic plates and gravure cylinders. 2 lectures, 1 laboratory. Prerequisite: GRC 328.

**GRC 331 Color Management and Quality Analysis (4)**

Color perception, color measurement, and color management for print and digital media. Application of systems engineering concepts to color reproduction in the digital imaging and printing industry. Development of print quality judgment skills, with particular emphasis upon understanding market-dependent aspects of optimum color quality. 3 lectures, 1 activity. 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 and Variable Data Printing (4)**

Advanced application of type arrangement, digital illustration, image capture and page layout. Digital content management strategies for print and electronic media including file management, database principles, archiving, document formats, variable data publishing, workflow analysis and repurposing. Technical and creative problem-solving for content production and management in print and web publishing. 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 Specialty Printing Technologies (3)**

Specialty printing technologies as related to niche markets including garment decorating, signage, point of purchase displays, decals, and various forms of packaging. Digital file preparation and printing using special processes including screen printing, pad printing, and wide-format printing. 2 lectures, 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.

**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 402 Digital Printing and Emerging Technologies in Graphic Communication (3)**

Application of digital printing including the study of marking engines, RIPs, and related technologies. Emerging graphic communication technologies that are impacting the methods and procedures of producing and distributing print media. Technological transitions and how to manage technological change. 2 lectures, 1 activity. Prerequisite: GRC 201.

**GRC 403 Estimating for Print and Digital Media (4)**

Estimating the cost of various kinds of print and digital products and services. Development of budgeted hour costs and production standards. Cost estimating methods for Print on Demand, VDP, sheetfed lithography, web site development, and wide-format output. Analysis of material, labor and other cost factors. 3 lectures, 1 laboratory. Prerequisite: GRC 315 or GRC 328.

**GRC 411 Pricing, Costing and Web Print Estimating (4)**

Graphic communication industry market trends. Marketing and pricing strategies for printing and digital products. Cost estimating for web printing. Company profitability using ratio analysis. Cost-effective techniques for graphic communication companies including data collection systems, management information systems, and innovative management practices. 3 lectures, 1 activity. 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 or GRC 328, 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: GRC 421.

**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 439.

**GRC 451 Management Topics in Graphic Communication (3)**

Current trends and practices in select graphic communication management topics. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 12 units. 3 lectures. Prerequisite: GRC 101 and GRC 201.

**GRC 452 Emerging Digital Topics in Graphic Communication (3)**

Current trends and practices in select graphic communication emerging digital topics. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 12 units. 3 lectures. Prerequisite: GRC 101 and GRC 201.

**GRC 453 Design Reproduction Topics in Graphic Communication (3)**

Current trends and practices in select graphic communication design reproduction topics. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 12 units. 3 lectures. Prerequisite: GRC 101 and GRC 201.

**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 6 units; total credit limited to 18 units. 2 lectures. Prerequisite: GRC 472 and consent of instructor.

**GRC 485 Cooperative Education Experience (6) (CR/NC)**

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

**GRC 495 Cooperative Education Experience (12) (CR/NC)**

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

**GRC 500 Special Problems in Document Systems Management for Graduate Students (2)**

Investigation, research, studies of problems in document systems management. Repeated course over four quarters working with University Graphic Systems, the Graphic Communication Institute at Cal Poly, and with individual faculty. Total credit limited to 8 units. Prerequisite: Second year MBA student, GRC 101 and GRC 201 or advisor approval.

**GRC 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 12 units. Credit/No Credit grading only. Prerequisite: Graduate 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 Programs. Open only to graduate students who have demonstrated ability to do independent work. A formal written proposal must be accepted by the Associate Dean of OCOB Graduate Programs before work begins. Prerequisite: Graduate standing and formal petition with approval from the Associate Dean of OCOB Graduate Programs.



**GSB 501 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 cannot be followed effectively in regularly offered elective courses. A formal written proposal must be accepted by the Associate Dean of OCOB Graduate Programs before work begins. Prerequisite: Graduate standing and formal petition with approval from the Associate Dean of OCOB Graduate Programs.

**GSB 503 Collaborative Industry Project (1-8)**

Collaborative business project with a client organization that allows graduate level students the opportunity to apply knowledge, skills and competencies to address a business problem. Small teams work in collaboration with a client organization and a faculty advisor. A formal written proposal must be accepted by the Associate Dean of OCOB Graduate Programs before work begins. The project may last up to one year. Prerequisite: Graduate standing and formal petition with approval from the Associate Dean of OCOB Graduate Programs.

**GSB 511 Accounting for Managers (4)**

Emphasis on development of the ability to read and interpret public and internal financial reports. Public reporting responsibilities of companies and management's responsibilities for developing and maintaining effective internal control systems. 3 lectures, 1 activity. Prerequisite: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**GSB 512 Quantitative Analysis (4)**

Focus on a variety of statistical techniques that help to transform data into useful information that can be used to make informed business predictions and decisions. 3 seminars, 1 laboratory. Prerequisite: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**GSB 513 Organizational Behavior (4)**

Application of behavioral, social and organizational science concepts to management. Individual, team and organizational levels of analysis, including such topics as expectations, perception, motivation, communications, creativity, leadership, cultural and ethical behavior, group dynamics, team effectiveness, work design, organization change and development. 4 seminars. Prerequisite: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**GSB 514 The Legal and Regulatory Environment of Business (4)**

Legal and regulatory environment in which business operates. Consideration of historical, societal, and global perspectives reflecting political, social and/or economic beliefs and values. Strong emphasis on fundamental concepts of law and analytical tools to understand interaction between law, ethics and management decisions. 4 seminars. Prerequisite: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**GSB 522 Advanced Management Information Systems (4)**

Set of tools to ensure understanding of the strategies, tactics, and operations employed by managers to assimilate technology across their firms. Critical topics include alignment, partnership, technology, human resources, governance, communications, and metrics. 3 lectures, 1 activity. Prerequisite: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**GSB 523 Managerial Economics (4)**

Managerial economics, or microeconomics, focuses on private markets. Choices made by firms and consumers within topics that include demand, supply, efficiency, marketing structure, and government intervention. Development of an analytical framework for analyzing how these topics are important for managers. 4 lectures. Prerequisite: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**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 lectures. Prerequisite: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**GSB 525 Project Management (4)**

Focus on project management tools and processes required to establish priorities for and management of projects within normal and abnormal scope, money and time constraints. Planning, organizational and resource challenges common to a variety of project types. Product life cycle, normal operational, new product introduction and profit oriented product family projects reviewed in service and production environments. 3 lectures, 1 laboratory. Prerequisite: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**GSB 526 Knowledge Management and Business Intelligence (4)**

Relationships among knowledge management (KM), knowledge organizations and knowledge workers. Mapping of the field of knowledge management and exploration of the nature and key features of KM. Discussion of knowledge management and business intelligence central themes using case studies; alternative ways to design, implement and improve KM systems in organizations; business intelligence, decision support systems and data warehousing. Integration of querying, reporting, OLAP, data mining and data warehousing functions. 3 lectures, 1 activity. Prerequisite: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**GSB 527 Management of Information Security (4)**

Topics of information security and the need for security from a managerial perspective. Legal, ethical and professional information security issues. Planning for security and contingency considerations. Business policies and programs for organizational security. Risk management and control as mechanisms for protection. Examples of information security issues and practices implemented in today's business environment. 3 lectures, 1 activity. Prerequisite: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**GSB 531 Managerial Finance (4)**

Theories, practices and tools of corporate financial decision making. Topics include valuation of fixed income securities and stocks, capital budgeting, capital structure, dividends, and an overview of financial markets and institutions. Introduction to valuation of derivative securities, market efficiency, and agency costs. 4 seminars. Prerequisite: GSB 511 and graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**GSB 532 Strategic Information Systems (4)**

Overview 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 lectures, 1 activity. Prerequisite: GSB 522 and graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**GSB 533 Aggregate Economics Analysis and Policy (4)**

Development of the theoretical and empirical framework of the macroeconomy in which businesses must operate. Topics include GDP, inflation, unemployment, interest rates and monetary and fiscal policies. The dynamics of the macroeconomic environment over time. 4 lectures. Prerequisite: GSB 523 and graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**GSB 534 Production and Operations Management (4)**

Introduction to the operations function and its interaction with other areas in an organization. Emphasis on strategic and tactical decisions to achieve competitive advantage in cost, delivery speed and reliability, quality, flexibility, and product innovation through manufacturing and services. 4 seminars. Prerequisite: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**GSB 535 Advanced Accounting Process Analysis and Risk Assessment (4)**

Contemporary topics associated with documenting and assisting risk, controls, and business processes. Topics include business objectives and organizational performance, risk identification and assessment, application

of assessment techniques, and the role of accounting information systems in controlling transaction authorization. 3 seminars, 1 activity. Prerequisite: GSB 511 and graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**GSB 536 Advanced Financial Reporting Issues (4)**

Comprehensive coverage of selected advanced financial accounting and reporting topics. Topics include restructuring charges, accounting for income taxes, pensions, leases, accounting charges, and consolidated statement topics. 4 seminars. Prerequisite: GSB 511 and graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**GSB 537 Corporate Governance in Ethical Organizations (4)**

Coverage of mechanisms, at the firm level, that contribute to more effective corporate governance and ethical climate at publicly traded corporations. Topics include role of boards of directors, audit committees, structures and systems that affect ethical climate in organizations. 4 lectures. Prerequisite: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**GSB 539 Graduate Internship in Business (2-8) (CR/NC)**

Correlation of experience and academic knowledge. Placement in a supervised business or public organization. A formal written proposal must be accepted by the Associate Dean of OCOB Graduate Programs before work begins. Credit/No Credit grading only. Prerequisite: Graduate standing and formal petition with approval from the Associate Dean of OCOB Graduate Programs.

**GSB 541 Federal Income Tax for Business (4)**

An introduction to the principles of business taxation. Emphasis of the role taxes play in financial and managerial decision making and how taxes motivate people and institutions to engage in certain transactions and activities. 4 lectures. Prerequisite: GSB 511 and graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**GSB 555 Negotiation for Managers (4)**

Negotiation concepts and practice in two-party and multiple-party situations faced by practicing managers. 4 seminars. Prerequisite: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**GSB 560 Derivative Markets and Instruments (4)**

Introduction to derivative markets and their key instruments. Application of financial theory to the problems of valuing derivative securities and the management of business risks with derivative instruments. Principal securities considered include forwards, futures, options, and swaps. 4 lectures. Prerequisite: GSB 531 and graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**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: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**GSB 564 Entrepreneurial Finance (4)**

The process of financing new and fast-growing firms. Preparation of pro forma financial statements for a new venture. Readings on the venture capital process, from seed capital through the initial public offering (IPO). Valuation of firms seeking venture capital, and those planning their IPO. Valuing convertible securities. Real options valuation. 4 lectures. Prerequisite: GSB 531 and graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**GSB 565 Services Marketing (4)**

Service organizations such as financial services firms, professional services firms, and health care organizations. The 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 and graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**GSB 566 Product Management (4)**

Issues which confront brand/product managers: includes content needed to design new product/brand marketing development programs. Appropriate for students pursuing product career paths in consumer/business/service sectors. 4 seminars. Prerequisite: GSB 524 and graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**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. Course satisfies the culminating experience through the comprehensive examination option. 4 seminars. Prerequisite: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**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: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**GSB 570 Entrepreneurship and Small Business Management (4)**

Exploration of 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: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**GSB 571 Organizational Theory and Design (4)**

Open systems theory and macro dimensions of organizations including environment, mission, goals, structure, technology, and managerial processes. Alternative redesign processes, and business results through cases and exercises. Role of management in designing the organization to achieve balanced outcomes. 4 seminars. Prerequisite: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**GSB 573 Market Research and Planning (4)**

The steps in the marketing research process which include formulation of the research problem, situation analysis, qualitative data collection, questionnaire design, data collection and data analysis. 4 seminars. Prerequisite: GSB 524 and graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**GSB 574 Seminar in Labor-Management Relations (4)**

The impact of unionized labor on management practice. Three challenges to management; namely, the organizing challenge, the negotiation challenge, and the grievance/arbitration challenge. 4 seminars. Prerequisite: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**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, quality management tools, and new management technologies focused on continuous organizational improvement. 4 seminars. Prerequisite: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**GSB 577 Advanced Quantitative Business Analysis (4)**

The necessary conceptual framework of operations research techniques for solving key problems encountered while managing an enterprise. Concepts

of linear programming, simulations, network models, inventory models, PERT/CPM, and forecasting techniques. 3 seminars, 1 laboratory. Prerequisite: GSB 512 and graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

#### **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. 4 seminars. Prerequisite: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

#### **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. Developing flexible capabilities, central to developing and implementing an effective manufacturing strategy. 4 seminars. Prerequisite: GSB 534 and graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

#### **GSB 581 Advanced Marketing Seminar (4)**

Product, branding, and pricing strategies: an in-depth understanding of new product development processes and strategy; analysis of the strategies and policies pursued by firms to build and sustain successful brands; an integrative framework for pricing decisions. 4 seminars. Prerequisite: GSB 524 and graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

#### **GSB 582 High-Technology Marketing (4)**

Marketing as applied to high technology products, and the impact of high technology on the marketing effort. 4 seminars. Prerequisite: GSB 524 and graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

#### **GSB 583 Management of Human Resources (4)**

An overview of the major functional and support activities in the personnel/human resource field, including strategic human resource planning, job analysis, recruitment, selection, performance appraisal, compensation, employee rights, and employee safety and health. 4 seminars. Prerequisite: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

#### **GSB 584 Corporate Financial Policy (4)**

An overview of the factors that affect corporate financial decisions, including firms' financing, investment and hedging policies. Factors included: taxes, transaction costs, contracting (between managers and shareholders, and between shareholders and other claimholders such as bondholders), and asymmetric information. 3 seminars, 1 activity. Prerequisite: GSB 531 and graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

#### **GSB 585 Investments and Portfolio Management (4)**

The application of financial theory to the problems of investment management. Topics cover the valuation of basic financial instruments, portfolio optimization, risk management, asset allocation, the CAPM, and market efficiency. Required use of optimization software and writing spreadsheet programs. 4 seminars. Prerequisite: GSB 531 and graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

#### **GSB 586 Financial Markets and Instruments (4)**

The form and function of major types of financial institutions and markets. Exposure of financial institutions to a wide variety of risks, the successful management of which is important for the growth and survival of these institutions (liquidity risk, interest rate risk, market risk, credit risk, off-balance-sheet risk, and operating risk). In-depth exploration of the measurement and management of these risks. 4 seminars. Prerequisite: GSB 531 and graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

#### **GSB 587 International Financial Management (4)**

The international aspects of corporate finance and investing. Balance of payments, foreign exchange with emphasis on exchange rate determination, exchange risk, hedging, and interest arbitrage, international money and capital markets, international financing, and international banking. 4 seminars. Prerequisite: GSB 531 and graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

#### **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 511 and graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

#### **GSB 590 Designing and Managing Sociotechnical Systems (4)**

Sociotechnical Systems (STS) thinking and methods, which examine the fit between the technical systems used by an organization and its human (social) system. Techniques for analyzing work in both routine and non-routine business systems. 4 seminars. Prerequisite: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

#### **GSB 595 Managing Change (4)**

The knowledge and the elementary skills/competencies needed to intervene in an organization in order to improve its effectiveness. Design and use of action to improve organizational effectiveness. 4 seminars. Prerequisite: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

#### **GSB 596 Economic Forecasting (4)**

Applications to business planning of selected economic forecasting techniques. Classical time series analysis, Box-Jenkins (ARIMA) models, leading indicators and input-output analysis. 3 seminars, 1 laboratory. Prerequisite: GSB 523, 533 and graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

#### **GSB 597 Seminar in Selected Economic Problems (4)**

Selected economic 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 and graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

## **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 120 Principles of Horticulture and Crop Science (4)**

Introduction to horticulture and crop science. Basic plant processes, classification, anatomy, physiology, and biotechnology. Effect of environment on plants and how we control it. Introduction to plant growth including propagation, media, irrigation, nutrition, management, harvest, and post harvest handling. People's use of plants. Field trip required. 3 lectures, 1 laboratory.

#### **HCS 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, HCS 120, and BOT 121.

**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 304 Plant Breeding (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.

**HCS 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: HCS 120, EHS 123, HCS 124, EHS 231, EHS 232, BOT 121, CHEM 111, SS 121.

**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 410 Applied Plant Ecophysiology (4)**

Ecological and physiological interactions associated with the production of agronomic and horticultural plants. Biochemical and physiological processes that elucidate the mechanism of whole plant and community performance. 3 lectures, 1 laboratory. Prerequisite: HCS 120; BOT 121, or BIO 325; and CHEM 312.

**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 I (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 II (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 activity. 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 repeated in same term. Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

**HCS 511 Ecological Biometrics (4) (Also listed as PPSC 511)**

General survey of current analytical methodology available to ecological researchers to evaluate effects and assess the underlying mechanisms that drive natural and cultivated ecosystems. Methodology includes general linear models, ordination, survival analysis, multivariate analyses, and computer simulations. Student research used as a basis for instruction. Total credit limited to 8 units. 3 seminars, 1 activity. Prerequisite: Any one of the following statistical methods courses: CRSC 411, STAT 212, STAT 218, STAT 313, STAT 512, STAT 513 or consent of instructor.

**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 repeated 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 repeated 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: Reform 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**  
(Some sections 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 300 Junior Seminar (4)**  
Historical analysis of selected problems and topics for undergraduates. Seminar format, intense discussion of readings and issues. *Class Schedule* will list topic selected. Total credit limited to 8 units. 4 seminars. Prerequisite: Completion of GE Area A. Completion of two courses in lower-division Area D (preferably D2 and D3). Junior standing or consent of instructor.
- 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)**  
Theoretical approaches used to study the past, including scholarship on history and memory, the influence of interdisciplinary studies, the significance of race and gender as categories of analysis, and the place of history and the historian in contemporary society. 3 seminar meetings and research project. Prerequisite: HIST 303; junior standing or consent of instructor; and History major.
- 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 316 Modern East Asia (4)** **GE D5**  
Modern histories of China, Japan and Korea: great disruptions of modernity that have transformed these societies, common characteristics of modernity in East Asia, great differences between Chinese, Japanese and Korean histories, and the mutually constitutive nature of these East Asian histories. 4 lectures. Prerequisite: Completion of GE Area A. Completion of two courses in lower-division Area D (preferably D2 and D3), or consent of instructor.
- 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 323 Versions of the Past: Novels, Comics and Movies (4)** **GE D5**  
An introduction to historical novels, comics, movies, memoirs and autobiographies as forms of historical representation in the contemporary U.S. Exploration of the vision of American history that each work presents and the truth-claims made for that particular vision. 4 lectures. Prerequisite: Completion of two courses in lower-division GE Area D and completion of Area A; junior standing or consent of instructor.
- HIST 324 The Historical Novel in the United States, 1960s to the Present (4)** **GE D5**  
An introduction to the historical novel as it has developed in the United States since the 1960s. Exploration of how historical novels typically represent the past and the ways in which they change our notion of what counts as "history." 4 lectures. Prerequisite: GE D1 and any other lower-division Area D course.
- 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 Renaissance, 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 336 Britain at War: The British, the Americans and the Struggle for Freedom, 1939-1945 (4)** **GE D5**  
Historical examination of Great Britain's challenge to its sovereignty and freedom by the regime of Nazi Germany from 1939-1945. An account of how Britain formed an alliance with the United States, and how that partnership forged a successful campaign that culminated in the survival of Britain and destruction of the Nazi regime. 3 lectures, 1 activity. Prerequisite: Limited to London Study students; completion of GE Area A; completion of two courses in lower-division Area D courses; junior standing or permission of the 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 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.
- 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.
- 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 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 (4)**

Organization, selection, presentation, application, and interpretation of subject matter in history in secondary schools. 4 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)

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.

USCP

**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 Senior Project I (2)**

Completion of paper or creative project under faculty supervision. Must be historical in nature, investigate a question of significance, include an historiographical analysis, and make an argument based on primary and secondary sources. Take HIST 461 during a subsequent quarter. Prerequisite: HIST 303; HIST 304; senior standing or consent of instructor; and History major.

**HIST 461 Senior Project II (2)**

Completion of paper or creative project begun in HIST 460 under faculty supervision. Prerequisite: HIST 303, HIST 304; HIST 460; senior standing or consent of instructor; and History major.

**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 504 Graduate Study in History (4)**

Weekly reading and discussion course on practical methods and theoretical approaches to the study and writing of history. 4 seminars. Prerequisite: Graduate standing in History and consent of instructor.

**HIST 505 Seminar in United States History (4)**

Intensive study of selected topics in United States history. *Class Schedule* will list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: HIST 504 or consent of instructor.

**HIST 506 Seminar in Modern European History (4)**

Intensive study of selected topics in modern European history. *Class Schedule* will list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: Graduate standing in History or consent of instructor.

**HIST 507 Seminar in East Asian History (4)**

Intensive study of selected topics in East Asian history. *Class Schedule* will list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: Graduate standing in History and consent of instructor.

**HIST 508 Seminar in Latin American History (4)**

Intensive study of selected topics in Latin American history. *Class Schedule* will list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: HIST 505 or consent of instructor.



**HIST 509 Seminar in African History (4)**

Intensive study of selected topics in African history. *Class Schedule* will list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: Graduate standing in History or consent of instructor.

**HIST 512 Supervised Reading for Comprehensive Exams (2)**

Directed supervision of reading for MA comprehensive exams. Regular consultation between advisor and student. Total credit limited to 4 units. 2 seminars. Prerequisite: HIST 504 and 12 units of graduate study.

**HIST 599 Thesis (3)**

Directed supervision of MA thesis. Regular consultation between advisor and student. Course to be taken three times over three separate quarters; total credit limited to 9 units.

**HNRC--HONORS CONTRACT****HNRC 199 Honors Contract (CR/NC)**

Students in the Honors Program are required to take at least eight courses for honors credit before graduation. Taking an Honors course may not be possible due to scheduling conflicts or unavailability of courses. In these cases and with the permission of the Director of the Honors Program, the student may enter into a "Contract" to engage in honors-level work in a class on an individual basis. Credit/No Credit grading only. Students can register for a maximum of 2 Honors Contracts; repeatable in same term.

**HNRC 200 Honors Leadership Experience (CR/NC)**

The Honors Program encourages its students to develop leadership skills through serving on the Honors Board, chairing Honors Committees, participating as International Student mentors and/or Preface discussion leaders. To receive Honors credit for these activities, students must also participate in a number of formal leadership-training seminars/workshops, and contribute their insights to the Honors and greater Cal Poly communities. Credit/No Credit grading only. Total credit limited to two courses. Prerequisite: Student must be in good standing in the Honors Program, and have permission of the Director.

**HNRC 399 Honors Contract (CR/NC)**

Students in the Honors Program are required to take at least eight courses for honors credit before graduation. Taking an Honors course may not be possible due to scheduling conflicts or unavailability of courses. In these cases and with the permission of the Director of the Honors Program, the student may enter into a "Contract" to engage in honors-level work in a class on an individual basis. Credit/No Credit grading only. Students can register for a maximum of 2 Honors Contracts; repeatable in same term.

**HNRC 400 Honors Professional, Social and Global Experience (CR/NC)**

The Honors Program encourages its students to enhance their academic coursework by broadening their professional, social and global perspectives through professional internships/co-ops, participation in community projects and study abroad experience. To receive Honors credit, students must also reflect on these experiences and contribute their insights through presentations (oral and/or written) to the Honors and greater Cal Poly communities. Credit/No Credit grading only. Total credit limited to two courses, repeatable in the same term.

**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 134 General Physics IA (4) GE B3  
(Also listed as PHYS 141)**

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 science students. Not open to students with credit in HNRS/PHYS 131. 4 lectures. Prerequisite: MATH 141 with grade C- or better and MATH 142 or MATH 182 (or concurrent enrollment). Recommended: High school physics.

**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 211 Materials Science and Engineering (3)**  
(Also listed as MATE 211)

MATE 210 for honor students. A more in-depth treatment of the topics presented in MATE 210. 3 lectures. Prerequisite: CHEM 111, CHEM 124, or CHEM 127; MATH 141.

**HNRS 212 Global Origins of United States Cultures (4)**  
(Also listed as ES 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.

**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 231 Philosophical Classics: Social and Political Philosophy (4) (Also listed as PHIL 231) 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.

**HNRS 241 Calculus IV (4) (Also listed as MATH 241)**

Partial derivatives, multiple integrals, introduction to vector analysis. 4 lectures. Prerequisite: MATH 143.

**HNRS 244 Linear Analysis I (4) (Also listed as MATH 244)**

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/HNRS 143 or consent of instructor.

**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 299 Honors Group Seminar (1) (CR/NC)**

Students in the Honors Program are required to take at least eight courses for honors credit before graduation. Taking an Honors course may not be possible due to scheduling conflicts or unavailability of courses. This course allows students to engage in honors-level work in a standard, non-honors course on a group basis. Credit/No Credit grading only. Total credit limited to 8 units; repeatable in same term. 1 seminar.

**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) GE Area F**  
(Also listed as AERO 310)

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 319 Natural Resource Ecology, Theories and Applications (4) (Also listed as FNR 319) 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.

**HNRS 320 Values, Media, and Culture (4) GE C4**  
(Also listed as HUM 320)

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 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 Honors Program Director.

**HNRS 411 New Media Arts I (4) (Also listed as ENGL 411)**

Advanced-level presentation of new media theory, design and practice. Topics covered include, but are not limited to, interactivity theory, user-centered system design, cognitive psychology, media analysis, and basic web design theory. Total credit limited to 8 units. 4 lectures. Prerequisite: advanced skills in writing and/or graphics, and/or computer programming; upper-division standing, ENGL 148 or ENGL 149 and consent of instructor.

**HNRS 412 New Media Arts II (4) (Also listed as ENGL 412)**

Advanced level of work with the primary technologies and design/critique theories currently at use in the professional creation of new media works. Lectures and readings expand upon material presented in HNRS/ENGL 411. 4 lectures. Prerequisite: HNRS/ENGL 411 and consent of instructor.

**HNRS 475 Forest and Environmental Practices (15) (Also listed as FNR 475)**

Typical modules: ecosystem sampling and inventory methods, photo interpretation, hydrologic resources, road condition, project impact analysis, best management practices. Topics covered vary from term to term depending on the priority for learning modules. Residency at Swanton Pacific and extended field trips required. 6 lectures, 7 laboratories, 2 activities. Prerequisite: Completion of Area B and consent of instructor.

**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.

**HNRS 499 Honors Group Seminar (1) (CR/NC)**

Students in the Honors Program are required to take at least eight courses for honors credit before graduation. Taking an Honors course may not be possible due to scheduling conflicts or unavailability of courses. This course allows students to engage in honors-level work in a standard, non-honors course on a group basis. Credit/No Credit grading only. Total credit limited to 8 units, repeatable in same term. 1 seminar.

**HUM–HUMANITIES****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) GE C4 (Also listed as HNRS 304)**

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 318 Culture of Spain: Activities (2) (CR/NC)**

Examination and experience of Spanish culture via participant observation in Spain. An introductory exploration of the development of Spanish architecture, art, literature, music, theatre and popular culture as experienced in Valladolid, Spain. Credit/No Credit grading only. 2

activities. Prerequisite: Limited to Valladolid, Spain Fall program. Co-requisite: HUM 310.

**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) GE C4 (Also listed as HNRS 320)**

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 (Also listed as AG 330)**

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 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 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)**

Introduction of major topics in industrial and manufacturing engineering. Time management, study skills and class scheduling necessary for academic

success. University services. Professional ethics. 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 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. 3 lectures, 1 laboratory. Prerequisite: Junior standing, IME 314 or equivalent.

**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: CSC 232.

**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)**

Analysis of cognitive, sensory and physical limitations and capabilities of operators and users of technology, both hardware and software, in working

**GE Area F**

and living environments. Analysis of pertinent databases for a proactive approach to designing user-centered industrial products /systems, consumer products, and work environment. 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: IME 144, CSC 232, or consent of instructor.

**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 241, MATE 210 and MATE 215, and CE 204.

**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 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 instructor.

**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 405 Operations Research II (4)**

Queuing models, dynamic programming and inventory models, Markovian processes, simulation modeling, computer programming in solution of problems. 3 lectures, 1 activity. Prerequisite: IME 301, STAT 312 or STAT 321 or consent of instructor.

**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. 3 lectures, 1 activity. Prerequisite: IME 301 or consent of instructor.

**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 326, IME 405, CSC 232.

**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 314, and IME 405, or consent of instructor.

**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 405 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 326, IME 405.

**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, or consent of instructor.

**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 326. 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 326 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 326.

**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 326 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 326.

**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 326 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 405 or IME 342, IME 314, or equivalent. Recommended: IME 319, IME 420.

**IME 455 Manufacturing Design and Implementation I (3)**

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. 3 laboratories. Prerequisite: IME 418. Recommended co-requisite: IME 430.

**IME 457 Advanced Electronic Manufacturing (4)**

Design and fabrication of commercial electronic products; PCB layout design, bill of material analysis and component purchasing, production planning and scheduling, programming automated surface-mount assembly line, marketing of products. Multidisciplinary project teams exposed to real-world challenges of electronics manufacturers. 2 lectures, 2 laboratories. Prerequisite: IME 156 or IME 157 or IME 251.

**IME 458 Microelectronics and Electronics Packaging (4)**

Materials, processes, and reliability of microelectronics and electronics packaging, surface mount assembly and printed circuit board fabrication. Overview of semiconductor manufacturing and optoelectronics packaging. 3 lectures, 1 laboratory. Prerequisite: MATE 210 and PHYS 133.

**IME 461, 462 Senior Project I, II (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 as repeat credit.

**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 as repeat credit.

**IME 493 Cooperative Education Experience (2) (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 6 units. Prerequisite: Sophomore standing and consent of instructor.

**IME 494 Cooperative Education Experience (6) (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 18 units. 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. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. Total credit limited to 24 units. Prerequisite: Sophomore standing and consent of instructor.

**IME 500 Individual Study (1–4)**

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. Prerequisite: Consent of department chair and supervising faculty member.

**IME 501 Graduate Survey I (4)**

Survey of traditional industrial engineering applications in industrial systems, work methods, measurements and analysis. Facilities design, automation and logistics of industrial operations. Human factors and cost estimation of industrial applications. 3 seminars, 1 activity. 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 and consent of instructor.

**IME 503 Applied Statistical Methods in 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: Graduate standing or consent of instructor.

**IME 507 Graduate Seminar (2)**

Selected topics of interest to industrial engineering, integrated technology management, and engineering management graduate students. *Class Schedule* will list topic selected. Total credit limited to 4 units, with a maximum of 2 units per quarter. 1 seminar, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

**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 326 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. Application of project management software. 3 seminars, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

**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. 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 and consent of instructor.

**IME 577 Engineering Entrepreneurship (4)**

The special requirements of entrepreneurship in a high-tech environment. Guest lectures, focused seminar topics, a business plan project, and case studies provide the tools to evaluate and pursue technology-based business opportunities. 3 lectures, 1 laboratory. Prerequisite: Graduate standing 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. Enterprise resource planning (ERP) and integration with financials. Information requirements, operational issues, and policy matters. 4 seminars. Prerequisite: Graduate standing or 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: Graduate standing.

**IME 593 Cooperative Education Experience (2) (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.

**IME 594 Cooperative Education Experience (6) (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.

**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. A fully-developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.



**IME 596 Team Project/Internship (1-10)**

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, normally taken over 2 quarters. 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.

**IS-INTERDISCIPLINARY STUDIES****IS 101 Orientation to Interdisciplinary Studies and the University (3)**

Introduction to collaborative interdisciplinary inquiry. Topics include: Scholarly knowledge production and bibliographic finding tools, University role in knowledge dissemination and creation, and information search and evaluation processes. "Learn-by-doing" disciplinary investigation and interdisciplinary analysis and synthesis. 3 lectures.

**IS 301 Critical Issues Seminar (4)**

Discussion-oriented seminar focusing on ethics and effective interdisciplinary decision-making in the contemporary world. Examination of ethical and other issues facing society through current public debates, as well as great intellectual traditions that have shaped the past. *Class Schedule* will list topic selected. Total credit limited to 8 units. 4 seminars. Prerequisite: Admission to the Adult Degree Program (Bachelor of Arts in Interdisciplinary Studies) prior to enrolling in this seminar.

**IS 302 Analytical Skills Seminar (4)**

Improvement of abilities to collect data, analyze information, frame questions, reach and defend logical conclusions. Emphasis on applying methods of data analysis to a variety of contemporary interdisciplinary issues. *Class Schedule* will list topic selected. 4 seminars. Prerequisite: Admission to the Adult Degree Program (Bachelor of Arts in Interdisciplinary Studies) prior to enrolling in this class, and IS 101.

**IS 450 Advanced Investigation Seminar (5)**

In-depth interdisciplinary investigation into a narrowly defined issue of personal and/or professional interest. Identification of topic and examination from a variety of standpoints (e.g., cultural, environmental, religious, political, or economic). *Class Schedule* will list topic selected. 5 seminars. Prerequisite: Admission to Adult Degree Program (bachelor of Arts in Interdisciplinary Studies), IS 301 and IS 302.

**IS 460 Capstone Project (6)**

Selection and completion of a summative project or report under the supervision of a faculty member. Topic must be approved by the seminar instructor and the ADP director. Investigation of the topic from an interdisciplinary approach. Prerequisite: Senior standing, IS 301, IS 302, IS 450.

**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 233 Decision Making and Problem Solving Using CAD (4)**

Fundamental theory and practice of technical design communication and management of information systems. The basic application of computer-aided design (CAD) and fundamental skills in communication of product design and information systems and their impact on the industrial organization. 2 lectures, 2 laboratories.

**IT 260 Manufacturing Processes (4)**

Manufacturing processes; emphasis on shaping metallic products. Precision measuring, technical drawings, safety and equipment use as they apply to metal machining, welding, casting and sheet metal fabrication. 2 lectures, 2 activities.

**IT 276 Principles of Purchasing (3)**

Purchasing function applied to manufacturing, retailing, and food-service institutions. Its interdependence with other functional areas of the organization. 3 lectures.

**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 Manufacturing Technologies and Society (4)**

Survey of 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, industrial strategies and their implications. 2-- lectures, 2 activities. Prerequisite: Completion of GE Area B and junior standing.

**IT 302 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 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 and Project Evaluation (4)**

Foundation and practical application of value engineering and project management. 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. Introduction of project management principles and techniques 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, pneumatics and hydraulics, 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 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 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.

**GE Area F****IT 341 Plastic Processes and Applications (4)**

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.

**GE Area F****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 371 Production Operations and Project Management (4)**

Introduction to operations management and production systems; service operations and project management; production and service models. Planning and control in manufacturing and service industries. Quantitative methods and statistical techniques used in production systems and project 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.

**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 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.

**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 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 and Facilities Planning (4)**

Production planning and control. Linking production planning systems and manufacturing technologies in a global economy. Relating of mechanical equipment and systems along with utility and production support systems into the overall industrial plan. 3 lectures, 1 activity. Prerequisite: IT 233, 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, junior 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 Computer Numerical Control and Robotics (4)**

Automated manufacturing systems, including computer numerical control (CNC), flexible manufacturing systems, computer-integrated manufacturing and robotics. Laboratory work in manual/automatic programming and set-up of CNC machines and robots. 2 lectures, 2 laboratories. Prerequisite: IT 233, IT 260, or consent of instructor.

**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 456 Textile Product Quality Assurance (4)**

Quality assurance in the textile/apparel industry. Materials and product testing and evaluation through laboratory experimentation. Developing standards and specifications for textile products, inspection processes, sampling and testing procedures. Integration of products with materials and consumers. 3 lectures, 1 laboratory. Prerequisite: IT 336, completion of Areas A, B and F, 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 and seminars in selected topics in industrial technology. Open to undergraduate students. *Class Schedule* will list topic

selected. Total credit limited to 12 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

**IT 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: IT 371.

**IT 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: IT 371.

**IT 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: IT 371, and senior standing.

**IT 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, IT 371.

**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. Maximum of 6 units may be applied to degree requirements. Prerequisite: Graduate standing and formal petition with approval from the Associate Dean of OCOB Graduate Programs.

**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 management, packaging, transportation, food technology, and facilities. 4 seminars. Prerequisite: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**IT 512 Improving Productivity Through Technology (4)**

Study, from a management of technology perspective, of 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 approval from the Associate Dean of OCOB Graduate Programs.

**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 approval from the Associate Dean of OCOB Graduate Programs.

**IT 520 Leadership of Technology (4)**

The role 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 or approval from the Associate Dean of OCOB Graduate Programs.

**IT 521 Training in Industrial and Technical Systems (4)**

Developing and managing technological training in industry. The 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 approval from the Associate Dean of OCOB Graduate Programs.

**IT 522 Facilities Planning (4)**

Introduction of prospective managers to the methods and techniques used in the planning 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 or approval from the Associate Dean of OCOB Graduate Programs.

**IT 523 Industrial Sales (4)**

Development and implementation of a base of competencies that support the sale of products whose intended application is in manufacturing. Refinement of technical knowledge and selling in an industrial setting. 4 lectures. Prerequisite: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**IT 527 Trends and Issues in Technology Management (4)**

Advanced study of key current trends and issues relative to technology management of industrial and technical systems. 4 seminars. Prerequisite: Graduate standing or approval from the Associate Dean of OCOB Graduate Programs.

**IT 598 Industrial and Technical Studies Project (5)**

Completion of a project involving individual research significant to the field of industrial and technical systems. A formal written proposal must be accepted by the Associate Dean of OCOB Graduate Programs before work begins. Course satisfies culminating experience requirement through the completion of the project. Prerequisite: Graduate standing and consent of instructor or approval from the Associate Dean of OCOB Graduate Programs.

**IT 599 Industrial and Technical Studies Thesis (5)**

Completion of a thesis involving individual research that is significant to the field of industrial and technical systems. A formal written proposal must be accepted by the Associate Dean of OCOB Graduate Programs before work begins. Course satisfies culminating experience requirement through the completion of the comprehensive thesis. Prerequisite: Graduate standing and consent of instructor or approval from the Associate Dean of OCOB Graduate Programs.

**ITAL-ITALIAN****ITAL 101, 102, 103 Elementary Italian I, II, III (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 Writing for the Media (4)**

Introduction to the techniques of reporting and writing news from various media perspectives including print, online, broadcast and public relations. Intensive laboratory and field practices in gathering and evaluating information. Writing basic news stories under close supervision. 3 lectures, 1 laboratory.

**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 219 Mass Media in a Multicultural Society (4)**

Challenges and triumphs of the mass media in a multicultural society. Survey of print, electronic and online media and how they serve and reflect the communication needs and aspirations of citizens in a multi-ethnic democracy. 4 lectures. Prerequisite: JOUR 203.

**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 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 Public Affairs Reporting (4)**

Experience leading to advanced skills in reporting and writing stories about contemporary issues, government and courts. Field and laboratory assignments in beat reporting, public meeting coverage, writing style, investigative techniques and online journalism research. 3 lectures, 1 laboratory. Prerequisite: JOUR 203 and JOUR 233 or JOUR 342.

**JOUR 312 Introduction to Public Relations (3)**

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. 3 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 and reporting for radio and television. Emphasis on developing news judgment and producing radio newscasts. Introduction to television studio equipment and procedures. Lab experience includes writing and reporting live on-air for KCPR. 3 lectures, 1 laboratory. Prerequisite: JOUR 203.

**JOUR 342 Advanced Public Relations Writing (4)**

Specialized course combining theory and practice in advanced public relations writing. Persuasive copy for diverse internal and external audiences. Emphasis on gathering information, preparing news releases, newsletters, talking points, position papers, speeches, and other communications vehicles. Analysis of various media case studies. 4 lectures. Prerequisite: JOUR 233 and JOUR 312.

**JOUR 346 Broadcast Announcing and Production (4)**

Develop on-air skills in the performance of voice-overs, stand-ups, hosting and the production of televised public service announcements. Emphasis on the effective use of audio and non-linear video editing techniques as well as broadcast writing. 3 lectures, 1 activity. Prerequisite: JOUR 203 and JOUR 333.

**JOUR 348 Electronic News Gathering (4)**

Instruction on electronic news gathering (ENG) that includes advanced news writing, field reporting and editing for broadcast. Emphasis on developing research techniques, interviewing skills, responsible and effective non-linear video editing, compelling use of natural sound and professional on-air delivery. 3 lectures, 1 laboratory. Prerequisite: JOUR 203 and JOUR 333.

**JOUR 351 Advanced Radio Reporting: KCPR (3)**

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 6 units. 2 lectures, 1 laboratory. Prerequisite: JOUR 203 and JOUR 333 and JOUR 346 or JOUR 348. Non-majors: consent of instructor.

**JOUR 352 Advanced Newspaper Reporting: *Mustang Daily* (3)**

Reporting lab for students holding editorial positions on *Mustang Daily*. Total credit limited to 6 units. 2 lectures, 1 laboratory. Prerequisite: JOUR 203, JOUR 233 and JOUR 304.

**JOUR 353 Advanced Television News Production: CPTV (3)**

Senior-level course synthesizing the diverse skills and experiences developed through the broadcast journalism curriculum to produce a weekly 60-minute newscast; emphasis on producing. Total credit limited to 6 units. 2 lectures, 1 laboratory. Prerequisite: JOUR 203 and JOUR 333 and JOUR 346 or JOUR 348. 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 203 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 Global 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: JOUR 203.

**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 203.

**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 Applied Multimedia 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: JOUR 203.

**JOUR 413 Public Relations Campaigns (3)**

Methods employed in dissemination by organizations, institutions and governments. Interaction of media and PR practitioners, strategies for integrating appropriate media to facilitate effective dissemination, case histories, formation and measurement of public opinion. Public opinion survey projects. 3 lectures. Prerequisite: JOUR 203 and JOUR 312 and JOUR 342 or consent of instructor.

**JOUR 415 Advanced Public Relations Practice (4)**

Application of public relations tools and techniques required to create, manage, and implement a comprehensive, professional public relations campaign. Includes research, planning, writing goals and objectives; establishing themes, strategies, and plan evaluations. Public relations crisis management. 4 lectures. Prerequisite: JOUR 203, JOUR 312, JOUR 342 and JOUR 413.

**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 I, II, III (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 students after consultation with their advisor. All courses are one or two units and meet for two or four hours per week. The primary purpose of all professional activities is for students to attain intermediate skills in performance and analysis and knowledge of rules and strategy. Secondary purposes may include leadership and teaching experiences. In some classes a beginning level activity class (see Physical Education) will be recommended for individuals who have little or no previous experience.

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 optimal physical fitness. 1 lecture. Prerequisite: Concurrent enrollment in one course in the PE 101-199 series, or consent of instructor.

#### 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. AED, and O<sub>2</sub> Administration. Credit/No Credit grading only. 2 lectures, 1 activity.

#### KINE 250 Healthy Living (4)

GE D4

Personal health with emphasis on healthful behavioral practices including physical fitness, nutrition, psychosocial well-being, alcohol and other drugs, intentional and unintentional injury, reproductive health, infectious and non-infectious diseases. 3 lectures, 1 recitation. Not open to students with credit in KINE 255.

#### 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

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) (CR/NC)

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. Credit/No Credit grading only. Learning outcomes must be developmental if more than one practicum is completed. 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, implementation and evaluation of a lesson in a laboratory setting. 3 lectures, 2 activities. Prerequisite: 2 professional activities or equivalent. Recommended: KINE 317.

#### KINE 301 Functional 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 and KINE 301.

#### KINE 303 Physiology of Exercise (4)

Application of human physiology to exercise situations. 3 lectures, 1 laboratory. Prerequisite: ZOO 331, 332 (or transfer equivalent). Recommended: FSN 210, KINE 317.

#### KINE 304 Pathophysiology and Exercise (3)

Selected human diseases, their etiology, pathophysiology, symptoms, diagnosis, effects on health and physical performance, and as affected by preventive or therapeutic exercise. 3 lectures. Prerequisite: KINE 303.

#### 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: GE Area D4.

#### 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.

#### KINE 308 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: GE D4 or consent of instructor.

#### 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)

Movement as it relates to physical motor skill development, fitness, wellness, social development, cross-cultural understanding, and self-image. 2 lectures, 1 activity. Prerequisite: GE D4. Recommended: Junior standing.

#### KINE 315 Field Sports (3)

Introduction and preparation for teaching field sports in accordance with state and national standards for K-12 physical education programs. Students learn to present activities in a manner that reflects effective models of instruction.. 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: Basic computer literacy.

**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. 3 lectures, 1 activity. Prerequisite: STAT 217 or STAT 218. Recommended: KINE 317.

**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 324 Sport, Media and American Popular Culture (4)****GE D5 USCP**

Issues of class, race/ethnicity, gender, various forms of deviance, and other aspects of social life. Exploration of sociological manifestations and implications of how the aforementioned social issues are embedded in mediated forms of sports. Kinesiology majors will not receive GE Area D5 credit. 3 lectures, 1 activity. Prerequisite: Completion of GE Areas A, D1 and D3.

**KINE 354 Health Education Strategies (2)**

Introduction to health promotion services, environment, and instruction within public and private settings. Strategies, methods, technology and resources used in the design and delivery of health education about infectious and non-infectious diseases. 2 activities. Prerequisite: BIO 111/BIO 115, KINE 250 or KINE 255. Recommended: KINE 317.

**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. Recommended: KINE 317.

**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 instructor certifications issued in: Lifeguard Instructor, CPR for the Professional Rescuer Instructor, community First Aid and Safety, Automated External Defibrillation, and Oxygen Administration Instructor. 2 lectures, 1 activity. Prerequisite: KINE 243 or equivalent certifications.

**KINE 396 Outdoor Education (3)**

Introduction and preparation for teaching Outdoor Education activities in accordance with state and national standards for K-12 physical education programs. Students learn to present activities in a manner that reflects effective models of instruction. Includes a clinical teaching experience. 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: Senior standing or consent of instructor.

**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: STAT 217 or KINE 319 or consent of instructor.

**KINE 405 Community Health Promotion (4)**

Practices 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 and GE Areas A and D3, junior standing.

**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 and ZOO 332.

**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 or KINE 255, and one of the following: KINE 220, KINE 227, KINE 228, or KINE 219, 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: Junior standing. Recommended: PSY 201 or PSY 202.

**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: Junior standing. Recommended: Completion of GE Areas A and D3; PSY 201 or PSY 202.

**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 and two activity classes.

**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 419.

**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 laboratory. Prerequisite: 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 (4)**

Methods of teaching K-12 physical education, with emphasis on alignment with the California Physical Education Challenge Standards, English language learners, special students, and educational technologies. 4 lectures. Prerequisite: KINE 425 or consent of instructor.

**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 423, and one 300-level activity class.

**KINE 426 Senior Seminar (2)**

Capstone course which engages students in activities that integrate the sub-disciplines of kinesiology, and facilitates the development of a personal portfolio. 2 seminars. Prerequisite: Senior standing.

**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 disease. 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, completion of GE Areas A and D3, and junior standing.

**KINE 437 Directed Fieldwork (1-3) (CR/NC)**

Practical work experience in related activities of kinesiology 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 instructor.

**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 people 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: 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.

**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 or consent of instructor.

**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. Design and implementation of workplace health promotion

programs. 3 lectures. Prerequisite: KINE 250 or KINE 255, KINE 434, and senior standing. Recommended: KINE 317.

**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: KINE 303, KINE 445 (or concurrent enrollment in KINE 445) or consent of instructor.

**KINE 461 Senior Project (1)**

Comprehensive report, or a field experience, or a synthesis of professional literature that integrates content from kinesiology courses. Topic must be approved by the instructor. 1 laboratory. Prerequisite: KINE 319 and completion of GE Area A.

**KINE 462 Research Honors Senior Project (2-4)**

Completion of an advanced research, or creative project. Intended for students taking a significant or leadership role in a professional area. Results may be submitted for poster presentation or other public/professional forum. 2-4 laboratories (minimum 60 hours). Prerequisite: KINE 319, completion of GE Area A, and consent of instructor.

**KINE 463 Exercise Science and Health Promotion Fieldwork (3) (CR/NC)**

200 hours of concentration specific practical experience over a ten-week period at an approved agency that provides exercise/fitness/health promotion programs. Students participate in program administration under the direct supervision of an approved on-site coordinator. Credit/No Credit grading only. Prerequisite: Senior standing, minimum GPA of 2.0, successful completion of all concentration coursework requirements and consent of fieldwork coordinator.

**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 501 Evaluation of Current Studies (3)**

Analysis and evaluation of published studies in kinesiology. 3 seminars. Prerequisite: Graduate standing.

**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 Advanced Pathophysiology and Exercise (3)**

Selected human diseases, their etiology, pathophysiology, symptoms, diagnosis, effects on health and physical performance, and as affected by preventive or therapeutic exercise. Not open to students with credit for KINE 304. 3 lectures. Prerequisite: KINE 303 or equivalent, and graduate standing.

**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 and graduate standing or consent of instructor.

**KINE 511 Management and Administration in Kinesiology (3)**

Principles and techniques of administration in health, activity and academic settings including budget, personnel supervision, resource acquisition, leadership techniques, and facility management. 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 434, and KINE 510.

**KINE 517 Research Methods in Kinesiology (3)**

Experimental, descriptive, historical, philosophical, survey, and action research in kinesiology. Selection of adequate problems for investigation; various sampling techniques and analyses; use of library facilities; manuscript requirements for the thesis. 3 seminars. Prerequisite: KINE 501 or consent of instructor.

**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 Advanced Motor Learning and Control (3)**

Analysis of control theories, research principles and motor learning variables involved in the acquisition of skilled movement with an emphasis on the behavioral level of learning. 3 seminars. Prerequisite: KINE 402 or equivalent.

**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 and graduate standing.

**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 and graduate standing.

**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 and graduate standing.

**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 517, consent of graduate committee and supervising faculty member.

**LA—LANDSCAPE ARCHITECTURE****LA 101 Introduction to Landscape Architecture (4)**

Introduction to the profession of landscape architecture and orientation to the department curriculum and learning processes. 3 lectures, 1 recitation.

**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. 2 lectures, 2 laboratories. Concurrent: SS 121.

**LA 130 Landscape Interpretation (4)**

Introduction to the relationships between culture and art, architecture and the natural environment through the description and exploration of significant landscapes and related societies and cultures. 4 lectures.

**LA 170 Principles of Design Communication (4)**

Overview of design communications for landscape architects incorporating the principles, techniques, skills and tools used in design generation, exploration, review and implementation. 4 laboratories. Prerequisite: LA 101; concurrent: LA 202.

**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 202 Design Fundamentals I (4)**

Introduction to the principles, methods and elements of two- and three-dimensional design in order to communicate intended concepts and meanings. Exploration of the basic design elements including composition, design process and the creation of spatial settings. 4 laboratories. Prerequisite: LA 101, LA 130; concurrent: LA 170.

**LA 203 Design Fundamentals II (4)**

Continuation of ideas introduced in LA 202 with the introduction of environmental and visual perception, including three-dimensional site design and landscape architectural design principles. Spatial design and sequencing of space with concern for human behavioral, environmental and natural site factors and generation of program, concept and design development. 4 laboratories. Prerequisite: LA 202, LA 170; concurrent: LA 220.

**LA 204 Design Fundamentals III (4)**

Continuation of ideas introduced in LA 202 and LA 203 with the introduction of the principles of design theory, landscape ecology and technical applications. Problems of increasing complexity incorporate critical and creative problem solving, the relationship of aesthetics, response to human needs and design for sustainable environments. 4 laboratories. Prerequisite: LA 203, LA 220; concurrent: LA 241.

**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 220 Landscape Ecology: Concepts, Issues and Interrelationships (4)**

Concepts, theories and techniques related to landscape analysis, ecology, planning and design with an emphasis on landscape assessment, sustainability, land health, environmental protection and restoration, and natural resource management. 4 lectures. Prerequisite: LA 101, LA 202, LA 170, BOT 121; concurrent: LA 203.

**LA 221 California Plants and Plant Communities (4)  
(Also listed as BOT 221)**

Introduction to the horticultural characteristics and landscape design potential of California native plants, California plant communities and associated vernacular plants. Includes experiences in field identification, basic planting design, installation techniques and maintenance

requirements. Required field trips. 2 lectures, 2 laboratories. Prerequisite: 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 241 Site Engineering Techniques and Applications (4)**

Introduction and application of the techniques, methods, principles and criteria for site engineering and landform design. Includes an introduction to soil science, survey methods, and experiences in the principles, procedures and application of site grading and drainage for landscape architecture. 4 laboratories. Prerequisite: LA 220, MATH 118/119; concurrent: LA 204.

**LA 242 Implementation Strategies (4)**

Introduction and application of the methods, principles and criteria for landscape implementation. Encompasses fundamental design and technical decisions common to landscape architectural design and construction projects including the development of concept, design development and working drawings, and construction management process. 3 lectures, 1 activity. Prerequisite: LA 204, LA 241; concurrent: LA 243.

**LA 243 Materials and Techniques of Landscape Construction (4)**

Introduction to the properties, uses and inherent qualities of the fundamental materials of landscape architectural concerns and associated construction techniques and processes. Materials and techniques explored as a source of design ideas, form and expression in landscape architecture. 3 lectures, 1 activity. Prerequisite: LA 204, LA 241; concurrent: LA 242.

**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 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 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.

**LA 318 Applications in GIS (3) (Also listed as FNR/GEOG 318)**

ARC/INFO and ArcView Geographic Information System (GIS) computer software to explore environmental, natural resource, social and economic issues using spatial data. Develop and apply data base and software management competencies. 1 lecture, 2 laboratories. Prerequisite: Junior standing, computer literacy or consent of instructor.

**LA 320 Design Theory for Landscape Architects (4)**

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. 4 lectures. Prerequisite: LA 341, LA 342, 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 330 Cultural Landscapes: People, Places and Ethical Decisions (4)**

Investigation of the complexities and interrelatedness of culture, environment and ethical decisions. Interpretation of personal and cultural values and ethics in terms of decisions made and behaviors and actions expressed in the built landscape. 3 lectures, 1 activity. Prerequisite: LA 341, LA 342; concurrent: LA 320.

**LA 341 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 342 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 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 I, II (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 370 Professional Practice (4)**

Issues related to the practice of landscape architecture incorporating processes, procedures and outcomes of professional practice. Topics include professional ethics, business and legal aspects of the profession, relationships to the client and society, personal goal setting, resume and portfolio preparation. 4 lectures. Prerequisite: LA 204.

**LA 371 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 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 402 Design Theory and Exploration Focus Studio (4)**

Exploration and application of design theory, exploratory design process and form exploration to design and planning projects. Emphasis on incorporation of inquiry techniques based on the synthesis of interdisciplinary frameworks of art and design theory with historical and cultural issues. Total credit limited to 12 units. 4 laboratories. Prerequisite: LA 204, LA 341, LA 342; prerequisite or concurrent: LA 320; concurrent: Integrated Learning Course (ILC) of student's option.

**LA 403 Natural Environments Design Focus Studio (4)**

Assessment, exploration and integration of landscape ecology, sustainability and environmental planning to design and planning projects. Emphasis on interpretation and application of environmental and ecological issues at a range of design scales. Total credit limited to 12 units. 4 laboratories. Prerequisite: LA 204, LA 220, LA 341, LA 342; concurrent: Integrated Learning Course (ILC) of student's option.

**LA 404 Cultural Environments Design Focus Studio (4)**

Assessment, exploration and interpretation of cultural values, issues and landscapes to design and planning projects. Emphasis on observation and inquiry of diverse cultural settings, differences in cultural values and personal ethics in the design process. Total credit limited to 12 units. 4 laboratories. Prerequisite: LA 204, LA 341, LA 342; concurrent: Integrated Learning Course (ILC) of student's option.

**LA 405 Project Design and Implementation Focus Studio (4)**

Development, exploration and integration of project design and implementation strategies to design and planning projects. Emphasis on creative and exploratory problem solving, spatial design, project resolution, and graphic communication. Total credit limited to 12 units. 4 laboratories. Prerequisite: LA 204, LA 243, LA 242, LA 241; concurrent: Integrated Learning Course (ILC) of student's option.

**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 431 CAD and Digital Media Communications (ILC) (4)**

Integrated Learning Course (ILC) to assist integration and application of computer-aided drafting (CAD) skills in coursework, project planning and design studio courses. Focus on CAD skills and integration of digital media. Total credit limited to 12 units. 4 activities. Prerequisite: LA 170, LA 204; concurrent: Design Focus Studio of student's option.

**LA 432 Landscape Ecology Applications (ILC) (4)**

Integrated Learning Course (ILC) to assist integration and application of landscape ecology principles in project planning and design studio courses. Focus on understanding and developing a framework for ecological planning and design to anticipate consequences of planning and design decisions. Total credit limited to 12 units. 4 activities. Prerequisite: LA 220, LA 221; concurrent: Design Focus Studio of student's option.

**LA 433 Cultural Environments (ILC) (4)**

Integrated Learning Course (ILC) to assist integration and application of culture, environment and personal ethics in coursework, project planning and design studio courses. Focus on skills, distinctions and integration of analyzing the cultural landscape, understanding diverse cultural values and assessing personal ethics. Total credit limited to 12 units. 4 activities. Prerequisite: LA 341, LA 320, LA 330; concurrent: Design Focus Studio of student's option.

**LA 434 Project Design and Implementation (ILC) (4)**

Integrated Learning Course (ILC) to assist integration and application of project design principles and implementation strategies in project planning and design studio courses. Focus on skills, techniques and decisions of the design, documentation and construction processes. Total credit limited to 12 units. 4 activities. Prerequisite: LA 241, LA 242, LA 243; concurrent: Design Focus Studio of student's option.

**LA 435 Professional Practice (ILC) (4)**

Integrated Learning Course (ILC) to assist integration and application of professional practice principles and techniques in planning and design studio and internship courses. Focus on achieving a high level of professional quality, ethical concern, and legal responsibility in project work. Total credit limited to 12 units. 4 activities. Prerequisite: LA 370; concurrent: Design Focus Studio of student's option.

**LA 436 Traditional and Digital Media Communications (ILC) (4)**

Integrated Learning Course (ILC) to assist integration and application of graphic communication and presentation skills in coursework, project planning and design studio courses. Focus on skills, distinctions and integration of traditional and digital media explorations. Total credit limited to 12 units. 4 activities. Prerequisite: LA 170, LA 202, LA 203, LA 204; concurrent: Design Focus Studio of student's option.

**LA 437 3D Digital Design Communications (ILC) (4)**

Integrated Learning Course (ILC) to assist integration and application of 3D digital graphic communication and presentation skills in coursework, project planning and design studio courses. Focus on skills and integration of three-dimensional digital media explorations. Total credit limited to 12 units. 4 activities. Prerequisite: LA 170, LA 204; concurrent: Design Focus Studio of student's option.

**LA 438 GIS Application to Design Projects (ILC) (4)**

Integrated Learning Course (ILC) to assist integration and application of geographic information systems (GIS) and spatial information into focus design studio courses. Total credit limited to 12 units. 4 activities. Prerequisite: LA 220; concurrent: Design Focus Studio of student's option.

**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 I, II, III (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 Focus Studio (4)**

Comprehensive landscape architectural design and research project showing professional level competency in the integration of design theory, landscape architectural principles and project resolution. Emphasis on creative resolutions, organization and communication skills and technical abilities in program generation, design process, design and research. Total credit limited to 8 units. 4 laboratories. Prerequisite: Completion of Design Focus Sequence (20 units from LA 402-LA 405).

**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 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.

**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)**

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. 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 Field Experience I (2)**

Overview of current practices and issues in elementary education, including teacher compensation, cultural impact on schools, time and classroom management, English learners, and the affective aspect of teaching. 48 hours of fieldwork required. 1 lecture, 1 activity.

**LS 250 Field Experience II (2)**

Overview of current practices and issues in elementary education, including components of effective teaching, motivating students, diagnostic/prescriptive teaching, curriculum, and accountability. In

addition to class time, forty-eight hours of fieldwork required. 1 lecture, 1 activity.

**LS 270 Introduction to Visual and Performing Arts Standards in the Elementary Classroom (4)**

Introduction to the visual arts, music, dance and theatre. California visual and performing arts standards. Emphasis of aesthetic perception, creative expression, historical/cultural context, aesthetic valuing and application to the elementary classroom. 4 lectures.

**LS 310 Storytelling: The Oral Tradition (4)**

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 312 Advanced Visual Arts in the Elementary Classroom (4)**

Application of visual arts, through multi-strategies including direct classroom application, as related to child development and visual arts processes for the elementary setting. 4 lectures. Prerequisite: LS 311.

**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 Seminar (4)**

Examination of issues in education of state, national and international concern. Students prepare presentations and conduct individual research and analysis of selected problems. Substantial research paper required. 4 seminars. Prerequisite: Senior standing, completion of GWR or consent of instructor.

## MATE-MATERIALS ENGINEERING

**MATE 110 Introduction to Materials Engineering Design I (1)**

Laboratory work in teams to design, build and test a product. Material from math, science and engineering courses tied together. 1 laboratory.

**MATE 120 Introduction to Materials Engineering Design II (1)**

Second design laboratory, working in teams on a project that benefits humanity. Issues of engineering ethics, technology and society, the environment and sustainability also studied. 1 laboratory.

**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, MATEH 141, PHYS 131.

**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 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)** **GE Area F**  
(Also listed as HIST 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.

**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 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, MATE 215. *Materials analysis and characterization course or Special topics course.*

**MATE 430 Microfabrication (3)**

Silicon-based fabrication science and technology. 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 Microfabrication Laboratory (2)**

Basic processes involved in microfabrication; cleanroom protocol, oxidation, diffusion, photolithographic and etching processes, sputtering and evaporation, process development through experimentation, device testing. Each student will be part of a 4-6 person team that will fabricate a micro electronic device or 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 481 Corporate Culture (1)**

Practical working knowledge of key corporate topics such as leadership, ethics, organizational structure, intellectual property, professional communications, life-long learning, global and social impacts of technology. The product development process. 1 activity. Prerequisite: Senior standing. Co-requisite: MATE 482 for MATE majors.

**MATE 482 Senior Project Design I (1)**

Foundations of senior project design. Completion of the preliminary stages of selecting a senior project, designing experiments, evaluating realistic constraints, conducting initial experiments, and managing a project timeline. 1 lecture. Prerequisite: Senior standing. Co-requisite: MATE 481 for MATE majors.

**MATE 483 Senior Project II (2)**

Continuation of senior project. Completion of a senior project experimental component under the guidance of a faculty supervisor. Research methodology, experimental design, experimental work and data analysis. 1 lecture and supervised work. Prerequisite: MATE 482.

**MATE 484 Senior Project III (2)**

Continuation of MATE 483. Completion of a senior project data analysis and communication under the guidance of a faculty supervisor. Mathematical modeling and technical communication. 1 lecture and supervised work. Prerequisite: MATE 483.

**MATE 493 Cooperative Education Experience (2) (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 6 units. Prerequisite: Sophomore standing and consent of instructor.

**MATE 494 Cooperative Education Experience (6) (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 18 units. 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. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. Total credit limited to 24 units. 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 504 Research and Development in Materials Engineering (4)**

Overview of the materials science and engineering field. Current materials research and technologies, such as fuel cells, nanotechnology, etc. Emphasis on independent learning, individual research topics, and presentations. Analysis of information from different media used to comprehend how advancements in materials research and development are made. *Class Schedule will list topic selected.* Total credit limited to 8 units. 4 lectures. Prerequisite: MATE 210 and graduate standing or consent of instructor.

**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 (3)**

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. 3 lectures. Prerequisite: MATE 210, MATE 215.

**MATE 545 Tribology Laboratory (1)**

Wear testing and measurement through various processes including dry sand rubber wheel, cavitation/erosion, and simulated chemical/mechanical polishing. Wear analysis to include wear modeling, materials characterization via metallography, scanning electron microscopy, and surface profilometry. Experiments focus on real engineering systems and their degradation as a result of wear. 1 laboratory. Prerequisite: MATE 210, MATE 215, MATE 230, MATE 235 or consent of instructor. Co-requisite: MATE 540.

**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 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. For additional mathematics placement (MAPE) information, see page 61.

**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.

**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: 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: Passing 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. 3 lectures.

**MATH 116** prerequisite: Passing 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. 4 lectures. Prerequisite: Completion of ELM requirement and passing score on appropriate Mathematics Placement examination.

**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. 4 lectures. Prerequisite: Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination, or MATH 117, or MATH 118 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.

**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 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 192 Calculus for Architecture and Construction Management Laboratory (1) (CR/NC)**

Facilitated study and discussion of the theory, problems, and applications of calculus to architecture and construction management. Credit/No Credit grading only. 1 laboratory. Corequisite: Concurrent enrollment in the associated section of MATH 182.

<sup>1</sup> Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.

**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) (Also listed as HNRS 241)**

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 206 and MATH 241.

**MATH 244 Linear Analysis I (4) (Also listed as HNRS 244)**

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 258 Methods of Proof in Mathematics Laboratory (1) (CR/NC)**

Facilitated study and discussion of the methods and techniques of proof in mathematics. Credit/No Credit grading only. 1 laboratory. Corequisite: Concurrent enrollment in the associated section of MATH 248.

**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 206 or MATH 244, and 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.

**MATH 326 Mathematics and Visual Art (4) GE B5**

Topics connecting mathematics and visual art including regular polygons, symmetry groups, repetition and pattern, perspective, straightedge and compass constructions, and origami. Examples of mathematical art including historic and contemporary art. 4 lectures. Prerequisite: Completion of GE Area B1 and a college course in art or design.

**<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 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 206 and 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.

<sup>1</sup> Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.

**MATH 350 Mathematical Software (4)**

Problem-solving using mathematical software. 4 lectures. Prerequisite: CSC/CPE 101 or CSC/CPE 235, and MATH 206 or MATH 244, and MATH 241, or consent of instructor.

**MATH 370 Putnam Exam Seminar (2)**

Directed group study of mathematical problem solving techniques. Open to undergraduate students only. Class members are expected to participate in the annual William Lowell Putnam Mathematical Competition. Course may be repeated up to eight units. 2 seminars. Prerequisite: Consent of instructor.

**MATH 371 Math Modeling Seminar (2)**

Directed group study of mathematical modeling techniques. Open to undergraduate students only. Class members are expected to participate in the annual Mathematical Competition in Modeling. Total credit limited to 8 units. 2 seminars. Prerequisite: Consent of instructor.

**MATH 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 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 306 or consent of instructor.

**<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 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 206 and 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. Recommended: MATH 304.

**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 422 Introduction to Analysis I Laboratory (1) (CR/NC)**

Facilitated study and discussion of the methods and techniques of proof in introductory analysis. Credit/No Credit grading only. 1 laboratory. Corequisite: Concurrent enrollment in the associated section of MATH 412.

**MATH 423 Advanced Mathematics for Teaching (4)**

Introduction to mathematics education research and advanced exploration of the rational number system, real number system, complex number system, functions, equations, distance and similarity, trigonometry, area and volume, and the Cartesian model for Euclidean geometry. 4 lectures. Prerequisite: MATH 442 and MATH 481.

**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.

**MATH 433 Numerical Analysis II (4)**

Numerical techniques for solving partial differential equations of the parabolic, hyperbolic and elliptic type. Further topics in approximation theory. 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, and MATH 248 with a grade of C- or better, or consent of instructor.

**MATH 440 Topology I (4)**

Introduction to general topological spaces with emphasis on surfaces and manifolds. Open and closed sets, continuity, compactness, connectedness, Quotient spaces. 4 lectures. Prerequisite: MATH 412 and concurrent enrollment in or completion of MATH 481, or consent of instructor.

**MATH 441 Topology II (4)**

Introduction to general topological spaces with emphasis on surfaces and manifolds. Fundamental group. Triangulations of spaces, classification of surfaces. Other topics may include covering spaces, simplicial homology, homotopy theory and topics from differential topology. 4 lectures. Prerequisite: MATH 440 or consent of instructor. Recommended: MATH 304.

**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. Recommended: MATH 300 or familiarity with dynamic geometry software.

**MATH 443 Modern Geometries (4)**

Non-Euclidean and projective geometries. Properties of parallels, biangles, Saccheri and Lambert quadrilaterals, angle-sum and area. Limiting curves,

<sup>1</sup> Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.

hyperbolic trigonometry, duality, perspectivity, quadrangles, fundamental theorems of projective geometry, conics. 4 lectures. Prerequisite: MATH 442.

**MATH 459 Senior Seminar (4)**

Written and oral analyses and presentations by students on topics from advanced mathematics and mathematical modeling. 4 seminars. Prerequisite: MATH 306, and completion of at least two additional upper-division courses in the math major, or consent of instructor.

**<sup>1</sup> MATH 461, 462 Senior Project I, II (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 306 or MATH 341 or consent of instructor.

**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 491 Abstract Algebra I Laboratory (1) (CR/NC)**

Facilitated study and discussion of the methods and techniques of proof in abstract algebra. Credit/No Credit grading only. 1 laboratory. Corequisite: Concurrent enrollment in the associated section of MATH 481.

**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 AERO 300 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 and graduate standing, or consent of the instructor. Recommended: MATH 418.

**<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 540 Topology I (4)**

Introduction to general topological spaces with emphasis on surfaces and manifolds. Open and closed sets, continuity, compactness, connectedness, Quotient spaces. 4 lectures. Not open to students with credit in MATH 440. Prerequisite: MATH 412, concurrent enrollment in or completion of MATH 481, and graduate standing, or consent of instructor.

**MATH 541 Topology II (4)**

Introduction to general topological spaces with emphasis on surfaces and manifolds. Fundamental group. Triangulations of spaces, classification of surfaces. Other topics may include covering spaces, simplicial homology, homotopy theory and topics from differential topology. 4 lectures. Not open to students with credit in MATH 441. Prerequisite: MATH 540 and graduate standing, or consent of instructor. Recommended: MATH 304.

**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. 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; microbiology 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. 3 lectures, 1 laboratory. Prerequisite: One quarter of chemistry.

<sup>1</sup> Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.

**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 161 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 224 or consent of instructor.

**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 161.

**MCRO 342 Sanitary Microbiology (4)**

Principles of disease prevention and control. Water-, food-, and air-borne microbial contaminations and epidemiology of ensuing diseases. 3 lectures, 1 laboratory. Prerequisite: MCRO 221 or MCRO 224.

**MCRO 402 General Virology (4)**

Infective macromolecules (prions, viroids, and viruses) associated with microbes, plants, and animals. Epidemiology, immune responses, pathogenicity, carcinogenesis, diagnoses, vaccination, and therapy. 3 lectures and 1 activity. Prerequisite: BIO 351 or CHEM 373. Recommended: BIO 452.

**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 and CHEM 312 or CHEM 316.

**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 or CHEM 371.

**MCRO 433 Microbial Biotechnology (3)**

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. Prerequisite: MCRO 221 or MCRO 224, and BIO 303, BIO 351 or equivalent, and CHEM 312, CHEM 316 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: BIO 160 and BIO 161 or MCRO 221 or MCRO 224.

**MCRO 461 Senior Project (2)**

Completion of a literature review and/or research proposal, including analysis of experimental results from published peer-reviewed articles covering issues in microbiology, culminating in both written and oral

presentations. 2 activities. Prerequisite: Junior or senior standing or consent of instructor.

**ME—MECHANICAL ENGINEERING****ME 134 Introduction to Mechanical Engineering (1)**

Introduction to mechanical engineering and its application in professional practice. Includes design, analysis, testing and dissection of mechanical engineering systems, from simple machines to more complicated systems. 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. 3 lectures.

**ME 236 Thermal Measurements (3)**

Introduction to principles of experimental measurement, including practical instrument reading, data collection, and uncertainty analysis. Techniques for measuring temperature, pressure, and other parameters. Introduction to theory and practice of writing lab reports and communication of experimental data. 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 303 Thermal Engineering (3)**

Vapor and gas power cycles, refrigeration cycles, thermodynamic relations, psychrometrics, and chemical reactions. 3 lectures. Prerequisite: ME 236, ME 302.

**ME 305 Introduction to Mechatronics (4)**

Introduction to microcontrollers and assembly language programming. Emphasis on components and techniques for interfacing that are typical of embedded microcontroller applications (A/D conversion, D/A conversion, interrupts, timers, and pulse-width modulation). Laboratory exercises involve real-time interfacing of microcontrollers to external mechanical and/or electromechanical devices. 3 lectures, 1 laboratory. Prerequisite: EE 321 and EE 361, or consent of instructor.

**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. 4 lectures. Prerequisite: PHYS 131 or PHYS 123, completion of GE Area B and junior standing.

**GE Area F****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 207, 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 Fluid Mechanics I (3)**

Fluid statics. Conservation equations of fluid dynamics. Viscous flow, boundary layer concepts, lift and drag, compressible flow, turbomachinery. 3 lectures. Prerequisite: ME 212.

**ME 343 Heat Transfer (4)**

Basic principles of heat transfer. Conduction, convection, radiation, and combined modes. Optional thermal engineering design project. 4 lectures. Prerequisite: ME 341, ME 302 or CHEM 305, MATH 244, CSC 231 or CSC 234.

**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 cycles. 1 laboratory. Prerequisite: ME 303, ME 341, ME 343.

**ME 347 Fluid Mechanics II (4)**

Conservation equations of fluid dynamics. Viscous flow, boundary layer concepts, lift and drag, compressible flow, turbomachinery. Laboratory measurement of turbomachine performance, velocity profiles, boundary layers on surfaces. 3 lectures, 1 laboratory. Prerequisite: ME 236, ME 341.

**ME 359 Fundamentals of HVAC Systems (4)**

Fundamentals of heating, ventilating and air-conditioning (HVAC) systems, human comfort and indoor air quality, primary and secondary systems and components. 3 lectures, 1 laboratory. Prerequisite: ME 302.

**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. Prerequisite: Consent of instructor.

**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 207, MATH 344, ME 328 or consent of instructor.

**ME 402 Orthopedic Biomechanics (4)**

Biomechanical analysis of the musculoskeletal system. Emphasis on the use of statics, dynamics, strength of materials, viscoelasticity, and poroelasticity to analyze the mechanical loads acting on human joints, the mechanical properties of tissues, and the design of artificial joints. 4 lectures. Prerequisite: ME 328 or consent of instructor.

**ME 404 Applied Finite Element Analysis (4)**

Finite element based solutions to engineering problems with an emphasis on elastostatic problems in structural mechanics. The power and pitfalls associated with the finite element method highlighted through practical modeling assignments. Use of commercial finite element code(s). 3 lectures, 1 laboratory. Prerequisite: ME 329.

**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: ME 305, 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 moiré fringe methods including birefringent coatings, shadow, and projection moiré. 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 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 207, ME 347, CSC 231, MATE 210.

**ME 428 Senior Design (3)**

Component and system design from global integration point of view of various design parameters, using real life problems. Techniques of brainstorming, decision making, and feasibility studies. Industrial participation design program. 1 lecture, 2 laboratories. Prerequisite: ME 329, ME 343, ME 347, 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 302, ME 347, ME 343.

**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 347.

**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 347.

**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 303, ME 347, ME 343.

**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 303, ME 347, ME 343, MATH 344.

**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 303, ME 343.

**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 347, ME 343.

**ME 446 Advanced and Hybrid Vehicle Design (4)**

Systematic methodology to design and optimize hybrid powertrains. Exploration of conventional and hybrid powertrain subsystem models and application in a vehicle simulation, including internal combustion engines, electric motors and generators, transmissions, batteries, fuel cells, hydraulic reservoirs, ultracapacitors, flywheels, etc. Analytical modeling and optimization. 3 lectures, 1 laboratory. Prerequisite: ME 329 and ME 303.

**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 343.

**ME 456 HVAC Air and Water Distribution System Design (4)**

Air and water distribution components and systems and the design of these systems with applications to the heating, ventilating and air-conditioning (HVAC) industry. 3 lectures, 1 laboratory. Prerequisite: ME 302, ME 347.

**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 341, ME 343.

**ME 458 Building Heating and Cooling Loads (4)**

Building heating and cooling load calculations, estimating energy consumption and operating costs for heating, ventilating and air-conditioning system design and selection. 3 lectures, 1 laboratory. Prerequisite: ME 303, and ME 343.

**ME 459 HVAC System Design (3)**

Team project work in designing heating, ventilating and air-conditioning (HVAC) systems. Industry projects and collaborative work with other disciplines. 1 lecture, 2 laboratories. Prerequisite: ME 456, ME 458.

**ME 461, 462 Senior Project I, II (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 303, ME 343 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 303, ME 343 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 I, II (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 303, ME 343, ME 329 (or concurrent). **ME 482:** an option to ME 462; 3 laboratories; prerequisite: ME 481 or equivalent.

**ME 488 Wind Energy Engineering (4)**

Engineering aspects of windpower systems including mechanical design, support structure design, aerodynamic analysis, wind field analysis, system concepts and analysis, and economics. 4 lectures. Prerequisite: ME 329, ME 342, ME 302.

**ME 493 Cooperative Education Experience (2) (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 6 units. Prerequisite: Sophomore standing and consent of instructor.

**ME 494 Cooperative Education Experience (6) (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 18 units. 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. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. Total credit limited to 24 units. Prerequisite: Sophomore standing and consent of instructor.

**ME 500 Individual Study (1–3)**

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

**ME 501 Continuum Mechanics and Linear Elasticity (4)**

Introduction to continuum mechanics. Kinematics, stress, and balance laws. Constitutive equations for isotropic and anisotropic solids and viscous fluids. Applications in mechanical engineering including design of beams and pressure vessels, stress concentrations, fiber-reinforced composites, and non-homogeneous biological materials. 4 lectures. Prerequisite: ME 401 or consent of instructor.

**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 501, or consent of instructor.

**ME 503 Inelastic Stress Analysis (4)**

Perfectly plastic and work hardening materials; von Mises and Tresca yield, isotropic and kinematic hardening flow rules, boundary-value problems. Finite elasticity: kinematics, Cauchy- and Green-elasticity, invariance, constraints, Neo-Hookean and Mooney-Rivlin materials, experimental approaches, non-uniqueness, anisotropy, residual stress, thermoelasticity, boundary-value problems. 4 lectures. Prerequisite: ME 501.

**ME 506 System Dynamics (4)**

Unified approach for mathematical modeling and analysis of dynamic physical systems which may store energy in multiple energy domains. Emphasis on developing lumped-parameter linear system models from a set of primitive elements in a systematic manner. 4 lectures. Prerequisite: Graduate standing or consent of instructor.

**ME 507 Mechanical Control System Design (4)**

Application of principles of high-level design to mechanical control system implementation. Use of modified state transition logic in conjunction with object-oriented programming as design methodology. Real-time programming using above techniques for control of mechanical systems. 3 lectures, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

**ME 517 Advanced Vibrations (4)**

Vibration of complex engineering systems. Inertia and stiffness matrices. Natural frequencies and normal modes. Approximate solutions and computer techniques. Response to transient and periodic inputs. 3 lectures, 1 laboratory. Prerequisite: ME 318, graduate standing or consent of instructor.

**ME 518 Machinery Vibration and Rotor Dynamics (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. Research project on a related topic. 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 344.

**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 303, ME 343, ME 347 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 303, ME 343, ME 347, MATH 244, 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 343, ME 347, MATH 344, 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 343, ME 347, MATH 344, and graduate standing or consent of instructor.

**ME 554 Computational Heat Transfer (4)**

Numerical solutions of classical, industrial, and experimental problems in conduction, convection, and radiation heat transfer. 3 seminars, 1 laboratory. Prerequisite: ME 343, ME 347, MATH 418, 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 593 Cooperative Education Experience (2) (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.

**ME 594 Cooperative Education Experience (6) (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.

**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. A fully-developed formal report and evaluation by work supervisor required. 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 Leader's Training Course (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. LTC 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 Leadership Development and Assessment Course (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: Diatonic Materials (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 and compound meters; identification and performance of melodic and harmonic intervals and triads; dictation of major diatonic melodies and basic chord progressions. 2 activities. Prerequisite: MU 101 or consent of instructor. (Music majors may be concurrently enrolled in MU 101 and MU 104.)

**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 and triadic chord progressions. 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, sightreading 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 101 or 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, sightreading, transposition, harmonization or a melody, accompanying, improvisation of a melody. 1 activity. Prerequisite: Consent of instructor.

**MU 162 Piano Skills II (1)**

Continuation of MU 161. Preparation for Piano Proficiency Examination. Study of piano repertoire, sightreading, transposition, harmonization of a melody, accompanying, improvisation of a melody. 1 activity. Prerequisite: MU 161 or consent of instructor.

**MU 163 Piano Skills III (1)**

Continuation of MU 162. Preparation for Piano Proficiency Examination. Study of piano repertoire, sightreading, transposition, harmonization of a melody, accompanying, improvisation of a melody. 1 activity. Prerequisite: MU 162 or consent of instructor.

**MU 170 University Jazz Band (1)**

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 Symphony 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 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 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: Chromatic Materials (4)**

Construction and resolution of diatonic and seventh chords, secondary dominants, basic modulation, change of mode. Augmented sixth and Neapolitan chords. 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; identification of phrase structure; 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 changing meters; chord progressions with seventh chords and secondary dominants; seventh chord inversions; modulation to closely-related keys; identification of binary and ternary forms; 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 performance and dictation in changing and irregular meters; chord progressions with Neapolitan and augmented sixth chords; modulatory progressions and dictations and identification of sonata, rondo, and variation forms. 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 contrapuntal genres; 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 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 207.

**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: Advanced Chromaticism (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 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 and MU 341.

**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 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 Symphony 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 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 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. Total credit limited to 6 units. 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 Music Theory IV: Contemporary Practices (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 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 (8)**

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 113 Intermediate Billiards
- 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. 4 lectures. 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) (Also listed as HNRS 231) 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 336 Ethics, Gender and Society (4) \*\*GE C4 \*\*USCP**

Critical examination of the relations between gender, ethnicity, society and ethics from feminist perspectives, with special attention paid to problems in contemporary applied ethics. Joint focus on theory and application. 4 lectures. Prerequisite: Completion of GE Area A and PHIL 230 or PHIL 231.

**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 421 Philosophy of Space, Time and Matter (4)**

Investigation of the philosophical foundations and interpretation of relativity theory and elementary quantum mechanics. Emphasis on philosophical issues relevant to contemporary philosophy of science such as scientific realism. Some discussion of very recent theories of space, time, and matter. 3 lectures, research paper. Prerequisite: Completion of Area A and PHIL 230 or PHIL 321.

**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 449 Selected Topics in Recent Philosophy (4)**

Advanced discussion of selected topics in recent philosophy. Examination and analysis of important recent movements in central philosophical areas (e.g., metaphysics, epistemology, philosophy of science, philosophy of language, philosophy of mind) or, alternatively, of particular philosophers or philosophical works of exceptional recent importance. 3 lectures, 1 research paper. Prerequisite: Completion of GE Area A and PHIL 230.

**PHIL 460, 461 Senior Project I, II (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: Passing score on the ELM examination, or an ELM exemption.

**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: Passing 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 I (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 II (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 III (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 I (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 students, and for students majoring in the physical sciences. Not open to students with credit in PHYS 141. 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 II (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 or PHYS 141.
- PHYS 133 General Physics III (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 or PHYS 141, 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 141 General Physics IA (4)** **GE B3**  
(Also listed as **HNRS 134**)  
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 science students. Not open to students with credit in PHYS 131. 4 lectures. Prerequisite: MATH 141 with grade C- or better and MATH 142 or MATH 182 (or concurrent enrollment). Recommended: High school physics.
- 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, Schroedinger 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 (4)**

Laws of motion, kinematics and dynamics of a particle. Work and energy. Linear and angular momentum. Use of numerical methods for solving problems. Oscillatory motion (damped and forced oscillation). Coupled oscillators. Newton's Law of gravity, orbital motion, and central force problems. 4 lectures. Prerequisite: PHYS 131 or PHYS 141, MATH 242 or 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 313 Introduction to Atmospheric Physics (3)**

Properties of the atmosphere, atmospheric motions, solar and terrestrial radiation. Atmospheric optics and cloud physics. 3 lectures. Prerequisite: PHYS 132 or PHYS 122 and MATH 241.

**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. Recommended: PHYS 211.

**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. Schroedinger'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 I, II (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 I, II (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) (CR/NC)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 3 units per quarter. Credit/No Credit grading only. 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 325 Egg Production, Processing and Distribution (4)

Management of replacement pullets and laying hens including flock scheduling, vaccination and handling procedures, nutrition management, costs of operation and production projections. Quality determination, processing, sales and distribution of shell eggs and egg products. 3 lectures, 1 laboratory. Prerequisite: PM 225.

### PM 330 Poultry Meat Production and Processing (4)

Modern production techniques for the poultry meat industry. Management of hatcheries, broiler and/or turkey meat production, processing and further processing. 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. 4 lectures. 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 VS 340.

### PM 400 Special Problems for Advanced Undergraduates (2–4) (CR/NC)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 4 units per quarter. Credit/No Credit grading only. 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)

Introduction to basic concepts, issues, and theories in comparative politics. Use of the comparative method. Legitimacy, political culture and socialization, parliamentary and presidential institutions, judicial structures, electoral laws, party systems, federal and unitary governance, corporatism and pluralism. 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, or consent of instructor.

### 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, or consent of instructor.

**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, or consent of instructor.

**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, or consent of instructor.

**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, or consent of instructor.

**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, or consent of instructor.

**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, or consent of instructor.

**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, or consent of instructor.

**POLS 325 Global Political Issues (4)**

**GE D5**

Third World development from an international relations perspective. Issues relevant to the Third World, with an emphasis on global causes and consequences. Roles and responsibilities of developed states, international organizations, and non-governmental organizations in issues of development. 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, or consent of instructor. Political Sciences majors will not receive GE Area D5 credit.

**POLS 328 Politics of Developing Areas (4)**

A detailed survey of the domestic politics of developing countries from a comparative perspective. Assessment of theories of development with appropriate examples taken from particular areas and countries. Regional focus may alternate among Latin America, Asian, Middle Eastern, and African countries. 4 lectures. Prerequisite: POLS 229, or consent of instructor.

**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, or consent of instructor.

**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, or consent of instructor.

**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, or consent of instructor.

**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, or consent of instructor.

**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, or consent of instructor. Political Sciences majors will not receive GE Area D5 credit.

**POLS 339 Comparative Political Regimes (4)**

**GE D5**

A comparative examination of governing institutions used throughout the world. Emphasis on the diversity of governmental designs found within both authoritarian and democratic regimes. 4 lectures. Prerequisite: Completion of GE Area A and one course from two of the three subfields of Area D1, D2, and/or D3, or consent of instructor. 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, or consent of instructor.

**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, or consent of instructor.

**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, or consent of instructor.

**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, or consent of instructor.

**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, or consent of instructor.

**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-, or consent of instructor.

**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, or consent of instructor.

**POLS 381 Peace and War (4)**

Dynamics of interstate peace and war. Topics include: military strategy, the military-industrial complex, arms races and disarmament, diplomacy, deterrence and pre-emption, collective security and alliance behavior, civil-military relations, post-conflict reconstruction, and the role of international law and organizations. 4 lectures. Prerequisite: POLS 225 or consent of instructor.

**POLS 382 Comparative Foreign Policy (4)**

Systematic analysis of the international and domestic pressures leading different states to take particular foreign policy stances, with appropriate examples taken from different regions of the world. Discussion of contemporary foreign policy issues and responses. 4 lectures. Prerequisite: POLS 225 or consent of instructor.

**POLS 383 Politics of the European Union (4)**

History and development of the European Union in the context of theories of regional integration. Overview of institutional and policymaking machinery of the EU. Current issues facing member states. Impact of EU on US interests and world politics more generally. 4 lectures. Prerequisite: POLS 225 or consent of instructor.

**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, or consent of instructor. 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 chair.

**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, or consent of instructor

**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, or consent of instructor.

**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, or consent of instructor.

**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, or consent of instructor.

**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 459 The Politics of Poverty (4)**

Analysis of the politics and policies associated with the American welfare state, focusing particularly on welfare and homelessness policies. Questions addressed concerning the causes of poverty and how social policy responds to poverty. 4 lectures. Prerequisite: POLS 112 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, or consent of instructor.

**POLS 461, 462 Senior Project I, II (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, or consent of instructor.

**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, or consent of instructor.

**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, or consent of instructor.

**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, or consent of instructor.

**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, or consent of instructor.

**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, or consent of instructor.

**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, or consent of instructor.

**POLS 550 Development Administration (4)**

Administration in developing areas of the world. Tools for sustainable development. 4 lectures. Prerequisite: Graduate standing, or consent of instructor.

**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, or consent of instructor.

**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 course 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)**

Concepts and practices in weed science involving biotechnology, invasive plant ecology and management. Mechanisms of herbicide action. Molecular methods used to assess herbicide resistance in weeds. Improved management efficiency with the use of predictive computer simulations. 3 lectures, 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 421 Plant-Pest Interactions (4)**

Plant biochemical and physical defenses to herbivorous insects, plant pathogens and weeds, and the evolutionary and genetic basis thereof. Effects of environmental manipulations, including plant nutrition and water status, on pest populations, and the use of induced resistance materials. Not open to students with credit in PPSC 521. 3 lectures, 1 laboratory. Prerequisite: PPSC 311 or ZOO 335, BOT 323 or PPSC 321.

**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 monitoring, problem solving and application of appropriate pest control measures. 3 lectures, 1 laboratory. Prerequisite: HCS 120, PPSC 311, BOT 324, passing the sprayer math test 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 for Pest Management (4)**

Control of arthropods, weeds and vertebrates to include history of biocontrol; biology of beneficial arthropods; methods of introduction, augmentation and conservation; and case studies. 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.

**PPSC 511 Ecological Biometrics (4) (Also listed as HCS 511)**

General survey of current analytical methodology available to ecological researchers to evaluate effects and assess the underlying mechanisms that drive natural and cultivated ecosystems. Methodology includes general linear models, ordination, survival analysis, multivariate analyses, and computer simulations. Student research used as a basis for instruction. Total credit limited to 8 units. 3 seminars, 1 activity. Prerequisite: Any one of the following statistical methods courses: CRSC 411, STAT 212, STAT 218, STAT 313, STAT 512, STAT 513 or consent of instructor.

**PPSC 521 Plant-Pest Interactions (4)**

Plant biochemical and physical defenses to herbivorous insects, plant pathogens and weeds, and the evolutionary and genetic basis thereof, with particular focus on the master's thesis. Effects of environmental manipulations, including plant nutrition and water status, on pest populations, and the use of induced resistance materials. Not open to students with credit in PPSC 421. 3 lectures, 1 laboratory. Prerequisite: PPSC 311 or ZOO 335, BOT 323 or PPSC 321, graduate standing, or consent of instructor.

**PPSC 599 Thesis in Plant Protection Science (1-9)**

Systematic research of a topic in plant protection science, including weed science, entomology, plant pathology, nematology or vertebrate management. Thesis to describe the problem and its significance, methodology, results, data analysis, discussion and conclusion. Enrollment required every quarter in which facilities are used or advisement received. Degree credit limited to 6 units. Total credit limited to 9 units. Prerequisite: Graduate standing and 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 laboratory. 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.

**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 activity. Prerequisite: Completion of GE Area B, and junior standing.

**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 (4)**

Techniques, aims and objectives in the teaching of physical sciences and general sciences at the secondary level. Selection and organization of teaching material, including strategies for ELL and special needs students. Evaluation of results. 4 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 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 & Child Development majors only, or consent of instructor.

**PSY 325 Introduction to Positive Psychology (4)**

Scientific study of the enhancement of strengths and optimal functioning in humans. Basic research, assessment and helping concepts in understanding optimal functioning within diverse populations. 4 lectures. Prerequisite: PSY 201 or PSY 202.

**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 401 Special Problems: Experiential Learning (2-4) (CR/NC)**

Supervised experience in various community, governmental, educational, or research settings. Especially designed for individuals in applied settings requiring additional hours or a pre-fieldwork training experience. Applied psychological, developmental, or educational experiences determined by participating institution, supervising faculty member, and student. Cannot be substituted for PSY 448, PSY 449, PSY 453, or PSY 454. Credit/No Credit grading only. Total credit limited to 4 units. Prerequisite: Psychology major or gerontology minor, junior standing, and consent of instructor.

**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 448, 449 Research Internship I, II (5) (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. 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, 454 Supervised Fieldwork I, II (5) (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. 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 457 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, PSY 329 or consent of instructor.

**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) (CR/NC)**

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. Credit/No Credit grading 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 Multicultural Counseling and Psychology (4)**

Psychological, cultural, and ecological analysis of the experiences and histories of various cultural groups within the United States. Development of personal self-awareness of multicultural issues and culturally relevant counseling skills. 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 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 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 Traineeship: 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 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 599 Thesis (4)**

Completion of a thesis pertinent to the fields of psychology and human services. Prerequisite: PSY 590.

**REC-RECREATION, PARKS, and TOURISM ADMINISTRATION****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 205 Leadership in Recreation, Parks, and Tourism (4)**

Recreation, parks, and tourism leadership with small and large groups. Skills, knowledge, and abilities required of effective leaders in leisure organizations and settings. 3 lectures, 1 activity. Prerequisite: REC 101 or REC 127, sophomore standing or consent of instructor.

**REC 210 Introduction to Program Design (4)**

Methods of program planning, organization, implementation and evaluation in public and private settings. Interrelationship of needs and interests of people, physical settings, and activity content. Emphasis on program construction and scheduling in recreation, parks, and tourism services. 3 lectures, 1 activity. Prerequisite: REC 101, REC 127, sophomore standing 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, sophomore standing 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 270 Challenge Course Leadership and Facilitation (4)**

Techniques and models used in challenge course leadership and facilitation. Leadership styles, challenge course terminology, facilitation models, safety guidelines, and learning styles. 3 lectures, 1 laboratory. Prerequisite: Sophomore standing or consent of instructor.

**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. Use of forestry and natural resource examples. 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, junior standing 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 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, junior standing or consent of instructor.

#### **REC 314 Travel and Tourism Planning (4)**

The history and development of tourism. Emphasis on the economic impact of tourism activities on communities. Consideration of the effects of tourism on individual cultures and the natural environment. Travel motivations, travel research and planning models. Field visits required. 4 lectures. Prerequisite: REC 210 with C- or better, junior standing or consent of instructor.

#### **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, junior standing or consent of instructor.

#### **REC 320 Special Event Planning (4)**

Major trends and successful practices in festival and event planning. Emphasis on conceptualization, analysis, and planning considerations of small to large-scale community events. Exploration of event management field as a profession. 3 lectures, 1 activity. Prerequisite: REC 210, junior standing or consent of instructor.

#### **REC 321 Visitor Services in Recreation, Parks, and Tourism (2) (CR/NC)**

Management issues in meeting the needs of recreation, parks, and tourism organizations. *Class Schedule* will list topics selected. Topics to include customer satisfaction, service quality, visitor management, customer service skills and procedures, and creating a customer focused organization. Credit/No Credit grading only. Total credit limited to 8 units. 2 seminars. Prerequisite: REC 210, junior standing or consent of instructor.

#### **REC 325 Outdoor and Adventure Leadership (4)**

Theoretical principles and experience in leadership, judgment, and decision-making in outdoor and adventure settings. Total credit limited to 8 units. *Class Schedule* will list topic selected. 3 lectures, 1 activity. Prerequisite: REC 205, junior standing 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 342 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, junior standing or consent of instructor.

#### **REC 350 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, junior standing or consent of instructor.

#### **REC 360 Assessment and Evaluation of Recreation, Parks and Tourism (4)**

Evaluation of recreation, parks, and tourism programs 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, junior standing. Recommended: CSC 110/113/AG 250.

#### **REC 375 Leisure and Community Resources (4)**

Investigation of 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. 4 lectures. Prerequisite: Completion of GE Areas A1, A2, A3.

#### **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 academic advisor.

#### **REC 405 Recreation, Parks and Tourism Management (4)**

The study, analysis, and practice of management 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 205, REC 210, senior standing 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 412 Tourism Applications Seminar (2)**

Selected topics on aspects of the tourism field. *Class Schedule* will list topics selected. Field visits may be required. Total credit limited to 8 units. 2 seminars. Prerequisite: REC 210, REC 313, REC 314, or consent of instructor.

#### **REC 413 Tourism and Protected Area Management (4)**

Practices of tourism and recreation management in protected areas. History and principles of protected areas. Social, cultural, economic, and environmental benefits of and risks to protected areas and communities. Environmental stewardship in tourism and recreation management worldwide. 3 lectures, 1 laboratory. Prerequisite: REC 313 or REC 314 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 415 Adventure Programming and Planning (4)**

Exploration of the history, benefits, characteristics, goals, models, and applications of adventure programs. Emphasis on wilderness and outdoor programs, adventure tourism, inclusive programs, adventure education, planning, management, and implementation. 3 lectures, 1 activity. Prerequisite: REC 210 or consent of instructor.

#### **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)**

Management strategies and practices for small to large scale community festivals and events. Emphasis on sponsorship, marketing, staffing, production, and budgeting. Service-learning in the community required. 3 lectures, 1 laboratory. Prerequisite: REC 320, 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, senior standing.

**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: STAT 217, REC 360 with C- or better, ENGL 310, senior standing.

**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 502 Current Issues in Recreation, Parks, and Tourism (4)**

Societal issues that influence the management and delivery of recreation, parks, and tourism services. Critical investigation of current research and trends. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

**REC 527 Leisure Behavior and Theory (4)**

Theories of recreation and leisure; conceptual and theoretical foundations of leisure; the role of leisure behavior in modern day society. *Class Schedule* will list topics selected. Constructs that contribute to contemporary understanding of leisure behavior. Connection of theories to individual research. Total credit limited to 8 units. 4 lectures. Prerequisite: Graduate standing.

**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.

**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.

**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.

**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..

**RELS 310 Christianity (4) GE C4**

The development of the Christian religion from the story of Jesus, the New Testament, Church formation, the role of St. Paul, dissenting ideas, Protestant and Catholic views, and contemporary issues of conscience, such as the Social Gospel and liberation theologies. 4 lectures. Prerequisite: Completion of GE Area A and PHIL 230 or PHIL 231.

**RELS 311 Islam (4) GE C4**

The development of Islamic civilization from the inspiration of the Qur'an and the Prophet Muhammad and the Sunni-Shi'i split to contemporary political and social issues. Emphasis of Sufi literature, art, architecture, and philosophies of Islam. 4 lectures. Prerequisite: Completion of GE Area A and PHIL 230 or PHIL 231.

**RELS 336 Religion, Gender and Society (4) GE C4 USCP**  
(Also listed as WS 336)

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) (CR/NC)**

Introduction to the diversity of fields in biotechnology. Applications in agriculture, nutrition, medicine and environmental problems. Credit/No Credit grading only. 1 activity. Prerequisite: Completion of a course with a BIO, BOT or MCRO prefix and a course with a CHEM prefix.

**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.

**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 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**  
(Communication Studies Department)**SCOM 101 Public Speaking (4) GE A2**  
(Also listed as HNRS 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.

**SCOM 102 Principles of Speech Communication (4) GE A2**

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 A1 or A2.

**SCOM 145 Reasoning, Argumentation, and Writing (4)**  
(Also listed as ENGL/HNRS 145) **GE A3**

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 or A2.

**SCOM 201 Advanced Public Speaking (4)**

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**

Poetry, prose, nonfiction and dramatic literature performed to communicate the levels of meaning within each work to the audience. Communication Studies majors will not receive GE C3 credit. 4 lectures. Prerequisite: Completion of GE Areas A and C1.

**SCOM 212 Interpersonal Communication (4)**

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)**

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)** **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. Communication Studies majors will not receive GE C4 credit.

**SCOM 311 Communication Theory (4)**

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)**

Exploration of communication research strategies and methodologies. Basic methods of designing research in empirical communication studies. 4 lectures. Prerequisite: SCOM 311 and STAT 217, junior standing. For majors only.

**SCOM 315 Intergroup Communication (4)**

Survey of theory and research concerning language and communication between various social groups (e.g., age, sex, race, sexual orientation), with an emphasis on understanding the role verbal, nonverbal, and mass communication plays in identity formation and differentiating group members. 4 lectures. Prerequisite: Completion of GE Area A.

**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)**

Theory of persuasion with particular emphasis upon social psychological principles of influence. Analysis of various forms of persuasion, social influence and propaganda. 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 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)**

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 Media Criticism (4)**

Theory and method used in analyzing media from critical, rhetorical, and cultural perspectives. Practice in interpreting and evaluating news, advertising, prime-time television, the Internet, and other mass-mediated texts, with special attention to relationships among media, identity, and political action. 4 lectures. Prerequisite: Completion of GE Area A, 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)** **USCP**

Examination and clarification of cultural aspects of communication within and among ethnic groups. 4 lectures. Prerequisite: Completion of GE Area A.

**SCOM 418 Health Communication (4)**

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)**

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: Completion of GE Area A and junior standing.

**SCOM 420 Nonverbal Communication (4)**

Influence of kinesic, proxemic, artifactual, olfactory, paralinguistic and environmental factors in human communication. Theory, research and practice in nonverbal communication. 4 lectures. Prerequisite: Completion of GE Area A.

**SCOM 421 Gender and Communication (4)**

Examination of gender in a variety of communication contexts. Concepts presented will help students understand the theory and practice of communication with members of the same and opposite sex. 4 lectures. Prerequisite: 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)**

Role of oratory in American political and social history since Lincoln. Historical and rhetorical analyses of important political speeches delivered by presidents, activists, demagogues, and leaders of social movements. 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 materia: in current professional writings. 1 seminar. Prerequisite: Senior standing; completion of SCOM 312 and SCOM 332. 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 110 Comparative Societies (4)**

GE D3

Introduction to sociological theory and methods, emphasizing a comparative analysis of social institutions of contemporary societies in major world regions, including the family, religion, politics, and the economy. Direct comparisons made between American social institutions and those of other societies, their histories, social problems and social change. 4 lectures.

**SOC 111 Social Problems (4)**

An introduction to sociology with an 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.

**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 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 spatial 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 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 and junior standing.

**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 111 or consent of instructor.

**SOC 431 Population, Migration and the Environment (4)**

Description and analysis of basic population processes including fertility, mortality, and migration and the environment. Emphasis on understanding the significance of today's growth rates for the future, especially in relationship to resources and standards of living. 4 lectures. Prerequisite: SOC 111 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.

**SOCS-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 I, II (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 I, II, III (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 Elementary Hispanic Language and Culture (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 completed SPAN 101 or SPAN 104. 3 lectures, 1 activity.

### SPAN 121, 122 Fundamentals of Spanish I, II (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 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.

## 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, wetlands, range lands and urban development. 3 lectures, 1 laboratory. Prerequisite: SS 121.

### SS 322 Soil Plant Relationships (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) (Also listed as ERSC 323)

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, 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 I (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 II (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 Seminar (2) (Also listed as ERSC 463)**

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 Environmental Assessment for Erosion Control (3)**

Assessment techniques for the development of soil erosion control and the dispersal of surface runoff water on urban, agriculture, riparian, and

rangelands. Development of a water quality management plan for a specific land use. 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 570 Selected Topics in Soil 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.

#### **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: Passing score on the ELM examination, or an ELM exemption, or credit in 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 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 218 or STAT 221 or STAT 251. 4 lectures. Prerequisite: Passing score on the ELM examination, or an ELM exemption, or credit in 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 linear regression, chi-square tests, relative risk and odds. Applications of statistics to the life sciences. Use of a statistical computer package. Not open to students with credit in STAT 217 or STAT 221 or STAT 251. 4 lectures. Prerequisite: Passing score on the ELM examination, or an ELM exemption, or credit in 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: Passing score on the ELM examination, or an ELM exemption, or credit in 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 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 312 or 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 312 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 252 or STAT 312 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 312 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, or consent of instructor. Recommended: MATH 206.

**STAT 421 Survey Sampling and Methodology (4)**

Survey planning, execution, and analysis. Principles of survey research, including non-sampling and sampling error topics. Survey sample designs, including simple random, systematic, stratified, cluster, and multi-stage. Estimation procedures and sample size calculations. 4 lectures. Prerequisite: One of the following: STAT 217, STAT 218, STAT 221, STAT 252, STAT 312, 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, 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)**

Continuation of STAT 425. 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. 4 lectures. Prerequisite: STAT 425.

**STAT 427 Mathematical Statistics (4)**

Continuation of STAT 426. The theory of hypothesis testing and its applications. Power and uniformly most powerful tests. Categorical data and nonparametric methods. Other selected topics. 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 I, II (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 217, STAT 218, STAT 221, STAT 252, STAT 312, 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 290 Script Analysis (4)**

Script analysis taught as an essential applied skill for actors, designers and directors. Students read a variety of plays and learn how to examine their structure, theme and context. 4 seminars. Prerequisite: TH 210, TH 227 or TH 228.

**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)**

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 Acting Methods (4)**

Contemporary acting techniques focused on character building, objectives and tactics, with a focus on the development and implementation of various interactive methods of vocal work, images and actor resources. 4 lectures. Prerequisite: TH 210.

**TH 341 Acting Styles (4)**

An intensive examination of various styles and forms of acting, with specific attention toward the comparison and development of historical performance techniques and/or theories. 4 lectures. Prerequisite: TH 210.

**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 360 Theatre in the United States (4)**

Examination of American plays, playwrights, organizations and movements, applying them as portraits of the United States' historical, philosophical and cultural make-up. Topical emphasis focuses on the definition and development of an "American" identity via the context of theatre. 4 lectures. Prerequisite: Completion of GE Area A; TH 210, TH 227 or TH 228. Theatre majors will not receive GE C4 credit.

**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 390 World Drama (4)**

Investigation of non-western/underrepresented theatre and dramatic performance; emphasis on plays, playwrights, and movements as portraits of philosophical/national make-up. Topical emphasis focuses on the definition and development of a cultural identity via the context of historical and contemporary theatre practices. 4 lectures. Prerequisite: Completion of GE Area A; TH 210, TH 227 or TH 228. Theatre majors will not receive GE C4 credit.

**GE C4 USCP****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, TH 290 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, TH 290 or consent of instructor.

**TH 434 Introduction to Stage Design: Lighting (4)**

Lighting design process used in the entertainment industry, including concept development, research, the functional aspects of lighting equipment, drafting techniques, the development of production paperwork and the presentation of design material. 3 lectures, 1 activity. Prerequisite: TH 210, TH 290 or consent of instructor.

**TH 450 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, TH 290 and consent of instructor.

**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 190 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: HCS 120.

**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 and precooling methods. Survey of vegetable production for other than crop science majors. 3 lectures, 1 laboratory.

#### **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 190 or VGSC 230, 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 190 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) (CR/NC)**

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 3 units per quarter. Credit/No Credit grading only. 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 161.

#### **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 161.

#### **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 161.

#### **VS 440 Immunology and Diseases of Animals (4)**

Introduction to immune system, including innate and acquired immunity of domesticated animals. Application of immunological analyses and examination of current disease issues in domesticated animals. 3 lectures, 1 laboratory. Prerequisite: VS 223. Recommended: ASCI 320, CHEM 371 or equivalent.

#### **VS 400 Special Problems for Advanced Undergraduates (2-4) (CR/NC)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 4 units per quarter. Credit/No Credit grading only. 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.

#### **VS 540 Advanced Immunology and Diseases of Animals (4)**

In-depth analysis of the immune system, including molecular basis for immunity of domesticated animals. Application of immunological assays, and application of scientific method to examine immunity and disease in domesticated animals. Not open to students with credit in VS 440. 3 lectures, 1 laboratory. Prerequisite: VS 223; ASCI 320, CHEM 371 or equivalent; STAT 218 or equivalent; or consent of instructor. Corequisite: VS 541.

#### **VS 541 Advanced Animal Immunology Laboratory (4)**

Laboratory complement to VS 540. Independent research projects, including hypothesis development, experimental design, data collection and analyses, and written and oral presentations. Corequisite: VS 540.

## **WVIT-WINE AND VITICULTURE**

#### **WVIT 102 Grapes and Wines of the World (4)**

Brief history of grapes and wines, major winegrowing regions of the world, and major grape varieties. Types of wines, wineries, marketing, packaging and promotion. Hospitality issues such as ordering wine in restaurants, reading a wine label and wine service. 3 lectures, 1 activity.

#### **WVIT 341 Wines and Fermented Foods (4) (Also listed as FSN 341)**

Processing, manufacturing, historical and bio-technical applications of fermentation technology for the production of food products focusing on wine. Wines of the world, distilled beverages, beers, fermented dairy, vegetable and meat products important to the post-harvest economy of California. Field trip may be required. 4 lectures. Prerequisite: Junior standing and completion of GE Area B.

#### **WVIT 342 Sensory Evaluation of Wine (4) (Also listed as FSN 342)**

Evaluation of wines using the techniques in sensory evaluation. Difference and rating tests; descriptive analysis and pairing of wine and food. 3 lectures, 1 laboratory. Prerequisite: FSN 341, STAT 218 or STAT 221, age 21 or older.

#### **WVIT 463 Issues and Trends in the Wine Industry (2)**

Current topics in viticulture, enology and the wine business as a whole. Emphasis on controversial topics and future projections of the industry's vision. 2 seminars. Prerequisite: Senior standing.

## 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 340 Sexuality Studies (4) GE D5

Sexuality in a cultural and historical context. Changing definitions of human subjectivity. The cultural and social regimes that control and create sexuality (including the "invention" of homo/heterosexuality and the social, legal and political systems that define sexual ab/normality). Contemporary issues of sexual orientation and topics of sexuality in relation to gender and race. 4 seminars. Prerequisite: Completion of GE Area A and completion of two lower-division Area D courses. Completion of WS 301 preferred.

### WS 350 Gender, Race, Science and Technology (4) USCP (Also listed as ES 350)

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 or consent of instructor.

### 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) 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.

### WS 450 Feminist Theory (4) 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 231 Essentials of Human Anatomy and Physiology I (5)

See ZOO 331. ZOO 231 accepted in lieu of ZOO 331, but not for upper division credit. Not open for major credit in the Biological Sciences.

### ZOO 232 Essentials of Human Anatomy and Physiology II (5)

See ZOO 332. ZOO 232 accepted in lieu of ZOO 332, but not for upper division credit. Not open for major credit in the Biological Sciences.

### 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 160, BIO 162 and BIO 263 or consent of instructor.

### 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 162.

### 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 160, BIO 162 and BIO 263 or consent of instructor.

### 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 160, BIO 162 and BIO 263.

### 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 161; CHEM 111, CHEM 124 or CHEM 127. Not open for major credit in Biological Sciences.

### 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 161; CHEM 111, CHEM 124 or CHEM 127. Not open for major credit in Biological Sciences.

**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. Prerequisite: One course in college biology.

**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 160 and BIO 162.

**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 160 and BIO 162.

**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 162.

**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 162. 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 160 and BIO 161, or 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 263 or consent of instructor.

**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 in Biological Sciences, BIO 263 or consent of instructor.

# University Administration

## OFFICE OF THE PRESIDENT

President .....	Warren J. Baker
Administrative Assistant.....	Kimberly C. Uyttewaal
Presidential Aide.....	Gerry K. Mueller
Executive Assistant to the President....	Daniel Howard-Greene
University Legal Counsel.....	Carlos Córdova

## ACADEMIC AFFAIRS

Provost and Vice President for Academic Affairs (Interim).....	Robert C. Detweiler
Academic Personnel, Associate Vice President .....	Michael H. Suess
Center for Teaching and Learning, Director .....	Joseph E. Grimes
Employment Equity and Faculty Recruitment, Director .....	William Bailey
Academic Programs and Undergraduate Education, Vice Provost.....	W. David Conn
General Education Program, Director.....	Douglas Keeseey
International Education and Programs, Director (Interim).....	John Battenburg
University Honors Program, Director .....	Erika Rogers
Writing Skills Program, Coordinator. Mary Kay Harrington Admissions, Recruitment and Financial Aid, Assistant Vice President.....	James L. Maraviglia
Cal Poly Continuing Education, Dean.....	Dennis R. Parks
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Conference Services, Director .....	Devon Shearer
Information Technology, Vice Provost/Chief Information Officer .....	Jerry J. Hanley
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User Support Services, Director .....	Craig J. Schultz
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Intercollegiate Athletics, Director .....	Alison E. Cone
Library Services, Dean .....	Hiram L. Davis
Research and Graduate Programs, Dean.....	Susan C. Opava
Grants Development, Director.....	Michael Fish
Systems and Resource Management, Assistant Vice Provost .....	Kimi M. Ikeda
Academic Records, Registrar/Director .....	Thomas L. Zuur

## COLLEGE OF AGRICULTURE .. Dean, David J. Wehner Associate Dean, Mark D. Shelton Associate Dean, Mary E. Pedersen

Agribusiness .....	Kenneth C. Scott
Agricultural Education and Communication .....	Robert A. Flores
Animal Science.....	Andrew J. Thulin
BioResource and Agric. Engr .....	Richard A. Cavaletto (Interim)
Dairy Science .....	Walter R. Mark (Interim)
Earth and Soil Sciences .....	Brent G. Hallock
Food Science and Nutrition .....	Doris Derelian
Horticulture and Crop Science.....	Jennifer Ryder Fox
Military Science .....	Major Russell P. Clark
Natural Resources Management.....	Douglas D. Piirto
Recreation Administration.....	William W. Hendricks

## COLLEGE OF ARCHITECTURE AND ENVIRONMENTAL DESIGN .....

Dean, R. Thomas Jones	
Associate Dean, K. Richard Zweifel	
Architectural Engineering .....	Abraham C. Lynn
Architecture.....	William R. Benedict (Interim)
City and Regional Planning .....	William J. Siembieda
Construction Management .....	Allan J. Hauck
Landscape Architecture.....	Walter D. Bremer (Interim)

## ORFALEA COLLEGE OF BUSINESS

Dean, David P. Christy	
Associate Dean, Chris A. Carr	
Associate Dean, Douglas C. Cerf	
Accounting .....	Tad Miller (Interim)
Economics.....	Michael L. Marlow
Finance.....	Kenneth Riener
Graduate Management Programs (MBA).....	Chris A. Carr
Industrial Technology .....	(Position Vacant)
Interdisciplinary Studies.....	Rami Shani
Management.....	Rami Shani
Marketing.....	Norm A. Borin

## COLLEGE OF EDUCATION .....

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Associate Dean, Carl R. V. Brown	
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Graduate Studies .....	Roberta Herter

## COLLEGE OF ENGINEERING .....

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Associate Dean (Interim), Unny Menon	
Associate Dean, Daniel W. Walsh	
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Civil and Environmental Engineering .....	Alypios Chatziioanou
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Computer Science .....	Timothy J. Kearns
Electrical Engineering.....	Michael M. Cirovic
General Engineering Program.....	Daniel W. Walsh
Industrial and Manufacturing Engineering.....	Donald E. White
Materials Engineering.....	Linda S. Vanasupa
Mechanical Engineering.....	James M. Meagher (Acting)

## COLLEGE OF LIBERAL ARTS

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Associate Dean (Interim), Debra Valencia-Laver	
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Communication Studies .....	James R. Conway
English .....	David J. Kann
Ethnic Studies .....	Robert Ji-Song Ku
Graphic Communication .....	Harvey Robert Levenson
History.....	Carolyn J. Stefanco
Humanities Program.....	Richard K. Simon
Journalism .....	George Ramos
Liberal Studies .....	Susan Duffy
Modern Languages and Literatures.....	William Martinez, Jr.
Music.....	William T. Spiller
Philosophy.....	Tal Scriven
Political Science.....	Dianne W. Long
Psychology and Child Development.....	Donald H. Ryujiin
Social Sciences.....	Harold R. Kerbo
Theatre and Dance .....	Timothy J. Dugan
Women's Studies Program .....	Mary A. Armstrong

**COLLEGE OF SCIENCE AND MATHEMATICS**

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Kinesiology ..... Gerald E. DeMers	Mathematics ..... Kent E. Morrison
Physics ..... Richard A. Saenz	Statistics ..... Jay L. Devore

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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 .....	Mark A. Hunter
Human Resources, Director .....	Barbara Melvin
Risk Management Manager .....	Joseph C. Risser
University Police Chief, Director .....	Anthony Aeilts

**STUDENT AFFAIRS**

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Associate Vice President .....	Denise M. Campbell
Assistant Vice President .....	Preston C. Allen
Associated Students, Inc., Executive Director .....	Rick Johnson
Career Services and Testing Services, Director (Interim) .....	Martin C. Shibata
Dean of Students .....	Jean DeCosta
Disability Resource Center, (Interim) Director .....	Ann Fryer
Health and Counseling Services, Director .....	Martin Bragg
Housing and Residential Life, Director .....	Preston C. Allen
Judicial Affairs, Director .....	Ardith Tregenza
Student Academic Services, Director .....	Susan Sparling
Student Life and Leadership, Director .....	Kenneth B. Barclay

**UNIVERSITY ADVANCEMENT**

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Associate Vice President .....	Richard E. Ellison
Advancement Services, Director .....	Vacant
Cal Poly Fund, Director .....	Craig Nelson
Corporate and Foundation Relations, Director .....	Linda Kristenson
Advancement Programs, Director .....	Polly Harrigan
Alumni Relations, Director .....	Kim R. Gannon
Planned Giving and Endowments, Sr. Director .....	Michael D. McCall
Public Affairs, Director .....	Leah Kolt

**AUXILIARY ORGANIZATIONS****Associated Students, Inc.**

Executive Director .....	Rick Johnson
Business Services, Director .....	Dwayne Brummett
Children's Programs, Director .....	Tonya Iversen
Recreational Sports, Director .....	Marcy Maloney
University Union, Director .....	Marcy Maloney

**Foundation**

Executive Director .....	Frank Mumford
Director Emeritus .....	Al Amaral
Associate Executive Director .....	James Reinhart

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
James A. Anderson (1987–2004) .....	Accounting
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
Frederick P. Andoli (1868–2004) .....	Biological Sciences
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
John H. Applegarth (1952–1972) .....	Biological Sciences
William W. Armentrout (1953–1980) .....	Education
Gene A. Armstrong (1967–2002) .....	Animal Science
Mary Beth Armstrong (1984–2004) .....	Accounting
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
Marylud Baldwin (1982–2004) .....	College of Education

- 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  
 George L. Beardsley, Jr. (1975–2003) ..... Economics  
 Lloyd N. Beecher (1969–2002) ..... History  
 Joy G. Berghell (1956–1975) ..... Library  
 James Bermann (1964–2000) ..... BioResource and Agricultural Engineering  
 Dan Bertozzi, Jr., (1974–2004) ..... Accounting  
 A. C. W. Bethel (1968–2003) ..... Philosophy  
 Ellard W. Betz (1947–1976) ..... Engineering Technology  
 Edgar H. Beyer (1981–1997) ..... Horticulture and Crop Science  
 Joseph R. Biggs (1988–2004) ..... Management  
 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  
 Joseph C. Boone (1968–2003) ..... Physics  
 James S. Booth (1972–1988) ..... Biological Sciences  
 Michael Botwin (1981–2000) ..... Architectural Engineering  
 Leslie S. Bowker (1974–2004) ..... Biological Sciences  
 William C. Boynton (1985–2000) ..... Dean, College of Business, Accounting  
 Lois H. Brady (1988–2004) ..... Computer Science  
 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  
 C. Andrea Brown (1987–2004) ..... Kinesiology  
 Kenneth L. Brown (1979–2002) ..... Industrial and Manufacturing Engineering  
 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  
 Raúl J. Cano (1974–2003) ..... Biological Sciences  
 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  
 Nancy L. Clark (1989–2004) ..... History  
 William E. Clark (1977–2003) ..... Mechanical Engineering  
 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  
 Jaime S. Colomé (1972–2004) ..... Biological Sciences  
 Michael R. Colvin (1979–2003) ..... Mathematics  
 John B. Connely (1970–2000) ..... Computer Science  
 E. Wesley Conner (1963–1988) ..... Ornamental Horticulture  
 Lee C. Coombs (1970–2001) ..... Chemistry and Biochemistry  
 Alan F. Cooper (1970–2002) ..... Biological Sciences  
 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  
 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  
 M. Bilgi Denel (1981–2004) ..... Architecture  
 Serim Denel (1983–2004) ..... Architecture  
 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  
 Keith W. Dills (1983–2001) ..... Art and Design  
 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  
 Thomas E. Eltzroth (1967–2002) ..... Horticulture and Crop Science  
 James Emmel (1967–1988) ..... Speech Communication  
 David L. Englund (1973–2000) ..... Psychology and Human Development  
 Gary M. Epstein (1969–2004) ..... Mathematics  
 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  
 Jacob Feldman (1971–2003) ..... Architectural Engineering  
 Gary G. Field (1984–2004) ..... Graphic Communication  
 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. Fotter (1954–1976) ..... Industrial Engineering  
 H. Paul Fountain (1965–2001) ..... Crop Science  
 Frank Fox (1957–1988) ..... Animal Science and Industry  
 Richard B. Frankel (1988–2004) ..... Physics  
 H. Jo Anne Freeman (1974–2003) ..... Industrial and Manufacturing Engineering  
 Freeman Freitag (1966–1992) ..... Electronic and Electrical Engineering  
 Thomas G. Frey (1970–2004) ..... Chemistry and Biochemistry  
 Winton H. Frey, Jr. (1963–1990) ..... Ornamental Horticulture

Fred S. Friedman (1975–2000)	Mechanical Engineering	Robert L. Hoover (1970–1998)	Social Sciences
Clara B. Froggatt (1964–1980)	Counseling and Testing	William F. Horton (1968–1998)	Electrical Engineering
George S. Furimsky (1955–1973)	Engineering Technology	H. Clyde Hostetter (1958–1983)	Journalism
Merrill C. Gaines (1976–2002)	Architecture	A. L. Houk (1946–1972)	Chemistry
Roger D. Gamba (1974–2003)	Biological Sciences	Laurence D. Houlgate (1979–2002)	Philosophy
Timothy A. Gaskin (1970–1991)	Ornamental Horticulture	William A. Howard (1980–1994)	City and Regional Planning
Larry W. Gay (1979–2002)	Industrial Technology	Carl C. F. Hsieh (1970–2000)	Civil and Environmental Engineering
Teymoor Gedayloo (1965–1992)	Physics	John Y. S. Hsu (1970–2002)	Computer Science, Computer Engineering
Douglas G. Genreux (1970–2002)	Agribusiness	Earl D. Huff (1970–1996)	Political Science
David L. George (1970–2002)	Political Science	Roger M. Hunt (1978–2004)	Animal Science
Curtis F. Gerald (1964–1980)	Computer Science and Statistics	Robert J. Huot (1963–1986)	English
Peter Giambalvo (1968–1992)	Engineering Technology	James R. Hutchinson (1971–1997)	Graphic Communication
William R. Gibford (1955–1979)	Animal Science	Rex L. Hutton (1966–2000)	Mathematics
John F. Gillham (1973–1994)	Landscape Architecture	C. Dennis Hynes (1957–1990)	Biological Sciences
Jack E. Girolo (1970–2002)	Mathematics	Michael A. Iannce (1978–2002)	Mechanical Engineering
M. Patricia Glancy (1981–2003)	Library	George K. Ikenoyama (1963–1998)	Architecture
Margaret J. Glaser (1973–1992)	University Center for Teacher Education	Mohammad Z. Iqbal (1977–2004)	Accounting
L. Joe Glass (1970–2001)	BioResource and Agricultural Engineering	Ralph A. Jacobson (1975–2003)	Chemistry and Biochemistry
Sonja S. Glassmeyer (1973–2001)	Kinesiology	Peter T. Jankay (1973–2004)	Biological Sciences
Wallace F. Glidden (1961–1992)	Animal Sciences and Industry	Starr Jenkins (1961–1988)	English
Saul Goldberg (1970–2000)	Electrical Engineering	Charles W. Jennings (1968–2003)	Art and Design
James R. Golden (1967–1983)	Industrial Engineering	Eric V. Johnson (1969–1998)	Biological Sciences
Reginald H. Gooden, Jr. (1970–2002)	Political Science	Mead R. Johnson (1956–1980)	English
Stuart Goldenberg (1970–2003)	Mathematics	Miles B. Johnson (1957–1983)	English
Raymond G. Gordon (1967–2002)	Mechanical Engineering	Richard F. Johnson (1950–1988)	Animal Sciences and Industry
Robert Gordon (1967–1992)	Ornamental Horticulture	Robert M. Johnston (1946–1954, 1956–1974)	Engineering Technology
George G. Gowgani (1970–1997)	College of Agriculture	Jack B. Jones (1969–1991)	University Center for Teacher Education
Gary A. Granneman (1978–2003)	Electrical Engineering	William B. Judd (1956–1981)	Mathematics
Donald P. Grant (1967–2000)	Architecture	James S. Kalathil (1965–1998)	Physics
Rufus L. Graves, Jr. (1951–1954, 1957–1982)	Architecture	John J. Kane (1969–1984)	Aeronautical and Mechanical Engineering
Theodore G. Graves (1947–1984)	Engineering Technology	James Y. Katekaru, (1969–1992)	Chemistry
James S. Greil (1974–1996)	Crop Science	Thomas D. Kay (1958–1991)	Engineering Technology
Donald A. Grinde, Jr. (1977–1996)	History	Roger A. Keech (1965–1983)	Aeronautical and Mechanical Engineering
Robin R. Grinnell (1967–1997)	BioResource and Agricultural Engineering	Roger L. Keep (1968–2001)	Industrial Technology
John E. Groves (1968–2001)	Statistics	Brent H. Keetch (1969–1998)	English
Lester W. Gustafson (1947–1971)	Aeronautical Engineering	Rodney Keif (1960–1988)	Mechanical Engineering
David W. Hafemeister (1969–2000)	Physics	Elmo A. Keller (1963–2000)	Computer Science
Kenneth L. Haggard (1967–1986)	Architecture	Martin A. Kellerman (1968–2000)	Chemistry and Biochemistry
Thomas E. Hale (1966–2000)	Mathematics	Helen P. Kelley (1966–1985)	Art
Barbara M. Hallman (1973–1991)	History	Euel W. Kennedy (1974–2002)	Mathematics
Reino Hannula (1962–1981)	Computer Science and Statistics	Paul Kenyon (1957–1982)	Business Administration
Phyllis J. Hansen (1963–1990)	Library	Timothy W. Kersten (1971–2002)	Economics
Adelaide T. Harmon-Elliott (1974–1996)	Mathematics	Brian B. Kesner (1980–2003)	Architecture
John E. Harrigan (1969–1996)	Architecture	Chi Su Kim (1974–1992)	University Library
Leroy M. Harris (1954–1986)	Animal Sciences and Industry	George N. Knecht (1973–2002)	Biological Sciences
Charles Haskell (1963–1988)	Mathematics	Donald Koberg (1962–1992)	Architecture
David S. Hatcher (1980–1992)	Architectural Engineering	Irvin J. Kogan (1957–1985)	Engineering Technology
Michael Hawes (1967–2002)	Electrical Engineering	Ken Kohlen (1983–2004)	Architecture
James H. Hayes (1969–1992)	Journalism	Joseph M. Kourakis (1970–1997)	City and Regional Planning
Dwayne G. Head (1966–2000)	Physical Education and Kinesiology	Richard B. Krantzdorf (1971–2001)	Political Science
Henry J. Heesch (1986–2001)	Graphic Communication	Richard J. Krejsa (1968–1994)	Biological Sciences
Anatol Helman (1957–1974)	Architecture	R. Krishnan (1987–2004)	Marketing
Frank J. Hendel (1967–1984)	Aeronautical Engineering	Lezlie A. Labhard (1967–2004)	Industrial Technology
Charles A. Herald (1958–1975)	Electronic and Electrical Engineering	Royce L. Lambert (1969–1994)	Soil Science
John J. Herlihy (1975–2000)	Agribusiness	Alfred W. Landwehr (1970–1999)	English
Earl R. Hesch (1956–1983)	Engineering Technology	Alexander Landyshev (1956–1972)	Electronic and Electrical Engineering
William R. Hicks (1957–1983)	Physical Education	Martin T. Lang (1969–1999)	Mathematics
Robert Hill (1976–1991)	Accounting	James A. Langford (1955–1976)	Education
Vaughan Hitchcock (1962–1997)	Physical Education and Kinesiology	Paul S. Lansman (1964–1979)	Mathematics
Stephen L.M. Hockaday (1983–2002)	Civil and Environmental Engineering	Stuart E. Larsen (1969–2001)	Civil and Environmental Engineering
Jon A. Hoffmann (1968–2002)	Aerospace Engineering	Donald P. Lazere (1977–1995)	English
V. L. Holland (1972–2004)	Biological Sciences	Thomas Lee (1952–1988)	Physical Education and Recreation Administration
Roy B. Hollstien (1973–1988)	Computer Science	Robert B. Leonesio (1972–1992)	Materials Engineering
Ray J. Holt (1955–1978)	Physics	Robert L. Levison (1969–1997)	University Center for Teacher Education
Walter E. Holtz (1954–1966, 1968–1982)	Environmental Engineering	George M. Lewis (1967–2004)	Mathematics
Alan W. Holz (1974–2003)	Mathematics	Vance D. Lewis (1946–1972)	Physics and School of Science and Mathematics
Dennis N. Homan (1966–1997)	Biological Sciences	Karl D. Lilje (1981–1994)	Engineering Technology
Gilbert L. Homfeld (1960–1976)	Mathematics	John R. Lindvall (1973–2002)	Finance
Harry Honegger (1961–1986)	Metallurgical Engineering		
J. Myron Hood (1977–2004)	Mathematics		

- 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  
 David Lord (1985–2004) ..... Architecture  
 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 W. Luna (1977–2003) ..... Mathematics  
 Michael W. Lund (1984–2004) ..... Animal Science  
 George R. Mach (1954–1991) ..... Mathematics  
 Leon W. Magur (1958–1983) ..... Physics  
 Y. Leon Maksoudian (1963–1994) ..... Statistics  
 Michael R. Malkin (1974–2002) ..... Theatre and Dance  
 H. Mallareddy (1981–2003) ..... Civil and Environmental Engineering  
 Fredrick B. Malmborg (1969–2004) ..... Mechanical Engineering  
 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  
 Jean M. McDill (1973–2001) ..... Mathematics  
 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  
 Robert J. McNeil (1976–2004) ..... Horticulture and Crop Science  
 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. Mistic (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  
 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  
 Linden L. Nelson (1970–2002) ..... Psychology and Child Development  
 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  
 O. Robert Noyes (1974–2001) ..... Food Science and Nutrition  
 Dennis M. Nulman (1977–2003) ..... University Center for Teacher Education  
 David E. Nutter (1974–1992) ..... Accounting  
 Nancy C. Ochs (1975–2004) ..... Agribusiness  
 Eugene L. O'Connor (1964–1991) ..... Business Administration  
 Gene P. Offermann (1970–2003) ..... Horticulture and Crop Science  
 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  
 Kenneth F. Palmer (1984–2003) ..... College of Education  
 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  
 David A. Peach (1987–2004) ..... Management  
 Evelyn I. Pellaton (1966–1982) ..... Physical Education  
 Dominic Perello (1954–1987) ..... Economics  
 Elizabeth K. Perryman (1972–2003) ..... Biological Sciences  
 James M. Peters (1958–1980) ..... Chemistry  
 Ralph A. Peters (1969–2004) ..... Physics  
 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  
 Anthony J. Randazzo (1977–2003) ..... Industrial Technology  
 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  
 Satwant S. Rihal (1969–2003) ..... Architectural Engineering  
 Eugene A. Rittenhouse (1949–1976) ..... Economics and Placement  
 David M. Roach (1966–2000) ..... Physics  
 John C. Robison (1985–2004) ..... Accounting  
 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



- Joanne Beaulé Ruggles (1973–2004)..... Art and Design  
Philip K. Ruggles (1971–2004)..... Art and Design  
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  
Judy D. Saltzman (1975–2004)..... Philosophy  
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  
David J. Schaffner (1972–2003)..... Agribusiness  
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  
Edwin C. Seim (1978–2004)..... Horticulture and Crop Science  
Robert E. Sennett (1970–1997)..... Civil and Environmental Engineering  
Ramesh T. Shah (1969–2003)..... Mechanical Engineering  
Harry Sharp, Jr. (1975–2000)..... Speech Communication  
Habib Sheik (1967–2000)..... English  
Alden F. Shiers (1975–2004)..... Economics  
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  
Sarah M. Stephens (1986–2004)..... Agricultural Education and  
Communication  
Fred H. Steuck (1947–1978)..... Electronic and Electrical Engineering  
Edward O. Stoffel (1957–1988)..... Mechanical Engineering  
Richard A. Strahl (1985–2004)..... Industrial and Manufacturing Engineering  
J. Edward Strasser (1960–1984)..... Industrial Technology  
H. Bernard Strickmeier (1970–2002)..... Mathematics  
Rollin D. Strohman (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  
Moon Ja Minn Suhr (1969–2003)..... Theatre and Dance  
Gerald J. Sullivan (1968–1996)..... English  
Dale A. Sutliff (1973–2004)..... Landscape Architecture  
Vern Swansen (1969–1989)..... Architecture  
Clifton E. Swanson (1967–2004)..... Music  
Ronald D. Taskey (1977–2001)..... Soil Science  
Fuad H. Tellev (1960–1991)..... Economics  
John W. Thomas (1968–1992)..... Biological Sciences  
William Thurmond (1951–1989)..... Biological Sciences  
Rusell L. Tice (1965–2000)..... Chemistry and Biochemistry  
Neal R. Townsend (1965–1991)..... Mathematics  
Dean Trembly (1961–1976)..... Counseling and Testing  
Bernard A. Troy (1970–1998)..... University Center for Teacher Education  
Joseph Truex (1954–1986)..... Graphic Communication  
Walter M. Tryon (1976–2003)..... Landscape Architecture  
James H. W. Tseng (1969–1994)..... Electrical Engineering  
Pearl Turner (1951–1974)..... Library  
Robert G. Valpey (1972–1983)..... Dean, School of Engineering and  
Technology  
Robert D. Vance (1972–2003)..... Animal Science  
Gordon L. Van de Vanter (1968–86)..... Crop Science  
John Van Eps (1974–2003)..... Mathematics  
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  
Robert E. Walker (1983–2004)..... BioResource and Agricultural Engineering  
Matthias R. Wall (1976–2000)..... Construction Management  
Dirk R. Walters (1969–2004)..... Biological Sciences  
David L. Warfield (1975–2004)..... Horticulture and Crop Science  
Gustav N. Wassel (1980–1995)..... Electrical Engineering  
Archie M. Waterbury (1973–2003)..... Biological Sciences  
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  
Daniel P. Williamson (1970–2003)..... Economics  
David G. Williamson (1968–1998)..... Chemistry and Biochemistry  
Max T. Wills (1967–2000)..... Chemistry and Biochemistry  
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  
Calvin H. Wilvert (1973–2004)..... Social Sciences  
Donley J. Winger (1963–2000)..... Electrical Engineering  
Robert S. Wolf (1975–2003)..... Mathematics  
Paul Wolff (1971–1992)..... Architecture  
Michael T. Wollman (1977–2003)..... Electrical Engineering  
John A. Woodworth (1949–1974)..... Mathematics  
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<br>John L. Merriam, Agricultural Engineering   | 1980-81 | Sarah E. Burroughs, Food Science and Nutrition (Child Development and Home Economics)<br>Christina Orr-Cahall, Art<br>Kendrick W. Walker, Philosophy |
| 1964-65 | Joy O. Richardson, Mechanical Engineering<br>Milo E. Whitson, Mathematics   | 1981-82 | Christina A. Bailey, Chemistry<br>Kenneth E. Ozawa, Physics<br>Thomas L. Richards, Biological Sciences   |
| 1965-66 | A. Norman Cruikshanks, Social Sciences<br>Richard F. Johnson, Animal Husbandry<br>George R. Mach, Mathematics   | 1982-83 | James Bermann, Agricultural Engineering<br>Donald J. Koberg, Architecture<br>Jack D. Wilson, Aeronautical and Mechanical Engineering                 |
| 1966-67 | Robert W. Adamson, Mechanical Engineering<br>Kenneth G. Fuller, Mathematics<br>William D. Curtis, Psychology  | 1983-84 | Euel W. Kennedy, Mathematics<br>William L. Preston, Social Sciences<br>Michael J. Wenzl, English   |
| 1967-68 | Rodney G. Keif, Environmental Engineering<br>David M. Grant, English<br>Wesley S. Ward, Architecture  | 1984-85 | Robert S. Cichowski, Chemistry<br>Harvey C. Greenwald, Mathematics<br>Max E. Riedlsperger, History   |
| 1968-69 | Robert M. Johnson, Mechanical Engineering<br>Bruce Kennelly, Chemistry<br>Alice E. Roberts, Education   | 1985-86 | Edward H. Baker, Mechanical Engineering<br>Sue McBride, Education<br>Phillip K. Ruggles, Graphic Communication                                       |
| 1969-70 | Donald W. Hensel, History<br>David H. Montgomery, Biological Sciences<br>Philip H. Overmeyer, Business Administration<br>Willard M. Pederson, English<br>Omer K. Whipple, Chemistry | 1986-87 | Boyd W. Johnson, Mathematics<br>Craig H. Russell, Music<br>Calvin H. Wilvert, Social Sciences  |
| 1970-71 | Robert L. Cleath, Speech<br>Kenneth E. Schwartz, Architecture<br>Hewitt G. Wight, Chemistry   | 1987-88 | James R. Mueller, Mathematics<br>Ronald S. Mullisen, Mechanical Engineering<br>Robert G. Reynolds, Art and Design                                    |
| 1971-72 | Stuart E. Larsen, Aeronautical Engineering<br>Barton C. Olsen, History<br>Ronald L. Ritschard, Biological Sciences<br>Joseph N. Weatherby, Political Science (Social Sciences)      | 1988-89 | Stephen W. Ball, Philosophy<br>George Cotkin, History<br>Abraham B. Shani, Management  |
| 1972-73 | Lyle G. McNeal, Animal Science<br>Charles W. Quinlan, Architecture<br>James E. Simmons, English   | 1989-90 | Lloyd N. Beecher, History<br>Talmage E. Scriven, Philosophy<br>Jan W. Simek, Chemistry   |
| 1973-74 | William J. Phaklides, Engineering Technology<br>Louis D. Pippin, Education<br>Duane O. Seaberg, Agricultural Management   | 1990-91 | Jay L. Devore, Statistics<br>Linda H. Halisky, English<br>Ann Morgan, Psychology<br>James L. Webb, Physical Education & Recreation Admin.            |
| 1974-75 | Peter Jankay, Biological Sciences<br>Josephine S. Stearns, Child Development<br>George J. Suchand, Social Sciences  | 1991-92 | Mary E. Pedersen, Food Science and Nutrition<br>John Snetsinger, History<br>W. Fred Stultz, Psychology and Human Dev.                                |
| 1975-76 | James Hayes, Journalism<br>William V. Johnson, Music<br>Erna Knapp, Art   | 1992-93 | Susan Duffy, Speech Communication<br>Donald K. Maas, University Center for Teacher Education<br>Charles M. Slem, Psychology and Human Development    |
| 1976-77 | Harry L. Fierstine, Biological Sciences<br>Grant D. Venerable II, Chemistry<br>Ralph M. Warten, Mathematics   | 1993-94 | William T. Little, Foreign Languages and Literatures<br>Steven R. Marx, English<br>Raymond M. Nakamura, Physical Education & Kinesiology             |
| 1977-78 | Timothy M. Barnes, History<br>Donald P. Grant, Architecture and Environmental Design<br>John C. Syer, Political Science   | 1994-95 | Ronald F. Brown, Physics<br>Lee B. Burgunder, Business Administration<br>Nancy Lucas, English  |
| 1978-79 | Pat Pendse, Biological Sciences<br>Dane Jones, Chemistry<br>Adelaide Harmon-Elliott, Mathematics  | 1995-96 | David Keeling, Chemistry and Biochemistry<br>John Russell, Music<br>Richard Simon, English   |
| 1979-80 | David J. Keil, Biological Sciences<br>Thomas Ruehr, Soil Science<br>Stephen Weinstein, Mathematics<br>Michael D. Zohns, Ornamental Horticulture                                     | 1996-97 | Leonard Davidman, University Center for Teacher Education<br>Al Landwehr, English<br>Robert Thompson, Agribusiness                                   |
|         |   | 1997-98 | John Culver, Political Science<br>Jay S. DeNatale, Civil and Environmental Engineering<br>David R. Henry, Speech Communication                       |
|         |   | 1998-99 | Colette Frayne, Global Strategy and Law<br>Carol MacCurdy, English<br>Leonard Myers, Computer Science  |
|         |   | 1999-00 | J. Michael Geringer, Global Strategy and Law<br>Brent G. Hallock, Soil Science<br>Clinton A. Staley, Computer Science                                |
|         |   | 2000-01 | Sky Bergman, Art and Design<br>Phillip M. Doub, Agribusiness<br>William Martinez, Jr., Modern Languages and Literatures                              |

- 2001-02 Kevin Clark, English  
Alyson McLamore, Music  
Mark Zohns, BioResource and Agricultural Engineering
- 2002-03 Alvin De Jong, Biological Sciences  
Bernard Duffy, Speech Communication  
Linda Vanasupa, Materials Engineering
- 2003-04 Mathew Moelter, Physics  
Robert Smidt, Statistics  
Nanine A. Van Draanen, Physics

**DISTINGUISHED RESEARCH, CREATIVE ACTIVITY, AND PROFESSIONAL DEVELOPMENT AWARD**

In 2003-04 Cal Poly instituted an award program to recognize faculty in the areas of distinguished research, creative activity, and professional development. Nominations are solicited from the faculty, students, and alumni, and the Academic Senate's research and professional development committee, a group of eleven, selects the recipients. The recipients of the award and their departments are listed below:

- 2003-04 Charles Burt, BioResource and Agricultural Engineering  
Joanne Ruggles, Art and Design

**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 recipients of the Outstanding Faculty Advisor Award and their departments are listed below:

- 2001-02 Kathryn Rummell, English
- 2002-03 Jack Robison, Accounting
- 2003-04 William Preston, Social Sciences

**STAFF EMERITI** *(Dates indicate period of service)*

- Jeanne C. Aceto (1980-1996)..... College of Engineering
- Vincent P. Aceto (1982-2004)..... Facility Services
- Vic Allen (1951-1976)..... Custodial Services
- Alfred W. Amaral (1967-2000)..... Foundation Executive Office
- C. Robert Anderson (1982-2004)..... University Advancement
- 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
- Paul A. Bailey (1974-2004)..... Facility Services
- 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
- Joseph D. Baranek (1979-2004)..... University Police
- 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
- Virginia R. Bell (1973-2004)..... Honors Program
- 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

- Susan M. Bethel (1982-2003)..... Academic Personnel
- Leon R. Bierly (1978-2002)..... Information Technology Services
- Anita A. Biggs (1988-2004)..... Facility Services
- Dorothy M. Bishop (1962-1980)..... Education
- Odis D. Blankenship (1984-2004)..... Electrical Engineering
- Charles Boling (1968-1988)..... Athletics
- Wanda S. Bolt (1979-2003)..... Landscape Architecture
- Robert V. Bonds, Jr. (1972-1991)..... Learning Center
- Edna E. Bosch (1973-2003)..... Economics
- Robert M. Bostrom (1956-1992)..... Housing
- Rosemary C. Bowker (1977-2004)..... Biological Sciences
- Zoe A. Brazil (1970-1999)..... Library Services
- Phyllis Breckan (1973-1990)..... Academic Programs
- Patricia H. Breckenridge (1974-1998)..... Environmental Horticultural Science
- Carol A. Brookshire (1987-2004)..... Research and Graduate Programs
- Wayne R. Brotze (1980-2004)..... College of Agriculture
- Ann V. Brown (1976-2004)..... Academic Records
- Lee R. Brown (1974-1999)..... Graphic Communications
- John H. Buell (1976-2003)..... Library
- Elinor Bullock (1970-1986)..... General Office
- Harold A. Burnett (1962-1977)..... Agriculture and Natural Resources
- Carma Burns (1966-1990)..... Electronic and Electrical Engineering
- Shel A. Burrell (1973-2004)..... Career Services
- Rosemary Cameron (1964-1989)..... University Library
- James Capetillo (1969-1991)..... Plant Operations
- Darlene Cappellotti-Bowman (1988-2004)..... Financial Aid
- 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
- Ronald E. Christensen (1968-2003)..... Reprographics
- Barbara F. Ciesielski (1962-1999)..... Telephone Administration
- Joan M. Cirone (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
- Betty J. Cosslett (1974-2003)..... Housing and Residential Life
- Sherry L. Couture (1982-2003)..... Political Science
- Bernard R. Cox (1968-1988)..... Aeronautical Engineering
- Jane M. Cox (1977-1999)..... Fiscal Services
- Ann Crain (1986-2004)..... Campus Dining
- Loree Creath (1974-2002)..... Housing and Business Services
- Susan Crouch (1980-2004)..... Foundation
- Donald J. Curtis (1960-1976)..... Health Center
- Thomas E. Dana (1972-2000)..... Facility Services
- Roy E. Darr (1953-1971)..... Plant Operations
- Marjorie A. Davis (1976-2003)..... Health Services
- Susan Dawson (1981-2001)..... El Corral Bookstore
- Jean D. Degnan (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
- Robert E. Dominguez (1985-2001)..... Facility Services
- Zeta DuBarry (1974-1992)..... Financial Aid
- Collier 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	Edna X. Hjerrild (1973–2000).....	Library Services
Janice R. Emmack (1984–2004).....	Construction Management	Jarilyn H. Hobberlin (1968–1987).....	Payroll Services
Johanna K. Enos (1977–1994).....	Health Services	Betty L. Holland (1973–1998).....	Communications
George A. Enriquez (1984–2002).....	Facility Services	Alicemae Hollings (1966–1982).....	Foundation
Richard M. Equinoa (1973–2003).....	Career Services	Lillian R. Hooks (1964–1980).....	Library
Donald E. Erickson (1989–2004).....	Computer Science	Catherine Hoover (1945–1946, 1962–1983).....	Science and Mathematics
Robert A. Escobedo (1969–1985).....	Plant Operations	Irene R. Horvath (1950–1983).....	Communicative Arts and Humanities
Juanita Faye Esmon (1972–1991).....	Plant Operations	Lorraine H. Howard (1964–1991).....	Psychological Services
Lloyd R. Evans (1959–1978).....	Grounds	Mary L. Howard (1981–1996).....	Campus Dining
Mary Eyler (1961–1980).....	Financial Aid	Margaret Hoyt (1948–1981).....	El Corral Bookstore
Terri J. Ezell (1975–2003).....	Reprographics	Clara Huffman (1959–1974).....	El Corral Bookstore
James Farrar (1968–1989).....	Facilities Administration	Hazel L. Hunter (1965–1980).....	Evaluations
Patricia A. Eilers Farrow (1957–1972).....	Health Center	Ronald Hurd (1981–2004).....	Financial Aid
Leroy Fauset (1966–1983).....	El Corral Bookstore	Esther Iglesias (1972–1988).....	Philosophy
Albert Felis (1951–1991).....	Plant Operations	Leola H. Imel (1973–2002).....	Library Services
Barbara J. Fenske (1982–2003).....	College of Agriculture	Marie Williams Janolis (1962–1977).....	Engineering Technology
James Fiscalini (1966–1982).....	Farm Shop	Frank Jansen (1971–1992).....	Electronic/Electrical Engineering
Norma M. Fitton (1969–1994).....	Psychology and Human Development	Dorothy Jefferson (1982–1998).....	Minority Engineering
Lana K. Fleming (1974–2002).....	University Police	Edwin Jensen (1976–1993).....	Campus Dining
David Focht (1969–1991).....	Ornamental Horticulture	Elmer R. Johnson (1966–1982).....	Physics
Alice Foy (1962–1987).....	Foundation Business Office	John Johnson (1965–1992).....	Facilities Services
Sidney C. Francis (1984–2000).....	Information Technology Services	Mary L. Johnson (1950–1976).....	Administrative Affairs
Altha Freeman (1967–1988).....	Evaluations	Michael A. Johnson (1975–2002).....	Administration and Finance
Diana G. Frey (1969–2000).....	Animal Sciences	Norm E. Johnson (1957–1998).....	Communications Services
Marcia A. Friedman (1974–2004).....	Academic Records	Connie Jonte (1961–1983).....	Alumni Services
Robert J. Fritts (1965–1985).....	Plant Operations	Clifford A. Kaiser (1988–2004).....	Facility Services
Jack Fryer (1968–1984).....	Foundation Personnel	Joyce Kalicki (1960–1996).....	University Center for Teacher Education
Sandra J. Furtney (1982–2002).....	Disability Resource Center	Frank P. Kassak (1970–2001).....	Reprographics and Mail Services
Melissa G. Gallagher (1978–2002).....	Health Services	Roberta K. Kassak (1974–2003).....	Campus Dining
Judith A. Gallaher-Banfield (1979–2004).....	Landscape Services	Fred C. Kelley (1962–2000).....	Reprographics and Mail Center
Donna D. Gang (1968–1991).....	Student Health Services	Lawrence M. Kennedy (1985–2003).....	University Police
Joan O. Ganous (1984–2004).....	Career Services	Robert Kimble (1963–1992).....	Theatre & Dance
Joseph C. Garcia (1976–2004).....	Mustang Graphics	Jack Kirchner (1969–1990).....	Plant Operations
Edward R. Garner (1967–1998).....	Mechanical Engineering	Carlo D. Klitgaard (1970–2000).....	Journalism
Thomas O. Geiger (1974–2003).....	Facility Services	Edwin Koch (1961–1976).....	Foundation Custodial
Gerard Gentiluucci (1973–1991).....	Plant Operations	Geraldine Krenkel (1972–1998).....	Housing Services
Locksley D. Geoghagen (1977–1999).....	Student Life and Leadership	Catharine T. Krupp (1978–1996).....	Library Services
E. Douglas Gerard (1952–1991).....	Facilities Administration	Edna J. Kuhnes (1969–1984).....	Library
Roy Gersten (1967–1984).....	Associated Students, Inc.	Edith A. Kurtz (1985–2002).....	Facility Services
Jesse S. Gomez (1973–2004).....	Facility Services	Jeanne L. LaBarbera (1984–2000).....	Associated Students, Inc.
John R. Gonzales (1969–1994).....	Facility Services	Dale C. Lackore (1960–1999).....	Campus Dining
Jean Gordon (1969–1992).....	Library Services	Zoilo Lagunday (1977–1991).....	Plant Operations
Janice M. Gould (1960–1995).....	Information Technology Services	Dorothy I. Lambert (1979–2000).....	Fiscal Services
Joan P. Graham (1978–1998).....	Risk Management	Walter M. Lambert (1975–2000).....	Student Life and Activities
Ruth Gran (1957–1975).....	Health Center	George Lancaster (1962–1979).....	Plant Operations
Josephine R. Graves (1964–1982).....	Health Center	S. Dianne Lane (1966–1996).....	Library Services
Margaret Green (1960–1977).....	Food Services	James R. Landreth (1956–1991).....	Business Affairs
Robert Griffin (1976–2002).....	Foundation Executive Office	Ronald J. Larsen (1968–1983).....	Public Safety
Michael C. Grom (1968–1986).....	Plant Operations	Lois L. Larson (1962–1978).....	Health Center
Meri K. Gurnee (1971–2002).....	Art and Design	Frank T. Lebens (1972–2001).....	Administration and Finance
Leonard Hall (1968–1991).....	Plant Operations	Marianne Lefebvre (1968–1984).....	Financial Operations
Joseph C. Hampl (1943–1971).....	Foundation	Ervin A. Lembcke (1962–1980).....	Plant Operations
Danny A. Hampton (1978–2003).....	Facility Services	Alfons P. Lerno (1965–1983).....	Plant Operations
Patricia Harris (1984–2003).....	Student Life and Leadership	Francisco Limon (1961–1991).....	Physical Education and Recreation Admin.
Sandra V. Harris (1973–2000).....	Payroll Services	Neile Lincoln (1968–1992).....	Public Safety
Richard Harrison (1969–1988).....	Art and Design	Wayne Lindsey (1953–1983).....	Farm Shop
Bina Harrison (1972–1997).....	El Corral Bookstore	Joe A. Lipe (1965–1980).....	Plant Operations
Bill Hart (1960–1991).....	Plant Operations	Vernon Lopes (1973–1997).....	College of Agriculture
Dora L. Harter (1968–1983).....	Learning Assistance Center	Richard T. Lorton (1975–2002).....	Facility Services
Florence I. Hauge (1962–1983).....	Library	Robert A. Lucas (1975–1992).....	Graduate Studies and Research
Eugene Haugh (1966–1988).....	Ornamental Horticulture	Irene Lund (1961–1984).....	Foundation
Jill E. Hayden (1984–2000).....	Career Services	Ruth Lundquist (1960–1979).....	Business Affairs
Dell D. Hays (1975–2004).....	Library Services	Patricia S. Lutrin (1976–2002).....	Student Life and Leadership
Walter Heffner (1965–1983).....	Computer Center	Ray Macias (1980–1998).....	Support Services
John A. Heinz (1953–1986).....	Audiovisual Services	Josephine E. Maddalena (1965–1980).....	Physical Education
Norma Henderson (1949–1983).....	Academic Affairs	James Mapes (1961–1977).....	University Police
Kathlene A. Henry Gorman (1982–1997).....	Facility Services	Anne B. Marcell (1961–1982).....	Evaluations
Beverly J. Hensel (1972–1994).....	College of Business	Salvador R. Mares (1974–1991).....	Physical Education and Recreation Admin.
Ferdinand Herriman (1966–1987).....	Plant Operations	Naomi Marks (1970–1993).....	Health Services
Vivian E. Herriman (1973–1998).....	Admissions	Randall Martin (1985–2004).....	Foundation

Anna M. Martinez (1974–1991) .....	Fiscal Operations	Dallis Day Richardson (1975–2004) .....	Facility Services
Alfredo G. Mascorro (1972–2000) .....	Facility Services	Lois J. Richardson (1984–1999) .....	Campus Dining
Marguerite Maxwell (1977–1995) .....	Electrical Engineering	Lorraine Ridgeway (1955–1995) .....	Student Affairs
K. Jon Mayeda (1954–1982) .....	Plant Operations	Paula J. Ringer (1974–1994) .....	Enrollment Support Services
Barbara A. McCaleb (1975–1991) .....	Ornamental Horticulture	Jerry Roberts (1974–1992) .....	Payroll Services
Donald L. McCaleb (1962–1991) .....	Communications and Special Events	Jerry L. Roberts (1983–2004) .....	Payroll Services
Joan E. McCarthy (1976–2004) .....	Psychology and Human Development	Joan Roberts (1958–1980) .....	Foundation
Marion McCoy (1973–1990) .....	Foundation Food Services	Kerry Roberts (1967–1997) .....	El Corral Bookstore
Daniel H. McCready, Jr. (1961–1983) .....	Plant Operations	Henry Robinson (1958–1992) .....	Foundation
Jackie McDaniel (1970–1990) .....	Warehouse	Concho Robles (1985–2002) .....	Facility Services
Dorothy J. McDonald (1963–1985) .....	Telecommunications	Paul B. Rodriguez (1978–2003) .....	Campus Dining
John McGrath (1970–1988) .....	Warehouse	Connie M. Rogalla (1979–2000) .....	University Center for Teacher Education
Jimmie C. McLaughlin (1979–2004) .....	College of Science and Mathematics	Stanley B. Rosenfield (1979–2000) .....	Fiscal Services
Charles A. McMeans (1969–2002) .....	Information Technology Services	William N. Routh (1975–1999) .....	El Corral Bookstore
Wayne E. McMorran (1962–1998) .....	Electrical Engineering	Gerald Rowan (1986–2004) .....	Campus Dining
Sally A. Mello (1981–2001) .....	Associated Students, Inc.	Elizabeth P. Roxburgh (1987–2004) .....	Facility Services
Michael Merrell (1981–2004) .....	Foundation	Robert Salazar (1970–2003) .....	Environmental Health and Safety
Florence H. Mesler (1962–1983) .....	Health Center	Gerolamo Salmina (1969–1991) .....	Plant Operations
Julius F. Metz (1968–1983) .....	Plant Operations	Rafael Sanchez (1970–1991) .....	Plant Operations
Clement R. Michel (1988–2004) .....	Information Technology Services	Al Sanders (1964–1979) .....	Grounds
Viola E. Hughes Milburn (1956–1978) .....	Health Center	Gloria Sanderson (1978–1993) .....	Campus Dining
Robert J. Miller (1960–1980) .....	Business Affairs	Julia Sandoval (1973–1993) .....	Campus Dining
Peggy Milburn (1966–1988) .....	Foundation	Edmond L. Schellenger (1966–1983) .....	Plant Operations
William J. Minshull (1973–2002) .....	Facility Services	Byrle Schoepf (1973–1991) .....	Plant Operations
Diane J. Miramon (1983–2002) .....	Architecture	Stephen M. Schroeder (1970–2001) .....	University Police
David Mosher (1974–1992) .....	Materials Engineering	Robert C. Schumacher (1982–2000) .....	University Police
A. Teresa Mounier (1970–1986) .....	Purchasing	Ralph Schurtz (1949–1973) .....	Custodial Services
Nancy Muir (1962–1991) .....	Psychological Services	Mary E. Scrivner (1966–1983) .....	Academic Programs
George Mulder (1968–1991) .....	Counseling Services	Virginia A. Severa (1984–2002) .....	Academic Records
Shirley F. Muniz (1988–2004) .....	Natural Resources Management	Pauline Shaffer (1957–1989) .....	Foundation Food Services
Dorothy M. Munro (1964–2004) .....	Distribution Services	Donald K. Shemenske (1982–1999) .....	Foundation Business Office
Robert Myers (1967–1988) .....	Architecture	Virginia Shober (1988–2004) .....	Library
Valdora Myers (1960–1978) .....	Health Center	Tania Shwetz (1969–1992) .....	School of Liberal Arts
Edward M. Naretto (1979–2003) .....	Facility Services	Alexandria W. Sidah (1968–2000) .....	Administration and Finance
Harold A. Nash (1947–1974) .....	Power Plant	Jerome Silbert (1979–2002) .....	Facility Services
Donna D. Nash (1980–1998) .....	Campus Dining	Joseph V. Silva (1977–1997) .....	Facility Services
James Neal (1954–1990) .....	Foundation	Sue Y. Simenz (1984–2004) .....	Animal Science
James G. Neelands (1957–1991) .....	School of Science and Mathematics	Diane E. Simoes (1979–2000) .....	Extended University Programs
Rodney K. Neubert (1979–2001) .....	Associated Students, Inc.	Yvonne M. Simpkins (1984–2001) .....	Health Services
Avice I. Nolan (1960–1980) .....	Audiovisual	David L. Simpson (1966–1999) .....	Campus Dining
Edward L. Nolan (1953–1979) .....	Mechanical Engineering	Darlene L. Slack (1983–2003) .....	University Advancement
Eugene Nowicki (1976–2001) .....	Facility Services	Mary Smith (1960–1988) .....	Personnel and Employee Relations
Stella M. Nuncio (1962–1993) .....	Learning Resources and Curriculum	Patrick D. Smith, Jr. (1975–2003) .....	College of Engineering
Margot R. Ochoa (1973–1996) .....	Support Services Purchasing	David H. Snyder (1970–1989) .....	Enrollment Support Services/Admiss.
Aldyth O'Brien (1979–1992) .....	Agricultural Engineering	Alice Soto (1976–1997) .....	El Corral Bookstore
Jack O'Dell (1953–1986) .....	Foundation	Daniel Soto (1979–1999) .....	Facility Services
Isao Okada (1973–2002) .....	Chemistry and Biochemistry	Ethel Spry (1962–1985) .....	Associated Students, Inc.
Carol L. Osgood (1978–2001) .....	Modern Languages and Literatures	James Stacy (1970–1988) .....	Audio Visual Services
Lee Owen (1946–1978) .....	Plant Operations	Estelle S. Stanhill (1984–1999) .....	Intercollegiate Athletics
L. Ruth Palmer (1971–1987) .....	Foundation Business Office	Nettie L. Steels (1978–1998) .....	Facility Services
Elizabeth S. Patterson (1982–2001) .....	Political Science	Marcie Steger (1962–1979) .....	Food Services
Kathryn Patterson (1960–1982) .....	Procurement and Support Services	Joan M. Stevens (1976–2003) .....	Earth and Soil Sciences
Jacqueline S. Paulsen (1976–2000) .....	University Police	Martha J. Steward (1977–1994) .....	College of Architecture and Env. Design
Alfred J. Pelucca (1956–1971) .....	Custodial Services	Walter Stier (1970–1991) .....	School of Architecture and Env. Design
Audun Pettersen (1973–2000) .....	Food Science and Nutrition	Elisa Story (1973–1994) .....	Enrollment Support Services
Armando Pezo-Silva (1973–2002) .....	Student Academic Services	Mary Jo Summers (1962–1980) .....	Health Center
Peter K. Phillips (1968–1997) .....	Facilities Planning	Frank Y. Sweeney (1963–1983) .....	Plant Operations
Wilma Pierce (1971–1988) .....	Foundation	Meredith R. Takken (1976–2000) .....	Financial Aid
Judith G. Pinkerton (1963–2004) .....	Library	Alfred Tartaglia (1970–1991) .....	Plant Operations
Shirley L. Platt (1978–1997) .....	Fiscal Services	Harold S. Tartaglia (1969–1986) .....	Plant Operations
Ellen B. Polinsky (1985–2003) .....	Career Services	Richard A. Tartaglia (1959–1989) .....	Plant Operations
Donna Porter (1962–1986) .....	Student Health Services	Thomas W. Tarwater (1981–2003) .....	Facility Services
June Powell (1947–1991) .....	University Relations	John J. Teclaw (1987–2002) .....	Chemistry and Biochemistry
Gerald N. PUNCHES (1971–1992) .....	Enrollment Support Services	Joanne N. Temple (1978–1998) .....	Information Technology Services
Helen PUNCHES (1973–1992) .....	University Outreach	Melvin Thomas (1960–1992) .....	Facilities Services
Braulio Quezada (1972–2003) .....	Horticulture and Crop Science	Linda Lee Thoresen (1984–2001) .....	Associated Students, Inc.
Joan M. Radabaugh (1980–1994) .....	Ornamental Horticulture	Richard P. Tibbetts (1972–1996) .....	Information Technology Services
Infante V. Ramelb (1985–2000) .....	El Corral Bookstore	Gwen Tognazzini (1983–1999) .....	Financial Aid
Judy K. Ramos (1979–2000) .....	Academic Records	Yvonne B. Toma (1983–2002) .....	Horticulture and Crop Science
John Rankin (1974–1991) .....	Facility Services	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
Nancy J. Vilkitis (1972–2003)	Administration and Finance
Michael A. Voth (1977–2004)	Campus Dining
Gerry D. Wagner (1967–1993)	Dairy Science
Richard Walker (1979–1996)	Campus Dining
William C. Wallace (1970–2000)	University Center for Teacher Education
Julia R. Waller (1983–2004)	Financial Aid
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 Wettlaufer (1960–1976)	Audiovisual
Gerald Whiteford (1960–1983)	El Corral Bookstore
Lee A. Whitmer (1975–2004)	Fiscal Services
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
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. Zsadyani (1976–2002)	Foundation – CADRC

**OUTSTANDING STAFF EMPLOYEE AWARD**

The 1972–73 academic year saw the inception of the Outstanding Staff Employee Award. This honor is bestowed upon permanent, full-time employees of the university, Foundation, or Associated Students, Inc. who are in at least their third year of employment at Cal Poly. In order to be considered for this award, an employee should be truly dedicated and loyal; exhibit expertise in job performance; demonstrate a willingness to assist others enthusiastically; take initiative in making his or her department more efficient and productive; maintain an excellent relationship with co-workers, faculty, and students; and make contributions to both the university and the community. Nominations are solicited from staff employees, faculty members, and department or division heads. Selection of the awardees is made by a committee of former recipients of the award. Outstanding Staff Employees Award recipients are listed here.

1972-73	Everette Dorrrough	1988-89	Debbie Arseneau
1973-74	Vic Allen		June Powell
	Florence Hauge		Jacquie Rossi
	Lionel Middlecamp	1989-90	Grace Arvidson
	Jim Neelands		Janet Carlstrom
1974-75	Robert Baldrige		Ronald Christensen
	John Lee	1990-91	Barbara Ciesielski
	Gerry Wagner		Harriet Clendenen
	Arthur Young		Harriet Ross
1975-76	Merriam Erickson	1991-92	Wanda Bolt
	Viola Hughes		Pam Parsons
	Mary Johnson		Joe Risser
	Boyd Wettlaufer	1992-93	Rosemary Bowker
1976-77	Trudy Beck		Deborah L. Brothwell
	Stella Nuncio		Andy McMeans
1977-78	Luther Bertrando	1993-94	Connie Davis
	Pauline Shaffer		Jim McLaughlin
	Joanna DeRosier		Richard Tibbetts
1978-79	Harold Miller	1994-95	Francesca Fairbrother
	Doris Anderson		Joyce Kalicicki
	Richard Tartaglia		Lorraine Ridgeway
	Frank Lebens	1995-96	George Enriquez
1979-80	Dale Lackore		Cynthia Jelinek
	Steven Riddell		Carol Montgomery
	Joan Roberts	1996-97	Kristina Pena
1980-81	Joan Cirone		Don Shemenske
	Farlin Halsey		Judy Swanson
	Irene Lund	1997-98	Richard Equinoa
1981-82	James Neal		Pat Harris
	Connie Jonte		Nettie Steels
	Frank Kassak	1998-99	Darrell Blankenship
1982-83	Barbara Lund		Delores Estrada
	Larry Grimes		Rosemary Wagner
	Norman Johnson	1999-00	Bonnie Krupp
1983-84	Jerald (Louie) Budoff		Druci Reese
	Walter Clark		Ellen Stier
	Gail Simmons	2000-01	Donna Amos
1984-85	Alfred W. Amaral		Stacey Breitenbach
	Ethel Spry		Joyce Haratani
	Kathleen Lamoree	2001-02	Margaret Booker
1985-86	James Landreth		Judy Drake
	Geraldine Montgomery		Jimmy Ray Motley
	Vicki Stover	2002-03	Sue Bethel
1986-87	Lee Brown		Jim Gerhardt
	Gary Ketcham		Bonnie Long
	French Morgan	2003-04	Carol Erickson
1987-88	Lynette Klooster		Lori La Vine
	Judi Pinkerton		Bob Pinkin
	Nancy Raetz		

# Faculty and Staff

(Number in parentheses indicates year of appointment)  
Listed as of February, 2005.

- 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.
- ABRAMS, JESSICA R. (2003)..... Communication Studies  
B.A., California State University, Long Beach, 1994; M.A., 1997; Ph.D., University of California, Santa Barbara, 2003. Assistant Professor.
- 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.
- AELTS, 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 ehumanCertification.
- 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.
- 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.
- AMSPACHER, WILLIAM H. (1985) ..... Agribusiness  
B.S., Clemson University, 1978; M.S., 1980; Ph.D. University of California, Davis, 1988. Professor.
- ANDERSON, JAMES A. (1987) ..... Accounting  
B.A., DePauw University, 1968; Ph.D., Washington University, 1973. Professor Emeritus.
- 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 Emeritus.
- 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.
- 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., Penn State University, 2000. Assistant Professor.
- ARCENEAUX, 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.
- ARRIVÉE, DAVID A. (2004) ..... Music  
B.A., Princeton University, 1993; M.Mu., Boston University, 1995; D.M.A., Northwestern University, 2004. 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.
- ARVIZU-RODRIGUEZ, MARIA (1987).....Student Academic Services  
B.S., California Polytechnic State University, San Luis Obispo, 1987. Academic Advisor/Instructor; 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.
- ASPLUND, RICHARD (1999) ..... Orfalea College of Business  
B.S., California Polytechnic State University, San Luis Obispo, 1960; M.A., 1992. Director of Computer Lab.
- ATRÉ, 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.S., 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.
- AZEVEDO, JOHN (2001) ..... Intercollegiate Athletics  
B.A., California State University, Bakersfield, 1982. Head Coach.
- 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 and Department Chair.
- 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) ..... Academic Personnel  
B.A., University of California, Riverside, 1975; M.A., Pepperdine University,  
1975. Director, Employment Equity and Faculty Recruitment.
- BAIN, ALEX (2004) ..... English  
B.A., Duke University, 1994; M.A., Rutgers University, 1999; Ph.D., 2004.  
Assistant Professor.
- BAKER, CHRIS (2001) ..... Intercollegiate Athletics  
B.S., California Polytechnic State University, San Luis Obispo, 1997. Interim  
Associate Athletic Director of Advancement.
- BAKER, WARREN J. (1979) ..... President  
B.S., University of Notre Dame, 1960; M.S., 1962; Ph.D., University of New  
Mexico, 1966. President.
- BALL, STEPHEN W. (1983) ..... Philosophy  
B.A., Purdue University, 1972; M.A., University of Michigan, 1973; Ph.D., 1978.  
Professor.
- 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. (1984) ..... Financial Aid  
B.S., California Polytechnic State University, San Luis Obispo, 1990; M.A., 1994.  
Financial Aid 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, 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 Emeritus.
- BECKETT, JONATHON L. (1998) ..... Animal Science  
B.S., University of Wisconsin-River Falls, 1989; M.S., University of California,  
Davis, 1992; Ph.D., 1996. Associate Professor.
- 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, ANYA (2003) ..... Student Academic Services  
B.A., California State University, Chico, 2001; M.A., California Polytechnic State  
University, San Luis Obispo, 2003. Academic Advisor/Instructor.
- BERGMAN, SKY (1995) ..... Art and Design  
B.S., University of South Florida, 1987; M.F.A., University of California, Santa  
Barbara, 1991. 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. 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 Emeritus.
- BETHEL, A. C. W. (1968) ..... Philosophy  
B.A., University of California, Santa Barbara, 1964; M.A., 1968; Ph.D., 1974.  
Professor Emeritus.
- BEUG, JAMES L. (1973) ..... Computer Science, Computer Engineering  
B.A., Northwestern University, 1962; Sc.M., Ohio State University, 1971; Ph.D.,  
1974. 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. Registered  
Professional Engineer, Ohio.
- 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.
- BOMSTAD, LINDA (1994) ..... Philosophy  
B.A., University of California, Davis, 1974; M.A., 1976; Ph.D., 1982. Associate  
Professor.
- BOONE, JOSEPH C. (1968) ..... Physics  
B.A., Earlham College, 1962; M.A., University of Wisconsin, 1967; Ph.D., 1970.  
Professor Emeritus.
- 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.D., 1992. Assistant Professor.



- BOSWELL, MICHAEL R. (1998)..... City and Regional Planning  
B.A., University of Central Florida, 1989; M.S.P., Florida State University,  
Tallahassee, 1991; Ph.D., 2000. 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.
- BRADY, PAMALEE (1998)..... Architectural Engineering  
B.S., California Polytechnic State University, San Luis Obispo, 1979; M.S.,  
University of California, Berkeley, 1980; Ph.D., University of Illinois, Urbana-  
Champaign, 2004. Associate 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. Assistant Dean,  
Access and Bibliographic Services.
- 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 and Interim Department Head.
- BRODIE, DAVID A. (1970)..... Architecture  
B.Arch., University of Capetown, South Africa, 1953; M.Arch., University of  
California, Berkeley, 1964. Professor Emeritus.
- BROMLEY, KEVIN (1995)..... Intercollegiate Athletics  
B.A. Colorado State University, 1983; M.Ed., 1984. Head Coach.
- 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.A., California Polytechnic State University, San Luis Obispo, 1976. Associate  
Director, Budget and Analytic Business Services.
- BROWN, CARL R.V. (1982)..... College of Education  
B.A., Arizona State University, 1971; M.A., 1972; Ph.D., Stanford University,  
1977. Professor of English, and Associate Dean, College of 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, 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.
- BUFFA, ANTHONY J. (1970)..... Physics  
B.S., Rensselaer Polytechnic Institute, 1964; M.S., University of Illinois, 1966;  
Ph.D., 1969. Professor.
- BURD, MATTHEW A. (2003)..... Animal Science  
B.S., University of Wisconsin-Madison, 1987; M.S., San Jose State University,  
1991; D.V.M., University of California, Davis, 1996. Associate Professor.
- BURGUNDER, LEE B. (1983)..... Accounting  
B.A., Dartmouth College, 1977; M.B.A., Stanford University, 1981; J.D., 1981.  
Professor.
- 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, SHELL A. (1973)..... Career Services  
B.A., University of California, San Diego, 1971; M.A., California Polytechnic  
State University, San Luis Obispo, 1981. Interim Director, Career Services and  
Testing Center.
- 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)..... Student Affairs  
B.A., University of California, Irvine, 1977; M.A., American University,  
Washington, D.C. 1979. Associate Vice President.
- CANO, RAÚL J. (1974)..... Biological Sciences  
B.S., Eastern Washington State College, 1970; M.S., 1972; Ph.D., University of  
Montana, 1974. Professor Emeritus.
- 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, 2000. Financial Aid 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)..... Orfalea College of Business, Accounting  
B.A., University of Nebraska, 1987; M.A., University of California, Los Angeles,  
1998; J.D., Santa Clara University, 1990. Associate Dean and Professor.
- CARR, JANICE L. (1983)..... Accounting  
B.S., California State University, Northridge, 1971; M.S., 1975; Ph.D., Arizona  
State University, 1985. Professor. Certified Public Accountant.
- 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.S., 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.
- CHADWELL, CHARLES (2003)..... Civil and Environmental Engineering  
B.S., University of California, Berkeley, 1997; Ph.D., 2003. Assistant Professor.  
Registered Professional Engineer, California.
- 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.
- CHATZIOANOU, 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)..... College of 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.
- CHOI, DON H. (2003)..... Architecture  
A.B., Princeton University, 1988; M.Arch., Rice University, 1993; Ph.D., U.C.  
Berkeley, 2003. Assistant Professor.
- CHRISTY, DAVID P. (2004)..... Orfalea College of Business  
B.S., University of Dayton, 1972; M.Ed., University of Georgia, 1979; Ph.D.,  
1984. Dean.
- 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, RUSSELL P., MAJ (2002)..... Military Science  
B.S., Mesa State College, 1983; M.A., Chapman University, 2001. Assistant  
Professor and Department Head.
- 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.
- 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.
- COLOMÉ, JAIME S. (1972)..... Biological Sciences  
B.A., University of California, Santa Barbara, 1966; M.A., 1973; Ph.D., 1974.  
Professor Emeritus.
- 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. Registered  
Professional Engineer, California
- CONDON, JENNY (2004)..... Intercollegiate Athletics  
B.S., Iowa State University, 1991. Head Coach.
- CONE, ALISON (1994)..... Intercollegiate Athletics  
B.S., Washington State University, 1975; M.A., Cal State Dominguez Hills, 1990.  
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; MA, 2004.  
Assistant Director for Programs.
- CONOVER, MARK (1996)..... Intercollegiate Athletics  
B.S., Humboldt State University, 1983; M.S., California Polytechnic State  
University, San Luis Obispo, 1989. Head Coach.
- CONWAY, JAMES R. (1969)..... Communication Studies  
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.
- 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 Emeritus.

- COOPER, ALLAN R. (1975)..... Architecture  
B.S., Rice University, 1967; B.Arch., 1968; M.Arch., Cornell University, 1971.  
Professor. AIA, Registered Architect, California.
- COOPER, KEVIN (2005)..... Graphic Communication  
B.S., California Polytechnic State University, San Luis Obispo, 1980; M.B.A.,  
University of Southern California, 1990. Assistant Professor.
- COOPER, MARK A. (1978)..... Industrial and Manufacturing Engineering  
B.S., California State Polytechnic College, 1968; M.S., Arizona State University,  
1978. Professor Emeritus.
- 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.
- COSTELLO, MICHAEL J. (1999)..... Horticulture and Crop Science  
B.S., California Polytechnic State University, San Luis Obispo, 1981; Ph.D.,  
University of California, Berkeley, 1992. Assistant Professor. Pest Control  
Advisor.
- 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.
- COZZI, DIANA (1998)..... Associated Students, Incorporated  
B.S., California State University, Fresno, 1980; M.A., California Polytechnic  
State University, San Luis Obispo, 1990. 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.
- CROCKETT, ROBERT (2003)..... Industrial and Manufacturing Engineering  
B.S., University of California, Berkeley, 1989; M.B.A., Pepperdine University,  
1992; Ph.D., University of Arizona, 1997. Assistant Professor.
- CROZIER, ALEX (1992)..... Intercollegiate Athletics  
B.S., California Polytechnic State University, San Luis Obispo, 1984. Head  
Coach.
- 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.Urb.Plan., 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.
- DANIELS, DENISE H. (2003)..... Psychology and Child Development  
B.A., University of California, Santa Barbara, 1982; M.A., Pacific Oaks College,  
1983; Ph.D., University of California, Los Angeles, 1992. Associate Professor.
- D'ACQUISTO, JOSH (2002)..... Associated Students, Incorporated  
B.S., California Polytechnic State University, San Luis Obispo, 1995. Assistant  
Director for 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)..... College of Education  
B.A., Brooklyn College, 1966; M.A., 1972; Ph.D., Stanford University, 1976.  
Professor.
- DAVIDMAN, PATRICIA (1992)..... College of 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, GERALD E. (2001)..... Health and Counseling Services  
R.Ph., Drake University, 1961. Pharmacist.
- 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, STEVE 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. Associate  
Professor.
- DeCOSTA, JEAN (1994)..... Dean of Students  
B.A., San Francisco State University, 1972; M.S., California Polytechnic State  
University, San Luis Obispo, 1986; Ph.D., Fielding Institute, 1993. Dean of  
Students.
- 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.
- DeLAURE, MARILYN E. (2003)..... Communication Studies  
B.A., Drake University, 1993; M.A., University of Iowa, 1996; Ph.D., University  
of Iowa, 2000. Assistant Professor.
- DELMORE, JR., ROBERT J. (2003).....  
B.S., California Polytechnic State University, San Luis Obispo, 1991; M.S.,  
University of Nebraska, 1993; Ph.D., Colorado State University, 1998. Associate  
Professor.
- 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 and Department Chair.
- 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.
- 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.
- DERELIAN, DORIS (2004)..... Food Science and Nutrition  
B.S., California State University, Fresno, 1966; M.S., University of California,  
Davis, 1973; Ph.D., University of California, Los Angeles, 1993; J.D., University  
of California, Davis, 2001. Professor and Department Head. Registered Dietitian.

- 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.
- DEWEILER, ROBERT C. (1998) ..... Academic Affairs  
B.A., Humboldt State University, 1960; M.A., San Francisco State University, 1968; Ph.D., University of Washington, 1968. Trustee Professor, Special Assistant to the President, and Interim Provost and Vice President for Academic Affairs.
- 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.
- DIASSEMI, MANOCHER (2003) ..... Industrial Technology  
B.S., University of Science and Technology, Tehran, 1977; M.S., University of Wisconsin-Milwaukee, 1990; Ph.D., 1994. Associate Professor.
- 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. Professor.
- 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 Emeritus.
- 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, 1969; 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.
- DISANTO, THOMAS L. (2003) ..... Architecture  
M.Arch., California State Polytechnic University, Pomona, 1989; B.Arch, 1997; Ecole D'Architecture De Paris, La Defense, 1999. Assistant Professor.
- 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. Professor.
- DOI, JIMMY A. (2003) ..... Statistics  
B.A., California State University, Northridge, 1995; M.S., North Carolina State University, 1998; Ph.D., 2003. Assistant Professor.
- DOMINGUES, ANTHONY (1985) ..... Admissions  
B.S., California Polytechnic State University, San Luis Obispo, 1979. Senior Assistant Director.
- DOMINGUEZ, ANGÉLICA (2004) ..... Student Academic Services  
B.A., University of California, Santa Barbara, 2003. Educational Talent Search Outreach Counselor/Advisor.
- DOMINGUEZ, EDDIE (2003) ..... Student Life and Leadership  
B.S., Fresno State University, 1997; M.A., University of Phoenix, 1999. Coordinator, Greek Affairs.
- DOMINGUEZ, ROJEAN Y. (1994) ..... Health and Counseling Services  
B.S., Central Michigan University, 1972; M.P.H., University of Michigan, 1997. Health Educator.
- DOMPKE, 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  
B.S., California State Polytechnic College, 1966; M.B.A., College of William and Mary, 1971. Professor.
- DOYLE, D. GREGG (2002) ..... City and Regional Planning  
B.A., University of California, Berkeley, 1989; M.U.R.P., University of Washington, 1994; Ph.D., University of California, Los Angeles, 2003. 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) ..... 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 and Department Chair.
- DUKE, JULIETTE (2004) ..... Housing and Residential Life  
B.S., Barry University, 1997; M.Ed., University of South Florida, 2001. Learning Community Coordinator.
- 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) ..... College of Education  
B.A., California State University, Fresno, 1990; Ph.D., Stanford University, 1998. Associate 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.
- EFENDI, JAP (2004) ..... Accounting  
B.B.A., Texas A&M University, College Station, 1995; M.S., 1996; Ph.D., 2004. Associate Professor.
- 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.
- ELROD, SUSAN L. (1997)..... Biological Sciences  
B.S., California State University, Chico, 1986; Ph.D., University of California, Davis, 1995. Associate Professor.
- ELTZROTH, THOMAS E. (1967)..... Horticulture and Crop Science  
B.S., Ohio State University, 1965; M.S., 1966. Professor Emeritus.
- EMENAKER, JOSEPH (1994)..... Orfalea College of Business  
B.S., California Polytechnic State University, San Luis Obispo, 1998. System Administrator/Programmer.
- 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, 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.
- 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)..... Communication Studies  
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. 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 Jayawardenepura, 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.
- 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.
- 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. Associate 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.
- FLOYD, BARRY (1990)..... Management  
B.S., Michigan State University, 1973; M.S., 1974; M.B.A., University of Michigan, 1983; Ph.D., 1985. Professor.
- FOLGER, ROBERT (2004)..... Financial Aid  
B.A., University of Arizona, 1998. Financial Aid Counselor.
- 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 Emeritus.
- FRANKLIN, 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.
- 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 Emeritus.  
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  
Emeritus.
- FRIEDMAN, MARCIA A. (1973).....Academic Records  
B.S., California Polytechnic State University, San Luis Obispo, 1984. Records  
Process Manager.
- FRIEND, KATHLEEN D. (2000).....Liberal Studies  
B.S., Northern Illinois University, 1967; M.S., Ohio State University, 1968;  
Ph.D., University of Oregon, 1989. Assistant Professor.
- FRISCH, SHERYL (1990).....Art and Design  
B.A., University of California, Riverside, 1983; M.A., 1988. Visual Resource  
Specialist.
- 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. Interim Director.
- 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.
- 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 Emeritus.
- 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.
- GARDINER, 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.
- 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.
- GELLING, JUNE A. (2004).....Health and Counseling Services  
B.S., University of California, Santa Barbara, 1980; Pharm.D., University of  
Southern California, 1986. Pharmacist-in-Charge.
- GENTILUCCI, JAMES L. (2003).....College of Education  
B.A., California State University, Northridge, 1980; M.A., California Polytechnic  
State University, San Luis Obispo, 1985; Ph.D., University of California, Santa  
Barbara, 2001. Assistant Professor and Ed.D. Program Coordinator.
- 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.
- GHARIBYAN, HASMIK (2000).....Computer Science  
M.S., Yerevan State University, Republic of Armenia, USSR, 1981; Ph.D., 1991.  
Associate 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.
- GIROLO, JACK (1970).....Mathematics  
B.A., San Jose State College, 1964; M.S., Iowa State University, 1966; Ph.D.,  
1971. Professor Emeritus.
- 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.
- GODIN, STEVE (2001).....University Foundation  
B.S., Boston College, 1968. Director, Mustang Graphics.
- 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, MARNI (2003).....Natural Resources Management  
B.S., California State University, Sacramento, 1995; M.S., Purdue University,  
1997; Ph.D., University of Minnesota, 2002. Assistant Professor.
- GOLDENBERG, STUART (1970).....Mathematics  
B.S., University of California, Los Angeles, 1965; M.S., University of California,  
Riverside, 1969; Ph.D., 1970. Professor Emeritus.
- 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. Associate Professor.

- GRANNEMAN, GARY A. (1978).....Electrical Engineering  
B.S., Iowa State University, 1962; M.S., 1972; Ph.D., 1978. Professor Emeritus.  
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. Assistant 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. 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 Personnel, 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.
- GRUNDMEIER, TODD A. (2004).....Mathematics  
B.S., University of New Hampshire, 1997; M.S., 2000; Ph.D., 2003. Assistant  
Professor.
- GU, CAIXING (1998).....Mathematics  
B.S., Zhejiang University, 1982; M.S., China Textile University, 1986; Ph.D.,  
Indiana University, 1994. Associate Professor.
- HAGEN, CHARLES T. (1980).....Philosophy  
B.A., Harvard University, 1968; M.A., University of Michigan, 1977; Ph.D.,  
1981. Professor.
- HALISKY, LINDA H. (1984).....College of Liberal Arts, English  
B.A., Whittier College, 1968; M.A., University of California, Riverside, 1978;  
Ph.D., 1984. Interim Dean, College of Liberal Arts, and Professor.
- 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  
and Department Chair. 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.
- HAMILTON, STEPHEN (2004).....Economics  
B.A., University of California, Santa Barbara, 1991; M.S., University of  
California, Berkeley, 1994; Ph.D., 1996. Associate Professor.
- HAMMOND, AMIE (2000).....Associated Students, Incorporated  
B.A., Occidental College, 1995; M.A., New York University, 1998. Program  
Coordinator.
- 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.
- HAN, BING (2004).....Finance  
B.Eng., University of Science and Technology of China, 1993; M.A., University  
of Chicago, 1996; M.S., Stanford University, 2000; Ph.D., 2002. Associate  
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.
- 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).....Architecture  
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, DAVID L. (2004).....Health and Counseling Services  
B.S., California State University, Long Beach, 1971; M.D., University of East  
Quezon City, 1976. Physician.
- 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, KATHLEEN C. (2003).....College of Education  
B.A., Douglass College, Rutgers University, 1971; M.Ed., Rutgers University,  
1972; Ph.D., Temple University, 1981. Associate Professor.
- HARRIS, TERRANCE L. (2004).....Admissions  
B.S., California Polytechnic State University, San Luis Obispo, 2003. Admissions  
Officer.
- 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).
- HAUNGS, MICHAEL L. (2003).....Computer Science  
B.S., University of California, Berkeley, 1992; M.S., Clemson University, 1998;  
Ph.D., University of Davis, 2002. Assistant Professor.
- 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.
- HAWES, MICHAEL (1967).....Electrical Engineering  
B.Eng., University College, Dublin, Ireland, 1958; M.S., Ohio State University,  
1967. Professor Emeritus. 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.
- 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. Associate Professor. Pest Control Advisor, California.
- HEENAN, BRET (2004).....College of Engineering  
B.S., California Polytechnic State University, San Luis Obispo, 1997. Web Administrator.
- 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.
- HELMBRECHT, BRENDA (2004).....English  
B.A., Truman State University, 1997; M.A., Miami University, 1999; Ph.D., 2004. Assistant Professor, and Director of Writing.
- 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. Professor.
- HERNANDEZ, ANITA (1999)..... College of 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)..... College of 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.
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B.S., Western Washington University, 1980; Ph.D., University of Oregon, 1998. Assistant Professor.
- HILTPOLD, PAUL (1989)..... History  
B.A., University of Texas, 1974; M.A., 1976; Ph.D., 1981. 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 Emeritus. Registered Professional Engineer, California, Oregon, Great Britain.
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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 Emeritus.
- 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 Emeritus.
- HOOD, J. MYRON (1977)..... Mathematics  
B.A., Grinnell College, 1963; M.S., Northwestern University, 1965; Ph.D., Washington University, 1970. 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.
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B.A., California State University, 1974; M.Sc., University of Florida, 1982; Ph.D., Texas A&M University, 1987. Professor.
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B.S., University of California, Santa Cruz, 1975; M.S., University of Chicago, 1978; Ph.D., 1983. Executive Assistant to the President.
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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.
- HUGHES, STEPHEN (1997)..... Orfalea College of Business  
B.A., Colorado College, 1971. Media Presentation Specialist.
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B.S., Queens College, 1990; M.S., 1992; M.E., Teachers College of Columbia University, 1995; Ed.D., 1997. Associate Professor.
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B.S., California Polytechnic State University, San Luis Obispo, 1987. Director, Facility Services.
- HURLEY, SEAN P. (2002)..... Agribusiness  
B.A., University of San Francisco, 1994; Ph.D., Iowa State University, 2000. Assistant Professor.
- HURST, JENNIFER A. (2003)..... Housing and Residential Life  
B.A., University of Massachusetts – Amherst, 1992; M.A., University of Massachusetts – Boston, 1996; M.Ed., University of Massachusetts – Amherst, 1999. Learning Community Coordinator.
- IDDINGS, GAYLE (1991)..... Physics  
B.Sc., Imperial College, London, 1973; M.S., University of Colorado, 1977; Ph.D., 1982. Professor.
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B.S., California Polytechnic State University, San Luis Obispo, 1988; M.A., 1996. Assistant Vice Provost for Systems and Resource Management.
- IMMOOS, CHAD E. (2004)..... Chemistry and Biochemistry  
A.B., Occidental College, 1996; Ph.D., University of California, Irvine, 2002. Associate Professor.
- INCHAUSTI, ROBERT L. (1984)..... English  
B.A., California State University, Sacramento, 1974; M.A., 1976; Ph.D., University of Chicago, 1981. Professor.
- 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. Professor. Class A General Contractor, Virginia. Designated Design-Build Professional (DBIA).
- JACKSON, LORRAINE D. (1992)..... Communication Studies  
B.A., University of Western Ontario, 1987; M.A., Pennsylvania State University, 1989; Ph.D., 1992. Associate Professor.



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B.A., Montclair State College, 1962; Ph.D., Cornell University, 1966. Professor  
Emeritus.
- JANKAY, PETER T. (1973)..... Biological Sciences  
B.A., San Fernando Valley State College, 1966; M.S., 1969; Ph.D., University of  
California, Santa Barbara, 1973. Professor Emeritus.
- 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. Associate Professor.
- JANOWICZ, ROSEMARIE (1993)..... Health and Counseling Services  
B.S., California Polytechnic State University, San Luis Obispo, 1978. Clinical  
Laboratory Scientist.
- JANSEN, DANIEL (2003)..... Civil and Environmental Engineering  
B.S., University of California, San Diego, 1988; Ph.D., Northwestern University,  
1996. Assistant Professor.
- JAQUES, JODI D. (2001)..... College of Education  
B.A., Saint Mary's College of California, 1986; M.Ed., Virginia Polytechnic  
Institute and State University, 1993; Ph.D., University of Virginia, 2000. Assistant  
Professor.
- JASTER, EDWIN H. (1992).....Dairy Science  
B.S., University of Wisconsin, 1970; M.S., University of Arizona, 1977; Ph.D.,  
1979. Professor.
- JAVADPOUR, ROYA (2003)..... Industrial and Manufacturing Engineering  
B.S., Isfahan University of Technology, 1993; M.S., Louisiana State University,  
1996; M.S., 2000; Ph.D., 2001. Assistant 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, BETTY S. (2001).....College of Liberal Arts  
B.A., California Polytechnic State University, San Luis Obispo, 1995; M.A.,  
2000. Academic Advisor.
- JENNINGS, CHARLES W. (1968)..... Art and Design  
B.A., Wheaton College, 1966; M.A., M.F.A., Northern Illinois University, 1968.  
Professor Emeritus.
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B.A., San Jose State University, 1972; M.A., 1976; M.F.A., 1983. Professor.
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B.S., U. La Salle, Mexico City, 1981; M.S., Cornell University, 1984; Ph.D.,  
University of California, Davis, 1989. Professor..
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B.S., Tsinghua University, Beijing, China, 1992; M.S., 1996; Ph.D., University of  
Illinois at Urbana-Champaign, 2001. Assistant Professor.
- 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.
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B.S., California Polytechnic State University, San Luis Obispo, 1978; M.A., 1998.  
Career Counselor.
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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.  
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.
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B.S., California Polytechnic State University, San Luis Obispo, 1979.  
Admissions Communications Lead.
- JONES, DANE R. (1976)..... Chemistry and Biochemistry  
B.A., University of Utah, 1969; Ph.D., Stanford University, 1974. Professor.
- JONES, R. THOMAS (2003)..... College of Architecture and Environmental Design  
B.Arch., Cornell University, 1969. Dean. AIA, Registered Architect, California.
- 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. Associate  
Professor.
- JUNCO, MARIA L. (1989)..... Theatre and Dance  
B.A., University of California, Los Angeles, 1985; M.A., 1988. Professor. 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.  
Associate 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.
- 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/Learning  
Disabilities Specialist. Licensed Psychologist, California.
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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.
- KANTOROWSKI, ERIC J. (2004)..... Chemistry and Biochemistry  
B.S., California State University, Fullerton, 1993; Ph.D., University of California,  
Davis, 1998. Associate Professor.
- 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. 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.
- KAUL, ANTON (2003)..... Mathematics  
B.S., University of California, Davis, 1994; M.S., Oregon State University, 1996;  
Ph.D., 2000. Assistant Professor.
- KEAN, ANDREW J. (2004)..... Mechanical Engineering  
B.E., The Cooper Union, 1997; M.S., University of California, Berkeley, 1999;  
Ph.D., 2003. Assistant 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.
- 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.
- KEESE, JAMES R. (2003)..... Social Sciences  
B.S., California Polytechnic State University, San Luis Obispo, 1987; M.A., American Graduate School of International Management, 1989; Ph.D., University of Arizona, 1996. Assistant Professor.
- 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. (1989)..... 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. Associate 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.
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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.
- 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 Emeritus. 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)..... College of 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.
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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. Associate 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.
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B.S., Western Washington University, 1996; Ph.D., Stanford University, 2002. Assistant Professor.
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B.S., Washington University, 1972; Ph.D., University of California, Berkeley, 1979. Professor.
- 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)..... College of 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.
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B.S., University of California, Irvine, 1990. Head Coach.
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B.A., Loma Linda University, 1987; M.A., New York University, 1989; Ph.D., The Graduate Center of the City University of New York, 1998. Associate Professor and Department Chair.
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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.

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B.S., California Polytechnic State University, San Luis Obispo, 1992; M.S.,  
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M.Arch., University of Oregon, 1977. Professor. Registered Architect, Oregon.
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B.A., Santa Clara University, 1973; M.A., University of the Americas, 1975;  
M.A., University of California, Santa Barbara, 1996. Associate Director.
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Bachelor of Architecture, California Polytechnic State University, San Luis  
Obispo, 1975. Project Manager, Facility Services.
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B.A., Fort Lewis College, 1990; M.S., Colorado State University, 1991; Ph.D.,  
Texas A & M University, 1997. Associate Professor. Certified Public Accountant.
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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 Emeritus.
- LASSANSKE, DANIEL E. (1975) ..... Horticulture and Crop Science  
B.S., California State Polytechnic College, 1970; M.S., 1971. Professor.
- LAVAR, 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.
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B.A., California Polytechnic State University, San Luis Obispo, 2002. Assistant  
Director.
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B.S., Providence College, 1992; M.I.M., American Graduate School of  
International Management, 1998; Ph.D., University of Wisconsin, 2003. Assistant  
Professor.
- 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, 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.
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B.S., King Monkut's Institute of Technology, Thonburi, Bangkok, Thailand, 1994;  
M.B.A., Westminster College, 1996; Ph.D., University of Connecticut, 2004.  
Associate Professor.
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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.  
Associate Professor.
- LEWIS, GEORGE M. (1967) ..... Mathematics  
B.A., Stanford University, 1961; M.A., University of Southern California, 1964;  
Ph.D., 1970. Professor Emeritus.
- LI, ELDON Y. (1982) ..... Management  
B.Commerce, National Chengchi University, Taiwan, 1975; M.S.B.A., Texas  
Tech University, 1978; Ph.D., 1981. Professor.
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B.S., California Polytechnic State University, San Luis Obispo, 1989; M.S.,  
Stanford University, 1996; M.S., 1999; Ph.D., 2002. Assistant Professor.
- LINDERT, 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.
- 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  
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- LIU, YANG (2004) ..... Finance  
B.A., Tsinghua University, Beijing, China, 1998; M.S., University of Washington,  
2000; Ph.D., 2004. 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.
- LONG, TODD (2004) ..... Philosophy  
B.A., University of Southern Mississippi, 1986; M.A., 1995; M.A., University of  
Wales, 2000; M.A., University of Rochester, 2002; Ph.D., 2003. Assistant  
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.
- LUCAS, MICHAEL A. (1998) ..... Architecture  
B.Arch., University of Cincinnati, 1979; M.Arch., Morgan State University, 1995.  
Associate 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  
Emeritus.
- LUND, JOAN M. (1977) ..... Administration and Finance  
B.A., California Polytechnic State University, San Luis Obispo, 1985; M.A.,  
1990. Manager, Human Resources.
- 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.
- LYNCH, JOSEPH (2001)..... Philosophy  
B.A., Virginia Commonwealth University, 1982; M.A., Claremont Graduate  
School, 1985; Ph.D., 1989. Associate 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 and  
Department Chair.
- MAAS, DONALD K. (1976)..... College of Education  
B.A., University of California, Los Angeles, 1966; M.Ed., State University of  
New York at Buffalo, 1969; Ed.D., 1971. Professor.
- 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. 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.  
Associate 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. Associate Professor. Registered  
Professional Engineer, Texas.
- MacELROY, WILLIAM (2002)..... Landscape Architecture  
B.S., The Pennsylvania State University, 1969; M.L.A., University of Michigan,  
1984. Assistant Professor..
- MACHAMER, JOSHUA T. (2003)..... Theatre and Dance  
B.A., Whittier College, 1989; M.F.A., The Pennsylvania State University, 2000.
- MACRO, KENNETH L. (2000)..... Graphic Communication  
B.A., Pennsylvania State University, University Park, 1993; M.A., The University  
of Akron, 2000. Assistant 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.
- MADJEDI, JOHANNA J. (1992)..... Information Technology Services  
B.S., California Polytechnic State University, San Luis Obispo, 1988. Director,  
Communications and Computing Services.
- MAGNUSON, SHIRLEY J. (2004)..... College of Education  
B.S., University of Missouri, Columbia, 1980; M.S., University of Iowa, 1986;  
Ph.D., University of Maryland, College Park, 1991. Associate Professor.
- MALIK, ISMAIL (2003)..... Housing and Residential Life  
B.S., University of California, San Diego, 1994; M.A., Seattle University, 1997.  
Learning Community Coordinator – First Year Connection.
- MALKIN, MICHAEL R. (1974)..... Theatre and Dance  
A.B., Tufts University, 1965; M.A., 1970; Ph.D., 1971. Professor Emeritus.
- MALLAREDDY, H. (1981)..... Civil and Environmental Engineering  
B.E., Mysore University, India, 1958; M.E., University of Oklahoma, 1966; Ph.D.,  
1968. Professor Emeritus. Registered Professional Engineer, California, Indiana  
and Louisiana.
- MALONEY, MARCY (1990)..... Associated Students, Incorporated  
B.A., California Polytechnic State University, San Luis Obispo, 1976; M.A.,  
1991. Director, Julian A. McPhee University Union and 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.
- MARGARITA, CESAR (2003)..... Student Academic Services  
B.A., California Polytechnic State University, San Luis Obispo, 2002. Educational  
Talent Search Outreach Counselor/Advisor.
- MARK, WALTER R. (1972)..... Dairy Science, Natural Resources Management  
B.S., Utah State University, 1968; M.S., Colorado State University, 1970; Ph.D.,  
1972. Professor and Department Head, Dairy Science. 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 and Area Chair.
- MARSHALL, DAVID D. (2004)..... Aerospace Engineering  
B.S., Worcester Polytechnic Institute, 1994; M.S., Georgia Institute of  
Technology, 1995; Ph.D., 2003. Assistant 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 and Department Chair.
- 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.
- 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.
- McBRIDE, SUSAN L. (1979)..... College of Education  
B.S., University of Akron, 1963; M.S., 1972; Ph.D., 1979. Professor Emeritus.
- McCALL, MICHAEL D. (1999)..... University Advancement  
B.A., Old Dominion University, 1982; J.D., Wake Forest University, 1986. Senior  
Director, Planned Giving and Endowments.
- McCARTY, HEATHER J. (2004)..... History  
B.S., University of California, Los Angeles, 1997; M.A., University of California,  
Berkeley, 1998; Ph.D., 2004. Assistant Professor.
- McCLURE, PAMELA H. (2005)..... Orfalea College of Business  
M.A., Columbia University, 1966. Director of Advancement.
- 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.
- McCORMICK, KATHRYN E. (2003)..... Art and Design  
B.S., University of Cincinnati, 1996; M.S., 2001. Assistant Professor.
- McDERMOTT, STEVEN T. (1989)..... Communication Studies  
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. Assistant Director, Counseling, Operations and C compliance.
- McDONALD, MARGOT K. (1992)..... Architecture  
B.A., B.S., University of California, Santa Barbara, 1980; M.Arch., University of  
Oregon, 1987. Professor and Interim Director. AIA, Registered Architect, Oregon.  
NCARB Certificate.
- McGAUGHEY, KAREN J. (2003)..... Statistics  
B.S., Kansas State University, 1991; M.S., 1999; Ph.D., 2003. Assistant Professor.
- 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.
- 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. 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;  
Ph.D., University of Northern Colorado, 2000. Assistant Professor.
- MEDIZADE, MASON (1984).....Mechanical Engineering  
B.S., Abadan Institute of Technology, 1978; M.S., University of Southern  
California, 1980; Ph.D., 1984. Professor.
- MEHIEL, ERIC A. (2004).....Aerospace Engineering  
B.S., University of California, Santa Barbara, 1998; M.S., University of Colorado,  
2001; Ph.D., 2003. Assistant Professor.
- MELLO, JOSEPH D. (1998).....Mechanical Engineering  
B.S., California Polytechnic State University, 1983; M.S., 1989; Ph.D., University  
of California, Davis, 1996. 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.
- MENDES, ANTHONY A. (2004).....Mathematics  
B.S., University of California, Irvine, 2000; M.A., University of California, San  
Diego, 2001; Ph.D., 2004. Assistant Professor.
- 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).....College of Engineering, Industrial and Manufacturing  
Engineering  
A.P., Sheffield Polytechnic, England, 1969; M.Phil., 1972; Ph.D. University of  
Nottingham, 1985. Professor and Interim Associate Dean. Registered Professional  
Engineer, Great Britain.
- MERAYYAN, SAAD (2004).....Civil and Environmental Engineering  
B.S., Jordan University of Science and Technology, 1992; M.S., University of  
Missouri-Columbia, 1995; Ph.D., Wayne State University, Detroit, 2001.  
Assistant Professor.
- 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 and Area Chair. 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.
- 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. Associate Professor.
- MONTECALVO, JOSEPH (1983).....Food Science and Nutrition  
B.S., University of Rhode Island, 1972; M.S., 1975; Ph.D., 1979. Professor.
- MONTELONGO, JOSE (2004).....University Library  
B.S., The University of Texas at El Paso, 1976; M.Ed., 1988; M.L.S., The  
University of Texas at Austin, 1995; Ph.D., New Mexico State University, 2002.  
Senior Assistant Librarian.
- 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. Associate Professor.
- MOORE, CAROLE M. (1980).....Career Services  
B.A., California Polytechnic State University, San Luis Obispo, 1976; M.A.,  
1978. Career Counselor.
- 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.
- MORI, BARBARA L. ROWLAND (1986).....Social Sciences  
B.A., Hofstra University, 1967; M.A., University of Hawaii, 1983; Ph.D., 1987.  
Professor.
- MORRIS, ANDREW D. (1998).....History  
B.S., Harvey Mudd College, 1991; M.A., 1996; Ph.D., University of California,  
San Diego, 1998. Associate Professor.
- MORRISON, KENT E. (1979).....Mathematics  
B.A., University of California, Santa Cruz, 1971; Ph.D., 1977. Professor and  
Department Chair.
- 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.
- MUKHERJEE, PARNA (2003) ..... Civil and Environmental Engineering  
B.C.E., Jadavpur University, 1992; M.C.E., 1994; Ph.D., Lehigh University, 2003. Assistant Professor.
- MULLIGAN, PATRICIA A. (1988) ..... College of 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.
- MWANGI, JAMES (2003) ..... Architectural Engineering  
B.Sc., University of Nairobi, Kenya, 1984; MSc., University of Lagos, Nigeria; Ph.D., University of California, Davis, 2001. Assistant Professor. Registered Civil Engineer, California.
- MYERS, LEONARD D. (1984) ..... Computer Science, Computer Engineering  
B.S., Illinois State University, 1963; M.S., 1966; Ph.D., University of Kansas, 1977. Professor and Director, Computer Engineering.
- 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.
- 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 Emeritus
- 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. Associate Professor.
- NICHOLSON, LISA M. (2001) ..... Food Science and Nutrition  
B.S., California State University, Northridge, 1985; M.S., 1987; Ph.D., University of Southern California, 1999. Assistant Professor. Registered Dietitian..
- NICKELSEN, NONA (NICKY) (2000) ..... Parent Program  
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.
- NIEBUHR, 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. 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, and Director of Technical Communication Program.
- NULMAN, DENNIS M. (1977) ..... College of Education  
B.A., University of San Diego, 1970; M.Ed., 1972; Ph.D., University of Southern California, 1977. Professor Emeritus.
- NUTTALL, BRENT (2003) ..... Architectural Engineering  
B.S., California Polytechnic State University, San Luis Obispo, 1986; M.S., University of California, Berkeley, 1987. Assistant Professor. Registered Structural and Civil Engineer, California.
- O'BRYANT, CAMILLE P. (1999) ..... Kinesiology  
B.A., Smith College, 1983; M.S., 1986; Ph.D., Ohio State University, 1996. Assistant Professor.
- OGREN, SANDRA G. (2004) ..... University Advancement  
B.A., Luther College, 1969; J.D., University of Minnesota, 1973. Vice President for University Advancement.
- 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.
- OLSEN, ERIC (2004) ..... Industrial Technology  
B.S., University of Maine at Orono, 1979; M.B.A., Virginia Polytechnic Institute and State University, 1987; Ph.D., The Ohio State University, 2004. 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. Associate 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. Associate Professor.
- O'TOOLE, 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.
- PAL, NIRUPAM (1995)..... Civil and Environmental Engineering  
B.S., Calcutta University, India, 1984; M.S., 1986; Ph.D., New Jersey Institute of  
Technology, 1993. Professor.
- PAN, JIANBIAO (2003)..... Industrial and Manufacturing Engineering  
B.E., Xidian University, Xian, China, 1990; M.S., Tsinghua University, Beijing,  
China, 1996; Ph.D., Lehigh University, 2000. Assistant 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.
- PARKS, ROSEANN N. (2002)..... University Advancement  
B.M.E., Baldwin-Wallace College, 1997; M.Ed., University of Virginia, 1981;  
Ed.S., 1982. Associate Director, Alumni Relations.
- 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.
- PEACH, DAVID (1987)..... Management  
B.Sc., Ohio University, 1962; M.B.A., 1964; D.B.A., Harvard University, 1969.  
Professor Emeritus.
- 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, JOY (2002)..... Student Life and Leadership  
B.A., Claremont McKenna College, 2000; M.A., California Polytechnic State  
University, San Luis Obispo, 2004. Community Services Center Program  
Coordinator.
- PEDERSEN, MARY E. (1981)..... College of Agriculture  
B.A., University of California, Santa Barbara, 1973; M.S., University of  
California, Los Angeles, 1976; Ph.D., 1980. Associate Dean.
- PEDROTTI, JENNIFER TERAMOTO (2003)..... Psychology and Child Development  
B.A., University of California, Davis, 1996; M.S., University of Kansas, 2000;  
Ph.D., 2003.
- PEÑA, ROBERT B. (2002)..... Architecture  
BSArchE, University of Colorado, 1981; M.Arch., University of California,  
Berkeley, 1987. Assistant Professor.
- PENDERGAST, CAROL (2002)..... College of Education  
B.A., Dickinson College, 1966; M.A., 1968; Ph.D., Yale University, 1974.  
Advancement Director.
- 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 Emeritus.
- 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.
- PETERSEN, GEORGE J. (2004)..... College of Education  
B.A., Pontificia Studiorum Universitas A.S. Thoma AQ. In Urbe, Rome, Italy,  
1981; B.A., University of California, Santa Barbara, 1986; M.A., 1991; Ph.D.,  
1993. Associate Professor.
- PETERSON, DANIEL G. (2003)..... Animal Science  
B.S., University of California, Davis, 1999; Ph.D., Cornell University, 2003.  
Assistant 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.
- PILLIOD, DAVID S. (2004)..... Biological Sciences  
B.A., University of California, Santa Cruz, 1991; Ph.D., Idaho State University,  
2001.
- 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 and  
Department Chair.
- QENANI-PETRELA, EIVIS (2002).....Agribusiness  
B.S., University of Tirana, Albania, 1987; M.A., Washington State University,  
1998; Ph.D., 2002. Assistant Professor.
- QUARLES, MARKEL (1999).....Career Services  
B.S., California Polytechnic State University, San Luis Obispo, 1998; M.S., 2003.  
Career Counselor.
- QUIJANO, EDDY (2004).....Accounting  
B.A., University of New Orleans, 1970; J.D., Loyola University School of Law,  
1971. Associate 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.
- RAGSDALE, JOSEPH J. (2002).....Landscape Architecture  
B.A., University of California, Berkeley, 1991; M.L.A., University of Virginia,  
2000. Assistant Professor.
- RAHIM, ASHRAF (2003).....Civil and Environmental Engineering  
B.S., University of Mansoura, Egypt, 1986; M.S., 1991; Ph.D., University of  
Mississippi, Oxford, 2001. Assistant Professor.
- RAINEY, PAUL E. (1987).....Industrial and Manufacturing 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. 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.
- RAMOS, GEORGE (2003).....Journalism  
B.S., California Polytechnic State University, San Luis Obispo, 1969. Professor  
and Department Chair.
- RANDAZZO, ANTHONY JAMES (1977).....Industrial Technology  
B.A., San Jose State College, 1965; M.A., 1968; Ph.D., Washington State  
University, 1976. Professor Emeritus.
- RAWLINGS, DON (1980).....Mathematics  
B.S., Arizona State University, 1974; M.A., University of California, San Diego,  
1976; Ph.D., 1978. Professor.
- REAVES, SCOTT (2003).....Food Science and Nutrition  
B.S., California Polytechnic State University, San Luis Obispo, 1991; Ph.D.,  
University of Arizona, 1995. Assistant 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. Associate Professor.
- REINHART, JAMES (2002).....University Foundation  
B.S.B.A., Bryant College, 1978; M.B.A., National University, 1982. Associate  
Executive Director. Certified Public Accountant, California.
- RETSEK, DYLAN Q. (2003).....Mathematics  
B.S., California Polytechnic State University, San Luis Obispo, 1996; M.A.,  
Washington University, 1997; Ph.D., 2001. Assistant Professor.
- 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. Certified  
Professional Soil Scientist.
- RICHERT, BENJAMIN P. (2003).....Mathematics  
B.S., Wheaton College, 1995; Ph.D., University of Illinois, Urbana-Champaign,  
2000. Assistant Professor.
- 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.
- RIGONI, ROBYN (2004).....Financial Aid  
B.A., University of California, Riverside, 1994. Financial Aid Counselor.



- 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 Emeritus. Registered Civil  
Engineer, California.
- RILEY, KATE J. (2003)..... Mathematics  
B.S., South Dakota State University, 1980; M.S., Montana State University, 1992;  
Ph.D., 2003. Assistant Professor.
- 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.
- ROBBINS, MARIAN E. (2004)..... Mathematics  
B.A., Agnes Scott College, 1986; M.S., University of Virginia, 1989; Ph.D., 1992.  
Associate Professor.
- 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.
- 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.
- ROLINS, BARBARA A. (2004)..... Financial Aid  
B.A., California State University, San Marcos, 1993; M.A., California Polytechnic  
State University, San Luis Obispo, 1996. Financial Aid Counselor.
- 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.
- ROSS, GREGORY B. (2004)..... Health and Counseling Services  
B.S., California State University, Long Beach, 1978. Laboratory Scientist.
- 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)..... College of Education  
B.A., University of San Francisco, 1966; M.A., San Diego State University, 1992;  
Ph.D., University of Kansas, 1997. Associate 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.
- RUMMELL, KATHRYN (1997)..... English  
B.A., Centre College, 1990; M.A., University of North Carolina at Chapel Hill,  
1992; Ph.D., 1997. Associate Professor and Assistant Department Chair.
- RUSSELL, CRAIG H. (1982)..... Music  
B.M., University of New Mexico, 1973; M.M., 1976; Ph.D., University of North  
Carolina, 1981. Professor.
- RUTHERFORD, ROBERT T. (1974)..... Animal Science  
B.S., University of California, Davis, 1970; M.S., California Polytechnic State  
University, San Luis Obispo, 1976. Professor.
- RYAN, KATHLEEN A. (1981)..... Psychology and 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.
- 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.
- SAVAGE, ARLINE (2004)..... Accounting  
B.Com., University of Port Elizabeth, South Africa, 1977; B.Com. Honours, 1986;  
M.Com., 1993; D.Commerce, 1999. Associate Professor.
- SAVAGE, RICHARD (2002)..... Materials Engineering  
B.S., Juniata College, 1975; Ph.D., Indiana University, 1979. Associate Professor.
- SCHADER, BARBARA (2004)..... University Library  
B.A., Case Western Reserve University, 1969; M.L.S., 1975. Associate Librarian.
- SCHAFFER, 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. Associate 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 Emeritus.
- 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.
- 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.
- 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.
- SCHWARTZ, PETER V. (2005)..... Physics  
B.S., Massachusetts Institute of Technology, 1986; M.S., Princeton University,  
1993; Ph.D., 1998. Assistant Professor.
- SCOTT, KENNETH C. (1975)..... Agribusiness  
B.S., Brigham Young University, 1970; Ph.D., Washington State University,  
1975. Professor and Department Chair.
- SCRIVEN, TAL (1980)..... Philosophy  
B.A., University of South Florida, 1976; M.A., 1977; Ph.D., University of  
Southern California, 1980. Professor and Department Chair.
- 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.

- 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).....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.
- SENG, JOHN S. (2003).....Computer Science, Computer Engineering  
B.S., Northwestern University, 1997; M.S., University of California, San Diego, 1999; Ph.D., 2003. Assistant Professor.
- 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 Emeritus. 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 and Area Chair.
- 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. Associate Professor.
- SHARPE, JOHN P. (1995).....Physics  
B.Sc., Edinburgh University, 1985; Ph.D., 1989. Associate Professor.
- SHEARER, DEVON (1990).....Cal Poly Continuing Education  
B.S., California Polytechnic State University, San Luis Obispo, 1984. Director, Conference Services.
- 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. Interim Director.
- SHOLLENBERGER, KIM A. (2002).....Mechanical Engineering  
B.S., Cornell University, 1989; M.S., University of California, Berkeley, 1991; Ph.D., 1994. Associate Professor.
- SHUMAN, STEFANIE (1977).....Testing Services  
B.A., California Polytechnic State University, San Luis Obispo, 1978. Test Program Coordinator. Certified Test Center Administrator.
- 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.
- SINGH, JAGJIT (Jay) (2003).....Industrial Technology  
B.S., Poona University, Pune, India, 1992; M.S., Michigan State University, 1998; Ph.D., 2002. Assistant Professor.
- SIROIS, DAWN M. (1995).....College of Engineering  
B.A., University of Rhode Island, 1995. Academic Advisor.
- SKAMFER, RON (2003).....Associated Students, Inc.  
B.S., California Polytechnic State University, San Luis Obispo, 1997; M.S., San Jose State University, 2001. Assistant Director, Rec Sports.
- 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. IT Director.
- SLIVOVSKY, LYNNE A. (2003).....Electrical Engineering, Computer Engineering  
B.S., Purdue University, 1992; M.S., 1993; Ph.D., 2001. Assistant Professor.
- SMIDT, ROBERT K. (1978).....Statistics  
B.S., Manhattan College, 1971; M.S., Rutgers University, 1973; Ph.D., University of Wyoming, 1976. Professor.
- SMITH, DALE A. (1973).....Animal 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.
- SOARES, JOHN (2001).....Journalism  
B.A., Providence College, 1982; J.D., Syracuse University College of Law, 1997; M.A., Emerson College, 1998. Associate Professor.
- SOENEN, LUC A. (1989).....Finance  
B.S., Leuven University, Belgium, 1970; M.B.A., Cornell University, 1972; D.B.A., Harvard University, 1977. Professor.
- 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.
- SOMERVILLE, MARY (2003).....University Library  
B.A., Hamline University, 1971; M.L.S., University of Hawaii at Manoa, 1972; M.A., Goddard College, 1977; Ph.D., The Union Institute, 1988. Assistant Dean, Information and Instructional Services.
- SPARLING SUSAN (1978).....Student Academic Services  
B.S., University of Texas, 1970; M.A., California Polytechnic State University, San Luis Obispo, 1978. Academic Advisor/Instructor. 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 and Interim Department Chair.
- 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. Associate 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.
- STEERS, DENNIS (2003)..... College of Engineering  
B.A., California Polytechnic State University, San Luis Obispo, 1981. Communications Specialist.
- 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)..... Biological Sciences  
B.S., University of California, Davis, 1984; Ph.D., 1996. Associate Professor. Pest Control Advisor, California.
- STEVENSON, JON (2005)..... Intercollegiate Athletics  
B.A., University of California, Santa Barbara, 1980. Head Coach.
- 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; M.A., 2003. 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 LaVerne, 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 Emeritus. Registered Professional Engineer, Ohio.
- STUBLER, CRAIG P. (1997)..... Earth and Soil Sciences  
B.S., California Polytechnic State University, San Luis Obispo. Technician.
- 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 Emeritus.
- 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. 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 Emeritus. 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.
- SWARTZ, TERESA A. (1991)..... Marketing  
B.S., Clarion University of Pennsylvania, 1974; M.B.A., 1977; Ph.D., Ohio State University, 1981. 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. Licensed Psychologist, California.
- 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 Sessions and Supplemental Workshops in Science 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. Associate Professor.
- TAYLOR, EMILY N. (2005)..... Biological Sciences  
B.A., University of California, Berkeley, 1998; Ph.D., Arizona State University, 2005. 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. Associate Professor.
- 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. Associate 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 Head.
- 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.
- TODOROV, TODOR D. (2003) ..... Mathematics  
B.S., University of Sofia, 1975; Ph.D., University of Sofia and Bulgarian  
Academy of Sciences, 1982. Assistant Professor.
- TOMILSON, DOROTHY (1983)..... Testing Services  
B.A., University of the State of New York Regents College, 1991. Test Program  
Coordinator. Certified Test Administrator.
- TONG, PHILLIP S. (1988) .....Dairy Science  
B.S., University of California, Davis, 1977; M.S., Cornell University, 1982;  
Ph.D., 1986. Professor and Director of the Dairy Products Technology Center.
- 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.
- TREGENZA, ARDITH E. (1999)..... Judicial 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.
- TSO, JIN (1988) ..... Aerospace Engineering  
B.S., National Taiwan University, 1971; M.S., 1973; Ph.D., Johns Hopkins  
University, 1983. Professor.
- 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).....College of Liberal Arts, Psychology and  
Child Development  
B.S., University of California, Irvine, 1983; M.S., The Claremont Graduate  
Univer-sity, 1988; Ph.D., 1992. Associate Professor.
- 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.  
Associate 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.
- 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 Emeritus.
- 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.
- VAVRA, RANDY (2003) .....Student Academic Services  
B.S., California State University, Long Beach, 1972. Information Technology  
Consultant.
- 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. 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.S., 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.  
Associate Professor. Registered Professional Engineer, California.
- 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.
- WALL, LEONARD W. (1969)..... Physics  
B.S., Louisiana Tech University, 1963; Ph.D., Iowa State University, 1969.  
Professor.
- 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 Emeritus.
- WARNICK-WAIT, PATRICIA (1977)..... Academic Records  
B.S., California Polytechnic State University, San Luis Obispo, 2001. Assistant to  
the Director/Registrar.
- WATABE-BELZEL, MADOKA (1993)..... Food Science and Nutrition  
B.S., Illinois State University, 1982; M.S., 1983; Ed.D., Pepperdine University,  
1991. Professor. Registered Dietitian.
- WATERBURY, ARCHIE M. (1973)..... Biological Sciences  
B.A., San Jose State College, 1966; M.A., 1968; Ph.D., University of California,  
Davis, 1972. Professor Emeritus.
- 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, KAREN (1995)..... Administration and Finance  
B.A., University of California, Los Angeles, 1978. Assistant Vice President,  
Administration and Finance.
- 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.
- WEDDIGE, KRISTI S. (2004)..... College of Science and Mathematics  
B.S., University of Tennessee, Knoxville, 1994; M.A., California Polytechnic  
State University, San Luis Obispo, 2004. Academic Advisor.
- WEEKS, LOREN, MAJ (2002)..... Military Science  
B.A., Southern Illinois University, 1987.
- 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.
- WELLMAN, RICHARD, CPT (2005)..... Military Science  
B.S., University of Kansas, 1997.
- WENDT, DEAN E. (2002)..... Biological Sciences  
B.S., California Polytechnic State University, San Luis Obispo, 1993; A.M., 1995;  
Ph.D., Harvard University, 1999. Assistant Professor.
- 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.
- WIDMAN, JAMES M. (2004)..... Mechanical Engineering  
BSME, Michigan Technological University, 1987; MSME, Stanford University,  
1988; Ph.D., Stanford University, 1995. Associate Professor.
- 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.Engr.,  
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. Associate 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 Emeritus.
- 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.
- WINEBRENNER, TERENCE C. (1983)..... Communication Studies  
B.S., Southwest Missouri State University, 1971; M.A., 1972; Ph.D., Ohio State  
University, 1985. Professor.
- 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 Emeritus.
- 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 Emeritus.
- 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.
- WOOD, ZOË J. (2003)..... Computer Science  
B.A., University of California, Santa Cruz, 1992; B.S., 1997; M.S., California  
Institute of Technology, 2000; Ph.D., 2003. Assistant Professor.
- WOOTEN, RUDY A. (1977)..... Animal Science  
B.S., University of Arizona, 1971; M.S., 1973; Ph.D., 1976. Professor.
- XAVIER, M. J. (2004)..... Marketing  
B.Tech., University of Madras, 1976; M.Tech., Regional Engineering College,  
Warangal, 1981; F.I.I.M., Indian Institute of Management, Calcutta, 1985.  
Associate 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 and Department Chair.
- 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.
- ZANG, XIAOZHENG (Jane) (2003) ..... Electrical Engineering  
Diplom, University of Erlangen-Nuremberg, Germany, 1997; Ph.D., Georgia  
Institute of Technology, 2002. Assistant 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) ..... Communication Studies  
A.B., University of California, Berkeley, 1966; M.A., San Francisco State  
College, 1968; Ph.D., University of California, Los Angeles, 1973. Professor.
- 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.Engr., 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  
Associate 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 Dean of Students Office at (805) 756-0327.

## 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 what 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.ipa.calpoly.edu/federal/fed.html](http://www.ipa.calpoly.edu/federal/fed.html)

In 2004, the graduation rate for Cal Poly freshmen who entered the University in the Fall of 1998 was 69%. 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. A description of the federal, state, institutional, local, and private student financial assistance programs available to students who enroll at Cal Poly;
2. For each aid program, a description of procedures and forms by which students apply for assistance, student eligibility requirements, criteria for selecting recipients from the group of eligible applicants, and criteria for determining the amount of a student's award;
3. A description of the rights and responsibilities of students receiving financial assistance, including federal Title IV student assistance programs, and criteria for continued student eligibility under each program;
4. The satisfactory academic progress standards that students must maintain for the purpose of receiving financial assistance and criteria by which the student who has failed to maintain satisfactory progress may reestablish eligibility for financial assistance;
5. The method by which financial assistance disbursements will be made to students and the frequency of those disbursements;
6. The terms of any loan received as part of the student's financial aid package, a sample loan repayment schedule, and the necessity for repaying loans;
7. The general conditions and terms applicable to any employment provided as part of the student's financial aid package;
8. The responsibility of Cal Poly for providing and collecting exit counseling information for all student borrowers under the federal student loan programs; and
9. The terms and conditions for deferral of loan payments for qualifying service under the Peace Corps Act, the Domestic Volunteer Service Act of 1973, or comparable volunteer community service.

**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, board, and transportation 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.** The Dean of Students Office, Bldg 124, Rm 125, 756-03271.

**CAMPUS SMOKING POLICY**

Please view the revised smoking policy for the Cal Poly campus implemented January 1, 2004 at <http://policy/calpoly.edu/cap/100/cap%20190.htm>

**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/GC/resources.shtml](http://www.calstate.edu/GC/resources.shtml).

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, can demonstrate physical presence in the state combined with evidence of intent to remain in California



indefinitely, may establish California residence for tuition purposes. A minor normally derives residence from the parent(s) they reside with or most recently reside with. Evidence demonstrating intent may vary from case to case but will include, and 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 and listing a California address on federal 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 California Code of Regulations, Title 5, Subchapter 5, Article 4, sections 41906-41906.5, and include, but are not limited to, members of the military and their dependents, certain credentialed employees of school districts and most 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

Students classified as non-residents may appeal a final campus decision within 120 days of notification by the campus. 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, CA 90802-4210

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 identification 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.

#### 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) Willful, material and substantial 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) Unauthorized recording, dissemination, and publication of academic presentations for commercial purposes. This prohibition applies to a recording made in any medium, including, but not limited to, handwritten or typewritten class notes.

(1) The term "academic presentation" means any lecture, speech, performance, exhibition, or other form of academic or aesthetic presentation, made by an instructor of record as part of an authorized course of instruction that is not fixed in a tangible medium of expression.

(2) The term "commercial purpose" means any purpose that has financial or economic gain as an objective.

(3) The term "instructor of record" means any teacher or staff member employed to teach courses and authorize credit for the successful completion of courses.

(o) 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.

(6) The causes for discipline in this section shall, as appropriate, include computer-related crimes as provided in Section 502 of the Penal Code.

(p) This Section is not adopted pursuant to *Education Code* Section 89031.

(q) 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

Personal Responsibility and Work Opportunity Reconciliation Act to achieve licensure. Information concerning these requirements is available from the Academic Programs Office, Admin. 315, 756-2246.

**AVERAGE SUPPORT COST PER FULL-TIME EQUIVALENT STUDENT AND SOURCES OF FUNDS**

The total support cost per full-time equivalent student includes the expenditures for current operations, including payments made to students in the form of financial aid, and all fully reimbursed programs contained in state appropriations. The average support cost is determined by dividing the total cost by the number of full-time equivalent students (FTES). The total CSU 2004/05 final budget amounts were \$2,447,958,000 from state General Fund appropriations (not including capital outlay funding), \$902,669,000 from State University Fee Revenue, \$208,629,000 from other fee revenues, and \$184,709,000 from reimbursements for a total of \$3,743,965,000. The number of projected 2004/05 full-time equivalent students (FTES) is 324,120. 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 2004/05 average support cost per full-time equivalent student based on General Fund appropriation and State University Fee revenue only is \$10,338 and when including all sources as indicated below is \$11,433. Of this amount, the average student fee support per FTE is \$2,985, which includes all fee revenue in the state higher education fund (e.g., State University Fee, nonresident tuition, application fees, miscellaneous course fees).

2004/2005	Amount	Average Cost Per FTE Student	%
Total Support Cost .....	\$3,743,965,000	\$11,433	100.0
-State Appropriation.....	2,447,958,000	7,553	65
-Student Fee Support <sup>1</sup> .....	1,111,298,000	2,985	30
-Reimbursements.....	184,709,000	545	5

<sup>1</sup> Student fee support represents fee revenue deposited in the State Treasury/state higher education fund. The average CSU 2004/05 academic year, resident, undergraduate student fees required to apply to, enroll in, or attend the university is \$2,916. However, the costs paid by individual students will vary depending on campus, program, and whether a student is part-time, full-time, resident, or nonresident.

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 University honors program, 34.  
 University police, 35.  
 University union, McPhee, 38.  
 University year, 11.  
 Upward bound, 43.  
 Urban forestry concentration, 140.  
 U.S. cultural pluralism requirement, 74.  
 UU Gallery, 38.
- V**  
 Values, technology and society minor, 254.  
 Vegetable science, 129.  
     VGSC courses, 486.  
 Veterinary science, 111.  
     VS courses, 487.  
 Visitors within the CSU, 77.  
 Viticulture concentration, 100.  
 Viticulture, wine and, minor, 98.  
 Volunteer services, 43.
- W**  
 Washington-Alexandria consortium, 151.  
 Water engineering, MS specialization, 196.  
 Water science minor, 98.
- Watershed management and hydrology concentration, 140, 142.  
 Week of welcome (WOW), 44.  
 Western intellectual tradition, minor, 278.  
 Wildland fire and fuels management concentration, 140.  
 Wildlife biology, field and, concentration, 287.  
 Wine and viticulture, 99.  
     minor, 98.  
     WVIT courses, 487.  
 Wine business concentration, 100  
 Withdrawal, from courses, 80.  
     from term, 80.  
     from previous terms, 80.  
     unauthorized, 79.  
 Withdrawing from the institution and financial aid, 53.  
 Writing, graduation requirement (GWR), 66.  
 Women's engineering program, 193.  
 Women's programs and services, 44.  
 Women's studies, minor, 279.  
     WS courses, 488.  
 Work study programs, 59.
- Z**  
 Zoology, 284.  
     ZOO courses, 488.

# DIRECTORY OF CAL POLY FACILITIES

Alphabetical with Aliases

## BUILDING NAME, NUMBER, GRID LOCATION

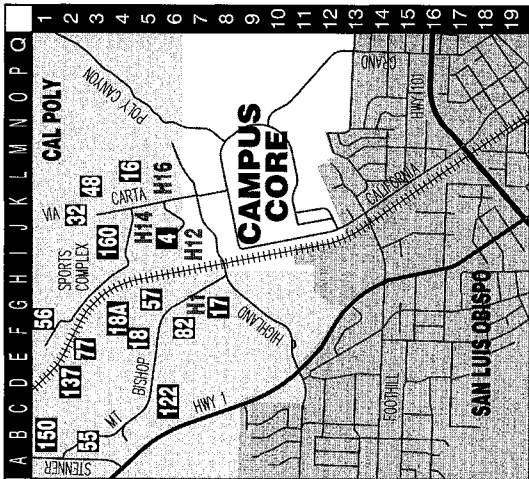
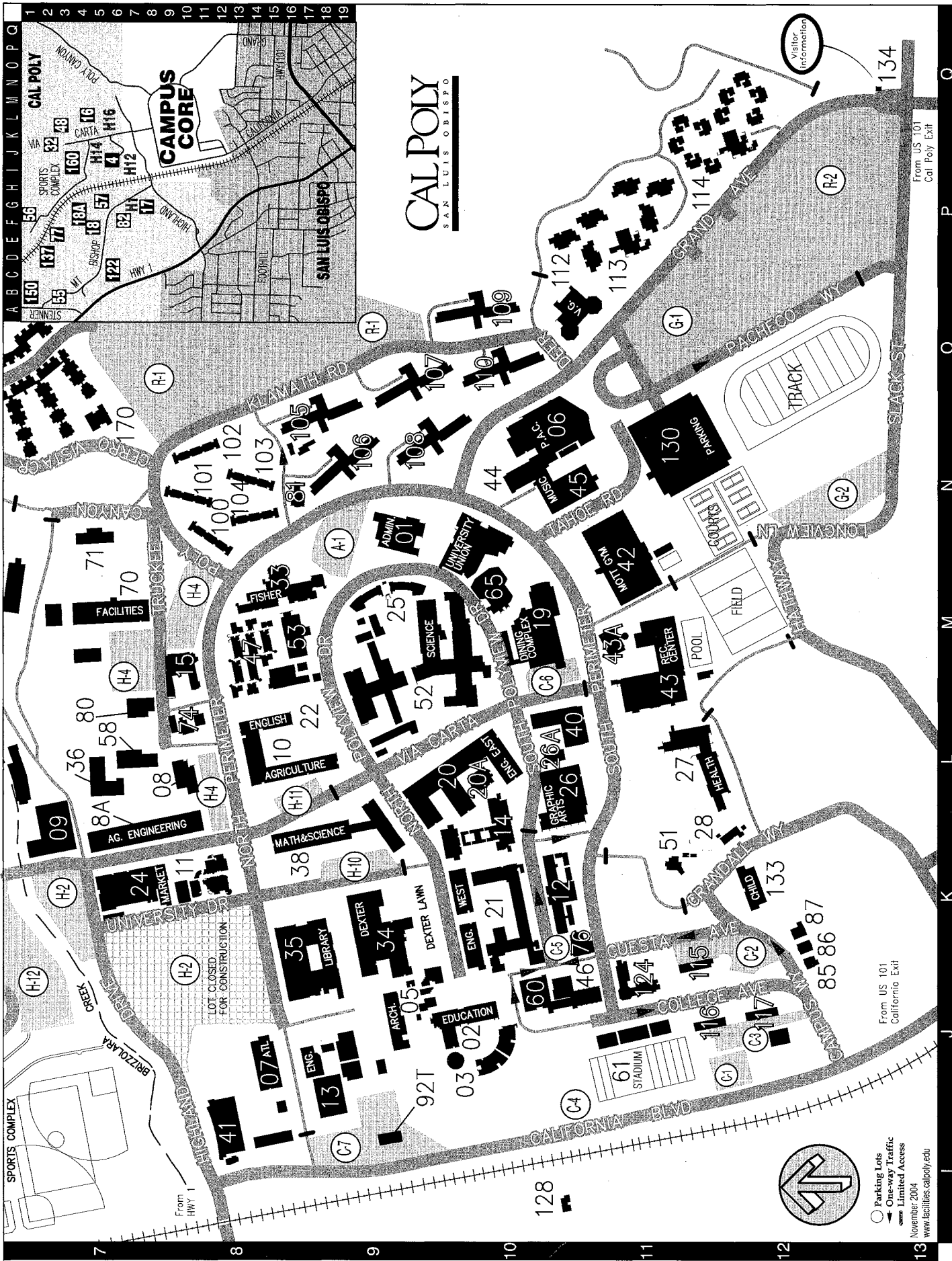
Administration	1	N 9	60	J 10	
Advanced Technology Laboratories	7	J 8	17	G 8	
Agricultural Engineering Shop	8A	L 8	18A	F 4	
Agricultural Engineering, Bioscience and	8	L 8	18	F 4	
Agricultural Sciences	11	K 8	18	F 5	
Agriculture, Alan A. Erhart	10	L 8	34	K 9	
Air Conditioning	12	K 10	101	N 8	
Alan A. Erhart Agriculture	10	L 8	19	M 10	
Albert B. Smith Alumni and Conference Center	28	K 12	65	M 10	
Alex and Fay Spanos Theatre	44	N 10	20	L 10	
Alex G. Spanos Stadium	61	J 11	20	L 10	
Anderson Aquatic Center	42A	M 11	41	I 8	
Architecture & Environmental Design	5	J 9	40	L 10	
ARDFA	4	J 6	21	K 10	
Baggett Stadium	160	I 4	22	L 8	
Baseball Stadium	160	I 4	80	L 7	
Beef Cattle Evaluation Center	55	B 4	48	K 3	
Beef Unit	16	L 4	10	L 8	
Bert and Candace Forbes Center for Engineering Excellence	20A	L 10	127	off	
Bioresource and Agricultural Engineering	8	L 8	18	F 4	
Bioresource and Agricultural Engineering Shop	8A	L 8	70	M 7	
Bob Janssen Field	161	I 4	25	M 9	
Business	3	J 10	47	M 8	
CAD Research Center	117T	J 12	9	L 7	
Cal Poly Equine Center	32	J 2	23	M 6	
Campus Market	24	K 7	33	M 8	
Cerro Bishop	170E	O 6	24	K 7	
Cerro Cabrillo	170B	O 7	15	M 8	
Cerro Hollister	170C	N 6	82	F 7	
Cerro Islay	170F	O 6	14	K 10	
Cerro Morro	170A	O 7	109	O 10	
Cerro Romaldo	170D	N 6	130	N 11	
Cerro San Luis	170G	N 7	26	L 10	
Cerro Vista Apartments	170	N 7	60	J 10	
Chase Hall	115	K 11	42	M 11	
Cheda Ranch	121	off	45	N 10	
Child Development Lab	38	K 9	4	J 6	
Chorro Creek Ranch	126	off	27	L 11	
Christopher Colhan Center	6	N 10	117	J 12	
Clock Tower Building	2	J 10	81	N 8	
Clyde P. Fisher Science Hall	33	M 8	30	M 6	
Computer Science	14	K 10	29	N 8	
Cotchett Education Building	2	J 10	80	L 7	
Housing Warehouse / Risk Management	80	L 7	150	B 1	
Indoor Pool, Natatorium	46	J 10	40	L 10	
Janssen Field	161	I 4	43	M 11	
Jesspersen Hall	116	J 11	70	M 7	
Julian A. McPhee University Union	65	M 10	4	J 6	
Kennedy Library, Robert E.	35	K 8	170	N 7	
Lassen Hall	104	N 8	170	N 7	
Library, Robert E. Kennedy	35	K 8	101	N 8	
Manufacturing	36	L 7	109	O 10	
Market, Campus	24	K 7	104	N 8	
Mathematics and Science	38	K 9	104	N 8	
McPhee University Union	65	M 10	107	N 9	
Meats Unit, Abattoir	39	N 6	45	N 10	
Mott Physical Education, Robert E.	42	M 11	61	J 11	
Muir Hall	107	N 9	46	J 10	
Music Center, H. P. Davidson	45	N 10	76	K 11	
Mustang Stadium	61	J 11	133	K 12	
Natatorium	46	J 10	6	N 10	
North Mountain Residence Halls	100	N 8	102	N 8	
Old Power Plant	76	K 11	122	C 6	
Ofralea Family and ASI Children's Center	133	K 12	122	C 6	
PAC	6	N 10	130	N 11	
Palomar Hall	102	N 8	128	I 10	
Parker Ranch	122	C 6	6	N 10	
Parker Residence	122	C 6	123	off	
Parking Structure, Grand Avenue	130	N 11	43A	M 11	
Parson's Residence	128	I 10	14	K 10	
Performing Arts Center	6	N 10	74	L 8	
Peterson Ranch	123	off	119U	I 9	
Physical Education Classrooms and Offices	43A	M 11	92T	I 9	
Pilling Building	14	K 10	150	B 1	
Police Station	74	L 8	Center		
Poly Grove	119U	I 9	Power Plant	40	L 10
Poly Grove Faculty Offices (M030-M031)	92T	I 9	Recreation Center	43	M 11
Poultry Science Instructional Center	150	B 1	Reprographics	70	M 7
Power Plant	40	L 10	Research Development Center	4	J 6
Recreation Center	43	M 11	Residence Hall, Cerro Vista	170	N 7
Reprographics	70	M 7	Residence Hall, Diablo Hall	101	N 8
Research Development Center	4	J 6	Residence Hall, Fremont Hall	109	O 10
Residence Hall, Cerro Vista	170	N 7	Residence Hall, Lassen Hall	104	N 8
Residence Hall, Diablo Hall	101	N 8	Residence Hall, Muir Hall	107	N 9
Residence Hall, Fremont Hall	109	O 10			
Residence Hall, Lassen Hall	104	N 8			
Residence Hall, Muir Hall	107	N 9			
Rose Float Shop	78	M 6			
Sandwich Factory	19A	M 10			
Santa Lucia Hall	106	O 9			
Science	52	M 9			
Science North	53	M 8			
Science, Fisher	33	M 8			
Sequoia Hall	108	O 9			
Serrano Ranch	125	off			
Shasta Hall	100	N 8			
Sierra Madre Hall	113	P 11			
Softball Stadium	161	I 4			
South Mountain Residence Halls	105	N 9			
Sports Complex Baseball Stadium	160	I 4			
Sports Complex Softball Stadium	161	I 4			
Student Experimental Farm Offices	137	D 2			
Student Services	124	J 11			
Swine Unit	56	F 1			
Tenaya Hall	110	O 10			
Theater	44	N 10			
Transportation Services	71	N 7			
Trinity Hall	105	N 9			
University Dining Complex	19	M 10			
University House	51	K 11			
University Police	74	L 8			
University Union, Julian A. McPhee	65	M 10			
Veterinary Hospital	57	G 5			
Visitor Information	134	Q 13			
Vista Grande Restaurant	112	O 10			
Walter F. Dexter Building	34	K 9			
Walters Ranch	139	off			
Warehouse, State Receiving	70	M 7			
Welding	58	L 7			
Whitney Hall	103	N 8			
Yosemite Hall	114	Q 11			

2/18/2005

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# CAL POLY

SAN LUIS OBISPO



- Parking Lots
- One-way Traffic
- ◀ Limited Access

November 2004  
[www.facilities.calpoly.edu](http://www.facilities.calpoly.edu)

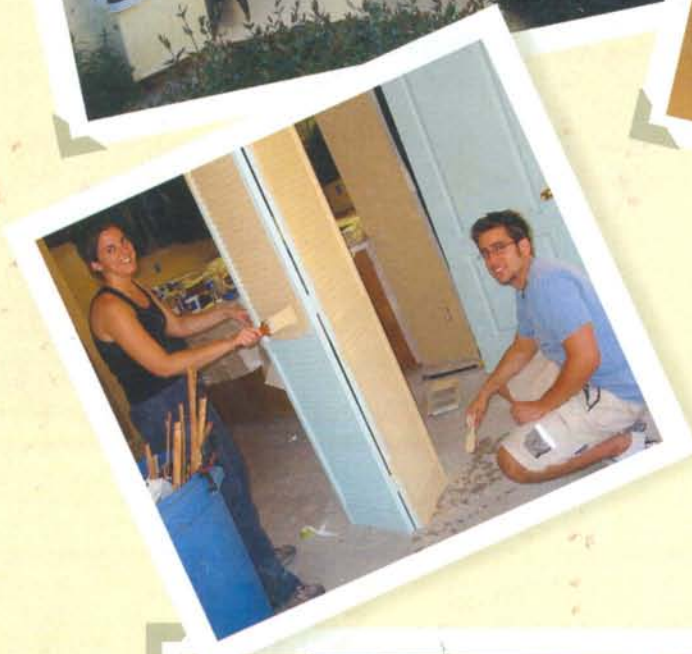
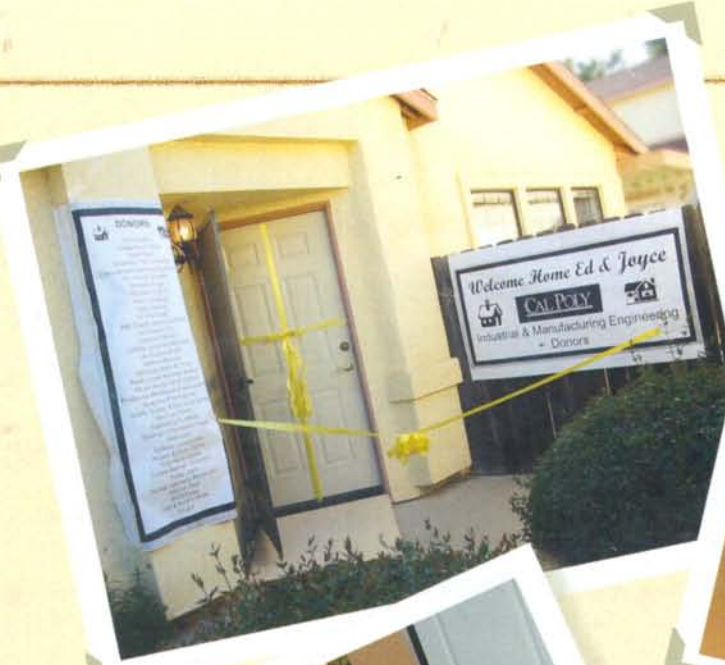
From US 101  
 California Exit

From US 101  
 Cal Poly Exit

Visitor Information

A B C D E F G H I J K L M N O P Q  
 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

7 8 9 10 11 12 13



*Cal Poly students from IME 556 renovated a home whose occupants had suffered challenges of disability for many years.*



**CAL POLY**

California Polytechnic State University  
San Luis Obispo, CA 93407

