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# CAL POLY CATALOG

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Copies of the *Catalog* may be purchased at the El Corral Bookstore (805 756-1101 or toll-free in California 800-367-0771) or ordered by mail. The price per copy is \$8.80. For mail orders add \$3.50 to the check or money order to cover the cost of handling and mailing. The quarterly *Class Schedule* is also available at the El Corral Bookstore.

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# THE PROGRAM

## CAL POLY IS DIFFERENT

Walk around the Cal Poly campus and look into the corners.

Look into the classrooms, labs, studios and barns.

You find Cal Poly students reading, studying, attending class, of course.

But that's not all. You find them working - rolling up their sleeves and getting their hands dirty.

You find them testing the strength of beams, raising livestock, publishing a newspaper, designing structures, caring for young children, writing computer programs, performing music. You find them machining metal, testing aircraft, auditing books, developing experiments, building all manner of things. In a word, you find them getting *experience* as part of their education.

From row crops to computers, Cal Poly believes the best way for someone to learn something is to *do* it. That's been the school's philosophy since it began.

"Learn by doing," the university calls it.

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

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

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

Unlike most universities, Cal Poly requires every prospective student to apply for a particular major field of study, whether seeking to enter from high school or as a transfer student from a community college or another university. Instruction in the major begins on the first day of class.

The difference shows also in the programs. Of the 59 undergraduate majors offered, 12 are available within the CSU system only at Cal Poly, and another eight are offered at only one other CSU campus. The university's career orientation is evident in its programs in agriculture, architecture, business, design, education, engineering, graphic communication, home economics and journalism. Those and other professional programs are offered in addition to curricula in the arts, sciences, mathematics and humanities.

Emphasis on the Undergraduate













And those programs are state-of-the-art education. Twenty-four are accredited or recognized at the national level by independent reviewing bodies.

A Complete Education

An Effective Education

A Faculty of Teachers

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

Career education at Cal Poly is taught within the framework of a thorough general education that helps students develop fully as educated individuals, not just as trained professionals. Curricula are designed to teach students to think logically, judge critically and communicate clearly. They help give students a sense of responsibility to society – both national and international – and an understanding of their own and other cultures. Just as students in scientific and technical fields learn about the humanities, humanities majors study science and technology.

Overseas study, which can immeasurably broaden a student's knowledge and outlook, is available through year-long CSU programs in 16 countries, as well as through Cal Poly's spring- and summer-quarter London Study Program and a variety of special study programs organized by Cal Poly departments and professors. The university also continues to expand its international involvement through programs involving faculty and staff as well as students. One example: Cal Poly was chosen by the U.S. Agency for International Development to lead in creating a wholly new agricultural college in Costa Rica.

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

An essential element in helping people learn is getting them involved in what they're learning. From the hands-on orientation of academic courses to the student responsibility built into student activities, Cal Poly evinces a true commitment to student involvement.

**A** university's teachers, of course, are the ones who put the institution's educational principles into practice. Cal Poly's faculty is especially well-chosen to deliver an effective practical education. It's a teaching faculty. Professors give students top priority and individual attention. And Cal Poly faculty members have proved their competence, and continue to develop it, in the world *outside* academia as well – in research, in development, in industry, in the marketplace.

When it selects its faculty, Cal Poly doesn't look at academic qualifications alone. It seeks men and women who are interested in teaching undergraduates, who have records of successful teaching, who are committed to making their teaching even more effective, and whose professional experience shows they have met and mastered the working world their students will face.

With its approach to education and success in applying it, Cal Poly has built a solid statewide and national reputation. The proof of success is the eagerness of recruiters from business and industry to hire Cal Poly graduates, the support well-known corporations have given its programs, and the loyalty of its alumni. The quality of the university's programs attracts students from throughout California and has helped make Cal Poly one of the most popular campuses in the state.













# THE PLACE

A FRIENDLY, SMALL-CAMPUS FEELING

Cal Poly is at San Luis Obispo, a pleasant, progressive city of about 43,000 on California's Central Coast, midway between San Francisco and Los Angeles. The city and university share a neighborly, small-campus, small-town feeling and one of the finest natural environments anywhere. Sparkling-clear air and a climate that's temperate year-round blend with majestic peaks, quiet valleys and the nearby ocean to create an exhilarating environment that's ideal for learning and growing.

It's a pleasure to walk around Cal Poly's compact, 400-acre central campus, with its sweeping views of the nearby peaks and valleys. To the north of the academic core is an additional 5,651 acres of rolling campus devoted to student farming, experimental architecture and other outdoor laboratory study, making Cal Poly's one of the largest campuses in the nation.

Instructional facilities are as diverse, specialized and lab-oriented as the instructional programs, and Cal Poly never stops developing new facilities and adapting old ones to include the latest technology in those continually evolving curricula. A prime example is the multimillion-dollar Computer-Aided Productivity Center, funded and equipped in large part by generous donations from industry. It's one of numerous computing facilities available daily to students at all levels in all programs. Another example among many is a \$4.3 million high-tech dairy instructional facility that went into operation in the spring of 1992.

The university's spacious, modern library contains about 853,000 books and 100,000 bound periodicals, as well as a highly rated government documents collection and other special collections.

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

Food is available on campus to suit almost any taste and any budget – at two cafeterias, a snack bar, a sandwich shop, a pizza place, an ice cream parlor, a convenience store and a full-service restaurant with a splendid view.

A modern Health Center assures attention to students' medical problems and conducts a variety of preventive programs.

For the Necessities, a Choice

A World of Activities

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

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

Student-run activities have earned enviable reputations even outside of California. A good example is the animated Rose Parade float designed and built jointly by students from Cal Poly and Cal Poly Pomona. Cal Poly floats consistently win some of the most-coveted prizes in that New Year's Day event.

Cal Poly's reputation for success applies to sports, too. In intercollegiate athletics, the university is making the transition from NCAA Division II to Division I. In the campus intramurals program, almost 1,000 teams participate in 20 sports open to both men and women. Students also can join more than 30 clubs involved in more-exotic sports like rugby, crew and ultimate Frisbee. Extensive athletic and other recreation facilities are available until late at night. A \$13.5 million recreational sports and events center was scheduled to open in 1993.

Cal Poly has long been known as a friendly campus that welcomes visitors. Parking permits and campus maps are available on weekdays at the information center at the campus's Grand Avenue entrance and at the information desk in the Administration Building lobby. The University Union lobby is the starting point for guided campus tours, offered several times a week. For tour days and times, call (805) 756-1111 or 756-2792, or write to the University Outreach Services office. Special group tours can be arranged. On weekends, campus maps are available in the University Union (weekend parking doesn't require a permit).

# THE HISTORY

## A VISION THAT NEVER WAVERED

**O**n a cold rainy day in December of the gold-rush year of 1849, a young West Point drop-out got off a ship in San Francisco and went looking for a job. He'd spent his last cent getting there.

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

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

"Yes, sir!"

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

The young man paused.

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

Someone else got the job.

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

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

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

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

In 1901 San Luis Obispo was a farm and rail community of just over 3,000 people. What's now the Cal Poly campus was farm land some distance north of town. The Southern Pacific had just completed the last link in its coastal route and supported the proposal to build a technical school as one way of increasing business for the new line. And it was on March 8 of that first year of the 20th century that legislation founding the California Polytechnic School was signed into law after six years of debate.

The mandate was clear: "To furnish to young people of both sexes mental and manual training in the arts and sciences, including agriculture, mechanics, engineering, business methods, domestic economy, and such other branches as will fit the students for non-professional walks of life."

Much has changed in the ensuing years – including the definition of "professional" – as Cal Poly has grown from a vocational high school into a major university. But the essence of that original charge is still part of state law, and Cal Poly has never lost sight of the purpose for which it was created.

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

Born with a New Century













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

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

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

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

During the next 33 years, until his retirement in 1966, McPhee guided Cal Poly's transformation. A third year of instruction was added in 1936, a fourth in 1940. Cal Poly's first baccalaureate exercises were held May 28, 1942.

During World War II, the campus was the site of a Naval Flight Preparatory School. After the war, a wave of practical-minded veterans using the G.I. Bill helped inject fresh vigor into the college's programs. The curriculum, facilities and enrollment expanded rapidly.

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

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

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

From a School to a College

New Times, New Challenges

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

When Cal Poly's current president, Warren J. Baker, succeeded Kennedy in 1979, the student body had reached 16,000. The challenges facing the university had become the challenges of broadening and refining programs and facilities to meet the need for an ever-more-sophisticated education in today's rapidly changing and interdependent world. They're the kinds of challenges Cal Poly has always anticipated and met.

As Cal Poly nears the end of its first century, it remains clear in its purpose and proud of its achievements, but never satisfied that it can't be better. It remains a continually evolving institution, but also true to the original vision of a school to "teach the hand as well as the head."

And as Cal Poly rises among the ranks of major American universities, time continues to test and prove the worth of a Cal Poly education. Cal Poly graduates possess the knowledge and skills not just to nail on some shingles as Myron Angel couldn't, but to step right into careers of planning, designing, building, operating and improving whole structures and entire communities, of managing farms and businesses, of developing minds and expanding knowledge – of helping to build a better life in our nation and the world.

















# A GUIDE TO USING THE CATALOG

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

## SCHOOLS AND DEPARTMENTS

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

### **DEGREES AND MAJORS**

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

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

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

Cal Poly students select a major at the time they apply for admission. There are 59 undergraduate majors to choose from. A complete listing of majors, arranged by school and department, may be found in "Academic Programs."

General requirements for bachelor's degrees are given in "Academic Requirements," and for master's degrees in "Graduate Studies." The specific requirements for a particular degree program are listed under the academic department that offers the degree.

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

### COURSES

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 numbering system is explained at the start of the "Courses" section.

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

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

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

General Education and Breadth (GEB) courses provide a common foundation of knowledge for all undergraduate programs. Cal Poly's GEB course requirements are described in detail on pages 86–89.

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

## CONCENTRATIONS AND SPECIALIZATIONS

A **concentration** is a group of courses designed to provide specialized knowledge within a bachelor's degree program.

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

#### MINORS

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

## QUARTERS AND QUARTER UNITS

Cal Poly's academic calendar consists of four quarters – Fall, Winter, Spring and Summer.

Cal Poly's **academic year** consists of Fall, Winter and Spring quarters.

The **university year** includes, and begins with, Summer Quarter.

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

To convert semester units to quarter units, multiply by 1.5. For example, 6 semester units  $\times$  1.5 = 9 quarter units.



# ACADEMIC CALENDAR

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

## **SUMMER QUARTER 1992**

June 22	Monday	Beginning of university year Beginning of summer quarter
		Summer quarter classes begin
July 3	Friday	Academic holiday – Independence Day Observed
July 6	Monday	End of second week of instruction
		Last day to drop a class
July 7	Tuesday	Last day to add a class
		Last day to register late and pay late registration fee
July 13	Monday	End of third week of instruction – Census date
August 10	Monday	End of seventh week
August 28	Friday	Last day of classes
August 31–September 4	Monday–Friday	Final examination period
September 4	Friday	End of summer quarter
September 5–13	Saturday–Sunday	Academic Holiday
FALL QUARTER 1992		
September 14	Monday	Beginning of fall quarter (faculty only)
September 21	Monday	Fall quarter classes begin
October 2	Friday	End of second week of instruction
		Last day to drop a class
October 5	Monday	Last day to add a class
	,	Last day to register late and pay late registration fee
October 9	Friday	End of third week of instruction - Census date
November 6	Friday	End of seventh week of instruction
November 11	Wednesday	Academic holiday – Veterans' Day
November 25–29	Wednesday-Sunday	Academic holiday – Thanksgiving
December 4	Friday	Last day of classes
December 7–11	Monday–Friday	Final examination period
December 12	Saturday	Mid-Year Commencement
	-	End of fall quarter
December 13–January 3	Sunday-Sunday	Academic holiday

## WINTER QUARTER 1993

January 4	Monday	Beginning of winter quarter Winter quarter classes begin
January 15	Friday	End of second week of instruction
lanuary 18	Monday	Academic holiday – Martin Luther King, Jr. Birthday Observance
January 19	Tuesday	Last day to add a class
January 25	Monday	Last day to register late and pay late registration fee End of third week of instruction – Census date
February 15	Monday	Academic holiday – George Washington's Birthday Observance
February 23	Tuesday	End of seventh week of instruction
March 12	Friday	Last day of classes
March 15–19	Monday-Friday	Final examination period
March 19	Friday	End of winter quarter
March 20–28	Saturday–Sunday	Academic holiday

## **SPRING QUARTER 1993**

March 29	Monday	Beginning of spring quarter
		Spring quarter classes begin
April 9	Friday	End of second week of instruction
		Last day to drop a class
April 12	Monday	Last day to add a class
	-	Last day to register late and pay late registration fee
April 16	Friday	End of third week of instruction
-		Census date
May 14	Friday	End of seventh week of instruction
May 31	Monday	Academic holiday – Memorial Day
June 4	Friday	Last day of classes
June 711	Monday-Friday	Final examination period
June 12	Saturday	Commencement
		End of spring quarter
		End of university year (faculty only)
June 13–June 20	Sunday–Sunday	Academic Holiday

# SUMMER QUARTER 1993

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

# FALL QUARTER 1993

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

## WINTER QUARTER 1994

January 3	Monday	Beginning of winter quarter
		Winter quarter classes begin
January 14	Friday	End of second week of instruction
		Last day to drop a class
January 17	Monday	Academic holiday - Martin Luther King, Jr. Birthday Observance
January 18	Tuesday	Last day to add a class
		Last day to register late and pay late registration fee
January 24	Monday	End of third week of instruction
- ,		Census date
February 21	Monday	Academic holiday - George Washington's Birthday Observance
February 22	Tuesday	End of seventh week of instruction
March 11	Friday	Last day of classes
March 14–18	Monday–Friday	Final examination period
March 18	Friday	End of winter quarter
March 19–27	Saturday-Sunday	Academic holiday

## **SPRING QUARTER 1994**

Beginning of spring quarter
Spring quarter classes begin
End of second week of instruction
Last day to drop a class
Last day to add a class
Last day to register late and pay late registration fee
End of third week of instruction
Census date
End of seventh week of instruction
Academic holiday – Memorial Day
Last day of classes
Friday Final examination period
Commencement
End of spring quarter
End of university year (faculty only)
unday Academic Holiday
F

## SUMMER QUARTER 1994

June 20	Monday	Beginning of university year Beginning of summer quarter Summer quarter classes begin
July 1	Friday	End of second week of instruction Last day to drop a class
July 4	Monday	Academic holiday – Independence Day
July 5	Tuesday	Last day to add a class
		Last day to register late and pay late registration fee
July 11	Monday	End of third week of instruction
		Census date
August 8	Monday	End of seventh week of instruction
August 26	Friday	Last day of classes
August 29–September 2	Monday–Friday	Final examination period
September 2	Friday	End of summer quarter
September 3–11	Saturday–Sunday	Academic Holiday

ACADEMIC

# PROGRAMS

# ACADEMIC PROGRAMS

Schools and Departments	Curricula with Concentrations/Minors	Degrees
School of Agriculture		
C	Agriculture	M.S.
	Specializations:	
	Agricultural Engineering Technology	
	Dairy Products Technology	
	Food Science and Nutrition	
	General Agriculture	
	International Agricultural Development	
	Soil Science	
	Minor: Water Science	
Agribusiness Department	Agricultural Business	BS
, and controls a operational	Concentrations	0.0.
	Agribusiness Finance and Appraisal	
	Agribusiness Marketing	
	Agribusiness Policy	
	Farm and Ranch Management	
	Minor: Agribusiness	
Agricultural Education Department	Agricultural Science	RS
Agricultural Education Department	Concentrations:	D.J.
	Agricultural Mochanics	
	Agricultural Products and Processing	
	Agricultural Products and Processing	
	Agricultural Resources Management	
	Agricultural supplies and services	
	Animal Production	
	Diant Deduction	
Agricultural Engineering Department		nc
Agricultural Engineering Department	Agricultural Engineering	B.S.
Animal Caine and Industry Department	Agricultural Engineering Technology	B.S.
Animal Sciences and Industry Department	Animai Science	B.S.
	Poultry Industry	B.S.
Crop Science Department	Crop Science	B.S.
	Fruit Science	B.S.
	Minor: Plant Protection	<b>B</b> 0
Dairy Science Department	Dairy Science	B.S.
	Concentrations:	
	Dairy Husbandry	
	Dairy Products Technology	
Food Science and Nutrition Department	Food Science	B.S.
	Nutritional Science	B.S.
Natural Resources Management Department	Forestry and Natural Resources	B.S.
	Concentrations:	
	Environmental Management	
	Forest Resources–Management	
	Forest Resources–Urban Forestry	
	Forest Resources–Watershed, Chaparral, and Fire	
	Management	
	Parks and Forest Recreation	
Ornamental Horticulture Department	Ornamental Horticulture	B.S.
	Concentrations:	
	Floriculture and Nursery Production	
	Horticulture Sales and Services	
	Landscape Industry	
Soil Science Department	Soil Science	
-	Concentrations:	B.S.
	Land Resources	
	Environmental Management	
	Environmental Science and Technology	
	.07	

Schools and Departments	Curricula with Concentrations/Minors	Degrees
School of Architecture and Envi	ronmental Design	
Architectural Engineering Department	Architectural Engineering	B.S.
Architecture Department	Architecture	B.Arch.
	Architecture	M.S.
	Specializations:	
	Environmental Design	
	Professional Practice	
City and Regional Planning Department	City and Regional Planning	B.S., M.C.R.P.
Construction Management Department	Construction Management	B.S.
Landscape Architecture Department	Landscape Architecture	B.S.
School of Business		
	Business Administration	M.B.A.
	Specialization:	
	Agribusiness	
	Business Administration/Engineering	M.B.A./M.S.
	Specialization:	
	Engineering Management	
Accounting Department	WINOF: DUSINESS Business Administration	P C
Accounting Department	Concentration	D.3.
	Accounting	
Business Administration Department	Business Administration	BS
business Administration Department	Concentrations:	0.0.
	Financial Management	
	Marketing Management	
Economics Department	Economics	B.S.
·	Concentrations:	
	Business and Industrial Economics	
	International Trade and Development	
	Quantitative Economics	
	Minor: Economics	
Management Department	Business Administration	B.S.
	Concentrations:	
	Human Resources Management	
	International Business Management	
	Management	
	Production and Operations Management	
School of Engineering	, c	
School of Lingineering	Business Administration/Engineering	M.B.A./M.S.
	Specialization:	,
	Engineering Management	
	Engineering	M.S.
	Specializations:	
	Biochemical Engineering	
	Industrial Engineering	
	Mechanical Engineering	
	Materials Engineering	
	Engineering Science	B.S.
Aeronautical Engineering Department	Aeronautical Engineering	B.S., M.S.
	Concentrations:	
	Aeronautics	
Civil and Environmental Engineering	Astronautus Civil Engineering	RS
Civil and Environmental Engineering	Environmental Engineering	8 S
Department	Civil and Environmental Engineering	B.S. M.S
Computer Science Department	Computer Science	B.S., M.S.
compared october of opplithent	Minor: Computer Science	,
	• •	

## 26 Academic Programs

Schools and Departments	Curricula with Concentrations/Minors	Degrees	
Computer Engineering	Computer Engineering	рс	
Electronic and Electrical Engineering	Computer Engineering	D.J. D C	
Department	Electronic Engineering	D.J. P.C	
Department	Electronic Engineering	D.S.	
	Electronic and Electrical Engineering	IVI.5.	
	Specializations:		
	Computer Engineering		
	Electrical Engineering		
	Electronic Engineering	D.C.	
Engineering Technology Department	Electronic Engineering Technology	B.S.	
	Engineering Technology	B.S.	
	Concentration:		
	Mechanical Technology	<b>B</b> A 1	
Industrial Engineering Department	Industrial Engineering	B.S.	
	Concentrations:		
	Manufacturing		
	Systems Integration		
Materials Engineering Department	Materials Engineering	B.S.	
Mechanical Engineering Department	Mechanical Engineering	B.S.	
	Concentrations:	B.S.	
	General		
	Heating, Ventilating, Air Conditioning, and Solar		
	Petroleum		
School of Liberal Arts			
	Minor: Women's Studies		
Art and Design Department	Applied Art and Design	B.S.	
	Concentrations:		
	Graphic Design		
	Photography		
	Minor: Art		
English Department	English	B.A., M.A.	
2 .	Minors:		
	English		
	Linguistics		
Foreign Languages Department	Minors:		
	French		
	German		
	Spanish		
History Department	History	B.A.	
, ,	Minor: History		
Journalism Department	Journalism	B.S.	
	Concentrations:		
	Agricultural Journalism		
	Broadcast Journalism		
	News-Editorial		
	Public Relations		
Liberal Studies	Liberal Studies	B.A.	
Music Department	Music	B.A.	
	Minor: Music		
Philosophy Department	Philosophy	B.A.	
	Minor: Philosophy		
Political Science Department	Political Science	B.A.	
	Concentrations:		
	International Affairs		
	Pre-Law		
	Public Administration		
	Teaching		
	Urban Studies		
	Minors:		
	International Relations		
	Public Administration		

Schools and Departments	Curricula with Concentrations/Minors	Degrees	
Psychology and Human Development Department	Human Development <i>Concentrations</i> Applied Developmental Psychology Applied Social Psychology Early Childhood Education Formity Studion	B.S.	
	Pamily Studies Psychology Minor: Psychology	M.S.	
Social Sciences Department	Social Sciences Concentrations: Criminal Justice Cross-Cultural Studies Organizations Social Sciences (Teaching) Social Services Minor: Anthropology and Geography	B.S.	
Speech Communication Department	Speech Communication	B.A.	
Theatre and Dance Department	Minors: Dance Theatre		
School of Professional Studies	<i>Minors:</i> Gerontology Packaging		
Graphic Communication Department	Graphic Communication <i>Concentrations:</i> Computer and Printing Technology Design Reproduction Technology Printing Management	B.S.	
Home Economics Department	Home Economics <i>Concentrations:</i> Interior Design Textiles and Clothing/Merchandising	B.S.	
Industrial Technology Department	Home Economics Industrial and Technical Studies Industrial Technology <i>Concentrations:</i> Industrial and Technology Education Industrial Management	M.S. M.A. B.S.	
Military Science Department	Vocational Education	B.V.Ed.	
Physical Education and Recreation Administration Department	Physical Education <i>Concentrations:</i> Commercial/Corporate Fitness Health Education Teaching	B.S.	
	Physical Education Recreation Administration <i>Concentrations:</i> Leisure Services Management Therapeutic Recreation	M.S. B.S.	

Schools and Departments

Curricula with Concentrations/Minors

Degrees

# **School of Science and Mathematics**

	Minor: Biotechnology	
Biological Sciences Department	Biological Sciences	B.S.
	Concentrations:	
	Anatomy-Physiology	
	Biology	
	Plant Pathology-Entomology	
	Plant Tissue Culture	
	Biological Sciences	M.S.
	Ecology and Systematic Biology	B.S.
	Concentrations:	2.01
	Ecology	
	Marine Biology and Fisheries	
	Systematics	
	Wildlife Biology	
	Microbiology	B.S.
	Concentrations:	0.01
	General Microbiology	
	Medical Laboratory Technology	
Chemistry Department	Biochemistry	B.S.
	Chemistry	B.S.
	Concentration:	
	Polymers and Coatings	
	Chemistry	M.S.
Mathematics Department	Mathematics	B.S.
Mattenates Department	Mathematics	MS
	Specializations	
	Applied Mathematics	
	Mathematics Teaching	
	Minor: Mathematics	
Physics Department	Physical Science	8.5
Trysics Department	Physical Science	BS
	Concentrations	5.01
	Electronics	
	Electro-Ontics	
	Physics	
Statistics Department	Statistics	B.S.
outouco beparanent	Minor: Statistics	5.0.
	minor statistics	

# **University Center for Teacher Education**

Education	M.A.
Specializations:	
Computer Based Education	
Counseling and Guidance	
Curriculum and Instruction	
Educational Administration Services	
Reading	
Special Education	

# Enrollment in Programs by School and Major, Fall 1991

Schools and Major Curricula	Undergrad	Grad.	Men	Women	Total
School of Agriculture					
Agriculture (M.S.)	_	69	41	28	69
Agricultural Education/Science	138	· _	50	88	138
Agricultural Engineering	149	-	127	22	149
Agricultural Engineering Technology	79	-	78	1	79
Agricultural Business	890	-	517	373	890
Animal Science	494		180	314	494
Cron Science	156	_	126	30	156
Dairy Science	103	_	73	30	103
Food Science	137	_	51	86	137
Forestry and Natural Resources	176	_	126	50	176
Fruit Science	57	_	42	15	57
Natural Resources Management	171	-	125	46	171
Nutritional Science	381	_	40	341	381
Ornamental Horticulture	325		184	141	325
Poultry Industry	29	_	20	9	29
Soil Science	115	-	67	48	115
Tatala	1/15		1.947	1 ( 2 2	2.460
lotais	3,400	69	1,64/	1,622	3,469
School of Architecture and Environmental Design					
Architectural Engineering	255	_	165	90	255
Architecture	767	35	519	283	802
City and Regional Planning	175	31	128	78	206
Construction Management	249		218	31	249
Landscape Architecture	222	_	147	75	222
Totals	1,668	66	1,177	557	1,734
School of Business					
	1 = 2 2	110	071	7(0	1 ( 10
Business Administration	1,522	118	8/1	/69	1,640
Economics	14/_		99	48	147
Totals	1,669	118	970	817	1,787
School of Engineering					
Aeronautical Engineering	336	27	278	85	363
Civil and Environmental Engineering (M.S.)	-	10	6	4	10
Civil Engineering	507	_	404	103	507
Computer Engineering	202	_	168	34	202
Computer Science	423	80	389	114	503
Electrical Engineering	367	_	312	55	367
Electronic and Electrical Engineering	-	19	19	0	19
Electronic Engineering	480	_	450	30	480
Electronic Engineering Technology	20	-	19	1	20
Engineering (M.S.)	_	25	22	3	25
Engineering Management (M.B.A./M.S.)		17	15	2	17
Engineering Science	56	-	38	18	56
Engineering Technology	336	_	311	25	336
Environmental Engineering	159	_	103	56	159
Industrial Engineering	224		157	67	224
Materials Engineering	123	_	104	19	123
Mechanical Engineering	836	_	742	94	836
Totals	4.069	178	3,537	710	4,247
10(4).	-,003		2,201		.,

# Enrollment in Programs by School and Major, Fall 1991-Continued

Schools and Major Curricula	Undergrad	Grad.	Men	Women	Total
School of Liberal Arts					
Applied Art and Design	208	-	115	93	208
English	283	64	111	236	347
History	170	_	100	70	170
Iournalism	251	-	90	161	251
Music	29	<u> </u>	15	14	29
Political Science	273	-	172	101	273
Social Sciences	317		125	192	317
Speech Communication	159	-	55	104	159
Totals	1,690	64	783	971	1,754
School of Professional Studies					
Child and Family Development	14	_	2	12	14
Counseling (MS)	-	64	15	49	64
Graphic Communication	321	-	146	175	321
Home Economics	339	n	7	332	339
Human Development	508	-	78	430	508
Industrial and Technical Studies (M A )		9	, S 5	430	9
Industrial Technology	326	_	283	43	326
Liberal Studies	360	_	203 41	319	360
Physical Education	359	30	193	205	398
Recreation Administration	218		83	135	218
Vocational Education	210	_	05	,55	210
lotals	2,445	112	853	1,/04	2,557
School of Science and Mathematics					
Biochemistry	231	_	119	112	231
Biological Sciences	481	24	224	281	505
Chemistry	79	4	43	40	83
Ecology and Systematic Biology	166	-	81	85	166
Mathematics	245	24	140	129	269
Microbiology	68	-	25	43	68
Physical Science	24	-	18	6	24
Physics	97	_	86	11	97
Statistics	37	-	26	11	37
Totals	1,428	52	762	718	1,480
University Center for Teacher Education					
Education (M.A.)	_	470	118	352	470
Campus Totals	16,369	1,129	10,047	7,451	17,498

## ACCREDITATION

The university is fully accredited by the Western Association of Schools and Colleges. The Commission for Teacher Credentialing has authorized the university to recommend for a number of teaching credentials as described in the catalog section on "Teacher Preparation Programs." In addition, some degree programs are accredited by discipline-related accrediting agencies.

- Architecture (bachelor's degree) National Architectural Accrediting Board
- Business Administration (undergraduate and graduate) –
  American Assembly of Collegiate Schools of Business
- City and Regional Planning (undergraduate degree) Planning Accreditation Board of the American Institute of Certified Planners
- Computer Science (undergraduate) Computing Sciences Accreditation Board, Computer Science Accreditation Commission
- Construction Management American Council for Construction Education
- Engineering (undergraduate: Aeronautical Engineering, Agricultural Engineering, Architectural Engineering, Civil Engineering, Electrical Engineering, Electronic Engineering, Environmental Engineering, Industrial Engineering, Materials Engineering, and Mechanical Engineering– Accreditation Board for Engineering and Technology, Engineering Accreditation Commission
- Electronic Engineering Technology and Engineering Technology (Mechanical Technology concentration) – Accreditation Board for Engineering and Technology, Technology Accreditation Commission
- Industrial Technology National Association of Industrial Technology
- Interior Design (undergraduate concentration, Home Economics) Foundation for Interior Design Education Research
- Landscape Architecture American Society of Landscape Architects
- Nutritional Science American Dietetics Association
- Recreation Administration National Recreation and Parks Association/American Association of Leisure and Recreation



# POLICIES ON THE RIGHTS OF INDIVIDUALS

#### NONDISCRIMINATION POLICY

#### Sex

The California State University does not discriminate on the basis of sex in the educational programs or activities it conducts. Title IX of the Education Amendments of 1972, as amended, and the administrative regulations adopted thereunder prohibit discrimination on the basis of sex in education programs and activities operated by California Polytechnic State University, San Luis Obispo. Such programs and activities include admission of students and employment. Inquiries concerning the application of Title IX to programs and activities of California Polytechnic State University, San Luis Obispo may be referred to Carl Wallace, Director, Judicial Affairs, Office of Student Affairs, the campus officer assigned the administrative responsibility of reviewing such matters or to the Regional Director of the Office for Civil Rights, Region 9, 50 U.N. Plaza, Room 239, San Francisco, California 94102.

#### Handicap

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

#### Race, Color, or National Origin

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

#### Age, Marital Status, Religion, or Sexual Orientation

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

#### SEXUAL HARASSMENT POLICY

Discrimination on the basis of sex is prohibited by Title VII of the Civil Rights Act as well as Title IX of the Educational Act. Sexual harassment is a violation of Section 703 of Title VII. Cal Poly is committed to creating and maintaining an environment in which faculty, staff and students work together in an atmosphere of mutual respect and unconstrained academic interchange. In the university environment, all faculty, staff and students are entitled to be treated on the basis of their qualifications, competence and accomplishments without regard to gender. Individuals are entitled to benefit from university programs and activities without being discriminated against on the basis of their sex. Sexual harassment violates university policy, seriously threatens the academic environment, and is illegal. The policy of the campus is to eliminate sexual harassment and to provide prompt and equitable relief to the extent possible.

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

- Submission to or toleration of the conduct is an explicit or implicit term or condition of appointment, employment, admission or academic evaluation;
- Submission to or rejection of such conduct is used as a basis for a personnel decision or academic evaluation affecting an individual;
- The conduct has the purpose or effect of interfering with an employee's work performance, or creating an intimidating, hostile, offensive or otherwise adverse working environment;
- The conduct has the purpose or effect of interfering with a student's academic performance, creating an intimidating, hostile, offensive or otherwise adverse learning environment, or adversely affecting any student.

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

Formal complaints alleging sexual harassment of employees or applicants for employment should be made to the Director of Personnel and Employee Relations, Administration 110, 756-2844. Complaints involving sexual harassment of students should be made to the Director of Judicial Affairs, Office of Student Affairs, Administration 206, 756-5731. Such complaints will be investigated without delay in accordance with Cal Poly Administrative Bulletin 88-5, applicable collective bargaining agreements and appropriate action taken; Chancellor's Office Executive Order No. 345, dated June 1, 1981; and Executive Order 419, "Systemwide Grievance Procedure–Discrimination Complaints for Employees Not Covered by Existing Regulation," dated July 1, 1983; and/or AB 88-5.

#### STATEMENT ON RACISM AND DISCRIMINATION

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

#### STATEMENT ON ACADEMIC FREEDOM

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

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

#### CHEATING AND PLAGIARISM

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

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

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

University policy can be summarized simply:

As a student, you are responsible for your own work and you are responsible for your actions.


## THE CALIFORNIA STATE UNIVERSITY

#### 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, all 20 campuses have the title "university."

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

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

The Trustees, the Chancellor, and the Presidents develop systemwide policy, with actual implementation at the campus level taking place through broadly based consultative procedures. The Academic Senate of The California State University, made up of elected representatives of the faculty from each campus, recommends academic policy to the Board of Trustees through the Chancellor. Academic excellence has been achieved by The California State University through a distinguished faculty, whose primary responsibility is superior teaching. While each campus in the system has its own unique geographic and curricular character, all campuses, as multipurpose institutions, offer undergraduate and graduate instruction for professional and occupational goals as well as broad liberal education. All of the campuses require for graduation a basic program of general education requirements, regardless of the type of bachelor's degree or major field selected by the student.

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

System enrollments total more than 369,000 students, who are taught by some 20,500 faculty. Last year the system awarded over 50 percent of the bachelor's degrees and 30 percent of the master's degrees granted in California. More than 1.2 million persons have been graduated from the campuses since 1960.

#### TRUSTEES OF THE CALIFORNIA STATE UNIVERSITY

#### **Ex Officio Trustees**

The Honorable Pete Wilson	State Capitol, Sacramento 95814
Governor of California	,
The Honorable Leo T. McCarthy	State Capitol, Sacramento 95814
Lieutenant Governor of California	
The Honorable Willie L. Brown, Jr.	State Capitol, Sacramento 95814
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State Superintendent of Public Instruction	
Dr. Barry Munitz	
Chancellor of The California State University	, ,

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#### **Appointed Trustees**

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

Dr. Claudia H. Hampton (1994) Mr. Dean S. Lesher (1993) Mr. Roland E. Arnall (1998) Ms. Marian Bagdasarian (1996) Mrs. Marianthi K. Lansdale (1993) John E. Kashiwabara, M.D. (1994) Ms. Martha C. Falgatter (1995) Mr. William D. Campbell (1995) Mr. Ralph R. Pesqueira (1996) Mr. Ted J. Saenger (1997) Mr. J. Gary Shansby (1992) Mr. Anthony M. Vitti (1997) Mrs. Gloria S. Hom (1992) Mr. James H. Gray (1998) Mr. Terrance W. Flanigan (1999) Mr. R. James Considine, Jr. (1992) Mr. Ronald L. Cedillos (1999) Dr. Bernard Goldstein (1993)

Correspondence with Trustees should be sent:

c/o Trustees Secretariat The California State University 400 Golden Shore, Suite 214 Long Beach, California 90802-4275

#### **OFFICE OF THE CHANCELLOR**

The California State University 400 Golden Shore, Suite 322 Long Beach, California 90802-4275 (310) 985-2500

Dr. Barry Munitz	Chancellor – CSU System
Dr. Herbert L. Carter	Executive Vice Chancellor
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Dr. June Cooper	Vice Chancellor, Human Resources and Operations
Mr. Bruce M. Richardson	Acting General Counsel
	*

### CAMPUSES-THE CALIFORNIA STATE UNIVERSITY

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California State University, Bakersfield	Dr. Tomas A. Arciniega, President (805) 664-2011
California State University, Chico 1st and Normal Streets, Chico, California 95929	Dr. Robin S. Wilson, President (916) 898-6116
California State University, Dominguez Hills 1000 East Victoria Street, Carson, California 90747	Dr. Robert C. Detweiler, President (310) 516-3300
California State University, Fresno	Dr. John D. Welty, President (209) 278-4240
California State University, Fullerton	Dr. Milton A. Gordon, President (714) 773-2011
California State University, Hayward Hayward, California 94542	Dr. Norma S. Rees, President (510) 881-3000
Humboldt State University Arcata, California 95521	Dr. Alistair W. McCrone, President (707) 826-3011
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San Diego State University 5300 Campanile Drive, San Diego, California 92182 Imperial Valley Campus	Dr. Thomas B. Day, President (619) 594-5000
720 Heber Avenue, Calexico, California 92231	(619) 357-3721
San Francisco State University	Dr. Robert A. Corrigan, President (415) 338-1111
San Jose State University One Washington Square, San Jose, California 95192	Dr. J. Handel Evans, Acting President (408) 924-1000
California Polytechnic State University, San Luis Obispo San Luis Obispo, California 93407	Dr. Warren J. Baker, President (805) 756-1111
California State University, San Marcos	Dr. Bill W. Stacy, President (619) 752-4000
Sonoma State University 1801 East Cotati Avenue, Rohnert Park, California 94928	Dr. David W. Benson, President (707) 664-2880
California State University, Stanislaus 801 West Monte Vista Avenue, Turlock, California 95380	Dr. John W. Moore, President (209) 667-3122

# THE CALIFORNIA STATE UNIVERSITY





# **Special Programs and Resources**

Alumni Association Computing at Cal Poly Conferences and Workshops Extended Education The Foundation Health Sciences-Preprofessional Preparation Inservice Training in Agriculture Research and Project Involvement Robert E. Kennedy Library Services to Vocational Agriculture Study Abroad Programs Teacher Preparation Programs University Development

## SPECIAL PROGRAMS AND RESOURCES

#### **ALUMNI ASSOCIATION**

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

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

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

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

#### COMPUTING AT CAL POLY

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

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

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

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

*Computer Operations* ensures continuous operation of the campuswide computing systems; orders routine and emergency maintenance; plans, manages and controls access to the machine room facilities; monitors machine performance and environmental conditions; and orders routine supplies and services.

The Computer-Aided Productivity Center is a CSU specialty center devoted to the support of academic programs in the areas of computer-aided drawing, design, and engineering analysis. The primary software products utilized stem from an IBM university grant which include an IBM mainframe, high resolution graphics terminals and a number of specialty software products. The Center's resources are open to all academic programs, with past usage primarily from engineering and architecture. The Center's resources also service other critical academic needs within the CSU, including support for schools of business and K–12 education. It is under the auspices of the CSU/IBM Academic Mainframe Specialty Center (AMSPEC).

#### **Resources and Facilities**

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

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

#### **CONFERENCES AND WORKSHOPS**

The Conference Coordinating Center is responsible for the coordination of university facilities and services for confer-

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

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

#### **EXTENDED EDUCATION**

The university's extended education programs provide a variety of services to residents of San Luis Obispo, Santa Barbara, and southern Monterey Counties. Extended education programs are self-supporting through student enrollment fees or agency funding. An up-to-date catalog describing the programs and course schedule is available free from the Extended Education Office, and all information centers on campus. You may also be placed on a mailing list by calling (805) 756-2053.

#### **Extension Programs**

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

Many extension courses are short seminars or workshops and longer courses that do not provide college credit, but that offer opportunity for professional development or personal development for working people and members of the central coast community of all ages. Some of these seminars and workshops are parts of larger programs that lead to a certificate of completion. The programs are also described in the Extended Education catalog.

Extended Education provides support for the educational aspects of conferences and special programs, such as arrangements for academic or professional credit, recruiting and compensation of seminar leaders and instructors, and publicity through extension media. Applications to offer courses or take courses may be obtained from the Extended Education Office in Jesperson Hall. Programs are scheduled throughout the year including summer, with summer youth programs and senior summer programs.

#### **Concurrent Enrollment**

Extension students may also take regular on-campus courses on a space-available basis through the concurrent enrollment program. *Extension fees and unit limitations apply to concurrent enrollment students.* Petitions and application forms may be obtained from the Extended Education Office two weeks prior to the beginning of each quarter. This enrollment process is not available to regular matriculating students.

#### THE FOUNDATION

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

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

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

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

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

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

# HEALTH SCIENCES-PREPROFESSIONAL PREPARATION

#### **Choosing a Major**

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

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

#### **Preprofessional Advising**

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

The Committee consists of 20 faculty from the departments of Animal Sciences and Industry, Biological Sciences, Chemistry, English, Mathematics, Physical Education and Recreation Administration, Physics, Psychology and Human Development, and Speech and staff members from the Psychological Services and Minority Access to Health Careers Office. For more information about the pre-health professions program at Cal Poly, contact the departments noted above or: Chairman of the Health Professions Guidance and Evaluation Committee, School of Science and Mathematics, Cal Poly, San Luis Obispo, CA 93407; phone (805) 756-2226, 756-2245 or 756-2796.

Students who belong to groups traditionally underrepresented in the health professions (especially ethnic minorities who are Afro-American, Hispanic or Native American) are encouraged to seek assistance from the Minority Access to Health Careers (MAHC) Office. For more information contact the Director of MAHC Program, School of Science and Mathematics, Cal Poly, San Luis Obispo, CA 93407; phone (805) 756-2840 or 756-2226.

#### Chiropractic

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

BIO 151, 153 CHEM 127, 128, 129, 316, 317, 318 ENGL 114, 125, 215/218 PHYS 121, 122, 123 PSY 201/202, 304 ZOO 237, 331, 332 2 courses in Social Science or Humanities

#### Dentistry

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

BIO 151, 152, 153 CHEM 127, 128, 129, 316, 317, 318 ENGL 114, 125, 215/218 PHYS 121, 122, 123 PSY 201/202, 307

#### Medical Technology (Clinical Laboratory Technology)

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

BACT 224, 225, 226, 423 BIO 151 or ZOO 131 CHEM 127, 128, 129, 326, 328, 331 PHYS 121, 122, 123 ZOO 426, 428

#### Medicine (Allopathic, Osteopathic, Podiatric)

Students generally complete three to four years of preprofessional course work prior to admission to medical school. For exact prerequisites, check individual catalogs or for allopathic medicine, the latest edition of the "Medical School Admissions Requirements, U.S.A. and Canada" published by the Association of American Medical Colleges (One Dupont Circle, N.W., Washington, D.C. 20036) or for osteopathic medicine, the latest edition of "The Education of the Osteopathic Physician," published by the American Association of Colleges of Osteopathic Medicine (6110 Executive Blvd., Suite 405, Rockville, MD 20852). There is no similar general publication for podiatric medical colleges. For allopathic and osteopathic schools the Medical College Admissions Test (MCAT) must be taken at least one year prior to the projected date of admission. However, for some podiatric schools, the MCAT can be taken as late as the Spring of the year of projected admission. Students usually apply to 8-30 allopathic schools, or 3-6 osteopathic schools or 2-6 podiatric schools. The following Cal Poly courses meet the minimum preparation for most schools:

BIO 151, 152, 153 CHEM 127, 128, 129, 316, 317, 318 ENGL 114, 125, 215/218 MATH 141, 142 PHYS 121, 122, 123

#### Nursing

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

BACT 221 BIO 151 or ZOO 131 CHEM 127, 128, 326, 328 ENGL 114, 125 FSN 210 PSY 201/202 SOC 105 ZOO 237, 331, 332, 340

#### **Occupational Therapy**

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

BIO 151 or ZOO 131 PSY 201/202 SOC 105 or ANT 201 ZOO 237, 331, 332, 340 1 course in Studio Art or Industrial Arts skills

#### Optometry

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

BACT 221 BIO 151, 152, 153 CHEM 127, 128, 129, 316, 317, ENGL 114, 125, 215/218 MATH 141, 142 PHYS 121, 122, 123 PSY 201/202 STAT 211, 212 ZOO 237, 331, 332, 326 1 year of Social Science

#### Pharmacy

Students generally complete two to three years of preprofessional course work prior to admission to pharmacy school. The Pharmacy College Admissions Test (PCAT) may be required. For exact prerequisites, check individual catalogs or the latest edition of "Pharmacy School Admission Requirements" published by the American Association of Colleges of Pharmacy (1426 Prince St., Alexandria, VA 22314-2841). Students usually apply to 2 to 3 schools. The following Cal Poly courses meet the minimum preparation:

BACT 221 BIO 151, 152, 153 CHEM 127, 128, 129, 156, 316, 317, 318, 331 ECON 211, 212 ENGL 114, 125, 215/218 MATH 120, 141, 142 PHYS 121, 123 PSY 201/202, 301 SPC 201/202

#### **Physical Therapy**

Currently professional training occurs at either the Certificate, Baccalaureate or Graduate level. For exact prerequisites, check individual catalogs or the latest edition of "Directory of Physical Therapy Education Programs" published by the American Physical Therapy Association (1111 N. Fairfax St., Alexandria, VA 22314-1488). Applicants are expected to have considerable experience in the field. Graduate programs require satisfactory scores on the Graduate Record Examination (GRE). The following Cal Poly courses meet the minimum preparation:

BACT 221 BIO 151, 152, 153 CHEM 127, 128, 129, 326 CSC 110 PE 302, 303, 402 PHYS 121, 122, 123 PSY 201/202, 301, 307 SOC 105 STAT 211 ZOO 237, 331, 332, 340

#### **Physician Assistant**

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

BACT 221 BIO 151 or ZOO 131 ENGL 114 MATH 118 PSY 201/202, 307 SOC 105 or ANT 201 ZOO 237, 331, 332, 340

#### **Veterinary Medicine**

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

ASCI 111/112/113/114, 202 BACT 221 BIO 151, 152, 153, 303 CHEM 127, 128, 129, 316, 317, 318, 328/371 ENGL 114, 125, 215/218 PHYS 121, 122, 123 PSY 201/202 STAT 131 or 211 ZOO 303

#### **INSERVICE TRAINING IN AGRICULTURE**

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

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

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

#### **RESEARCH AND PROJECT INVOLVEMENT**

Faculty actively seek grants and contracts for research and development activities. These sponsored projects enhance the educational program by bringing to the campus state-of-the-art equipment and hundreds of thousands of dollars for undergraduate and graduate student research support.

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

#### **ROBERT E. KENNEDY LIBRARY**

The Robert E. Kennedy Library provides a variety of comfortable and attractive environments for study, research, and browsing. The building features an interior courtyard design, open stack accessibility, and individual study stations. The Library collection contains over two million bibliographic items. The 750,000-volume book collection is supplemented by periodicals, art prints, nearly 3,000,000 microforms, senior projects, government documents, maps, audio visual materials, and various special collections.

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

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

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

The Government Documents and Maps Department is a selective depository for United States documents and California State documents. It also contains cartographic material, the local government collection, Agricultural Experiment Station and Extension Service publications, National Technical Information Services publications and United Nations documents. It is a full depository for U.S. nuclear power plant documents.

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

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

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

#### SERVICES TO VOCATIONAL AGRICULTURE

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

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

#### STUDY ABROAD PROGRAMS

#### The California State University International Programs

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

International Programs participants earn resident academic credit at their CSU campuses while they pursue full-time study at a host university or special study center abroad. The International Programs serves the needs of students in over 100 designated academic majors. Affiliated with 35 recognized universities and institutions of higher education in 15 countries, the International Programs also offers a wide selection of study locales and learning environments.

#### Australia

The University of Queensland (Brisbane)

#### Brazil

Universidad de Sao Paulo

#### Canada

The universities of the Province of Quebec (13 institutions, including Université de Montréal, Concordia University, Université Laval, McGill University, Université du Quebec, Bishop's University, *i.a.*)

#### Denmark

The DIS Study Program (the international education affiliate of the University of Copenhagen)

#### France

Institut des Etudes Françaises pour Etudiants Etrangers, Université de Droit, D'Économie et des Sciences D'Aix-Marseille (Aix-en-Provence)

#### Germany

Universität Heidelberg and Universität Tübingen

#### Israel

The Hebrew University of Jerusalem

#### Italy

CSU Study Center (Florence), Universitá degli Studi di Firenze, and La Accademia di Belle Arti di Firenze

#### Japan

Waseda University (Tokyo)

#### Mexico

Universidad Iberoamericana (Mexico City)

#### New Zealand

Lincoln University (Christchurch) *and* Massey University (Palmerston North)

#### Spain

Universidad Complutense de Madrid *and* Universidad de Granada

#### Sweden

Uppsala Universitet

#### **United Kingdom**

Bradford University, Bristol University, Kingston Polytechnic, Sheffield University, and University of Wales, Swansea

#### Zimbabwe

University of Zimbabwe (Harare)

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

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

Many Cal Poly departments support the concept of international education and encourage students to investigate opportunities for overseas study. Additional information and application materials may be obtained from the International Programs Office, Administration Building 315, or by writing to The California State University International Programs, 400 Golden Shore, Long Beach, California 90802-4275. Applications for the academic year overseas must be submitted by February 1. Three countries are exceptions, and have the following deadlines: Zimbabwe (November 15), and Australia and New Zealand (May 1).

#### **Cal Poly International Programs**

#### Australia Study-Agriculture (Ornamental Horticulture)

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

#### Australia Study-Architecture

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

#### **Kenya Study**

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

#### London Study Program

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

#### **Paris Study Program**

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

#### **TEACHER PREPARATION PROGRAMS**

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

- Multiple Subjects Instruction (as commonly practiced in California elementary schools)
- Single Subject Instruction (as commonly practiced in California high schools and most junior high schools)

Adapted Physical Education Specialist

Agriculture Specialist

Administrative Services

Pupil Personnel Services

- **Reading Specialist**
- Special Education (Learning Handicapped Specialist, Severely
- Handicapped Specialist, and Resource Specialist Certificate)
- Multiple Subjects Credential Bilingual Emphasis (Spanish)

The Teacher Education Credential Program consists of the coursework and field experiences, including student teaching,

required to obtain the Preliminary and Professional Clear Teaching Credentials. Guidelines for credentials are established by the State of California's Commission on Teacher Credentialing (CTC). Admission to the university does not guarantee admission to the teacher education program.

For more information regarding Teaching Credentials, please refer to the University Center for Teacher Education.

#### UNIVERSITY DEVELOPMENT

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

Contributions made through estate planning and deferred giving have been especially beneficial, both to the university and to the donors. They permit donors to make major gifts whose benefits to the university continue beyond the lifetime of the donor. Contributions to endowments are very beneficial in providing a stable source of resources for school and faculty support.

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

The athletic development program is designed to assist in funding athletic scholarships and other athletic program needs not included in the university's budget. To facilitate this effort, the Mustang Boosters has been formed. The primary purpose of this statewide organization is to provide funds from private contributions for scholarships and other needs of student athletes.



# **Student Activities and Services**

## ACTIVITIES

Associated Students, Inc. Campus Organizations Children's Center Fraternities and Sororities The Program Board Recreational Sports Students Serving in the Community University Union Craft Center Escape Route The Galerie Multi-Cultural Center Travel Center Week of Welcome

### SERVICES

Campus Student Relations and Judicial Affairs Career Services Center for Women and Ethnic Issues Food Service Health Services Housing Services Psychological Services Student Academic Services University Outreach Services

### ATHLETICS

# **STUDENT ACTIVITIES**

#### THE ASSOCIATED STUDENTS INC.

#### Making Things Happen

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

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

#### **CAMPUS ORGANIZATIONS**

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

#### **CHILDREN'S CENTER**

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

#### FRATERNITIES AND SORORITIES

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

#### **Fraternities**

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

Phi Beta Sigma Phi Delta Theta Phi Kappa Alpha Phi Kappa Psi Phi Sigma Kappa Sigma Alpha Epsilon Sigma Chi Sigma Nu Sigma Phi Epsilon Sigma Pi Tau Kappa Epsilon Theta Chi Theta Xi

#### **Sororities**

Alpha Chi Omega
Alpha Kappa Alpha
Alpha Omicron Pi
Alpha Phi
Delta Sigma Theta

Gamma Phi Beta Kappa Alpha Theta Sigma Kappa Zeta Tau Alpha

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

#### **ROSE FLOAT**

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

#### THE PROGRAM BOARD

#### Fun and Entertainment

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

- Special Events Committee sponsors a diverse program including concerts, comedy shows, acrobats and general entertainment. They also feature local talent weekly during University Hour as well as movies.
- Speakers Forum arranges for speakers and panels to explore political, cultural, religious, technical and environmental issues.
- · Concerts Committee books nationally and internationallyknown touring groups, ranging from rock to jazz, to country and alternative sounds.
- Fine Arts Committee brings the classics to the campus in the form of professional musical ensembles, theatre and dance productions, and art exhibitions.
- Cultural Advisory Committee strives to create an environment of sensitivity and awareness to cultural diversity.
- · Craft Center provides a place to learn and do crafts of all kinds.

• *Outings* lets you get away from studying by hosting trips, helping you plan your own and providing low-cost rental equipment.

#### **RECREATIONAL SPORTS**

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

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

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

Indoor and outdoor swimming pools 6 volleyball courts

- 14 outdoor tennis courts
- 3 indoor basketball courts
- 16 outdoor basketball courts
- 2 weight rooms
- 6 racquetball courts
- 1 400-meter track
- 3 fields for soccer, softball, football

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

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

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

#### STUDENTS SERVING IN THE COMMUNITY

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

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

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

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

#### THE UNIVERSITY UNION

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

#### **Craft Center**

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

#### **Escape Route**

Opportunities for outdoor activities are offered by the ASI Outings Committee through the Escape Route. An extensive collection of books, information on state and national parks, and topographical maps, are available as are resources on snow camping, bicycle touring, back-packing, canoeing, rock climbing, and other activities. Outdoor equipment such as tents, sleeping bags, cross country skis and even ice cream makers can be rented at minimal cost.

#### The Galerie

The Galerie is a non-profit, educational arts facility which offers the first-hand experience of contemporary and historical works of art in a variety of media. The Galerie program is considered to be an integral part of education at the university, providing direct involvement in the arts through education, cultural and social interaction, interdisciplinary programs, and student employment.

#### **Multi-Cultural Center**

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

#### **Travel Center**

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

#### WEEK OF WELCOME

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

## **STUDENT SERVICES**

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

# CAMPUS STUDENT RELATIONS AND JUDICIAL AFFAIRS

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

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

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

#### **CAREER SERVICES**

A centralized service is available to all students and alumni of the university. The Career Services staff and instructional departments work together in assisting students to obtain the most suitable employment consistent with their preparation and experience. To this end, a full complement of programs and services are available.

#### **Career Counseling and Planning**

Through individual appointments and group seminars, students are guided through the exploration and formation of personal career plans. Under the direction of department staff, students may take advantage of interest and aptitude inventories, utilize computerized career guidance systems, review current literature on career profiles, trends, and work environments, attend department-sponsored career fairs or employer/industry information sessions, and meet informally with recent graduates who are currently in the career being considered. Students who are considering a change of major are particularly encouraged to utilize this popular career service in order to become better informed about their future career potential.

#### **Student Employment**

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

#### **Cooperative Education**

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

While requirements may vary among some academic departments, generally speaking, students with a GPA of 2.0 or higher and who have completed their freshman year (or one quarter in residence for transfer students) are eligible to register and begin the Co-op job search process. Opportunities for students are primarily located in California and the Western States; however, placement is not limited to this region. Students may choose to consider other parts of the United States or even abroad. Staff and faculty continually seek new contacts in order to provide appropriate employment for interested students.

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

#### **Career Placement**

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

#### CENTER FOR WOMEN AND ETHNIC ISSUES

The major focus of the Center For Women and Ethnic Issues is to create opportunities for students, faculty and staff to actively address issues of gender and race and to examine their impact on values and attitudes. The Center facilitates the creation of new activities and events and networks with existing campus programs.

#### FOOD SERVICE

#### **Campus Dining**

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

#### The Campus Express Club

Membership in the Campus Express Club is open to all students, whether living on or off campus, as well as faculty and staff. The Campus Express Club is a declining balance account that works like a credit card in reverse. Members deposit money to their account and then use their campus I.D. card to make purchases at most Campus Dining locations. Membership has its privileges, including a 5% bonus for deposits of \$100 or more and special deals and discounts offered at Campus Dining locations for members only.

#### **Meal Plans**

All residence hall students, as well as off-campus customers, enjoy the flexibility of purchasing a 19- or 14-Meal Plan. The Meal Plan offers all-you-can-eat meals at the University Dining Room as well as a cash equivalency system providing for ala carte and take out items from the Snack Bar, Sandwich Plant and VG Cafe.

#### **HEALTH SERVICES**

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

*Basic outpatient care* is available Monday through Friday, year round, 8:00 a.m. to 4:30 p.m. and includes physician and nursing services, women's health care, laboratory and x-ray services. Pharmacy items are available at cost.

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

Additional services are also available either by purchasing a Health Card or by paying a small fee for each service. Services include care on weekends, allergy injections, optometry, podiatry, physical therapy, physical exam, oral health, and subsidy for ambulance and emergency room. These extra services are available during fall, winter and spring quarters.

*Major medical insurance* coverage is strongly recommended since major medical/surgical problems cannot be treated at the Student Health Center.

#### HOUSING SERVICES

Living on campus can be a unique and rewarding experience. What makes living in Cal Poly's residence halls so special? The answer to that question really depends on the individual. For nearly two-thirds of all entering first year students it is the first experience in a new environment. For others, it is the tremendously varied social interaction and the diverse mixture of individuals sharing the same community that make life in the halls so exciting. Almost half of all entering students are visibly persons of color. The Housing Department believes it is this living environment, where issues and culturalism are discussed and addressed, that provides the resident the greatest opportunity to explore their ideas and values in a physically and emotionally safe learning community.

At Cal Poly, the Housing Department tries to provide a supportive living/learning environment, which educates, challenges, and supports residents' personal and academic development. Learning in the classroom is extended into the residence halls through formal programming, recreational activities, and the Living/Learning Centers. Faculty presentations, sand volleyball, hikes, workshops, and more are all coordinated jointly by the residents and the Housing Department staff. Most students make lifelong friends while residing in the residence halls.

#### Housing Department Staff

The activities within the residence halls are administered by the full-time professional Coordinators of Student Development. The Coordinators provide assistance in counseling, crisis intervention, general referral, judicial actions, and activity advising while supervising the desk services and the Resident Advisor staff team.

Resident Advisors are students who are trained to assist with academic advising, event planning, and crisis intervention in order to assist students to successfully make it through their first and second year experience at Cal Poly. Resident Advisors, known as RAs, are upperclass students who understand the challenges faced by new students and try to make the residence hall experience positive and memorable. This is one of the reasons housing at Cal Poly is enjoyed by 2,800 students.

#### **Residence Halls and Living/Learning Centers**

Housing at Cal Poly is designed to promote interaction. All rooms are double occupancy, accommodating two students in a male, female, or coeducational setting.

If residing in traditional housing is not of interest, accommodations are also available in the special interest Living/Learning Centers. Living/Learning Centers (LLCs) are residence halls which are centered around the Cal Poly academic theme and are offered for any student who wishes to reside with other students enrolled in the same academic school. In the LLCs, faculty, administrators, and alumni frequently coordinate special events and speak informally with students. 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: immediate academic support, direct faculty contact, study groups, numerous events and programs directly relating to the student's field of study, a better understanding of the student's major and the issues affecting it, and career planning. The LLCs are a lot of fun, too. LLC residents will often tour local industries or attend unique events allowing the resident to gain valuable "hands on" support. The LLC is not for everyone, however. It is only for those who want to gain the most from their on-campus living experience and have a great deal of fun while doing it.

#### **Community Development**

Unique to the Cal Poly Housing experience is student governance. Student representatives are elected to serve on governing boards in each residence hall during the fall term of each year. Participants in this leadership development opportunity assist in the total development of their hall's community, planning social, recreational, and educational events, and voicing student related concerns. Central to this experience are the "Networks." There are five networks: global issues, student community services, quality of life, health and wellness, and multicultural issues allowing additional opportunities for involvement. If residents have an interest in any one of these areas there is a place for them to become even more involved while promoting an important issues with their students peers.

#### **Closest Housing to Your Classes**

Cal Poly housing is "on-campus." This allows the resident convenient access to all campus services and events. Students who wish to reside on campus should request oncampus housing by returning their housing application to the Housing Office. This application is found in the "Notice of Admission" booklet. Housing licenses are then mailed to students. Priority for housing is generally assigned on a first come, first served basis. Students over 30 years of age may be offered housing by permission of the Director of Housing.

Signed licenses, accompanied by the required payment, must be returned by the deadline stated on the license to receive housing consideration.

#### Living Expenses for Students Living in Campus Residence Halls

#### (Subject to Change)

Room (academic year) annual license required (double occupancy)	\$2,058–2,160
Board, (required, academic year)	2,025-2,255
Housing Security Deposit (payable prior to occupancy)	25

Room and Board are payable in advance. A service fee will be charged with all installment plans.

Students furnish their own bed spreads and study lamps. Linen service is available.

#### **Board Plans**

On-campus residents have the opportunity to select from two different meals plans. The 19 meal plan provides a maximum of 19 meals per week at the approximate prepaid cost of \$2,175 for the entire academic year. The 14 meal plan provides a maximum of 14 meals per week at the approximate prepaid cost of \$2,025 for the entire academic year. Students may change from one meal plan to the other if written notification is given prior to an installment due date.

#### **Community Housing**

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

#### Statement of Human Dignity Standards

As a pluralistic University community, representing diverse racial, ethnic and class distinctions; national origins; religious and political beliefs; physical abilities and learning styles; and sexual orientations, we affirm the dignity inherent in all. members of the community, and we strive to provide a climate marked by respect for individual differences and backgrounds.

Our commitment to free expression is based upon mutual understanding, sensitivity, and cooperation. Each of us shares an obligation to the community. All who work, live, study, and teach in the residence halls are expected to assume responsibility and accountability for their actions.

#### **PSYCHOLOGICAL SERVICES**

Psychological Services offer assistance and growth experiences for a variety of student needs and environmental improvement. Services include counseling and testing. In addition to receiving help in a time of transition, students can develop skills in such areas as communication; problem solving; decision making; and ability, interest, or have a personality assessment done for them.

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

#### STUDENT ACADEMIC SERVICES

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

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

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

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

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

The Learning Center assists students in learning how to develop and maintain the basic skills necessary for effective study toward academic success.

Additionally, Student Academic Services is useful as a referral center for students' academic and personal questions and concerns.

#### UNIVERSITY OUTREACH SERVICES

University Outreach Services (UOS) provides leadership and service to Cal Poly in serving California's diverse student population by increasing the number of qualified university applicants to each of the academic schools. Its goals are:

- 1. To provide the university with an ample and balanced pool of undergraduate applicants, taking into consideration the students' ethnicity, gender, grade level, family income, personal disabilities (physical and learning), and major of choice, and
- 2. To provide prospective students and their key influencers (parents, counselors, teachers, administrators) information, services and responsiveness related to Cal Poly, the California State University system, and higher education.

UOS activities include high school and community college visits, community college transfer centers and workshops, developmental outreach programs, campus tours each Monday, Wednesday and Friday at 10:00 am and 2:00 pm (except major holidays) and pre-enrollment advising.

## INTERCOLLEGIATE ATHLETICS DEPARTMENT

#### (Position Vacant), Director

Marilyn A. McNeil, Associate Director

#### Robert Rowell, Business Manager

Sheri Bates	Tom Henderson
Steve Beason	Steve McFarland
Bill Becktel	Catherine Milligan
Lisa Boyer	lill Orrock
Mike Church	Lyle Setencich
Lennis Cowell	Randy Stewart
Craig Cummings	Rill Tripp
Bill Dutton	
Rich Firman	Deanne Vochatzer
Wolfgang Gartner	Steve Yoneda

Intercollegiate Athletics is administered as a separate department, though students participating on its teams receive academic credit for their efforts in courses offered through the Physical Education and Recreation Administration Department.

All the teams, with the exception of wrestling and women's volleyball, compete at the NCAA Division II level. Wrestling and women's volleyball compete at the Division I level. The football program is a member of the Western Football Conference. Wrestling competes in the PAC 10 conference. The balance of the women's and men's programs are in the California Collegiate Athletic Association (CCAA). Through the end of 1991, Cal Poly has won 37 NCAA Division II team titles.



# Admissions

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## **ADMISSIONS PROCEDURES AND POLICIES**

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

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

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

### **Undergraduate Application Procedures**

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

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

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

Applications postmarked after the filing period will be considered only if openings are still available.

#### THE ADMISSION PROCESS

Early in the month following the filing period, Cal Poly will send you an Admissions Supplemental Questionnaire (ASQ). The ASQ asks for information about your academic coursework, grades, ACT or SAT scores, activities and interests and allows us a more well-rounded view of our applicants. The ASQ must be completed and returned to receive further consideration in the Admissions process. The data submitted on the ASQ will be utilized to help determine which applicants are then sent a notice of space reservation. (This is not the same as admission nor associated with housing-it actually means that if a student is eligible for admission, he or she will be admitted).

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

Approximately 12 weeks after the end of the application filing period, and after your ASQ has been received and scored and if a space is reserved for you, you will receive your Notice of Space Reservation. It provides instructions for submitting transcripts and other supporting documents and includes an on-campus housing application and the Student Profile. You must complete and return all supporting documents by the specified deadline in order to receive further consideration for admission.

If you are not granted space at Cal Poly, but you listed an alternate campus on your application, your application will automatically be redirected to that campus if they still have openings in your major.

After your transcripts and test scores and required supporting documents have been received and we verify that you have met the CSU admission requirements, you will receive an acceptance letter confirming that you are eligible to register for classes.

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

#### **IMPACTED PROGRAMS**

The CSU designates programs as impacted when more applications are received in the first month of the filing period than can be accommodated. Some programs are impacted at every campus where they are offered; others are impacted only at some campuses. You must meet supplementary admissions criteria if applying to an impacted program.

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

You must file your application for admission to an impacted program during the first month of the filing period. Further, if

you wish to be considered in impacted programs at two or more campuses, you must file an application to each. Nonresident applicants are rarely admitted to impacted programs.

#### **Supplementary Admission Criteria**

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

The supplementary admission criteria used by the individual campuses to screen applicants appear periodically in the "CSU School and College Review" and are sent by the campuses to all applicants seeking admission to an impacted program. At Cal Poly we typically collect this information from our Admissions Supplemental Questionnaire.

Unlike unaccommodated applicants to locally impacted programs who may be redirected to another campus in the same major, unaccommodated applicants to systemwide impacted programs may not be redirected in the same major but may choose an alternate major either at the first choice campus or another campus.

#### **Application Acknowledgment**

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

#### **Hardship Petitions**

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

### **Undergraduate Admission Requirements**

#### FRESHMAN REQUIREMENTS

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

- (1) are a high school graduate,
- (2) have a qualifiable eligibility index (see section on Eligibility Index), and
- (3) have completed with grades of C or better each of the courses in the comprehensive pattern of college preparatory subject requirements (see "Subject Requirements"). Courses must be completed prior to the first enrollment in The California State University.

#### **Eligibility Index**

The eligibility index is the combination of your high school grade point average and your score on either the American College Test (ACT) or the Scholastic Aptitude Test (SAT). Your grade point average is based on grades earned during your final three years of high school (excluding physical education and military science) and bonus points for approved honors courses (see "Honors Courses").

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

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

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

You will qualify for regular admission when the university verifies that you have a qualifiable eligibility index and will have completed the comprehensive pattern of college preparatory subjects and, if applying to an impacted program, meet supplementary criteria.

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

		Application ring renous	
Terms in 1992-93	Applications First Accepted	Filing Period Duration	Student Notification Begins
Summer Qtr. 1992 Fall Qtr. 1992 Winter Qtr. 1993 Spring Qtr. 1993	Feb. 3, 1992 Nov. 2, 1991 June 1, 1992 Aug. 1, 1992	Each campus accepts applications until capacities are reached. Many campuses limit undergraduate admission in an enrollment category because of overall enrollment limits. If applying after the initial filing period, consult the campus admission office for current information.	March 1992 Dec. 1991 July 1992 Sept. 1992

### **Application Filing Periods**

#### **Provisional Admission**

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

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

GPA	2.00 *	2.20	2.40	2.60	2.80	3.00 **
ACT Score	30	26	22	18	14	
SAT Score	1200	1040	880	720	560	

\* Below 2.00 does not qualify for regular admission.

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

#### **Honors Courses**

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

#### **Subject Requirements**

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

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

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

#### Foreign Language Subject Requirement

The foreign language subject requirement may be satisfied by applicants who demonstrate competence in a language other

than English equivalent to or higher than expected of students who complete two years of foreign language study. Consult with your school counselor or any CSU campus admission or relations with schools office for further information.

# Subject Requirement Substitution for Students with Disabilities

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

#### TRANSFER REQUIREMENTS

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

- 1. You will meet the freshman admission requirements in effect for the term to which you are applying (see "Freshman Requirements").
- 2. You were eligible as a freshman at the time of high school graduation and have been in continuous attendance at an accredited college since high school graduation.
- 3. You were eligible as a freshman at the time of high school graduation except for the subject requirements, have made up the missing subjects, and have been in continuous attendance in an accredited college since high school graduation.
- 4. You have completed at least 56 transferable semester (84 quarter) units and have made up any missing subject requirements (see "Making Up Missing College Preparatory Subjects" section). Nonresidents must have a 2.4 grade point average or better.

Transferable courses are those designated for that purpose by the college or university offering the courses.

#### Making Up Missing College Preparatory Subject Requirements

Undergraduate transfer applicants who did not complete the subject requirements while in high school may make up missing subjects in any of the following ways. One college course of at least three semester or four quarter units will be considered equivalent to one year of high school study.

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

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

#### **TEST REQUIREMENTS**

Freshman and transfer applicants who have fewer than 56 semester or 84 quarter units of transferable college credit must submit scores, unless exempt (see "Eligibility Index"), from either the Scholastic Aptitude Test (SAT) of the College Board or the American College Testing Program (ACT). If you are applying to an impacted program and are required to submit test scores, you should take the test no later than early December if applying for fall admission or no later than November if applying to San Luis Obispo. Test scores are also used for advising and placement purposes. Registration forms and dates for the SAT or ACT are available from school or college counselors or from a CSU campus testing office. Or, you may write to or call:

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

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

#### **TOEFL Requirement**

All undergraduate applicants, regardless of citizenship, who have not attended schools at the secondary level or above for at least three years full time where English is the principal language of instruction must present a score of 550 or above on the Test of English as a Foreign Language (TOEFL). Applicants should take the TOEFL at least six months prior to the term applying for in order for scores to be received in time for full consideration in the selection process.

## **Other Admissions Information**

### **ADULT STUDENTS**

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

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

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

#### California Residents Sixty Years of Age or Older

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

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

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

#### **HIGH SCHOOL STUDENTS**

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

#### INTERNATIONAL (FOREIGN) STUDENT ADMISSION REQUIREMENTS

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

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

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

#### **GRADUATE ADMISSION**

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

#### DETERMINATION OF RESIDENCE FOR NONRESIDENT TUITION PURPOSES

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

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

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

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

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

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

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

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

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

Fall	September 20
Winter	January 5
Spring	April 1
Summer	

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

There are exceptions from nonresident tuition, including:

- 1. Persons below the age of 19 whose parents were residents of California but who left the state while the student, who remained, was still a minor. When the minor reaches age 18, the exception continues for one year to enable the student to qualify as a resident student.
- 2. Minors who have been present in California with the intent of acquiring residence for more than a year before the residence determination date, and entirely self-supporting for that period of time.
- 3. Persons below the age of 19 who have lived with and been under the continuous direct care and control of an adult, not a parent, for the two years immediately preceding the residence determination date. Such adult must have been a California resident for the most recent year.
- 4. Dependent children and spouses of persons in active military service stationed in California on the residence

determination date. The exception, once attained, is not affected by retirement or transfer of the military person outside the state.

- Military personnel in active service stationed in California on the residence determination date for purposes other than education at state-supported institutions of higher education.
- 6. Dependent children of a California resident who has been a California resident for the most recent year. This exception continues until the student has resided in the state the minimum time necessary to become a resident, so long as continuous attendance is maintained at an institution.
- 7. Graduates of any school located in California that is operated by the United States Bureau of Indian Affairs, including, but not limited to, the Sherman Indian High School. The exception continues so long as continuous attendance is maintained by the student at an institution.
- 8. Certain credentialed, full-time employees of California school districts.
- 9. Full-time State University employees and their children and spouses; State employees assigned to work outside the State and their children and spouses. This exception applies only for the minimum time required for the student to obtain California residence and maintain that residence for one year.
- 10. Certain exchange students.
- 11. Children of deceased public law enforcement or fire suppression employees who were California residents and who were killed in the course of law enforcement or fire suppression duties.

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

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

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

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



## FEES AND EXPENSES

#### STATE UNIVERSITY FEE

In September 1984 the Board of Trustees adopted major new policies with regard to state required registration fees. Under the new policy, the Student Services Fee was combined with the State University Fee. The combined fee is identified as the State University Fee which is divided into two categories depending on the number of units for which a student is registered. Students may register for up to six units per quarter at the lower rate. The higher rate is charged if the total units taken during the quarter exceeds six.

### SCHEDULE OF FEES

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

If your check is returned by the bank for any reason, your registration may be cancelled and you will be charged a returned check processing fee.

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

#### **Registration Fees Per Quarter**

Fees listed below were in effect at the time this catalog was printed and are for informational purposes only. This list is not to be used as a schedule of current fees. Unless otherwise noted, fees indicated are per guarter.

Fees and tuition are subject to change without advance notice by the Trustees of The California State University. Please consult the current *Class Schedule* for the fees that are applicable to the quarter in which you are registering.

	0–6.0 units	more than 6 units
State University Fee	\$180.00	\$312.00
Associated Students Fee	20.00 *	20.00 *
Facility Fee	2.00	2.00
Instructionally Related Activities		
Fee	30.00	30.00
University Union Fee	56.00 *	56.00 *
Total registration fees per quarter .	\$288.00	\$420.00

\* Fall quarter fee. Fees for other quarters may be slightly lower.

#### **Late Registration**

Late registration fee (See <i>Class Schedule</i> for dates when this fee will be assessed.)	\$25.00
Tuition for Nonresident Students	
Nonresident tuition per quarter unit	\$164.00
Health Services, Room and Board (On-Campus)	
Health fee (for optional services): Academic Year	\$20.00

Room, annual license, double occupancy. Fee indicated does not include deposit or installn charge.	nent
Academic year	\$2,094.00
Summer quarter Housing security deposit (payable prior to	698.00
occupancy)	20.00
Meals (approximate cost)	
19 meals per week, academic year	\$2,127.00
14 meals per week, academic year	1,980.00
Parking Fees	

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

#### **Miscellaneous Fees**

Application fee (nonrefundable)	55.00
Campus services card fee (Photo I.D. card, first	
time and replacement charge)	5.00
Check returned for any cause	10.00
Copy of student records, up to 4 pages	
(\$.25 each additional page)	1.00
Extension course fees (per quarter unit):	
Lecture and discussion	57.00
Activity	70.00
Laboratory	95.00
Administrative (contract)	18.00
Failure to meet administratively required	
appointment or time limit 2.00 to	20.00
Instrument use fee (Music)	5.00
Library fees see schedule in I	ibrary
Special examination fee (per examination) cost to	25.00
Sponsored Student Fee (per guarter) 2	50.00
Thesis binding fee	7.50
Transcript of academic record (cost varies with	
number ordered)	4.00

#### **REFUND OF FEES**

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

#### **DEBTS OWED TO THE UNIVERSITY**

Should a student or former student fail to pay a debt owed to the institution, the institution may "withhold permission to register, to use facilities for which a fee is authorized to be charged, to receive services, materials, food or merchandise or any combination of the above from any person owing a debt" until the debt is paid (see Title 5, California Code of Regulations, Sections 42380 and 42381). For example, the institution may withhold permission to receive official transcripts of grades from any person owing a debt. If a student believes that he or she does not owe all or part of an unpaid obligation, the student should contact the campus business office. The business office, or another office on campus to which the student may be referred by the business office. will review the pertinent information, including information the student may wish to present, and will advise the student of its conclusions with respect to the debt.

#### **CREDIT CARDS**

VISA and Master Charge bank credit cards may be used for the purchase of meal tickets from the University Foundation, theatre tickets from the Cal Poly Theatre Box Office, health cards from the University Health Center, Bookstore purchases and for Extended Education fees. No other use of credit cards is authorized.

# PROCEDURE FOR THE ESTABLISHMENT OF A STUDENT BODY FEE

The law governing The California State University provides that a student body fee may be established by student referendum with the approval of two-thirds of those students voting. The Student Body Fee was established at California Polytechnic State University, San Luis Obispo by student referendum on May 22, 1991. The same fee can be abolished by a similar two-thirds approval of students voting on a referendum called for by a petition signed by 10% of the regularly enrolled students (*Education Code*, Section 89300). The level of the fee is set by the Chancellor. An increase in the student body fee may be approved by the Chancellor only following a referendum on the fee increase approved by a majority of students voting. Student body fees support a variety of cultural and recreational programs, child care centers, and special student support programs.
# FINANCIAL

# AID

# **FINANCIAL AID**

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

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

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

#### **TYPICAL STUDENT EXPENSES**

Following is an estimate of typical expenses per quarter for the average California resident student living in campus residence halls. Charges for room and board are payable in advance or in installments. Nonresident students should be prepared to pay tuition and fees. For the 1991-92 school year nonresident tuition was \$164 per unit. Please see the "Fees and Expenses" section of this catalog for more information. All State fees are subject to change upon approval by the Board of Trustees of The California State University.

#### **Estimated Expenses per Quarter:**

Registration fees	420
Health fee (academic year)	20
Room and board with 14-meal ticket	1,525
Books and supplies (estimated) †	192
Personal expenses and transportation	516
Estimated total per quarter	\$2,673

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

# ALAN PATTEE SCHOLARSHIPS

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

#### UNIVERSITY SCHOLARSHIPS

#### **General Information**

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

Generally, a student must have at least an over-all grade point average of 3.0 to be granted a scholarship. There are some scholarships, however, that are awarded to students with lower grade point averages if they meet certain criteria such as need, field of study, or high school. *If you are in doubt about your eligibility or have not received word on your admission status to Cal Poly, be sure to apply by the filing deadline.* 

#### How to Apply

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

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

#### **Scholarship Notifications**

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

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

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

# **General Scholarships**

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

#### Agriculture

Catherine C. Adams Scholarships Barling Memorial Scholarship Paul L. Belveal Memorial Scholarships Danny Bettencourt Memorial Scholarships Harold G. Bradshaw Scholarship California Agri-Fair Scholarships California Association of Nurserymen-Peninsula Chapter Scholarship California Cattlewomen Scholarship California Creamery Operators Association Scholarship California Dairy Industries Association Scholarship California League of Food Processors Scholarship California PTA Scholarships California State Grange Scholarships Claire Davis Clark Scholarship Concord Farm Bureau Scholarship Rosario Curletti Scholarships Dr. Arnold Dean Scholarship General Dillingham Produce Industry Scholarships Kenneth H. Easter Scholarship

Environmental Industries, Inc.,- Lewis Sperber Memorial Scholarship Paul Etchechury Memorial Scholarship Gerald H. Fairbairn Scholarship Woody Frey Scholarship J. Cordner Gibson Scholarship Ray Hansen Memorial Scholarship William Randolph Hearst Foundation Scholarships William (Ben) and Helen Holman Alumni Scholarship Herbert Hopkins and Ruth Hembree Burlingham Scholarship Harold G. Hull Graduate Assistantships International Agriculture Fellowships Corwin M. Johnson Scholarship Richard F. Johnson Scholarship Kings River Prune and Apricot Scholarships Knight Brothers Scholarships Knudsen Foundation Scholarship E. C. Loomis and Son Scholarship Los Angeles County Fair Association Scholarship Lucky Stores Scholarships Chester O. McCorkle, Sr. Memorial Scholarship Dr. Ole Meland Scholarship Lou Merrill Scholarship James F. Merson Memorial Scholarship MoorMan Company Fund Scholarship Bob Muegge, Ir. Memorial Scholarship Natural Resource Management Scholarships Don Nikkel Memorial Scholarship Harry Parker Award Charles and Helen Penwell Scholarships Roger B. Peters Award Pi Alpha Xi-Howard C. Brown Scholarship Poultrymen's Cooperative Association Scholarship Dante Righetti Scholarship Rodeo Boosters Achievement Award Rodeo Club Scholarships Phillip Saaranzin Memorial Scholarship Burton Douglas Salisburg Memorial Jean Eddy Sander Rodeo Queen Award Fred and Marian Sandercock Scholarships San Luis Obispo Lions Club/ Food Industries Scholarship Vard M. and Mildred P. Shepard Memorial Scholarship Louis H. and Stella S. Soares Achievement Award Herman M. Sperber Memorial Scholarship Harmon M. Toone Scholarship Eric C. Twist Memorial Scholarships Warren's Nursery Scholarship War Veterans Scholarship Ralph R. Wilmar Rodeo Queen Scholarship Richard A. (Alex) Wilson, Jr. Memorial Scholarship Leopold Edward Wrasse Scholarships

#### Architecture and Environmental Design

Stephen O. Anderson Memorial Scholarship
Beavers Heavy Construction Scholarship
Bechtel Corporation Scholarships
Robert Bein, William Frost & Associates–Sean Rogers
Memorial Scholarship
Black Students in Architecture and Environmental Design
Scholarship
Douglas W. Butzbach Memorial Scholarship

City and Regional Planning Scholarships Richard Lee Fisher Memorial Scholarship Thor Gulbrand, AIA Memorial Scholarship D. Stewart Kerr Scholarship Kiewit-Pacific Co.–Santa Fe Springs Branch Scholarship Landscape Architecture Scholarship and Award Fund Alice C. Loh Competition Award Warren Ludvigsen Memorial Scholarship Dr. Glenn G. McRae Internship Julia Morgan/Phoebe Hearst Architecture Assistantships Robert Itifumi Odo Memorial Scholarship Oltmans Construction Company Scholarship Professional Architects Scholarship Frederick Peter Young Scholarships

# **Business**

Andersen Consulting Accounting Scholarship Andersen Consulting Outstanding Junior Management Award Mickie Burris Award Central Coast Chapter of California Society of CPAs Clorox Company Scholarship Controller's Roundtable of San Luis Obispo County Scholarship Daryl Damon Memorial Scholarship Milton Drandell Memorial Award Ernst & Young Scholarship Frank and Norma Exter Scholarship Jeffrey W. Land University and Community Service Scholarship James R. Landreth, Vice President for Business Affairs **Emeritus Scholarship KPGM Scholarship** John S. and Janice B. Maher Scholarships Merrill Lynch FMA Student Award Northrop Ventura Management Club Scholarship Price Waterhouse Scholarship Larry Ratner Scholarship Touche Ross Scholarship Leopold E. Wrasse Scholarship Engineering

#### Alcoa Foundation Scholarships Adele and Aldo Alessio Scholarships American Institute of Aeronautics and Astronautics Scholarships, Vandenberg Section American Microsystems, Inc., Assistantships American Society of Heating, Refrigeration and Air-Conditioning Engineers Scholar ships (ASHRAE) Sacramento Chapter San Jose Chapter Southern California Chapter Andersen Consulting Outstanding Junior Awards in **Computer Science** Mechanical Engineering Industrial Engineering Association of Old Crows Scholarship **Bechtel Corporation Scholarships Boeing Company Scholarships** Chevron USA Inc. Scholarships Allan R. Davis Scholarship Fluid Power Educational Foundation Scholarship William Squires Fowler Scholarship

Harold R. Frank-Applied Magnetics Corporation Scholarships Karl Arne Gulbrand Memorial Scholarship Glenn A. Hubbard Memorial Scholarship - Experimental Aircraft Association Charles E. and Pearl P. Knott Memorial Scholarships Litton Scholarships Mechanical Engineering Scholarship Dragoslav M. Misic Award National Action Council for Minorities in Engineering **Scholarships** Northrop Scholarship Frank E. Pilling, Sr., Scholarship Roy N. Poage Memorial Scholarships **Raychem Scholarships Raytheon Company Scholarships** lim and Merry Rodgers Scholarship Society of Manufacturing Engineers Student Chapter-Leo E. Rogers Scholarships Gregory Stines Memorial Scholarship Morris P. Taylor Memorial Scholarship Unocal Scholarships Dutch and Gladys Van Harreveld Scholarships Varian Scholarships Andrew Wacht Scholarship Charles Wiswell Scholarship Ziatech Corporation Scholarship

# **Liberal Arts**

John Bayliss Broadcast Scholarships Harold P. and Rosalie Davidson Award Christopher Frair Scholarship Jay Garner Memorial Scholarship Ann and Gordon Getty Scholarship Mary Lou Hughes English Excellence Scholarship Evelyn V. Johnson Scholarship Janet Lee Memorial Award Darren E. Loyd Photography Scholarship John H. Lynn Political Science Award Lucian Morrison Memorial Scholarship Music Department Memorial Award Music Faculty Scholarship Willard "Pete" Pederson Scholarship Ronald V. Ratcliffe Award Beatrice A. Rice Scholarship Eve Strong Memorial Scholarship Llovd Tevis Award Jeri Ewy Thiel Memorial Scholarship Tomczak-Carter Scholarship Ralph and Florence Welles Award Ralph R. Wilmar Classical Piano Scholarship

# **Professional Studies**

Arcata Graphics Scholarship CAHPERD Scholarship in Honor of Robert A. Mott California PTA Scholarships California Retired Teachers Association-- Laura E. Settle Scholarship Cal Poly Alumni-R.R. Donnelly Scholarship William, Joseph and Charles Cattaneo Scholarship Child Development Scholarship Sandra Crabtree Memorial Scholarship Christopher Frair Scholarship Graphic Communication Scholarship Gravure Scholarship Elizabeth Hanlon Parks Memorial Scholarship Hogue Scholarship Industrial Technology Society Scholarship Jacob Loeb Memorial Scholarships John S. and Janice B. Maher Scholarships Robert Mott Memorial Scholarship Larry Ratner Scholarship Redwood Empire Printing House Craftsmen Scholarship Vard M. and Mildred P. Shepard Memorial Scholarship Guy Thomas Memorial Scholarship

# **Science and Mathematics**

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

# **University Center for Teacher Education**

Calista Cheek Affirmative Action Scholarship Michael and Josephine Cappellotti Scholarship Teacher Diversity Scholarship

# Athletics

Jon Robert Andrews Memorial Scholarship Mickie Burris Award Charles Daum Memorial Scholarship Hall of Fame Scholarships Musselman Wrestling Scholarships

# **Other Scholarships**

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

# LOANS

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

# **Perkins Loans**

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

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

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

# **Stafford Student Loans**

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

# **University Emergency Student Loans**

University emergency student loan funds are available to provide temporary assistance to eligible students. Loans from these funds are made for varying periods of time and amounts, according to the regulations and conditions prescribed in the establishment of the particular loan fund. The following types of loans may be made by obtaining applications from the Financial Aid Office: University Long-Term Emergency Loans are granted to students who demonstrate a long-term educational need. They are approved by a standing loan committee on the basis of written applications, recommendations, and interviews. Promissory notes signed by the borrower and a cosigner are required. A four to six percent interest is charged on the unpaid balance after the specified due date, graduation, or withdrawal from the university as agreed upon by the borrower. A one percent service charge is deducted from the loan disbursement.

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

University Emergency Student Loans include donations received from the following:

Agricultural Engineering Loan Fund Alumni Loan Fund American Society of Heating, and Air Conditioning Loan Fund American Welding Society Loan Fund Lamar Anderson Memorial Loan Fund Student Architect Wives' Club Loan Fund Marie Van Aspersen Memorial Loan Fund Bachino Loan Fund Baer-Beck Loan Fund Edgar E. Bilodeau Loan Fund led S. Blake Memorial Loan Fund CFFA/Agricultural Education Loan Fund California Association of Agriculture Laboratories Loan Fund California Association of Resource Conservation Districts Loan Fund Cal Poly Women's Club Fund California Retired Teachers' Association Loan Fund W. B. Camp Loan Fund C.A.R.S.E.S. Loan Fund Logan S. Carter Loan Fund Margaret Chase Memorial Loan Fund Herbert E. Collins Loan Fund Thomas J. Comer Memorial Loan Fund Cooperative Education Loan Fund Harlan Diedrichsen Memorial Loan Fund Esther Biaggini Dugan Loan Fund Environmental Protection Agency Loan Fund 1960 Football Team Memorial Loan Fund Independent Order of Foresters Loan Fund Anita M. Hathaway Loan Fund John Holley Memorial Loan Fund Ralph Hoover Loan Fund Horsehoeing and Animal Husbandry Loan Fund 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 Nissen Educational Loan Fund Ornamental Horticulture Loan Fund Janet Penfold Memorial Loan Fund Mary T. Pollock Memorial Loan Fund Rotary Loan Fund San Fernando Valley Club of Printing House Craftsmen Loan Fund George Schlmeyer Memorial Loan Fund Sears Roebuck Loan Fund Norma Sullivan Memorial Loan Fund *Telegram-Tribune* Loan Fund Todd Farm Loan Fund

# **GRANTS**

# **Pell Grant**

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

#### Supplemental Educational Opportunity Grant Program

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

#### **College Work-Study Program**

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

# STATE AID TO THE PHYSICALLY HANDICAPPED

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



# **Academic Requirements and Policies**

Choice of Catalog

# **ACADEMIC PLACEMENT**

Systemwide Tests Required of Most New Students

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Entry Level Mathematics (ELM) Test

Cal Poly Mathematics Placement Examination (MAPE)

**Advanced Placement** 

Credit for Noncollegiate Instruction

Credit by Examination

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Graduation Requirement in Writing Proficiency

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**Double Majors** 

Second Bachelor's Degree

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# **GENERAL EDUCATION AND BREADTH**

# REGISTRATION

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# **GRADING AND ACADEMIC STANDARDS**

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# ACADEMIC REQUIREMENTS AND POLICIES

# CHOICE OF CATALOG

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

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

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

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

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

# **Academic Placement**

# SYSTEMWIDE TESTS REQUIRED OF MOST NEW STUDENTS

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

#### **English Placement Test (EPT)**

The CSU English Placement Test must be completed by all new non-exempt undergraduates <sup>1</sup> prior to placement in appropriate university English coursework. Exemptions from the test are given only to those who present proof of *one of the following*:

- a score of 3, 4, or 5 on either the Language and Composition or the Composition and Literature examination of the College Board Advanced Placement Program;
- a score on the CSU English Equivalency Examination that qualifies a student for exemption from the English Placement Test;
- a score of 470 or above on the Verbal section of the College Board Scholastic Aptitude Test (SAT-Verbal);
- a score of 22 or above on the ACT English Usage Test (taken prior to October 1989);
- a score of 25 or above on the enhanced ACT English Test (taken October 1989 or later);
- a score of 600 or above on the College Board Achievement Test in English Composition with essay;
- for transfer students, completion and transfer to the CSU of an acceptable college course in English composition of four quarter units or three semester units with a grade of C or better.

Failure to take the English Placement Test, as required, before the end of the second quarter of enrollment may lead to administrative probation which, according to Section 41300.1 of Title 5, *California Code of Regulations*, and CSU Executive Order 393, may lead to disqualification from future attendance.

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

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

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

### Entry Level Mathematics (ELM) Test

The ELM examination tests for entry level mathematics skills acquired through three years of rigourous college preparatory mathematics coursework (normally Algebra I, Algebra II, and Geometry). All new undergraduate students must take the test or be exempted from it prior to placement in any mathematics or statistics course which satisfies the baccalaureate level mathematics requirement of the General Education-Breadth program.

Students may satisfy the ELM requirement by

- 1. passing the ELM examination, or
- 2. satisfying one of the exemptions, or
- 3. taking the ELM examination and, in the event of not passing it, demonstrating competence in intermediate algebra by passing a campus approved remedial course at the level of intermediate algebra or by retaking and passing the ELM examination.

Exemptions from the test are given only to those students who can present proof of *one of the following*:

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

Failure to take the ELM, as required, before the end of the second quarter of enrollment may lead to administrative probration, which according to Section 41300.1 of Title 5 of the *California Code of Regulations,* and CSU Executive Order 393, may lead to disqualification from future attendance. Failure to satisfactorily complete the ELM requirement by the end of the first year will lead to administrative probation.

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

<sup>&</sup>lt;sup>1</sup> Undergraduates admitted with 56 or more transferable semester units and who are subject to a campus catalog or bulletin earlier than 1986–87 are not required to complete the EPT.

such a course. The results of the ELM test will not affect admissions eligibility.

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

# CAL POLY MATHEMATICS PLACEMENT EXAMINATION

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

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

# ADVANCED PLACEMENT

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

# **CREDIT FOR NONCOLLEGIATE INSTRUCTION**

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

# **Credit for Military Service**

Nine quarter units of elective credit will be allowed toward graduation to any student with an honorable discharge submitting evidence of satisfactory completion of one year of training in the military service of the United States. Credit is allowed in accordance with the recommendations by the Commission on Educational Credit and Credentials of the American Council on Education. The number of units allowed are those recommended in the *Guide to the Evaluation of Educational Experience in the Armed Services.* 

Credit is not given for college level General Educational Development Tests. No grade points are assigned in connection with units of credit allowed for military service. The units allowed are not included in scholarship computations.

# **CREDIT BY EXAMINATION**

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

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

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

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

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

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

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

Detailed instruction for applying for credit by examination may be obtained from the Records Office.

# General Requirements for the Bachelor's Degree

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

The specific requirements for each of the degree programs are listed under the academic department offering the major and include a curriculum display which lists major courses, support courses, general education and breadth courses and electives. Your department may have a flow chart which shows in detail the recommended sequence of courses leading to your degree.

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

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

### 1. Total Units

Bachelor of Arts	186 units
Bachelor of Science	186-198 units
Bachelor of Science (Engineering	
programs)	198-210 units
Bachelor of Architecture	248-263 units

# 2. Grade Point Average (GPA)

You must have at least a 2.0 GPA in Higher Education (all college-level work), in Cal Poly cumulative and in your major (the courses listed in the major column of your curriculum). For a definition of GPA and quality points and hours, please refer to Grading.

#### 3. General Education and Breadth (GEB) Courses

You must complete the GEB requirements as indicated in your degree program and shown in the GEB section of this catalog (see page 86).

#### 4. Graduation Writing Requirement (GWR)

You must demonstrate competency in writing skills as described below.

#### 5. Senior Project

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

#### 6. Academic Residence Requirements

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

#### 7. Evaluation for Graduation

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

# GRADUATION REQUIREMENT IN WRITING PROFICIENCY

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

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

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

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

ENGL 302	ENGL 331	ENGL 339	ENGL 355
ENGL 310	ENGL 332	ENGL 345	ENGL 362
ENGL 311	ENGL 333	ENGL 346	ENGL 370
ENGL 318	ENGL 334	ENGL 350	ENGL 372
ENGL 326	ENGL 335	ENGL 351	ENGL 380
ENGL 330	ENGL 338	ENGL 352	

Students must earn proficiency after reaching 90 units. Each student should review his or her curricular requirements to determine which option is appropriate. The GWR must be fulfilled at Cal Poly, not at another campus.

# **Other Information**

#### HONORS

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

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

The three honors categories are as follows:

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

#### MINORS

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

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

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

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

#### Minors

Agribusiness	Agribusiness Department
Anthropology/Geography	MinorSocial Sciences
	Department
Art	Art and Design Department
Biotechnology	School of Science and Mathematics
Business	School of Business
Computer Science	Computer Science Department
Dance	
Economics	Economics Department
English	English Department
FrenchForeign	Languages & Literatures Department
GermanForeign	Languages & Literatures Department
Gerontology	School of Professional Studies
History	History Department
Integrative Technology	School of Professional Studies
International Relations	Political Science Department
Linguistics	English Department
Mathematics	Mathematics Department
Music	Music Department
Packaging	School of Professional Studies
Philosophy	Philosophy Department
Plant Protection	Crop Science Department
Psychology	Psychology and Human
	Development Department
Public Administration	Political Science Department
SpanishForeign	Languages & Literatures Department
Speech Communication	Speech Communication
Statistics	Statistics Department
Theatre	Theatre and Dance Department
Water Science	School of Agriculture
Women's Studies	School of Liberal Arts

#### **DOUBLE MAJORS**

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

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

However, no more than one diploma or degree will be granted to the same student at one commencement. In the event that a student has completed the requirements for two different degrees, such as a B.A. and a B.S., the student will be required to declare one major as the degree major in order to determine which degree will be awarded. The fact that the requirements of another program have been completed will be noted on the transcript.

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

# SECOND BACHELOR'S DEGREE

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

### GRADUATE CREDIT TAKEN BY UNDERGRADUATES

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

Candidates for professional clear credentials (except Agricultural Education) may *not* use courses taken as an undergraduate in a planned 45-unit program.

# **General Education and Breadth**

General Education and Breadth (GEB) requirements in the CSU are so designed that, taken with the major depth program and elective units presented by the candidate for the bachelor's degree, they will assure that graduates from the several campuses in the system have made noteworthy progress toward becoming truly educated persons. Particularly, the purpose of the breadth requirements is to provide means whereby graduates:

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

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

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

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

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

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

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

#### **Distribution Area A**

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

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

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

- 2. Select *one:* ENGL 125 Critical Thinking (3) PHIL 125 Critical Thinking (3) SPC 125 Critical Thinking (3)
- 3. Select one: SPC 201 Public Speaking (3) GEB A.3. SPC 202 Principles of Speech Communication (3)
- 4. Select *one:* ENGL 215 Writing: Argumentation (4) ENGL 218 Professional Writing: Argumentation and Reports (4)

#### **Distribution Area B**

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

#### 1. Physical and Life Sciences

GEB B.1.

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

(a) Physical Sciences

- GEB B.1.a.
- Courses may be selected as follows: ASTR Any lower division course
- CHEM Any lower division course except 106, 200, 252, 253
- GEOL Any lower division course except 211. GEOL 206 can be selected if GEOL 201 or 204 have been completed.
- PHYS Any lower division course except 100, 137, 200, 202, 206, 207, 256, 257
- PSC Any lower division course (only PSC 101 has a lab). A student using PSC 205 for GE&B credit also must take at least one other course in area B.1.a.
- Any 300-level physical science course (having one of the prefixes ASTR, CHEM, GEOL, PHYS or PSC prefix) and having one of the above as a prerequisite may also be selected with the exception of CHEM 350, PHYS 357, PHYS 363.

#### (b) Life Sciences

- GEB B.1.b.
- Courses may be selected as follows: BACT Any lower division course
- BIO Any lower division course except 100 and 253. A student using BIO 205 for GE&B credit also must take at least one other course in area B.1.b.
- BOT Any lower division course except 238
- ZOO Any lower division course except 237
- Any 300-level life science course (having one of the prefixes BACT, BIO, BOT or ZOO prefix) and having one of the above as a prerequisite may also be selected with the exception of BIO 321, 322, 323, 324, 342.

# 2. Mathematics and Statistics

#### **GEB B.2.**

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

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

#### (b) Statistics

- Courses may be selected as follows:
- STAT 130 Introduction to Statistical Reasoning (3)
- STAT 211 Elementary Probability and Statistics (3)
- STAT 251 Statistical Inference for Management I (4)
- STAT 321 Statistical Analysis (4)
- Any 200 or 300 level STAT courses having one of the above as a prerequisite may also be chosen with the exception of STAT 200 and STAT 330.

# Distribution Area C

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

#### 1. Critical Reading

#### GEB C.1.

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

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

#### 2. Fine and Performing Arts

#### GEB C.2.

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

- ART 101 Fundamentals of Drawing (4) ART 108 Fundamentals of Sculpture (4) ART 111 Introduction to Art (4) ART 112 Survey of Art History (3) DANC 221 Dance Appreciation (3) MU 101 Introduction to Music Theory I (3) MU 120 Music Appreciation (4) TH 210 Introduction to Theatre (3)
- 3. Electives in Literature, Philosophy, and the Arts

GEB C.3.

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

ARCH 316 California Architecture and the California Dream (3) ARCH 317 History of Architecture (3) ARCH 318 History of Architecture (3) ARCH 319 History of Architecture (3) ART 312 Art History-Contemporary Art (4) ART 314 History of Photography (4) DANC 321 Dance History (3) ENGL 330 British Literature: Medieval Period (4) ENGL 331 British Literature: The Renaissance (4) ENGL 332 British Literature: The Enlightenment (4) ENGL 333 British Literature: Romanticism (4) ENGL 334 British Literature: The Victorians (4) ENGL 335 British Literature: 20th Century (4) ENGL 338 Shakespeare in London (4) ENGL 339 Introduction to Shakesneare (3) ENGL 340 American Literature to 1860 (4) ENGL 341 American Literature: 1860-1914 (4) FNGL 342 American Literature: 1914 to the Present (4) ENGL 345 Women Writers (4) ENGL 346 Ethnic American Literature (4) ENGL 350 Modern Novel (3) ENGL 351 Modern Poetry (3) ENGL 352 Modern Drama (3) ENGL 353 Modern Drama in London (4) ENGL 370 World Cinema (4) ENGL 372 Film Directors (4) ENGL 380 Contemporary Literary Ideas (4) FR 305 Significant Writers in French (4) FR 405 French Literature in English Translation (4) GER 305 Significant Writers in German (4)

- GER 405 German Literature in English Translation (4)
- HUM 302 Human Values in Agriculture (3) HUM 310 Humanities in World Cultures (3)
- HUM 361 Modernism (4)
- HUM 362 Postmodernism (4)
- HUM 402 Values and Technology (3)
- MU 221 Jazz Styles (3)
- MU 324 Music and Society (3)
- PHIL 305 Judeo-Christian Religions (3)
- PHIL 306 Asian Religions (3)
- PHIL 308 Islamic Religions (3)
- PHIL 311 History of Greek Philosophy (3)
- PHIL 312 History of Medieval Philosophy (3)

PHIL 313 Continental Philosophy: Montaigne to Leibniz (3)PHIL 314 British Philosophy: Bacon to Mill (3) PHIL 315 German Philosophy: Kant to Nietzsche (3) PHIL 316 Contemporary European Philosophy (3) PHIL 317 Contemporary British and American Philosophy (3)PHIL 321 Philosophy of Science (3) PHIL 331 Ethics (3) PHIL 332 History of Ethics (3) PHIL 333 Political Philosophy (3) PHIL 334 Jurisprudence (3) PHIL 335 Social Ethics (3) PHIL 337 Professional Ethics (3) PHIL 341 Philosophy of Art (3) PHIL 342 Philosophy of Religion (3) PHIL 411 Metaphysics (3) POLS 334 Jurisprudence (3) SPAN 305 Significant Writers in Spanish (4) SPAN 405 Hispanic Literature in English Translation (4) SPC 330 Classical Rhetorical Theory (4) TH 327 Theatre History and Literature (3) TH 328 Theatre History and Literature (3)

#### **Distribution Area D**

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

1. Title 5, Section 40404 Requirements: GEB D.1.

HIST 204 The History of American Ideals and Institutions (3)

POLS 210 American and California Government (3)

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

3. Select at least one course: GEB D.3.

ECON 201 Survey of Economics (3) ECON 211 Principles of Economics (3) ECON 222 Macroeconomics (4)

4. Select at least one course from each group:

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

GEB D.4.b.

#### Group b:

Courses offered by the student's major department cannot be counted as satisfying the requirements of this group. ANT 360 Human Cultural Adaptation (3) BUS 404 Governmental and Social Influences on Business (4) ECON 304 Comparative Economic Systems (3) ECON 325 Underdevelopment and Economic Growth (3) GEOG 308 Global Geography (3) POLS 370 Contemporary Global Political Issues (3) POLS 371 World Food Politics (3) SOC 309 World Social System and Its Problems (3) SOC 315 Race Relations (3)

#### **Distribution Area E**

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

1.	Select one.	PSY	201	General	Psychology	(3)	GEB	E.1.
		PSY	202	General	Psychology	(3)		

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

#### **Distribution Area F**

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

#### 1. Computer Literacy Select at least *one* course from the following:

GEB F.1.

AG 250 Computer Application to Agriculture (3) ARCH 250 Computer Applications (3) CSC 110 Computers and Computer Applications: MS-DOS (3)CSC 111 Introduction to Computer Applications for the Sciences (3) CSC 113 Computers and Computer Applications: Macintosh (3) CSC 118 Fundamentals of Computer Science 1 (4) CSC 120 Principles of Data Processing (4) CSC 204 C and UNIX (3) CSC 251 Digital Computer Applications (2) CSC 410 Computer Fundamentals for Educators (3) 2. Select at least one course from the following: GEB F.2. AE 121 Agricultural Mechanics (2) AE 340 Irrigation Water Management (3) AERO 210 History of Aviation (3) AG 301 Agriculture and American Life (3) ARCH 312 Home and Community Design (3) CE 221 Fundamentals of Transportation Engineering (4) CRP 211 Introduction to Urbanization (3) CRP 212 Introduction to Urban Planning (3) CRSC 230 General Field Crops (4) CSC 302 Computers and Society (3) DH 230 General Dairy Husbandry (4) EET 302 Electronics: Concepts, Applications, and Safety (3)ENGR 301 Technology in the 20th Century (3) ENVE 324 Introduction to Air Pollution (3) ENVE 330 Environmental Quality Control (3) FNR 101 Natural Resources Management and Society (3) FNR 201 Forest Resources (3) FNR 202 Environmental Management (3) FRSC 230 California Fruit Growing (4) IE 319 Human Factors Engineering (3) IT 125 Industrial Wood Processes (3)

IT 130 Automotive Fundamentals (2) IT 141 Plastics Processes and Applications (1) IT 233 Metal Technology (3) IT 301 Current Technological Issues (3) LA 201 Survey of Landscape Architecture (2) LA 311 History of Landscape Architecture (3) LA 321 Concepts in Environmental Decision Making (3) ME 221 Solar Energy (3) OH 230 Ornamental Gardening (3) SS 121 Introductory Soils (4) VGSC 230 General Vegetable Crops (4)

Students in the Schools of Agriculture, Architecture and Environmental Design, and Engineering and the Departments of Home Economics and Industrial Technology are exempt from the requirements of this section (F.2). They may apply a maximum of 3 units from their major toward the satisfaction of the 12-unit upper division General Education requirement.

# Registration

# REGISTRATION

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

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

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

# **CLASS ATTENDANCE**

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

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

# HOLDING OF RECORDS

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

# MAXIMUM UNIT LOAD

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

# ADD/DROP (Change of Program)

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

#### Adding

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

*Time conflict:* Students may not enroll in two classes which meet at the same time.

*Eligibility:* Students must meet prerequisite and Class Schedule footnote requirements and be in attendance at the first class meeting to remain enrolled in the class.

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

#### Dropping

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

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

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

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

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

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

# **CHANGE OF MAJOR**

Students who feel they have selected an inappropriate major for their interests and abilities should contact their adviser and a Counselor at Career Services (756-2501) for advice and assistance in making curriculum changes. Students should contact the prospective major department for preliminary information regarding changing majors; requirements vary depending on major. Admission to a new curriculum will depend on the availability of space within the limitations imposed by budget, faculty, and facilities.

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

# **CURRICULUM SUBSTITUTION**

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

# LEAVES OF ABSENCE

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

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

9. Students are eligible to obtain two Educational Leaves during their career at Cal Poly including graduate school.

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

# **RETURNING STUDENTS**

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

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

# **HEALTH SCREENING**

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

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

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

# **Grading and Academic Standards**

# GRADING

#### DEFINITIONS

Quality Hours carry grade point value.

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

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

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

#### **GRADING SYMBOLS**

The following marking and grading system is in effect:

A	cademic Grading Symbols Earned	Quality Points Earned
А	Superior Attainment of Course	4.0
	Objectives	
A-	Superior Attainment of Course	3.7
	Objectives	
B+	Good Attainment of Course	3.3
	Objectives	
В	Good Attainment of Course	3.0
	Objectives	
B —	Good Attainment of Course	2.7
_	Objectives	
C+	Acceptable Attainment of Course	2.3
~	Objectives	
C	Acceptable Attainment of Course	2.0
~	Objectives	
C-	Acceptable Attainment of Course	1.7
	Objectives	4.0
† D+	Poor Attainment of Course Objectives	1.3
D	Poor Attainment of Course Objectives	1.0
D-	Poor Attainment of Course Objectives	0.7
t CD	Non-Attainment of Course Objectives	0.0
	Credit	-
NC	No Credit	-
Admir	nistrative Grading Symbols	
AU	Audit	-
I	Incomplete (authorized)	-
U	Incomplete (unauthorized)	0
SP	Satisfactory Progress	-
RD	Report Delayed	
W	Withdrew	_

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

# AUDIT

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

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

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

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

#### **INCOMPLETE** (Authorized)

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

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

#### **INCOMPLETE** (Unauthorized)

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

#### SATISFACTORY PROGRESS

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

# **CREDIT/NO CREDIT GRADING**

Some courses, *as indicated in their catalog descriptions,* are offered on a Credit/No Credit grading basis only.

The following conditions apply when a student *elects* to take for Credit/No Credit grading those courses which are *not* designated by the university as being graded on an exclusive Credit/No Credit basis.

- a. Up to 2 courses (not to exceed 8 units) or one intensive language course (12-15 units) may be taken per student per quarter on a Credit/No Credit grading basis; a maximum total of 15 courses (not to exceed 45 units) may be elected per student for Credit/No Credit grading.
- b. Students desiring to elect a course on a Credit/No Credit grading basis must be currently enrolled in the course and must complete the declaration form available from the Records Office. The form for Credit/No Credit grading must be filed not later than the end of the third week of instruction of the quarter. Students may not change from one grading system to the other after the end of the third week.
- c. Undergraduate students will be given a grade of CR for accomplishment equivalent to a grade of C- or better. No credit will be given for D+ or lower grades. Graduate students will receive a grade of CR which is based on an evaluated grade of B- or higher and NC for assigned grades of C+ or lower. Instructors will submit conventional letter grades to the Registrar's Office where they will be converted to Credit/No Credit grades.
- d. Major or support courses in the student's curriculum may not be elected for Credit/No Credit grading.
- e. The applicant for a Credit/No Credit grade must have at least a 2.0 grade point average in cumulative Cal Poly work. This requirement is waived for first-time students.
- f. Units earned in courses for which the grade was CR will count toward satisfaction of all degree requirements.
- g. Grades of CR or NC are not included in calculating grade point averages.
- h. Nonmatriculated students in the Extension Program, Summer Session, and Workshops must meet the same requirements as matriculated students to elect courses on a Credit/No Credit grading basis. (The 2.0 GPA requirement is waived in the case of nonmatriculated students having no previous coursework recorded at Cal Poly.)

# **REPEATING A COURSE**

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

- 1. A course taken at Cal Poly or at another university or college in which a grade of D+ or less was received may be repeated here with the new grade recorded along with the prior grade. The grade earned by repeating the course will replace the quality points, quality hours, and earned hours which were previously earned.
- 2. The course may not be repeated for Credit/No Credit if the student has previously received a grade of D+or less in that course. The course may be repeated for Credit/No Credit only if the student has previously received a grade of NC in that course. An original NC grade may be repeated for CR/NC or a letter grade, but not for improving grade point averages.
- 3. Undergraduate students may repeat up to 20 units for grade point average improvement. However, under the terms of this rule, the student must file a notice of intent to repeat a course with the Records Office prior to the end of the seventh week of instruction during the quarter in which the course is repeated.
- 4. Except where noted in the specific course description that the course may be repeated for credit, a student may not receive additional credit for any course in which a grade of C or higher, including CR has been received. If the student repeats a course in which a C+ or higher grade was earned, both grades will be calculated in the grade point average but the duplicate earned hours will not be counted toward the degree.

# WITHDRAWALS FROM COURSES

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

Between the end of the regular add/drop period and the last day of instruction a student must request permission to withdraw from a course by processing a petition which is available at the Records Office. The petition will be approved and withdrawal authorized only if there are serious and compelling reasons for withdrawal in the judgment of the instructor and department head.

After the end of the 7th week of instruction withdrawals are permitted only if the withdrawal is based on an emergency situation clearly beyond the control of the student. In such cases a final or incomplete grade may be assigned for courses in which sufficient work has been completed to permit an evaluation to be made. The student must request permission to withdraw as specified above, or request grade assignment, both of which are subject to approval by designated campus officials. Any student who fails to provide notification or who fails to obtain formal approval to withdraw will be subject to failing grades (U or F).

### WITHDRAWAL FOR THE TERM

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

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

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

#### WITHDRAWAL FROM PREVIOUS TERMS

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

#### ACADEMIC RENEWAL

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

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

# ACADEMIC STANDARDS

# ACADEMIC OBLIGATIONS

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

Students are expected to satisfy the academic demands required by their instructors in such ways as they may set forth, in order to satisfy the instructor that they are performing their assignments in a proper manner. Instructors are expected to give first priority to meeting their scheduled classes and other assigned responsibilities, including keeping regular office hours for student conferences.

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

Uniform standards for academic probation or disqualification, and for administrative-academic probation or disqualification, are in effect at all campuses of The California State University. Undergraduate students may be placed on academic probation and later be disqualified, or be placed on administrative-academic probation and later be disqualified, when they do not meet these standards.

Students who have been placed on academic probation, administrative-academic probation, or who have been notified of their disqualification may request review of such action by the dean of the school taking the action. Students who have been disqualified for inadequate progress or performance will not be readmitted until presentation of satisfactory evidence that they have improved their chances of academic success. The request for readmission will be referred to the dean of the school in which the student wishes to enroll.

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

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

# ACADEMIC PROBATION 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 Studies section.

#### I. Academic Probation:

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

#### **II. Academic Disqualification:**

- A. An undergraduate student on academic probation for two consecutive terms is subject to academic disqualification.
- B. An undergraduate student on academic probation is subject to disqualification when:
  - As a freshman or sophomore student (less than 90 quarter units of college credit completed) the student is 22.5 or more quality points below a 2.00 (C) in all units attempted (higher education GPA) or in all units attempted at Cal Poly (Cal Poly cumulative GPA).
  - 2. As a junior student (90 to 134 quarter units of college credit completed) the student is 13.5 or more quality points below a 2.00 (C) in all units attempted (higher education GPA) or in all units attempted at Cal Poly (Cal Poly cumulative GPA).
  - 3. As a senior student (135 or more quarter units of college credit completed) the student is 9 or more quality points below a 2.00 (C) in all units attempted (higher education GPA) or in all units attempted at Cal Poly (Cal Poly cumulative GPA).
- C. In addition to the above disqualification standards applicable to students on probation, the President may designate a campus official to act to disqualify an individual not on probation when the following circumstances exist:
  - 1. At the end of any term, the student has fewer cumulative grade points than cumulative units attempted, and
  - 2. The cumulative grade point deficiency is so great that in view of the student's overall educational record, it seems unlikely that the deficiency will be removed within a reasonable period.

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

# ADMINISTRATIVE-ACADEMIC PROBATION OR DISQUALIFICATION

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

- A. Withdrawal from all or a substantial portion of a program of studies in two successive terms or in any three terms.
- **B.** Repeated failure to progress toward the stated degree or program objective when such failure appears to be due to circumstances within the control of the student.

C. Failure to comply, after due notice, with an academic requirement or regulation which is routine for all students or a defined group of students.

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

# **ELIGIBILITY FOR INTERCOLLEGIATE ATHLETICS**

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

### **ELIGIBILITY FOR STUDENT ACTIVITIES**

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

# STUDENT GRIEVANCE PROCEDURES

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

# The Fairness Board

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

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

# STUDENT CONDUCT AND DISCIPLINE

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

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

### STUDENT DISCIPLINARY PROCEDURES

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

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

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

#### **Student Involvement in Disciplinary Procedures**

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

#### **PROCEDURAL DUE PROCESS**

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

# GRADUATE

# STUDIES



# **GRADUATE STUDIES**

# Programs

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

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

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

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

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

# APPLICATION

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

Start early to complete your application. You must have all information on file before the closing periods listed below to ensure that your application package receives priority consideration. Information about the specified GPA requirements and qualifying examinations such as the Graduate Record Exam (GRE) is contained in the catalog section describing requirements for individual graduate programs.

#### **Filing Periods**

#### For all graduate programs except Education, Psychology, Industrial and Technical Studies, Physical Education:

	Applications First Accepted	Campus Closing Periods	Student Notification Begins	
Summer Qtr.	Feb. 1	One month prior	March 1	
Fall Qtr.	Nov. 1	to first day of	Dec. 1	
Winter Qtr.	June 1	quarter of	July 1	
Spring Qtr.	Aug. 1	application	Sept. 1	

#### For Education, Psychology, Industrial and Technical Studies, Physical Education: \*

,	Applications First Accepted	Campus Closing Periods	Student Notification Begins
Summer Qtr.	Feb. 1	April 3	March 1
Fall Qtr.	Nov. 1	April 17	Dec. 1
Winter Qtr.	June 1	Oct. 11	July 1
Spring Qtr.	Aug. 1	Dec. 13	Sept. 1

\* For M.A. Eucation, Counseling and Guidance Specialization, no summer quarter applications are taken. For M.S. Psychology only fall quarter applications are taken and February 14 is the closing date.

#### **Application Acknowledgment**

You may expect to receive an acknowledgment of your application and information regarding your program from your first choice campus within four to six weeks of filing the application. You will also receive a request that you submit the records necessary for the campus to evaluate your qualifications. If the evaluation of your qualifications indicates that you meet admission requirements, your documents will be forwarded to the graduate coordinator of your program for final approval. An acceptance notice is not transferable to another term or to another campus.

# Who Must Apply

All graduate and postbaccalaureate applicants (e.g., master's degree applicants, those seeking credentials, and those interested in taking courses for personal or professional growth) must file a complete application as described in the admission booklet and pay the \$55 nonrefundable application fee. Applicants who completed undergraduate degree requirements and graduated the preceding term are also required to complete and submit an application and the \$55 nonrefundable application fee. Since applicants for postbaccalaureate programs may be limited to the choice of a single campus on each application, redirection to alternate campuses or later changes of campus choice will be minimal. To be assured of initial consideration by more than one campus, it will be necessary to submit separate applications (including fees) to each. Applications may be obtained from the Graduate Studies Office or Admissions Office of any California State University campus in addition to the sources noted for undergraduate applications.

# **Completed Application Materials**

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

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

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

*Note:* any coursework taken prior to the receipt of an undergraduate degree may not be counted for postbaccalaureate degree credit.

# **Residency Status Determination**

The campus Admissions Office determines the residence status of all new and returning students for nonresident tuition purposes. Responses to the Application for Admission and, if necessary, other evidence furnished by the student are used in making this determination. A student who fails to submit adequate information to establish a right to classification as a California resident will be classified as a nonresident. A detailed explanation of residence requirements appears on page 66.

# GRADUATE AND POSTBACCALAUREATE ADMISSION REQUIREMENTS

### **Admission Requirements**

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

• General Requirements - The general requirements for admission to graduate and postbaccalaureate studies at a California State University campus are in accordance with university regulations as well as Title 5, chapter 1, subchapter 3 of the California Code of Regulations. Specifically, a student shall: (1) have completed a four-year college course of study and hold an acceptable baccalaureate degree from an institution accredited by a regional accrediting association, or shall have completed equivalent academic preparation as determined by appropriate campus authorities; (2) be in good academic standing at the last college or university attended; (3) have attained a grade point average of at least 2.5 (A = 4.0) in the last 60 semester (90 quarter) units attempted; and (4) satisfactorily meet the professional, personal. scholastic, and other standards for graduate study, including qualifying examinations, as appropriate campus authorities may prescribe. In unusual circumstances, a campus may make exceptions to these criteria.

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

• *Postbaccalaureate Unclassified* – To enroll in courses for professional or personal growth, you must be admitted as a postbaccalaureate unclassified student. By meeting the general requirements, you are eligible for admission as a postbaccalaureate unclassified student. Some departments may restrict enrollment of unclassified students because of heavy enrollment pressure. Admission in this status does not constitute admission to, or assurance of consideration for admission to, any graduate degree or credential program; or

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

• *Graduate Conditionally Classified* – You may be admitted to a graduate degree program in this category if, in the opinion of appropriate campus authority, you can remedy deficiencies by additional preparation; or

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

### INTERNATIONAL (FOREIGN) STUDENT ADMISSION REQUIREMENTS

#### **General Requirements**

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

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

Priority in admission is given to residents of California. There is little likelihood of nonresident applicants, including international students, being admitted either to impacted degree programs or to those with limited openings. Anyone considering a program should contact the Graduate Coordinator for that program to check on the space availability for any given quarter.

### TOEFL and TWE Requirement for English Language Proficiency

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

# **HEALTH SCREENING**

All new and readmitted students, born after January 1, 1957, will be notified of the requirement to present proof of measles and rubella immunizations. This is *not* an admissions requirement, but shall be required of students by the beginning of their second term of enrollment in CSU. Proof of measles and rubella immunizations shall also be required for certain groups of enrolled students who have increased exposure to these diseases. See page 91 for more information.

# ACADEMIC REQUIREMENTS AND RESPONSIBILITIES

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

• A student shall take the standardized tests required in the area of the master's degree objective on dates announced by the Testing Center of the university. These tests must be applied for by designated times, well in advance of testing, on forms supplied by the Testing Center. Payment of fees must accompany the form. If the specific tests required in the student's master's degree program have been taken elsewhere, the student must consult with the Testing

Center to transfer the results to the Cal Poly Center as soon as possible and arrange with it for subsequent transfer of test results to the department concerned.

- All students shall attempt to satisfy the graduation writing requirement during the first quarter of enrollment.
- A student shall file an approved formal study plan before the twelfth unit of graduate study is completed.
- A student shall maintain a grade point average of 3.0 (grade of B on a scale where A = 4.0), or better, in all units attempted subsequent to admission to the program, as well as in all courses in the formal program of study. A course in which no letter grade is assigned shall not be used in computing the grade point average.
- A student shall maintain satisfactory scholarship and professional standards. Only those graduate students who continue to demonstrate a satisfactory level of scholastic competence and fitness, as determined by the appropriate university authorities, shall be eligible to continue in such curricula. Students whose performance is judged to be unsatisfactory by the authorities of the university may be required to withdraw from all graduate degree curricula offered by the university.
- A student shall be formally advanced to candidacy before being allowed to enroll for thesis or project units or to take the comprehensive examination.
- A student shall successfully complete a culminating experience (thesis, project and/or comprehensive examination).
- A student shall complete 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 Disqualification

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

# **Academic Probation**

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

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

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

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

# Administrative Academic Disqualification

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

# Advancement to Candidacy

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

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

# Advisement

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

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

# **Change of Postbaccalaureate Objective**

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

# **Comprehensive Examination**

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

# Courses Counting Towards Graduation and Credit/No Credit Grading

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

Graduate students may elect to take courses which are not part of their formal program of study on a credit/no credit basis, subject to the conditions stated in this catalog on page 93.

# Credit by Exam for Coursework

See page 82.

# **Culminating Experience**

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

#### **Enrollment in Graduate Courses**

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

### **Formal Study Plan**

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

Certain 400 series courses may be completed by the graduate student as part of the degree program when this is consistent with university requirements, departmental master's degree specifications, and the candidate's formal program of study. No fewer than one-half of the units required for the degree shall be in courses organized primarily for graduate students (500 level). The student should always consult the adviser to make certain that only approved courses are selected since departmental requirements vary, and some courses are excluded.

Only 400- and 500-level courses are allowed in the 45 units of an approved graduate plan of study. In those programs where specific courses below the 400-level may be essential for a student's success, the student may be conditionally accepted to the program contingent upon completing those courses. Courses below the 400-level may not constitute any part of the approved 45 units in the plan of graduate study.

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

No more than 13 quarter units of approved extension courses shall be accepted for the master's degree. Regular extension courses may not be used to satisfy the residence requirement, but grades earned in these courses count in calculation of the student's grade point average if they are part of the formal study plan.

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

No more than 12 quarter units of summer session shall be granted credit if taken prior to the submission of a formal program of study. Summer session courses are counted as residence credit. In addition to the above rules governing in-residence courses, the following apply to courses included on the formal study plan:

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

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

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

# Full-Time Graduate Student Status

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

# Grade Point Calculation for Graduate Degree

Satisfaction of the GPA requirement for the conferral of the master's degree requires a GPA of 3.0 or more in the courses taken in the formal study plan and a GPA of 3.0 or more in all units attempted subsequent to admission to the program for which one is applying for a degree. The base for calculation of the overall grade point average includes graduate courses taken through extension and credential courses. Students who take courses primarily for enrichment or to satisfy deficiencies may elect to take them credit/no credit. Repeating a failed course does not remove a lower letter grade from the overall GPA calculation.

# Graduate Courses Taken by Undergraduates for Graduate Credit

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

#### Graduation

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

Those candidates for master's degrees who attain a grade point average which is in the upper ten percent of those graduating in their major in that academic year and whose grade point average is 3.75 or better may upon the recommendation of the school dean be designated as "Graduating with Distinction."

For information on diploma regulations, see page 83.

#### **Graduation Requirement in Writing Proficiency**

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

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

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

#### Leaves of Absence

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

- A Planned Educational Leave must be for a purpose which contributes to the student's educational objective and is approved by the student's major department head or chair.
- 2. A Medical Leave provides time for the student to receive treatment or to recover from a disabling injury or other medical condition and is approved by either the campus' Director of Health and Psychological Services or Disabled Student Services.
- 3. To be considered for an Educational Leave, the student must be eligible to enroll for the term in which the leave begins and not be on academic probation.
- 4. The application for Educational Leave must be initiated and approved before the leave begins and will not be granted retroactively; the Medical Leave begins the term following the student's last term in attendance and may be granted retroactively based on the student's personal situation.
- 5. A student on Educational or Medical Leave will be considered to be in continuous attendance with the purpose of returning to the same curriculum which was in effect when the leave began.
- 6. A student on Educational or Medical Leave will not be required to apply for readmission or pay an application fee provided that the student returns to the same major

and returns within the time period agreed upon at the time the application was approved.

- 7. The student on leave may return and enroll for any term prior to the term when the leave is scheduled to end. Neither leave will be extended beyond the two-year limitation for any reason.
- 8. Any student on leave who fails to return and enroll within the time limits specified by the leave agreement will be required to reapply for admission, pay the reapplication fee, and may be held to any new curriculum requirements which may be in effect.
- 9. Students are eligible to obtain two Educational Leaves during their career at Cal Poly including graduate school.
- 10. Students who take educational leaves are still required to complete their graduate degree within the original time limit.

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

#### **Prerequisites**

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

# Registration

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

#### **Repeating a Course**

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

# **Research Involving Special Conditions**

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

#### **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. The application fee must accompany the application for readmission. To ensure that they get the registration priority to which they are entitled, they should apply for readmission at last three months before classes begin.

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

#### Second Master's Degree

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

#### **Thesis or Project Report Requirements**

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

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

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

If a thesis or project is required in a master's degree program, a committee-approved copy must be completed in accordance with university specifications. Guidelines to be followed in preparing final copy for filing with the university can be obtained from the Graduate Studies Office.

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

#### **Time Limit for Degree**

The time allowed to complete coursework in the formal study plan is seven years. The university, at its option, may extend the time frame. Students who wish to extend the seven year limit must file a graduate student petition for special consideration explaining the reasons why the extension is necessary, what courses are requested for the inclusion in the study plan (that are over 7 years old at the proposed time of graduation), and what evidence is offered to support claims of currency in that coursework.


# **School of Agriculture**

## **DEGREE PROGRAMS**

- B.S. Agricultural Business Agribusiness Finance and Appraisal Concentration Agribusiness Marketing Concentration Agribusiness Policy Concentration Farm and Ranch Management Concentration
- B.S. Agricultural Engineering
- B.S. Agricultural Engineering Technology
- B.S. Agricultural Science Agricultural Mechanics Concentration Agricultural Products and Processing Concentration Agricultural Resources Management Concentration Agricultural Supplies and Services Concentration Animal Production Concentration Ornamental Horticulture Concentration Plant Production Concentration
- **B.S.** Animal Science
- **B.S. Crop Science**
- B.S. Dairy Science Dairy Husbandry Concentration Dairy Products Technology Concentration
- **B.S.** Food Science
- B.S. Forestry and Natural Resources Management Forest Resources–Management Concentration Forest Resources–Urban Forestry Concentration Forest Resources–Watershed, Chaparral, & Fire Management Concentration Environmental Management Concentration Parks and Forest Recreation Concentration
- **B.S. Fruit Science**
- **B.S.** Nutritional Science
- B.S. Ornamental Horticulture Floriculture and Nursery Production Concentration Horticulture Sales and Services Concentration Landscape Industry Concentration

- B.S. Poultry Industry
- B.S. Soil Science Environmental Management Concentration Environmental Science and Technology Concentration Land Resources Concentration
- M.S. Agriculture
  - Agricultural Engineering Technology Specialization Dairy Products Technology Specialization Food Science and Nutrition Specialization General Agriculture Specialization International Agricultural Development Specialization Soil Science Specialization

## MINORS

Agribusiness Plant Protection Water Science

## SCHOOL OF AGRICULTURE

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

Joseph E. Sabol, Interim Dean M. Stephen Kaminaka, Interim Associate Dean Academic Affairs Larry P. Rathbun, Associate Dean Administrative Affairs

## PROGRAMS

The School of Agriculture offers programs reflecting the growing diversity of choices available and skills required in modern agriculture and its related professions. Undergraduate students may earn a Bachelor of Science degree in any of the following majors: agricultural engineering, agricultural engineering technology, agricultural business, agricultural science, animal science, crop science, dairy science, food science, forestry and natural resources, fruit science, nutritional science, ornamental horticulture, poultry industry, or soil science. Graduate students may earn a Master of Science degree in Agriculture in one of the following specializations: agricultural engineering technology, general agriculture, dairy products technology, food science and nutrition, international agriculture, and soil science. The School of Agriculture offers minors in agribusiness, plant protection, and water science.

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

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

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

The students' early involvement in their major field, combined with the faculty's close contacts with schools, private industry, governmental agencies, and nonprofit organizations provide excellent opportunities for student internships during junior or senior years. Other opportunities which enhance education, provide financial assistance, and help prepare students for the job market include enterprise projects, scholarships, and work-study jobs. Student clubs are active in every department. The 35 clubs, most of which are affiliated with national professional organizations, provide an excellent forum for student and faculty interactions. Active club members may practice leadership skills, and attend national, state and local professional meetings, as well as participate in a variety of professional and social events.

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

## FACILITIES

The School of Agriculture facilities include a 6,000 acre farm having beef cattle, dairy cattle, horse, sheep, swine and poultry units, rodeo and horse show arenas, a horse training track, vineyards, irrigated and non-irrigated fields for various crops, citrus groves, avocado and deciduous orchards, an arboretum, and greenhouses. The school facilities also include several microcomputer laboratories, a market news information facility, an irrigation demonstration field, reservoirs, an agroforestry demonstration plot, laboratories with modern equipment for soil-plant-water testing, engineering testing and manufacturing shops, complete food processing units for dairy products, meats, fruit and vegetables.

The School of Agriculture also operates the 3,200 acre Swanton Pacific Ranch in Santa Cruz County which has been generously donated by Al Smith, alumnus of the Crop Science Department. This unit provides students with an opportunity to live and work on a commercial farm with forestry, cattle and crop production activities.

All of these facilities are for student use. They provide students with unique opportunities for hands-on experiences which augment the instruction received in the classroom.

## COURSES

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

#### Courses in the major:

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

#### Support courses:

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

#### **General Education and Breadth:**

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

#### **Electives:**

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

## **Recommended Preparation**

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

## **Laboratory Safety**

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

## AGRICULTURAL ENTERPRISE PROJECT FACILITIES

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

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

The Animal Sciences and Industry Department conducts student enterprise projects with beef cattle, swine, sheep, horses and poultry. The stock utilized by our students represents the best bloodlines in the nation.

The beef program includes registered herds of 150 cows, stocker programs averaging 200 head, a 300-head performance test facility, a 200-head feedlot, and 15-20 show steers. These cattle are managed in a variety of settings from environmentally controlled confinement to our 3,000 acre native range operation. The cattle are dispersed over six different ranches away from the campus core and four distinct areas on campus. These animals and facilities are utilized for student projects including cow-calf, feedlot, stocker, performance, and show cattle operations.

The sheep section includes purebred flocks of 70 Suffolk and 35 Hampshire ewes and a commercial range flock of 185

whiteface ewes. The sheep are housed on one ranch of 600 acres near, but not on campus, and a group of pastures and facilities closer in. Students become involved in commercial ewe, lamb feeding, range ram, ram test, and show lamb projects.

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

The Foundation horse herd is made up of the Thoroughbred and Quarter Horse breeds. An approximate total of 60 head of broodmares, foals, yearlings and riding stock are housed at the horse unit facilities. Currently standing at stud are three stallions: two Quarter Horses and one Thoroughbred.

Emphasis is placed on basic horse handling and training procedures leading up to the breeding and training of two-yearolds for in-training sales. These sales expose students to professionals and their ideas and expose the industry to what we do at Cal Poly.

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

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

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

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

The Ornamental Horticulture Department provides facilities consisting of fifteen greenhouses, six shade houses, extensive growing grounds, a sales area, a large plant tissue culture lab, extensive turf plots, disease and pest lab, and three large labs available for production. The unit has the latest equipment and machinery to facilitate student projects needs which encompass all phases of nursery and greenhouse production. The Crop Science Department is well equipped with all types of machinery found on mechanized farms in California. All of the crop production and marketing operations are carried on under the supervision of the Crop Science Department through enterprise projects. Orchards, vineyards, crop land, fruit and vegetable packing facilities and marketing outlets are available for instructional purposes.

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

## CURRICULUM FOR WATER SCIENCE MINOR

Unit	ts
Base Core11AE 340 Irrigation Water Management (4)11SS 121 Introductory Soil Science (4)11FNR 408 Water Resource Law and Policy (3)	
Select one emphasis area 13-16	
Irrigation Emphasis (13) AE 131 Agricultural Surveying (2) AE 405 Chemigation (1) AE 435 Drainage (3) AE 440 Agricultural Irrigation Systems (4) AE 492 Pumps and Pump Drivers (3)	
Watershed Management Emphasis (16) FNR 304 Ecology of Resource Areas (4) FNR 440 Watershed Management (3) FNR 441 Forest and Range Hydrology (3) FNR 442 Watershed Protection (2) SS 440 Forest and Range Soils (4)	

24-27

## Master of Science Degree in Agriculture

## Programs

M.S. Agriculture with Specializations in:

Agricultural Engineering Technology Dairy Products Technology Food Science and Nutrition General Agriculture International Agricultural Development Soil Science

## **General Characteristics**

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

## When to Apply

Application filing periods are given on page 98 of this catalog. To ensure adequate processing and full consideration, all application materials should be filed with the Cal Poly Admission's Office before the dates given below; nevertheless, applicants are encouraged to file during the initial filing period.

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

## **Prerequisites**

Consideration for admission to this program as a classified graduate student requires a minimum grade point average of 2.75 in the last 90 quarter units attempted. An applicant not meeting these academic standards, but who meets the basic university standard of a grade point average of 2.5 in the last 90 quarter units attempted may be considered for admission as a postbaccalaureate student; such admission does not constitute admission to graduate degree standing (refer to page 99). A change from postbaccalaureate status to graduate status requires application and additional processing through the university's admissions office.

An applicant meeting the grade point requirement for classified graduate status, but who is deficient in background courses in agriculture, natural resources and/or related support disciplines may be considered for admission as a conditionally classified graduate student. Before such a student is advanced to classified graduate status, deficiencies in prerequisites must be removed and satisfactory academic performance in a graduate program must be demonstrated by the completion of no fewer than 12 units of specified courses with a minimum grade point average of 3.0. Courses taken to remove deficiencies in prerequisites will not count toward the unit requirement for the degree.

All applicants who do not speak and write English as their primary language are required to complete the Test of English as a Foreign Language (TOEFL), with a minimum score of 550, and the Test of Written English (TWE), with a minimum score of 4.5.

#### **Program of Study**

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

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

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

Students also should refer to the Graduate Program Guidelines obtainable from the school's Graduate Studies Coordinator. All students must pass the Graduation Writing Requirement by earning a score of 10 or higher (12 possible) on the Writing Proficiency Exam (WPE) or by completing ENGL 302 or ENGL 318 with a grade of A or B prior to advancement to candidacy. ENGL 302 or ENGL 318 may not be used to satisfy course or unit requirements in the Master of Science program.

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

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

## **M.S. AGRICULTURE, SPECIALIZATION IN** AGRICULTURAL ENGINEERING TECHNOLOGY

Units

Units

Core Courses	12
400-500 level research methods course (3)	
AE 581 Graduate Seminar in Agricultural	
Engineering (3)	
Required in the specialization	9
AE 521, AE 522, AE 533	
Restricted electives	18
At least 9 units must be in computer related	
coursework; remaining units shall be approved by	
the student's Graduate Studies Committee. At least	
6 units must be at the 500 level.	
Electives	6
400-500 level courses approved by the student's graduate committee	
-	
	45

## FOR M.S. AGRICULTURE, SPECIALIZATION IN DAIRY PRODUCTS TECHNOLOGY

Core Courses	12
AG 599 Thesis (6)	
FSN 581 Graduate Seminar (3)	
SS 501 Research Planning (3)	
Required in the specialization	13
DPT 401 Physical and Chemical Properties of	
Dairy Products (3)	
DPT 402 Quality Assurance of Dairy Products (3)	
DPT 433 Dairy Plant Management and Equipment	
(4)	
DPT 522 Bioseparation Processes in Dairy	
Technology (3)	

Restricted electives	2
AE 500 Individual Study (1-6)	
AE 521 Engineering of Agricultural Systems (4)	
AE 522 Instrumentation Control/Microprocessors	
(4)	
CHEM 528 Nutritional Biochemistry (3)	
CHEM 572/573 Advanced Biochemistry (3)	
FSN 501 Lipid Metabolism and Nutrition (3)	
STAT 512 Statistical Methods (3)	

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

	Units
Core Courses	12
AG 599 Thesis (6)	
FSN 581 Graduate Seminar (3)	
SS 501 Research Planning (3)	
Required in the specialization	12
AG 500 Individual Study (3-6)	
FSN 410 Nutritional Aspects of Food Processing	
(3)	
FSN 501 Lipid Metabolism and Nutrition (3)	
STAT 512 Statistical Methods (3)	
Approved electives	12
AE 425 Computer Controls in Agriculture (3)	
AE 521 Engineering of Agricultural Systems (4)	
AE 522 Instrumentation Control/Microprocessors	
(4)	
BIO 431 Physiology I: General (4)	
CHEM 435 Food Analysis (4)	
CHEM 436 Agricultural Chemicals (4)	
CHEM 439 Instrument Analysis (5)	
CHEM 528 Nutritional Biochemistry (3)	
CHEM 572 Advanced Biochemistry (3)	
EDUC 555 Introduction to Counseling (4)	
FSN 407 Food Composition Science (4)	
FSN 409 Sensory Evaluation of Food (4)	
FSN 431 Advanced Meats (3)	
FSN 437 Advanced Food Processing (4)	
PE 451 Nutrition for Fitness and Sport (3)	
Electives (400–500 level courses)	9

#### **M.S. AGRICULTURE, SPECIALIZATION IN GENERAL AGRICULTURE**

Units

45

Core Courses	12
Required of agricultural educators:	
AG 539 Internship (6)	
AGED 520 Program Development in Agricultural	
Education (3)	
AGED 522 Instructional Programs in Agricultural	
Mechanics (3)	
Required of students other than agricultural	
educators:	
AG 599 Thesis (6)	
400- or 500-level research methods course (3)	
Any 581 Graduate Seminar offered in School of	
Agriculture (3)	
Restricted electives	27

0

45

For agricultural educators: Any approved 400- and 500-level agriculture courses. No less than 11 units must be at the 500 level. For students other than agricultural educators: Any 400- and 500-level courses approved by the student's graduate committee. At least 12 units	
must be at the 500 level. Electives Any 400- and 500-level course approved by the student's graduate committee. All agricultural education students are required to complete one year of successful teaching or graduate level	6
internship prior to the final examination.	

45

## M.S. AGRICULTURE, SPECIALIZATION IN INTERNATIONAL AGRICULTURAL DEVELOPMENT

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

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

	Units
Core Courses AG 599 Thesis (6) AGB 510 World Agriculture Development (3) AGB 515 International Agriculture Marketing (3) AGB 516 Program Management in Developing Countries (3) AGB 421/AGB 435/AE 521 (3/4) SS 453 Tropical Soils (4)	26
400-500 level research/statistical methods course	
Restricted electives to be selected with adviser's approval	11
Courses to be selected from an area of emphasis in Agroforestry Technology, Cropping Systems Technology, or Irrigation Technology.	
Global Requirement	6
Any suitable combination of 400-500 level courses from ECON, POLS, GEOG, ANT, and HIST. To be approved by student's graduate committee.	
Electives	3
To be selected from any 400-500 level course approved by the student's graduate committee.	
-	46

# M.S. AGRICULTURE, SPECIALIZATION IN SOIL SCIENCE

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

	Units
Core courses	12
SS 501 Research Planning (3)	
SS 581 Graduate Seminar in Soil Science (3)	
SS 599 Thesis (6)	
Required in the specialization	9
SS 508 Landscape Management for Erosion Control	
(3)	
SS 522 Advanced Soil Fertility (3)	
SS 582 Advanced Land Management (3)	
Electives	24
400-500 level courses approved by the student's	
graduate committee. At least 6 units of electives	
must be from outside of the School of Agriculture.	
-	45

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

## AGRIBUSINESS SPECIALIZATION IN THE MBA PROGRAM

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

## AGRIBUSINESS DEPARTMENT

Agriculture Bldg. (10), Room 210 (805) 756-5000

## Faculty

Department Head, M. LeRoy Davis

Robert E. McCorkle
Steven D. McGary
Nancy C. Ochs
Clay L. Robinson
John A. Rogalla
David J. Schaffner
Jack F. Scott
Kenneth C. Scott
Robert C. Thompson
Stanton G. Ullerich
Marlin D. Vix

## **Programs**

B.S. Agricultural Business with Concentrations in:

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

#### Minor: Agribusiness

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

#### CURRICULAR CONCENTRATIONS

#### Agribusiness Finance and Appraisal

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

#### **Agribusiness Marketing**

Career placement opportunities for graduates of this concentration involve management operations of agribusiness firms providing supplies and service to farmers and by those firms engaged in marketing, distribution, and sales of farm products. These careers include sales representatives for agricultural chemical organizations and fertilizer companies and may lead into more responsible management positions. Other careers are found in fresh fruit and vegetable marketing, advertising, food chains, food processing, and agricultural county and district fairs.

#### **Agribusiness Policy**

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

#### Farm and Ranch Management

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

<sup>1</sup> The Business Administration major is distinguished from the major in Agricultural Business. The major in Business Administration provides students with the knowledge and analytical skills essential for employment in all sectors of business and industry, as well as for managerial careers in governmental and other non-profit organizations. Opportunities for specialization are provided for students preparing for careers in accounting, financial management, marketing management, management information systems, international business management, general management.

# CURRICULUM FOR B.S. AGRICULTURAL BUSINESS

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

Units

## **MAJOR COURSES**

AGB 100 Orientation to Agribusiness Management.	1
AGB 102 Introduction to Agricultural Economics	3
AGB 201 Agribusiness Sales and Service	3
AGB 203 Agribusiness Organizations	3
AGB 212 Agricultural Economics	3
AGB 301 Agricultural Marketing	3
AGB 310 Agribusiness Credit and Finance	3
AGB 312 Agricultural Policy	3
AGB 313 Agricultural Economic Analysis	4
AGB 401 Agribusiness Labor Relations and	
Personnel Management	4
AGB 460 Research Methodology in Agribusiness	1
AGB 461 Senior Project	2
AGB 462 Senior Project	3
AGB 463 Undergraduate Seminar	2
AGB 300-400 electives (maximum of 2 units of	
AGB 400)	6
AG 250 Computer Applications to Agriculture	
(F.1.)	3
Concentration courses (see below)	23-24
-	70-71

## SUPPORT COURSES

	ACTG 211 Financial Accounting for Nonbusiness	
	Majors	4
	CHEM 122 General Chemistry or	
	BACT, BOT, or ZOO life science elective (with	
	lab) (B.1.)	4
	BUS 207 Business Law	4
	CHEM 121 General Chemistry (B.1.a.)	4
I	ECON 222 Macroeconomics (D.3.)	4
2	MATH 118 Pre-Calculus Algebra or	
	MATH 221 Calculus for Business and Economics	
	(B.2.)	4
	SS 121 Introductory Soil Science	4
	STAT 211 and STAT 212 or	
	STAT 251 and STAT 252 (B.2.)	/4,4
	ASCI 230/DH 230/PI 230	4
	FRSC 131 or 230/CRSC 131 or 230/VGSC 230	4
	AE 340/FSN 230/CRSC 311	4
	Restricted electives	16
	12 to 16 units are to be selected in Agriculture	
	with prefixes other than AGB or AGED. Of	
	these units, 6 to 8 units must be selected from	
	the following courses: AE 340, 440; ASCI 302,	
	304, 329, 401; CRSC 221, 311, 405, 431, 441;	
	DH 301, 330; FSN 333; OH 340, 425; SS 221;	
	VS 203, 302. Students may also select CHEM	
	326. No more than 3 units can come from	
	courses with AG prefix, i.e., AG 243, AG 339.	

No more than 3 units can come from Enterprise Projects, i.e., CRSC 100, FSN 100, etc.

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# GENERAL EDUCATION AND BREADTH REQUIREMENTS

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

A.1. ENGL 114 Writing: Exposition	4
A.2. ENGL 125/PHIL 125/SPC 125 Critical Thinking	3
A 3 SPC 201 Public Speaking or	5
SPC 202 Principles of Speech Communication	3
A.4. ENGL 215 Writing: Argumentation <i>or</i>	
ENGL 218 Professional Writing: Argumentation	
and Reports	4
B.1. Physical and life sciences electives (one	
with lab)	4
C.1. PHIL 230/PHIL 231 Philosophical Classics	3
C.1. Critical reading electives	6
C.2. Fine and performing arts elective	3
C.3. Literature, philosophy, arts elective	
(300–400 level)	3
Area C Arts and humanities elective	3
D.1. HIST 204 History of American Ideals and	
Institutions	3
D.1. POLS 210 American and California	~
Government	3
D.2. HIST 315 Modern World History	1 1
D.4.a. ANT 201/GEOG 150/SOC 105	3
D.4.D. ANI/BUS/ECON/GEOG/POLS/SOC	,
E 1 BSV 201 (BSV 202 Conoral Baychology	2
E.I. PST 201/PST 202 General Psychology	J
204/PEC 100 elective	7
	56
ELECTIVES	10.7
ELEC 11 Y L3	
	198

<sup>1</sup> AGB 212 is the prerequisite for ECON 222 for AGB majors, not ECON 221.
<sup>2</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 will satisfy GEB area B.2.

#### CONCENTRATIONS (select one)

## **Agribusiness Finance and Appraisal Concentration**

AGB 322 Principles of Farm Management	4
AGB 324 Agricultural Property Management and	
Sales	4
AGB 326 Farm Appraisal	4
AGB 331 Farm Accounting	4
AGB 410 Management Practices in Agricultural	
Lending	3
ECON 337 Money, Banking, and Credit	4
-	23

## **Agribusiness Marketing Concentration**

AGB 304 Agribusiness Marketing Management	3
AGB 318 Agricultural Trade Policies	3
AGB 323 Agribusiness Managerial Accounting	4
AGB 405 Agribusiness Marketing Research	
Methods	3
AGB 406 Agribusiness Marketing Communication	3
AGB 421 Agribusiness Operations Analysis or	
AGB 433 Agricultural Price Analysis	4/3
AGB 450 Agribusiness Strategy Formulation	4
-	24/23

## **Agribusiness Policy Concentration**

AGB 302 Agricultural Associations and	
Cooperatives	3
AGB 317/AGB 409/HIST 305	3
AGB 318 Agricultural Trade Policies	3
AGB 323 Agribusiness Managerial Accounting	4
AGB 412 Agricultural Resource Use: Policy	
Analysis	4
AGB 421 Agribusiness Operations Analysis or	
AGB 433 Agricultural Price Analysis	4/3
GEOG 315 Geography of Resource Utilization	3
	24/23

## Farm and Ranch Management Concentration

AGB 321 Farm Records	4
AGB 322 Principles of Farm Management	4
AGB 331 Farm Accounting	4
AGB 413 Crop Management Problems	3
AGB 415 Livestock Management Problems or	
AGB 416 Dairy Management Problems	3
AGB 433 Agricultural Price Analysis	3
AGB 435 Linear Programming in Agriculture	3
-	24

## CURRICULUM FOR 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 School of Agriculture this opportunity. Interested students must apply for acceptance into the minor through the Agribusiness Department.

The minor offers students two areas of emphasis. Agribusiness production management emphasizes management of the farm or ranch as an enterprise and agribusiness marketing focuses on sales and marketing of agricultural commodities. Other areas of emphasis are possible through the flex minor program, but they must be approved in advance by the Agribusiness Minor Coordinator.

	Units
Required courses AGB 212 Agricultural Economics (3) AGB 301 Agricultural Marketing (3) AGB 310 Agribusiness Credit and Finance (3) AGB 401 Agribusiness Labor Relations and Personnel Management (4) ACTG 211 Financial Accounting for Nonbusiness Majors (4)	17
Courses in area of emphasis 10	0–11
Select one of the following areas of emphasis:	
Agribusiness Production Management (11) AGB 321 Farm Records (4) AGB 322 Principles of Farm Management (4) AGB 413/AGB 415/AGB 416 (3)	
Agribusiness Marketing (10) AGB 201 Agribusiness Sales and Service (3) AGB 304 Agribusiness Marketing Management (3) AGB 323 Agribusiness Managerial Accounting (4)	

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# AGRICULTURAL EDUCATION DEPARTMENT

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

## Faculty

#### Department Head, Glen R. Casey

Robert A. Flores William C. Kellogg

## Programs

B.S. Agricultural Science with Concentrations in:

Agricultural Mechanics Agricultural Products and Processing Agricultural Resources Management Agriculture Supplies and Services Animal Production Ornamental Horticulture Plant Production

The primary function of the Agricultural Education Department is to provide for the preparation of teachers of agriculture for the public secondary schools of California. Specialized pre-professional and professional courses are offered for undergraduates and graduate students. The Agricultural Sciences major can also provide for professional preparation in agricultural communication in association with the Brock Center for Agricultural Communications and selected courses in Journalism.

The department offers a Bachelor of Science degree in Agricultural Science with two elective areas teaching agriculture or agricultural communications. The credential preparation program provides for early field experience and professional education coursework in the undergraduate curriculum. Agricultural communications preparation includes a breadth and depth in agriculture, foundations in journalism and an industry internship.

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

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

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

## CURRICULAR CONCENTRATIONS

#### **Agricultural Mechanics**

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

## Agricultural Products and Processing

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

#### **Agricultural Resources Management**

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

## **Agricultural Supplies and Services**

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

#### **Animal Production**

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

## **Ornamental Horticulture**

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

### **Plant Production**

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

## CURRICULUM FOR B.S. AGRICULTURAL SCIENCE

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

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## **MAJOR COURSES**

AGED 202 Introduction to Agricultural Education	2
AGED 404 Agricultural Leadership	2
AGED 438 Instructional Processes in Agricultural	
Education	3
AGED 461 Senior Project	3
AGED 462 Senior Project	3
AGB 301 Agricultural Marketing	3
AGB 321 Farm Records	4
AE 340 Irrigation Water Management	4
ASCI 230 General Animal Science	4
CRSC 230 General Field Crops	4
DH 230 General Dairy Husbandry	4
OH 230 Ornamental Gardening	3
PI 230 General Poultry Production	3
SS 121 Introductory Soil Science	4
Concentration courses (see below)	22
	68

## SUPPORT COURSES

AGB 201 Agribusiness Sales and Service	3
AE 121 Agricultural Mechanics	2
AE 141 Agricultural Machinery Safety	3
CHEM 121 General Chemistry (B.1.a.)	4
FRSC 230 California Fruit Growing or	
VGSC 230 General Vegetable Crops	4
Select one of the following elective areas or 32	
units of adviser approved electives	32
Teaching Agriculture	
AGED 303, 339, 350, 351; EDUC 302, 305, 403,	
411; ETWT 144; AG/AGED electives (8)	
Agricultural Communication	
JOUR 203, 205, 233, 304/312/331; AG 339;	
AG/AGED electives (5 units at 300-400	
level) (7)	
-	48

# GENERAL EDUCATION AND BREADTH REQUIREMENTS

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

	A.1.	ENGL 114 Writing: Exposition	4
	A.2.	ENGL 125/PHIL 125/SPC 125 Critical	
	Thi	nking	3
	A.3.	SPC 201 Public Speaking or	
	SPO	202 Principles of Speech Communication	3
	A.4.	ENGL 215 Writing: Argumentation or	
	EN	GL 218 Professional Writing: Argumentation	
	á	and Reports	4
	B.1.b.	BOT 121 General Botany	4
	B.1.b.	ZOO 131 General Zoology	4
1	B.2.	MATH 118 Pre-Calculus Algebra	4
	B.2.	Mathematics or statistics elective	2

C.1. PHIL 230/PHIL 231 Philosophical Classics	3
C.1. Critical reading electives	6
C.2. Fine and performing arts elective	3
C.3. Literature, philosophy, arts elective	
(300-400 level)	3
Area C Arts and humanities elective	3
D.1. HIST 204 History of American Ideals and	
Institutions	3
D.1. POLS 210 American and California	
Government	3
D.2. HIST 315 Modern World History	3
D.3. ECON 201/ECON 211/ECON 222	3
D.4.a. ANT 201/GEOG 150/SOC 105	3
D.4.b. ANT/BUS/ECON/GEOG/POLS/SOC	
elective (300-400 level)	3
E.1. PSY 201/PSY 202 General Psychology	3
E.2. BIO 220/FSN 210/HE 210/PE 250/PSY	
304/REC 100 elective (Teacher credential	
candidates should select PE 250)	2
F.1. AG 250 Computer Application to Agriculture.	3
	72
ELECTIVES	10
ELECTIVES	10
	198
	, 50

<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 will satisfy GEB area B.2.

## **CONCENTRATIONS** (select one)

A

#### **Agricultural Mechanics Concentration**

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

## Agricultural Products and Processing Concentration

DPT 230 General Dairy Manufacturing	4
FSN 211 Meats	3
FSN 212 Meat Grading and Evaluation	2
VGSC 421 Postharvest Tech. Horticultural Crops	4
DPT/FSN electives (6 units at 300-400 level)	9
—	22
gricultural Resources Management Concentration	•
CONS 120 Fisheries and Wildlife Management	3
CONS 207 Resource Survey	3
FNR 101 Natural Resources Management and	
Society	3
FNR 304 Ecology of Resource Areas	4
FNR electives (6 units at 300-400 level)	9

## Agricultural Supplies and Services Concentration

AGB 203 Agribusiness Organizations	3
AGB 302 Agricultural Associations and	
Cooperatives	3
AGB 310 Agribusiness Credit and Finance	3
AGB 406 Agribusiness Marketing Communication	3
AGB electives (1 unit at 300-400 level)	10
	22

## **Animal Production Concentration**

ASCI 202 Feeds and Feeding	3
ASCI 226 Livestock Evaluation	3
ASCI 240 Applied Feeds and Feeding	2
ASCI 260 Preparation of Livestock for Shows and	
Sales	2
DH 330 Artificial Insemination	3
ASCI/DH/DPT/PI electives (7 units at 300-400	
level)	9
-	22

## **Ornamental Horticulture Concentration**

OH 125 Commercial Floral Design Practices	3
OH 133 Plant Propagation Fundamentals III	4
OH 134 Landscape Maintenance Fundamentals IV.	3
OH 324 Foliage Plant Culture	4
OH electives (6 units at 300-400 level)	8
—	22

## **Plant Production Concentration**

CRSC 230/FRSC 230/VGSC 230	4
CRSC 221 Weed Control	4
CRSC 311 Insect Pest Management	4
SS 221 Fertilizers	4
CRSC/FRSC/VGSC electives (300-400 level)	6
· · · · · · · · · · · · · · · · · · ·	22

## AGRICULTURAL ENGINEERING DEPARTMENT

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

## Faculty

#### Department Head, Edgar J. Carnegie

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

## Programs

**B.S.** Agricultural Engineering

B.S. Agricultural Engineering Technology

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

Department facilities include well-equipped laboratories for hydraulic systems, evaluation and testing of power units, fabrication of agricultural machinery, agricultural electrical systems, design and construction of agricultural structures, photogrammetry, microcomputers and controllers.

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

Students are encouraged to participate in the student clubs of the department. The Agricultural Engineering Society is composed of Agricultural Engineering Technology and Agricultural Engineering majors and is involved in a broad range of activities and services including Homecoming displays. The student branch of the American Society of Agricultural Engineers and the Student Mechanization Branch offer an active program of professional and extracurricular activity.

## AGRICULTURAL ENGINEERING MAJOR

Agricultural engineers provide the engineering necessary for the development of agriculture and other biological systems. The agricultural engineer represents the most general type of engineer, adept at utilizing electrical and mechanical energy sources and water resources and designing structural units. The curriculum features a unique combination of engineering and applied science coursework designed to prepare the graduate to assume a productive role in society.

Employment opportunities exist primarily in the design, evaluation and management of systems encompassing irrigation, drainage, hydrology, soil conservation; farm machinery; food processing; and agricultural environments. Manufacturers, consulting engineers, and governmental and private agencies are the primary employers.

The curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

## AGRICULTURAL ENGINEERING TECHNOLOGY MAJOR

This major gives the student broad agricultural training with emphasis on the applied mechanical phases of agriculture. Business and management courses also are emphasized. Eight units of electives enable the student to tailor his or her degree program in agricultural engineering technology toward those emphasis areas which suit his or her career objectives. Emphasis areas include business, agribusiness, crop science, animal science, or industrial technology and irrigation system management.

Career opportunities are available in sales and service of equipment and machinery, fabrication and design of equipment, teaching vocational agriculture with an emphasis on agricultural mechanics, and management of machinery systems for farm, ranch, or industrial applications.

Cal Poly offers a Master of Science degree in Agriculture with a specialization in Agricultural Engineering Technology.

## **CURRICULUM FOR B.S. AGRICULTURAL ENGINEERING**

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

## Freshman

AE 128 Introduction to Fundamentals of
Agricultural Technology
AE 143 Power and Machinery
AE 237 Engineering Surveying I
ETME 141 Applied Descriptive Geometry
ETME 142 Engineering Drawing I
ETMP 144 Manufacturing Processes: Machining I
SS 121 Introductory Soil Science
CSC 251 Digital Computer Applications (F.1.)
ENGL 114 Writing: Exposition (A.1.)
ENGL 125/PHIL 125/SPC 125 Critical Thinking
(A.2.)
MATH 141 Calculus I (B.2.)
MATH 142 Calculus II (B.2.)
MATH 143 Calculus III (B.2.)
PHYS 131 General Physics (B.1.a.)
PHYS 132 General Physics (B.1.a.)
<sup>1</sup> Critical reading elective (C.1.)

## Sophomore

AE 232 Agricultural Structures Planning	3
AE 236 Principles of Irrigation	4
ETME 143 Engineering Drawing II	1
ETWT 144 Manufacturing Processes: Welding	2
MATH 241 Calculus IV	4
MATH 242 Differential Equations	4
ME 211 Engineering Statics	3
ME 212 Engineering Dynamics	3
CHEM 124 General Chemistry (B.1.a.)	4
CHEM 125 General Chemistry (B.1.a.)	4
ECON 201 Survey of Economics or	
ECON 211 Principles of Economics (D.3.)	3
ENGL 218 Professional Writing: Argumentation	
and Reports (A.4.)	4
PHYS 133 General Physics (B.1.a.)	4
SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	
(A.3.)	3
Elective	3

## Junior

AE 312 Hydraulics	4
AE 326 Energy Systems for Agriculture	3
AE 328 Measurements and Computer Interfacing	3
AE 331 Irrigation Theory	3
AE 403 Agricultural Systems Engineering	3
AE 430 Finite Element Analysis	3
CE 204 Strength of Materials	3
CE 205, CE 206 Strength of Materials and	
Laboratory	2,1

	EE 311 Electrical Circuit Theory	3
	EE 351 Electric Circuits Laboratory	1
	IE 314 Engineering Economics	3
	ME 302 Thermodynamics	3
	STAT 321 Statistical Analysis	3
	BIO 220 Physiology and Biological Adaptation	
	(B.1.b., E.2.)	4
	PHIL 230/231 Philosophical Classics (C.1.)	3
	POLS 210 American and California Government	
	(D,1.)	3
1	Critical reading elective (C.1.)	3
1	Fine and performing arts elective (C.2.)	3
	-	54

#### Senior

	AE 414 Irrigation Engineering	4
	AE 415 Hydrology	3
	AE 421 Equipment Engineering	4
	AE 422 Equipment Engineering	3
	AF 427 Agricultural Process Engineering	3
	AF 433 Agricultural Structures Design	4
	AE 461 Senior Project	2
	AF 462 Senior Project	3
	AE 462 Senior Projection	2
	ANT 201/CEOC 150/SOC 105 (D 4 $_2$ )	3
	HIST 201/ History of American Ideals and	5
	Institutions (D 1)	2
	Institutions (D.1.)	2
	HIST 315 Modern World History (D.2.)	3
	PSY 201/PSY 202 General Psychology (E.1.)	3
1	ANT/BUS/ECON/GEOG/POLS/SOC elective	
	(300–400 level) (D.4.b.)	3
1	Arts and humanities elective (Area C)	3
1	Literature philosophy arts elective (300-400	-
	level) (C 2)	2
	level) (C.3.)	2
	Elective	3
	-	53
		206

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 86 of this catalog.)

## **B.S. AGRICULTURAL ENGINEERING**

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

Units MAJOR COURSES 64 AE 128, 143, 232, 236, 237, 312, 326, 328, 331, 403, 414, 415, 421, 422, 427, 430, 433, 461, 462, 464 SUPPORT COURSES 79 ETME 141, 142, 143 **ETMP 144 ETWT 144** CSC 251 (F.1.) CHEM 124 (B.1.a.), 125 (B.1.a.) MATH 141 (B.2.), 142 (B.2.), 143 (B.2.), 241, 242 SS 121 PHYS 131 (B.1.a.), 132 (B.1.a.), 133 (B.1.a.) **STAT 321** ME 211, 212 CE 204, 205, 206 ME 302 EE 311, 351 IE 314 **GENERAL EDUCATION AND BREADTH** REQUIREMENTS.....

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Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300-400 level. Additional GEB courses are listed under Support Courses.

Area A: (14) ENGL 114 (A.1.) ENGL 125/PHIL 125/SPC 125 (A.2.) SPC 201/SPC 202 (A.3.) ENGL 218 (A.4.) Area B: (2) BIO 220 (B.1.) Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300-400 level) (C.3.) Arts and humanities elective (Area C) Area D: (18) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/211/222 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.) Area E: (5) PSY 201/PSY 202 (E.1.) BIO 220 (E.2.) ELECTIVES

6 206

## **CURRICULUM FOR B.S. AGRICULTURAL ENGINEERING TECHNOLOGY**

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

## Freshman

AE 128 Introduction to Fundamentals of	
Agricultural Technology	3
AE 133 Agricultural Drafting	3
AE 141 Agricultural Machinery Safety	3
AE 142 Agricultural Power and Machinery	
Management	4
ETMP 144 Manufacturing Processes: Machining I	
and	
ETMP 145 Manufacturing Processes: Machining	
11	2,1
ETWT 144 Manufacturing Processes: Welding 1	2
ETWT 155 Industrial Welding Technology	1
SS 121 Introductory Soil Science	4
ENGL 114 Writing: Exposition (A.1.)	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking	
(A.2.)	3
MATH 116 Pre-Calculus Algebra 1	3
MATH 117 Pre-Calculus Algebra II (B.2.)	3
MATH 119 Pre-Calculus Trigonometry	5
Animal production elective	4
Plant production elective	4
Electives	
	50

### Sophomore

AE 134 Agricultural Electrification	3
AE 231 Agricultural Building Construction	3
AE 234 Agricultural Power Transmission and	
Mechanics	3
AE 237 Engineering Surveying L	2
AE 335 Agricultural Power	3
AE 341 Gasoline Engine Diagnosis	3
ACTG 211 Financial Accounting for Nonbusiness	
Majors	4
AG 250/CSC 110/CSC 120 (F.1.)	3
ENGL 218 Professional Writing: Argumentation and	
Reports (A.4.)	4
PHYS 121 College Physics (B.1.a.)	4
PHYS 122 College Physics (B.1.a.)	4
PHYS 123 College Physics (B.1.a.)	4
SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	
(A.3.)	3
Electives	5
	48
	- + U

## Junior

AE 323 Agricultural Products Handling	3
AE 340 Irrigation Water Management	4
AE 342 Diesel Fuel Systems	3
AE 343 Project Analysis	5
AE 344 Agricultural Equipment Projects	3

AE 347 Principles of Agricultural Machinery	4
BUS 201 Business Law Survey	3
BIO 220 Physiology and Biological Adaptation	
(B.1.b., E.2.)	4
CHEM 121 General Chemistry (B.1.a.)	4
CHEM 122 General Chemistry (B.1.a.)	4
ECON 201 Survey of Economics or	
ECON 211 Principles of Economics (D.3.)	3
PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
PSY 201/PSY 202 General Psychology (E.1.)	3
<sup>2</sup> Critical reading electives (C.1.)	6

Senior

	AE 301 Closed Circuit Hydraulics	3
	AE 324 Principles of Agricultural Electrification	4
	AE 425 Computer Controls for Agriculture	3
	AE 422 Agricultural Buildings	4
	AE 452 Agricultural bulluings	
	AE 461 Senior Project	2
	AE 462 Senior Project	- 3
	AE 463 Undergraduate Seminar	2
	AGB 312 Agricultural Policy	3
	ANT 201/GEOG 150/SOC 105 (D 4 a)	3
	HIST 2017 History of American Ideals and	Ū
	Institutions (D.1.)	2
	Institutions (D.I.)	2
	HIST 315 Modern World History (D.2.)	3
	POLS 210 American and California Government	
	(D.1.)	3
2	ANT/BUS/ECON/GEOG/POLS/SOC elective	
	(200, 400  lovel) (D.4 h)	. 2
2	(300-400  level) $(0.4.0.)$	2
-	Arts and numanities elective (Area C)	3
2	Fine and performing arts elective (C.2.)	3
2	Literature, philosophy, arts elective (300–400	
	level) (C.3.)	3
	-	48
	_	
	-	198

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

MATH 118 will substitute for MATH 116 and MATH 117 which are taught at a slower pace for those who need more review. MATH 117 will satisfy GEB area B.2.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 86 of this catalog.)

## **B.S. AGRICULTURAL ENGINEERING TECHNOLOGY**

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

MAJOR COURSES 69 AE 128, 133, 134, 141, 142, 231, 234, 301, 323, 324, 335, 340, 341, 342, 343, 344, 347, 425, 432, 461, 462 SUPPORT COURSES 68 ACTG 211 AE 237, 463 AGB 312 BIO 220 (B.1.b., E.2.) **BUS 201** CHEM 121 (B.1.a.), 122 (B.1.a.) ETMP 144, 145 ETWT 144, 155 MATH 116, 117 (B.2.), 119 1 PHYS 121 (B.1.a.), 122 (B.1.a.), 123 (B.1.a.) SS 121 AG 250/CSC 110/CSC 120 (F.1.) Animal production elective (4) Plant production elective (4) **GENERAL EDUCATION AND BREADTH** REQUIREMENTS.....

53

8

198

Units

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300-400 level. Additional courses are listed under Support Courses.

Area A: (14) ENGL 114 (A.1.) ENGL 125/PHIL 125/SPC 125 (A.2.) SPC 201/SPC 202 (A.3.) ENGL 215 or 218 (A.4.) Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300-400 level) (C.3.) Arts and humanities elective (Area C) Area D: (18) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/211/222 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.) Area E: (3) PSY 201/PSY 202 (E.1.) ELECTIVES .....

<sup>1</sup> MATH 118 will substitute for MATH 116 and 117 which are taught at a slower pace for those who need more review. MATH 117 will satisfy GEB area B.2.

x

## ANIMAL SCIENCES AND INDUSTRY DEPARTMENT

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

## Faculty

#### Department Head, John W. Algeo

Gene A. Armstrong M. Steven Daugherty James R. Flanagan Wallace F. Glidden Michael H. Hall Roger M. Hunt Michael W. Lund Roland K. Pautz William E. Plummer Robert T. Rutherford Kenneth C. Scotto Dale A. Smith Robert Spiller Clifford A. Stokes Robert R. Wheeler

## Programs

- **B.S.** Animal Science
- B.S. Poultry Industry

The department offers the Bachelor of Science degree in Animal Science and the Bachelor of Science degree in Poultry Industry. The educational approach of this department is to provide students with instruction in theory and practical application of all phases of production.

Instruction in the department also encompasses a diversified cocurricular program including special interest clubs and the sponsorship of championship-calibre national intercollegiate livestock judging teams.

Students in either major may complete a breadth of preveterinary science courses as a complement to their major fields of study. Through this training, students will enhance their qualifications for admission to schools of veterinary medicine throughout the United States.

An Agribusiness Minor is available to students in both majors. This minor allows for the combination of practical animal production expertise with agribusiness training and provides a unique preparation for graduates not only in technical farming and ranching, but also in allied businesses and industries.

## ANIMAL SCIENCE MAJOR

The Bachelor of Science degree in Animal Science prepares men and women for occupations related to beef cattle, horse, sheep, and swine production. Graduates of the department are engaged in the livestock and farming business as well as being employed as ranch workers or managers.

Livestock feeding yards, feed mills, auction sales companies, meat packers, commission firms, and other organizations servicing the livestock industry are sources of employment for graduates. Other employment fields include agricultural teaching, agricultural extension work, and agricultural research in the areas of animal nutrition, genetics, reproductive physiology and biotechnology. The department allows wide latitude in the selection of elective courses so that students may pursue a secondary emphasis area or broaden the cultural base of their total college education.

Students are provided with instruction in theory and application of all phases of livestock production and range management. To this end the department maintains purebred and commercial instructional herds of the chief meat animal species, and a brood mare band of thoroughbreds and quarter horses. The university herds and flocks are extensively used for laboratory and applied studies of management, feeding, breeding, and marketing techniques and procedures. More than 4000 acres of campus land are devoted to instruction in the animal sciences.

The student is encouraged to augment classroom and laboratory instruction through participation in the varied enterprise programs operated by the Cal Poly Foundation. Through these programs large numbers of student-owned beef cattle, sheep and hogs are grazed, fed and marketed each year. Provision also is made to give the students an opportunity to own and manage, in partnership with the Foundation, a commercial cow herd and a prototype range band of ewes. Enterprises with Quarter Horses and Thoroughbreds are available.

## POULTRY INDUSTRY MAJOR

The Bachelor of Science degree in Poultry Industry prepares students for a wide variety of positions in the commercial poultry industry and in many allied services related directly to the industry. Opportunities in the industry are many and varied as evidenced by the fact that graduates have worked in more than fifty types of jobs in the industry.

Poultry students have an opportunity to conduct enterprise projects in the production of market eggs, hatching eggs, meat birds, replacement pullets, turkey, and game birds, which give them valuable experience in production techniques as well as exposure to a number of business activities related to production. Advanced students may have opportunities to study special topics related to problems in management of commercial poultry flocks.

The university has facilities for more than 5,000 adult and over 6,000 growing chickens on approximately 10 acres of land. The poultry unit maintains flocks of a number of breeds and varieties of chickens for both egg and meat production. Flocks of turkeys and several game bird species are maintained in support of the instructional program. A 15,000-egg capacity hatchery is equipped to hatch eggs ranging in size from quail to turkey. A well-equipped poultry processing plant and egg handling and processing facility enables students to gain experience in these areas.

## **CURRICULUM FOR B.S. ANIMAL SCIENCE**

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

## Freshman

ASCI 101 Introduction to the Animal Sciences	2
ASCI 111 Market Beef Production	3
ASCI 112 Elements of Swine Production	3
ASCI 113 Elements of Sheep Production	3
ASCI 114 Elements of Horse Production	3
ASCI 241 Applied Beef Cattle Practices	2
ASCI 242 Applied Swine Management Practices	2
ASCI 243 Applied Sheep Management Practices	2
AE 121 Agricultural Mechanics	2
CHEM 121 General Chemistry	4
CHEM 122 General Chemistry	4
ENGL 114 Writing: Exposition (A.1.)	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking	
(A.2.)	3
SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	
(A.3.)	3
ZOO 131 General Zoology (B.1.b.)	4
BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC	
100 elective (E.2.)	2
Mathematics elective (B.2.)	3
Electives	2
-	E 1
	51

## Sophomore

	ASCI 202 Feeds and Feeding
	ASCI 240 Applied Feeds and Feeding
	VS 123 Anatomy and Physiology
	VS 203 Animal Parasitology
	BACT 221 General Bacteriology (B.1.b.)
	CHEM 326 Survey of Organic Chemistry
	CRSC 123 Forage Crops
	FSN 211 Meats
	SS 121 Introductory Soil Science
	ENGL 215 Writing: Argumentation or
	ENGL 218 Professional Writing: Argumentation
	and Reports (A.4.)
	HIST 204 History of American Ideals and
	Institutions (D.1.)
	PHIL 230/PHIL 231 Philosophical Classics (C.1.)
1	Computer literacy elective (F.1.)
1	Critical reading electives (C.1.)
1	Mathematics or statistics elective (B.2.)

#### Junior

ASCI 302 Applied Animal Nutrition	3
VS 302 Animal Hygiene	3
AGB 321 Farm Records	4
BIO 303 Genetics	3
ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
CHEM 328 Biochemistry (B.1.a.)	4
ECON 201 Survey of Economics or	
ECON 211 Principles of Economics (D.3.)	3

	HIST 315 Modern World History (D.2.)	3
	POLS 210 American and California Government	
	(D.1.)	3
	PSY 201/PSY 202 General Psychology (E.1.)	3
I	Critical reading elective (C.1.)	3
ł	Fine and performing arts elective (C.2.)	3
1	Literature, philosophy, arts elective (300–400	
	level) (C.3.)	3
	Electives	8
	-	49

#### Senior

	ASCI 304 Animal Breeding	3
	ASCI 401 Reproductive Physiology	4
	ASCI 402 Animal Nutrition	4
	ASCI 461 Senior Project	3
	ASCI 462 Senior Project	3
	ASCI 463 Undergraduate Seminar	2
	Animal Science electives to be selected with	
	adviser approval	12
1	ANT/BUS/ECON/GEOG/POLS/SOC elective	
	(300–400 level) (D.4.b.)	3
1	Arts and humanities elective (Area C)	3
2	Electives and courses to complete major	12
	-	49
	=	198

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 86 of this catalog.)
<sup>2</sup> Seven units to be selected from 300-400 level courses in ASCI, DSCI, FSN,

Seven units to be selected from 300–400 level courses in ASCI, DSCI, FSN, PI, or VS.

## **B.S. ANIMAL SCIENCE**

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

Units

MAJOR COURSES 66 ASCI 101, 111, 112, 113, 114, 202, 240, 241, 242, 243, 302, 304, 401, 402, 461, 462, 463 Animal Science electives to be selected with adviser approval (12) 300-400 level courses in ASCI, DSCI, FSN, PI, or VS (7) SUPPORT COURSES 53 AE 121 AGB 321 BACT 221 (B.1.b.) **BIO 303** CHEM 121, 122, 326, 328 (B.1.a.) **CRSC 123** FSN 211 SS 121 VS 123, 203, 302 ZOO 131 (B.1.b.) **GENERAL EDUCATION AND BREADTH** REQUIREMENTS..... 64 Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300-400 level. Additional GEB courses are listed under Support Courses. Area A: (14) ENGL 114 (A.1.) ENGL 125/PHIL 125/SPC 125 (A.2.) SPC 201/SPC 202 (A.3.) ENGL 215 or 218 (A.4.) Area B: (6) Mathematics elective (B.2.) Mathematics or statistics elective (B.2.) Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300-400 level) (C.3.) Arts and humanities elective (Area C) Area D: (18) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/211/222 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.) Area E: (5) PSY 201/PSY 202 (E.1.) BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100 elective (E.2.) Area F: (3) Computer literacy elective (F.1.) ELECTIVES ..... 15 198

## CURRICULUM FOR B.S. POULTRY INDUSTRY

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

## Freshman

	ASCI 101 Introduction to the Animal Sciences	2
	ASCI 202 Feeds and Feeding	3
	PI 121 Poultry Industry Development	4
	PI 122 Replacement Programs and Broiler	
	Production	4
	Pl 133 Poultry Incubation	- 3
	BOT 121 General Botany (B.1.b.)	4
	ENGL 114 Writing: Exposition (A.1.)	4
	ENGL 125/PHIL 125/SPC 125 Critical Thinking	
	(A.2.)	3
1	MATH 118 Pre-Calculus Algebra (B.2.)	4
	STAT 211 Elementary Probability and Statistics	
	(B.2.)	3
	ZOO 131 General Zoology (B.1.b.)	4
	BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC	
	100 elective (E.2.)	2
2	Critical reading elective (C.1.)	3
	Agricultural Engineering electives	4
	Electives	3
	-	50

## Sophomore

	PI 221 Poultry Selection and Egg Production	3
	PI 222 Poultry Products Processing and Marketing	3
	PI 231 Poultry Anatomy and Physiology	3
	PI 233 Poultry Plant Design and Equipment	2
	BACT 221 General Bacteriology	4
	BIO 303 Genetics	3
	ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
	ECON 201 Survey of Economics or	
	ECON 211 Principles of Economics (D.3.)	3
	ENGL 218 Professional Writing: Argumentation and	
	Reports (A.4.)	4
	PSY 201/PSY 202 General Psychology (E.1.)	3
	SPC 201 Public Speaking or	
	SPC 202 Principles of Speech Communication	
	(A.3.)	3
2	Computer literacy elective (F.1.)	3
2	Critical reading elective (C.1.)	3
	Agricultural Engineering or welding elective	2
3	Management elective	3
	Electives	6
		51

#### Junior

PI 322 Poultry Business Organization	4
PI 323 Poultry Diseases and Hygiene	4
PI 331 Turkey Industry	3
PI 333 Applied Poultry Feeding and Nutrition	4
AGB 212 Agricultural Economics or	
ECON 212 Principles of Economics	3
AGB 321 Farm Records or	
ACTG 211 Financial Accounting for	
Nonbusiness Majors	4

	CHEM 121 General Chemistry	4
	CHEM 122 General Chemistry	4
	CHEM 326 Survey of Organic Chemistry	4
	HIST 204 History of American Ideals and	
	Institutions (D.1.)	3
	POLS 210 American and California Government	
	(D.1.)	3
2	Fine and performing arts elective (C.2.)	3
	Agricultural Engineering elective	3
	Electives	3
	· -	49

#### Senior

	ASCI 402 Animal Nutrition	4
	PI 422 Advanced Poultry Enterprise Supervision	3
	PI 431 Applied Poultry Breeding	4
	Pl 461 Senior Project	3
	PL 462 Senior Project	3
	PI 463 Undergraduate Seminar	2
	AGB 401 Agribusiness Labor Relations and	-
	Personnel Management	4
	CHEM 328 Biochemistry (B.1.a.)	4
	HIST 315 Modern World History (D.2.)	3
	PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
2	ANT/BUS/ECON/GEOG/POLS/SOC elective	
	(300–400 level) (D.4.b.)	3
2	Arts and humanities elective (Area C)	3
	Computer science elective	3
2	Literature, philosophy, arts elective	
	(300–400 level) (C.3.)	3
3	Management elective	3
	-	48
	=	
		198

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Animal Science, Poultry Industry, Veterinary Science and other subjects.

<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 will satisfy GEB area B.2.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 86 of this catalog.)

<sup>3</sup> To be selected from BUS 201, MGT 118, MGT 311.

## **B.S. POULTRY INDUSTRY**

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

Units

77

MAJOR COURSES 68 PI 121, 122, 133, 221, 222, 231, 233, 322, 323, 331, 333, 422, 431, 461, 462, 463 ASCI 101 AGB 212/ECON 212 AGB 321/ACTG 211 AGB 401 **BIO 303** SUPPORT COURSES 41 ASCI 202, 402 **BACT 221** CHEM 121, 122, 326 Agricultural Engineering electives (7) Agricultural Engineering or welding elective (2) Computer science elective (3) Management electives. Select 2 from: BUS 201, MGT 118, MGT 311 (6) **GENERAL EDUCATION AND BREADTH** 

## GENERAL EDUCATION AND BREADTH REQUIREMENTS.....

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level.

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

Area B: (19) CHEM 328 (B.1.a.) BOT 121 (B.1.b.), ZOO 131 (B.1.b.) 1 MATH 118 (B.2.), STAT 211 (B.2.)

Area C: (18)

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

Area D: (18)

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

Area E: (5)

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

#### Area F: (3)

Computer literacy elective (F.1.)

ELECTIVES	12
	198

<sup>1</sup> MATH 116 and 117 will substitute for MATH 118 and are taught at a slower pace for those who need more review. MATH 117 will satisfy GEB area B.2.

# **CROP SCIENCE DEPARTMENT**

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

## Faculty

#### Department Head, George G. Gowgani

Edgar H. Beyer J. Wyatt Brown A. Charles Crabb H. Paul Fountain James S. W. Greil Louis W. Harper Robert J. McNeil Wesley J. Mueller Gene P. Offermann John C. Phillips Edwin C. Seim Mark D. Shelton Brenda S. Smith David L. Warfield Jo Ann C. Wheatley

## Programs

B.S. Crop Science B.S. Fruit Science

Minor: Plant Protection

Two major curricula leading to the Bachelor of Science degree are offered by the Crop Science Department and are designed to prepare students for field, fruit, or vegetable crop production management and for employment in related service areas.

Graduates in Crop Science and Fruit Science have attained responsible positions in agronomic and horticultural production and management, teaching, research, extension, quality control and inspection, and sales and service areas. Opportunities for employment in private industry and governmental sectors are available for those with practical knowledge of agricultural skills and techniques and a good background in the sciences and humanities.

The department has 70 acres of productive citrus, avocados, grapes, deciduous orchard, and berries with over 100 varieties represented. Additional nonbearing acreage for instructional use exists and new plantings are under way. About 400 acres are devoted to student production enterprises in field and vegetable crops. An additional 200 acres of campus farm crop land provide opportunities to gain experience through part-time employment. All departmental majors are encouraged to gain experience and earn income by participation in the Enterprise Project program or by working for the campus farm.

The technological phases of instruction are enhanced by packing and grading equipment, seed processing equipment, and specialized laboratory equipment for the study of various crops. Field trips supplement instruction for crops not common to the San Luis Obispo area.

## **CROP SCIENCE MAJOR**

A student in the Crop Science major must elect to specialize in agronomy or vegetable science and may select the Plant Protection minor in the junior and senior years. Employment opportunities for students graduating in the Crop Science major include private or corporate crop production and management, sales and service, positions with commercial pest control firms, government regulatory agencies, and agriculturally related organizations, and as agronomists and horticulturists with government or industry.

#### FRUIT SCIENCE MAJOR

The Fruit Science major qualifies graduates for orchard or vineyard management or for related employment in packing houses, cooperatives, canneries, sales and service businesses, pest control firms, government regulatory agencies, fruit tree nurseries, research stations, and produce-marketing companies. Instruction includes deciduous fruits, nut crops, citrus, avocados, grapes, berries, tropical and subtropical fruits, and minor fruit species.

## **CURRICULUM FOR B.S. CROP SCIENCE**

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

Units

#### **MAJOR COURSES**

CRSC 100/VGSC 100/FRSC 100 Enterprise Project.	3
CRSC 101 Orientation to Crop Science	1
CRSC 131 Introduction to Crop Science	4
CRSC 132 Grain Crops	4
CRSC 133 Row Crops	4
CRSC 221 Weed Control	4
CRSC 231 Commercial Seed Production and	
Conditioning	4
CRSC 304 Plant Breeding	4
CRSC 311 Insect Pest Management	4
CRSC 410 Crop Physiology	4
CRSC 411 Experimental Techniques and Analysis	4
CRSC 461 Senior Project	3
CRSC 462 Senior Project	3
CRSC 463 Undergraduate Seminar	2
VGSC 232 Vegetable Crops Production	4
Adviser approved electives (at least 3 courses at	
300–400 level)	16

## SUPPORT COURSES

AGB 321 Farm Records	4
BIO 303 Genetics	3
BOT 121 General Botany (B.1.b.)	4
BOT 223 Introductory Plant Taxonomy	4
BOT 323 Plant Pathology	4
CHEM 121 General Chemistry (B.1.a.)	4
CHEM 122 General Chemistry (B.1.a.)	4
CHEM 326 Survey of Organic Chemistry	4
CHEM 328 Biochemistry	4
FRSC 230 California Fruit Growing	4
SS 121 Introductory Soil Science	4
SS 221 Fertilizers and Plant Nutrition	4
Agricultural Engineering elective	3
Agribusiness elective (300-400 level)	3-4
School of Agriculture elective	2
-	55-56

### **GENERAL EDUCATION AND BREADTH** REQUIREMENTS

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300-400 level. Additional GEB courses are listed under Support Courses.

A.1. ENGL 114 Writing: Exposition	4
A.2. ENGL 125/PHIL 125/SPC 125 Critical	
Thinking	3
A.3. SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	3
A.4. ENGL 215 Writing: Argumentation or	
ENGL 218 Professional Writing: Argumentation	
and Reports	4
B.2. MATH 118 Pre-Calculus Algebra	4

B.2. STAT 211 Elementary Probability and	
Statistics	3
C.1. PHIL 230/PHIL 231 Philosophical Classics	3
C.1. Critical reading electives	6
C.2. Fine and performing arts elective	3
C.3. Literature, philosophy, arts elective	
(300–400 level)	3
Area C Arts and humanities elective	3
D.1. HIST 204 History of American Ideals and	
Institutions	3
D.1. POLS 210 American and California	
Government	3
D.2. HIST 315 Modern World History	3
D.3. ECON 201 Survey of Economics or	
ECON 211 Principles of Economics	3
D.4.a. ANT 201/GEOG 150/SOC 105	3
D.4.b. ANT/BUS/ECON/GEOG/POLS/SOC	
elective (300-400 level)	3
E.1. PSY 201/PSY 202 General Psychology	3
E.2. BIO 220/FSN 210/HE 210/PE 250/PSY	
304/REC 100 elective	2
F.1. AG 250 Computer Application to Agriculture.	3
· · · ·	65
ELECTIVES	10 <b>-9</b>
=	109
	1 20

<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 will satisfy GEB area B.2.

## **CURRICULUM FOR B.S. FRUIT SCIENCE**

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

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#### **MAJOR COURSES**

CRSC 101 Orientation to Crop Science	1
CRSC 221 Weed Control	4
CRSC 304 Plant Breeding	4
CRSC 311 Insect Pest Management	4
CRSC 411 Experimental Techniques and Analysis	4
CRSC 461 Senior Project	3
CRSC 462 Senior Project	3
CRSC 463 Undergraduate Seminar	2
FRSC 100/VGSC 100/CRSC 100 Enterprise Project	. 3,3
FRSC 131, FRSC 132, FRSC 133 Pomology	4,4,4
FRSC 231 Viticulture	4
FRSC 331 Advanced Viticulture or	
FRSC 422 Tropical Crop, Fruit & Nut Production	n
	4
FRSC 332 Fruit Plant Propagation	4
FRSC 342 Citrus and Avocado Fruit Production	4
FRSC 421 Postharvest Technology of Horticultural	
Crops	4
FRSC 436 Orchard Management	4

## SUPPORT COURSES

1

AGB 321 Farm Records	4
BIO 303 Genetics	3
BOT 121 General Botany	4
BOT 223 Introduction to Plant Taxonomy (B.1.b.)	4
BOT 323 Plant Pathology (B.1.b.)	4
CHEM 121 General Chemistry (B.1.a.)	4
CHEM 122 General Chemistry (B.1.a.)	4
CHEM 326 Survey of Organic Chemistry	4
CHEM 328 Biochemistry	4
SS 121 Introductory Soil Science	4
SS 221 Fertilizers and Plant Nutrition	4
VGSC 230 General Vegetable Crops or	
CRSC 230 General Field Crops	4
Agribusiness elective (300-400 level)	3-4
School of Agriculture electives	6
	56-57

# GENERAL EDUCATION AND BREADTH REQUIREMENTS

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

A.1.	ENGL 114 Writing: Exposition	4
A.2.	ENGL 125/PHIL 125/SPC 125 Critical	
Thi	inking	3
A.3.	SPC 201 Public Speaking or	
SP	C 202 Principles of Speech Communication	3
A.4.	ENGL 215 Writing: Argumentation or	
EN	GL 218 Professional Writing: Argumentation	
á	and Reports	4
B.2.	MATH 118 Pre-Calculus Algebra	4

B.2. STAT 211 Elementary Probability and	
Statistics	3
C.1. PHIL 230/PHIL 231 Philosophical Classics	3
C.1. Critical reading electives	6
C.2. Fine and performing arts elective	3
C.3. Literature, philosophy, arts elective (300-400	
level)	3
Area C Arts and humanities elective	3
D.1. HIST 204 History of American Ideals and	
Institutions	3
D.1. POLS 210 American and California	
Government	3
D.2. HIST 315 Modern World History	່ 3
D.3. ECON 201 Survey of Economics or	
ECON 211 Principles of Economics	3
D.4.a. ANT 201/GEOG 150/SOC 105	3
D.4.b. ANT/BUS/ECON/GEOG/POLS/SOC	
elective (300-400 level)	3
E.1. PSY 201/PSY 202 General Psychology	3
E.2. BIO 220/FSN 210/HE 210/PE 250/PSY	
304/REC 100 elective	2
F.1. AG 250 Computer Application to Agriculture.	3
-	65
ELECTIVES	10-9
=	109
	1 20

<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 will satisfy GEB area B.2.

## PLANT PROTECTION MINOR

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

Units

Required courses ..... 12 BOT 325 Plant Nematology (4) CRSC 327 Vertebrate Pest Management (4) CRSC 405 Advanced Weed Science (4) Courses in area of emphasis ..... 16 Students must select an emphasis based on their major (either plant production or non-plant production). For purposes of this minor plant production majors include Crop Science, Fruit Science, Forestry and Natural Resources (Forestry Concentration) and Ornamental Horticulture. Emphasis for Plant Production Majors I. ENT 220 Agricultural Entomology (4) or ENT 326 General Entomology (4) II. Select three of the following (courses used to fulfill requirements for the major cannot also be counted for the minor): BOT 323 Plant Pathology (4) BOT 431 Advanced Plant Pathology (4) CRSC 221 Weed Control (4) CRSC 311 Insect Pest Management (4) CRSC 431 Advanced Insect Pest Management (4) Emphasis for Non-Plant Production Majors I. Select one of the groups below for 12 units: CRSC 131 Introduction to Crop Science (4) CRSC 132 Grain Crops (4) CRSC 421 Oil and Fiber Crops (4) FRSC 131 Pomology (4) FRSC 231 Viticulture (4) FRSC 331 Advanced Viticulture (4) or FRSC 342 Citrus and Avocado Fruit Production (4)CRSC 131 Introduction to Crop Science (4) VGSC 232 Vegetable Crops Production (4) VGSC 326 Advanced Vegetable Production (4) OH 131 Fundamentals of Ornamental Horticulture 1(4)OH 133 Plant Propagation, Fundamentals III (4) or OH 243 Turf Management (4) OH 324 Foliage Plant Culture (4) or OH 424 Wholesale Nursery Management (4) FNR 208 Dendrology (4) FNR 303 Forest Protection (5) FNR 407 Silviculture and Vegetation Management (4) II. Select one of the following courses: BOT 323 Plant Pathology (4) CRSC 431 Advanced Insect Pest Management (4)

ENT 220 Agricultural Entomology (4) ENT 326 General Entomology (4)

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Crop Science, Fruit Science, Vegetable Science and other subiects.

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## DAIRY SCIENCE DEPARTMENT

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

## Faculty

## Department Head, Edwin H. Jaster

Leslie S. Ferreira William T. Gillis Stanley L. Henderson Gary D. Reif

#### **Dairy Products Technology Center:**

Phillip S. Tong, Director Nana Y. Farkye Wayne G. Geilman

## Programs

B.S. Dairy Science with Concentrations in:

Dairy Husbandry Dairy Products Technology

The Bachelor of Science degree in Dairy Science is designed to prepare students for employment in the various phases of the dairy industry, including husbandry and dairy products technology, as well as the related and allied fields. The basic curriculum is arranged to serve all students within the major with further courses included in the two concentrations of husbandry and dairy products technology to provide depth of instruction in either field.

The curriculum provides adequate elective units to complete a minor or select additional courses in various areas of your choice. Recommendations are available from faculty advisers.

Excellent facilities are provided for students selecting either of the concentrations. The dairy herd includes purebred Jerseys and Holsteins, located on a well-planned unit, where feeding, milking, calf raising, artificial insemination, and management are carried out. The campus creamery is a modern plant, well-equipped with modern processing equipment. Students are employed on a part-time basis to work in both the production and processing areas. A student dairy provides an opportunity for students with dairy projects. This farm accommodates 80–100 head of project cattle owned and cared for by students. There are two, six-unit dormitories at this project farm.

The Dairy Products Technology Center (DPTC) program 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. Master's degree candidates and undergraduates can conduct dairy foods related research projects under the guidance of DPTC faculty. Opportunities exist to work on joint projects with the University of California-Davis, industry short courses, and applied dairy foods research in state-of-the-art research and development facilities within the DPTC.

## **CURRICULAR CONCENTRATIONS**

#### **Dairy Husbandry**

The Dairy Husbandry concentration emphasizes the preparation of students in production and management areas of the industry, including the selection, management, feeding and breeding of dairy cattle, and efficient, economical milk production.

#### **Dairy Products Technology**

The Dairy Products Technology Concentration emphasizes preparation for participation in the processing and distribution field, including sales, quality control, field work and dairy inspection.

## **GRADUATE PROGRAM**

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

## **CURRICULUM FOR B.S. DAIRY SCIENCE**

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

#### Freshman

	DH 101 Dairy Feeds and Feeding
	DH 121 Elements of Dairying
	DPT 134 Intro. to Dairy Products Technology
	AGB 102 Introduction to Agricultural Economics
	CHEM 121 General Chemistry (B.1.a.)
	CHEM 122 General Chemistry (B.1.a.)
	ENGL 114 Writing: Exposition (A.1.)
	ENGL 125/PHIL 125/SPC 125 Critical Thinking
	(A.2.)
	ZOO 131 General Zoology (B.1.b.)
	BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC
	100 elective (E.2.)
1	Mathematics electives (B.2.)
1	MATH or STAT elective (B.2.)
	Electives and courses to complete major

## Sophomore

	DH 221 Milk Production	4
	DPT 233 Milk Processing and Marketing	4
	BACT 221 General Bacteriology	4
	CHEM 326 Organic Chemistry	4
	CHEM 328 Biochemistry	4
	PHYS 104/PHYS 121/BIO 303	4–3
	ECON 201 Survey of Economics or	
	ECON 211 Princ, of Economics (D.3.)	3
	FNGL 215 Writing: Argumentation (4) or	
	ENGL 218 Professional Writing: Argumentation	
	and Reports (A 4)	4
	PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
	SPC 201 Public Speaking or	Ų
	SPC 202 Print of Speech Communication (A 3)	3
1	Computer literacy elective (F1)	3
1	Critical roading electives (C1)	6
1	Fine and methoding electives (C.1.)	2
'	Fine and performing arts elective (C.2.)	3
	Electives and courses to complete major	2–3
	. –	51

## Junior

DPT 202 Dairy Product Marketing Programs	3
DPT 234 Dairy Foods Evaluation	2
DPT 332 Dairy Inspection	3
ACTG 211 Financial Accounting for Nonbusiness	
Majors	4
AGB 212 Agricultural Economics	3
POLS 210 American and California Govt. (D.1.)	3
PSY 201/PSY 202 General Psychology (E.1.)	3
Literature, philosophy, arts electives	
(300–400 level) (C.3.)	3
Electives and courses to complete major	25
-	49

#### Senior

DH 432 Dairy Herd Mgmt. & Equip. or	
DPT 433 Dairy Plant Mgmt. & Equip	4
DH 461 Senior Project	2
DH 462 Senior Project	2
DH 463 Undergraduate Seminar	2
AGB 401 Agribusiness Labor Relations and	
Personnel Management	4
ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
HIST 204 History of American Ideals and	
Institutions (D.1.)	3
HIST 315 Modern World History (D.2.)	3
ANT/BUS/ECON/GEOG/POLS/SOC elective	
(300–400 level) (D.4.b.)	3
Arts and humanities elective (Area C)	3
Electives and courses to complete major	19
-	48
=	198

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 86 of this catalog.)

#### CONCENTRATIONS (Select one)

#### **Dairy Husbandry Concentration**

Fresl	hman
Fresi	nman

DH 133 Fitting and Showing Dairy Cattle DH 142 Dairy Cattle Selection	2 2
Sophomore	
DH 222 Commercial Dairy Herd Management	4
DH 250 Dairy Cattle Safety and Production Practices.	3
Junior	
AGB 321 Farm Records	4
DH 301 Advanced Dairy Cattle Feeding	3
DH 323 Breeds, Pedigrees & Mgt. Dairy Cattle	3
DH 330 Artificial Insemination	3
SS 121 Introduction to Soils or	
CRSC 123 Forage Crops	4
VS 123 Anatomy and Physiology	3
Senior	
DH 422 Breeding and Selection of Dairy Cattle	4
ASCI 402 Animal Nutrition	4

#### **Dairy Products Technology Concentration** Freshman FSN 217 Fund. of Food Processing Operations..... Sophomore DPT 222 Frozen Dairy Foods ..... Junior DPT 326 Fermented Dairy Foods..... DPT 331 Concent. & Fractionation of Dairy Fluids ..... DPT 334 Technology of Cheese Manufacture..... DPT 336 Drying and Butter Technology ..... BACT 322 Dairy Microbiology..... FSN 331 Principles of Food Plant Sanitation..... Senior DPT 401 Physical & Chemical Prop. of Dairy Products ..... DPT 402 Quality Assurance & Control Dairy Prod...... FSN 332 Statistical Quality Control .....

## **B.S. DAIRY SCIENCE**

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

Units

DH 101, 121, 221, 461, 462 DPT 134, 202, 233, 234, 332 Concentration (select one): Dairv Husbandry Concentration (39) DH 133, 142, 222, 250, 301, 323, 330, 422 AGB 321 ASCI 402 SS 121/CRSC 123 VS 123 Dairy Products Technology Concentration (37) DPT 222, 326, 331, 334, 336, 401, 402 **BACT 322** FSN 217, 331, 332 SUPPORT COURSES 43 **ACTG 211** AGB 102, 212, 401 **BACT 221** BIO 303/PHYS 104/PHYS 121 CHEM 121 (B.1.a.), 122 (B.1.a.), 326, 328 DH 432/DPT 433 DH 463 **GENERAL EDUCATION AND BREADTH** REQUIREMENTS..... 68

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

Area A: (14) ENGL 114 (A.1.) ENGL 125/PHIL 125/SPC 125 (A.2.) SPC 201/SPC 202 (A.3.) ENGL 215 or 218 (A.4.) Area B: (10) ZOO 131 (B.1.b.) Mathematics elective (B.2.)

Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300-400 level) (C.3.) Arts and humanities elective (Area C)

Mathematics or statistics elective (B.2.)

Area D: (18) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/211 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300–400 level) (D.4.b.) Area E: (5)

PSY 201/PSY 202 (E.1.) BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100 elective (E.2.) 198

# FOOD SCIENCE AND NUTRITION DEPARTMENT

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

## Faculty

## Department Head, Joseph Montecalvo, Jr.

Sarah E. Burroughs Brian C. Hampson Hany M. Khalil Kathleen A. McBurney Krishnakumar (Kris) S. Morey O. Robert Noyes Mary E. Pedersen Patricia A. Saam Robert D. Vance Rudy A. Wooten

## Programs

**B.S. Food Science** 

**B.S.** Nutritional Science

The Food Science and Nutrition Department offers two degrees designed to prepare graduates for employment in the general areas of human nutrition and commercial food processing. Graduates in Nutritional Science find rewarding health service careers in hospitals, business, industrial plants, government institutions and education. Food Science graduates take responsible positions in commercial food processing and manufacturing, sales, services and government regulation. Opportunities for private consulting and business are available to graduates in both majors, depending on personal interests and initiative.

The department is equipped with a food processing operations pilot plant and meat processing facilities. The laboratories are designed for teaching courses in nutrition, food service management, sensory evaluation, functional components of foods, and quality control as well as other food processing systems. Classroom and laboratory instruction is personalized as much as possible, and faculty adhere to the university's learn-by-doing philosophy.

Through the student enterprise program, students can manufacture and market various food products. Enterprise projects are designed to simulate industry and business practices. Students are further encouraged to gain industry experience by working during the summer months or by participating in one of the university co-op or internship programs.

There are two departmental clubs–Nutrition Club and Food Science Club. Club activities involve a wide range of social, professional and service projects. Clubs provide opportunity for leadership training and participation in professional societies and organizations.

## **Graduate Program**

Cal Poly offers a Master of Science degree in Agriculture with a specialization in Food Science and Nutrition. Please refer to the M.S. Agriculture section.

## **Packaging Minor**

For information regarding the Packaging Minor, please see the School of Professional Studies.

#### FOOD SCIENCE MAJOR

The Bachelor of Science degree in Food Science is designed to prepare students for employment in the commercial food processing industry. Principal areas of instruction are in fruit and vegetable processing, cereal and snack food manufacture and red meat processing. Instruction qualifies graduates for careers in line production, quality control, food technology, marketing and management. The curriculum is approved by and is in compliance with minimum standards established by the Institute of Food Technologists, an international scientific society.

#### NUTRITIONAL SCIENCE MAJOR

The Nutritional Science curriculum prepares graduates for careers in various areas of nutrition, dietetics, and food administration. The Bachelor of Science degree program in Nutritional Science is an American Dietetic Associationapproved Plan IV program and fulfills the academic requirements for eligibility for admission to a dietetic internship or equivalency which must be completed before qualifying for registration as a dietitian with the American Dietetic Association. Hospitals, educational institutions, governmental agencies, and industry employ graduates with positions in food systems management, nutrition services and education. Graduates are also prepared to pursue advanced degrees in nutrition, foods, dietetics, public health and institution management.

## **CURRICULUM FOR B.S. FOOD SCIENCE**

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

## Freshman

	FSN 101 Orientation to Food Science and	
	Nutrition	1
	FSN 170 Introductory Food Science	4
	CHEM 121 General Chemistry (B.1.a.)	4
	CHEM 122 General Chemistry (B.1.a.)	4
	ENGL 114 Writing: Exposition (A.1.)	4
	ENGL 125/PHIL 125/SPC 125 Critical Thinking	
	(A.2.)	3
1	MATH 118 Pre-Calculus Algebra (B.2.)	4
	PHYS 104 Introductory Physics (B.1.a.)	4
	POLS 210 American and California Government	
	(D.1.)	3
	PSY 201/PSY 202 General Psychology (E.1.)	3
	STAT 211 Elementary Probability and Statistics	
	(B.2.)	3
2	Plant science elective	4
3	Electives	6
	-	47

## Sophomore

	FSN 210 Nutrition (E.2.)	3
	FSN 211 Meats	3
	FSN 217 Fundamentals of Food Processing	
	Operations	4
	CHEM 326 Survey of Organic Chemistry	4
	CHEM 328 Biochemistry	4
	DPT 230 General Dairy Manufacturing	4
	BACT 221 General Bacteriology (B.1.b.)	4
	ENGL 215 Writing: Argumentation or	
	ENGL 218 Professional Writing: Argumentation	
	and Reports (A.4.)	4
	HIST 204 History of American Ideals and	
	Institutions (D.1.)	3
	SPC 201 Public Speaking or	
	SPC 202 Principles of Speech Communication	
	(A.3.)	3
4	Critical reading electives (C.1.)	6
2	Animal science elective	4
3	Electives	5
		51

#### Junior

FSN 301 Unit Processing Operations I	4
FSN 302 Unit Processing Operations II	4
FSN 331 Principles of Food Plant Sanitation	3
FSN 332 Statistical Quality Control	3
FSN 333 Food Quality Control	4
FSN 336 Food Packaging	3
FSN 338 Meat Processing	3
FSN 339 Cereal, Bakery and Snack Food	,
Technology	3
AG 250 Computer Application to Agriculture	
(F.1.)	3
ANT 201/GEOG 150/SOC 105 (D.4.a.)	3

	ECON 201 Survey of Economics or	
	ECON 211 Principles of Economics (D.3.)	3
	HIST 315 Modern World History (D.2.)	3
	PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
4	ANT/BUS/ECON/GEOG/POLS/SOC elective	
	(300-400 level) (D.4.b.)	3
4	Fine and performing arts elective (C.2.)	3
2	Business electives	3

#### Senior

	FSN 407 Food Composition Science FSN 409 Sensory Evaluation of Food FSN 431 Advanced Meats FSN 435 Food Engineering FSM 436 Food Laws and Regulations FSN 436 Food Laws and Regulations FSN 437 Advanced Food Processing FSN 461 Senior Project FSN 462 Senior Project FSN 463 Undergraduate Seminar BACT 421 Food Microbiology CHEM 435 Food Analysis	4 3 4 3 4 3 3 2 4 4
	BACT 421 Food Microbiology	4
4	Arts and humanities elective (Area C)	3
4	Literature, philosophy, arts elective (300–400 level) (C.3.)	3
3	Electives	5
		49

<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 will satisfy GEB area B.2.

<sup>2</sup> Refer to departmental list of courses which satisfy Plant Science, Animal Science and Business electives.

<sup>3</sup> Seven of these elective units must be chosen from departmental list of approved electives (see adviser).

\* To be selected in accordance with the General Education-Breadth requirements. (Please see page 86 of this catalog.)

#### **B.S. FOOD SCIENCE**

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

Units MAJOR COURSES 69 FSN 101, 170, 210 (E.2.), 211, 217, 301, 302, 331, 332, 333, 338, 339, 407, 409, 431, 435, 436, 437, 461, 462, 463 SUPPORT COURSES 60 AG 250 (F.1.) BACT 221 (B.1.b.), 421 CHEM 121 (B.1.a.), 122 (B.1.a.), 326, 328, 435 **DPT 230** FSN 336 1 MATH 118 (B.2.) PHYS 104 (B.1.a.) STAT 211 (B.2.) Animal science adviser approved elective (4) Business adviser approved elective elective (3) Plant science adviser approved elective (4) Adviser approved electives (7) **GENERAL EDUCATION AND BREADTH** 

REQUIREMENTS.....

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Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Major and Support courses.

Area A: (14) ENGL 114 (A.1.) ENGL 125/PHIL 125/SPC 125 (A.2.) SPC 201/SPC 202 (A.3.) ENGL 215 or 218 (A.4.) Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300-400 level) (C.3.) Arts and humanities elective (Area C) Area D: (18) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/211 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.) Area E: (3) PSY 201/PSY 202 (E.1.) ELECTIVES .....

<sup>16</sup> 198

<sup>&</sup>lt;sup>1</sup> MATH 116 and 117 will substitute for MATH 118 and are taught at a slower pace for those who need more review. MATH 117 will satisfy GEB area B.2.

## **CURRICULUM FOR B.S. NUTRITIONAL SCIENCE**

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

## Freshman

FSN 101 Orientation to Food Science and	
Nutrition	1
FSN 210 Nutrition (E.2.)	3
ANT 201 Cultural Anthropology	3
HE 121 Fundamentals of Food	4
CHEM 121 General Chemistry (B.1.a.)	4
CHEM 122 General Chemistry (B.1.a.)	4
ECON 201 Survey of Economics (D.3.)	3
ENGL 114 Writing: Exposition (A.1.)	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking	
(A.2.)	3
<sup>1</sup> MATH 118 Pre-Calculus Algebra (B.2.)	4
POLS 210 American and California Government	
(D.1.)	3
SOC 105 Introduction to Sociology (D.4.a.)	3
Flectives	8
	47

#### Sophomore

FSN 209 Meat Procurement and Use 3	3
FSN 230 Elements of Food Processing 4	ŧ
ACTG 211 Financial Accounting for Nonbusiness	
Majors	1
BACT 221 General Bacteriology	1
CHEM 326 Survey of Organic Chemistry 4	1
MGT 206 Principles of Purchasing	3
AG 250 Computer Application to Agriculture or	
CSC 110 Computers and Computer Applications:	
MS-DOS (F.1.)	3
ENGL 215 Writing: Argumentation or	
ENGL 218 Professional Writing: Argumentation	
and Reports (A.4.)	4
HIST 204 History of American Ideals and	
Institutions (D.1.)	3
PSY 201/PSY 202 General Psychology (E.1.)	3
SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	
(A.3.)	3
STAT 211 Elementary Probability and Statistics	
(B.2.)	3
ZOO 131 General Zoology (B.1.b.)	4
Electives	4
Electives	4

## Junior

FSN 310 Maternal and Child Nutrition	3
FSN 315 Nutrition in Aging	3
FSN 328 Advanced Nutrition 1	3
FSN 329 Advanced Nutrition II	3
CHEM 328 Biochemistry	4
EDUC 305 Teaching and Learning Processes	3
HE 321 Meal Management	3
MGT 312 Organization and Management Theory	4
MGT 314 Human Resources Management	4

ZOO 237 Human Anatomy I	3
ZOO 331 Human Physiology II	3
ZOO 332 Human Physiology	3
PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
<sup>2</sup> Critical reading electives (C.1.)	6
Electives	4

#### Senior

FSN 412 Experimental Nutrition	2
FSN 415 Methods of Teaching Nutrition	3
FSN 416 Community Nutrition	3
ESN 425 Quantity Food Preparation	3
FSN 426 Food Systems Management	· 3
ESN 427 Equipment and Lavout	ž
FSN 429 Diet Therapy 1	3
FSN 420 Diet Therapy I	2
ESN 461 Senior Project	נ כ
FSIN 401 Serier Project	נ י
FSIN 462 Senior Project	3
FSN 463 Undergraduate Seminar	2
BACT 421 Food Microbiology	4
HIST 315 Modern World History (D.2.)	3
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective	
(300-400 level) (D.4.b.)	3
<sup>2</sup> Arts and humanities elective (Area C)	3
<sup>2</sup> Fine and performing arts elective (C.2.)	3
<sup>2</sup> Literature philosophy arts elective (300-400	Ų
lovel) (C 3)	3
IEVEL) (C.J.)	
_	50

See COURSE OF INSTRUCTION section of this catalog for description of courses in Food Science and Nutrition and other subjects.

<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 will satisfy GEB area B.2.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 86 of this catalog.)

## **B.S. NUTRITIONAL SCIENCE**

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

Units

16 198

MAJOR COURSES 61 FSN 101, 209, 210 (E.2.), 230, 310, 315, 328, 329, 412, 415, 416, 425, 426, 427, 429, 430, 461, 462, 463 HE 121, 321 SUPPORT COURSES 71 **ACTG 211** AG 250/CSC 120 (F.1.) **ANT 201** BACT 221, 421 CHEM 121 (B.1.a.), 122 (B.1.a.), 326, 328 ECON 201 (D.3.) **EDUC 305** ENGL 215/218 (A.4.) MGT 206, 312, 314 SOC 105 (D.4.a.) ZOO 131 (B.1.b.), 237, 331, 332 **GENERAL EDUCATION AND BREADTH** REQUIREMENTS..... 50

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level.

Area A: (10) ENGL 114 (A.1.) ENGL 125/PHIL 125/SPC 125 (A.2.) SPC 201/SPC 202 (A.3.) Area B: (7) MATH 118 (B.2.) STAT 211 (B.2.) Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300-400 level) (C.3.) Arts and humanities elective (Area C) Area D: (12) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.) Area E: (3) PSY 201/PSY 202 (E.1.) ELECTIVES

<sup>1</sup> MATH 116 and 117 will substitute for MATH 118 and are taught at a slower pace for those who need more review. MATH 117 will satisfy GEB area B.2.
## NATURAL RESOURCES MANAGEMENT DEPARTMENT

Agricultural Sciences Bldg. (11), Room 217 (805) 756-2702

#### Faculty

#### Department Head, Norman H. Pillsbury

John H. Harris Timothy G. O'Keefe Douglas D. Piirto Timothy R. Plumb Richard P. Thompson James R. Vilkitis

#### Programs

B.S. Forestry and Natural Resources with Concentrations in:

Environmental Management Forest Resources–Management Forest Resources–Urban Forestry Forest Resources–Watershed, Chaparral, and Fire Management Parks and Forest Recreation

The Bachelor of Science degree program in Forestry and Natural Resources prepares students for important careers in the protection, management, and development of our forest and natural resources. Students may elect to emphasize forest and land management disciplines, such as recreation management; urban forestry; environmental management; watershed, chaparral and fire management; hardwood management; fish and wildlife management.

Students are strongly encouraged to complete a period of natural resources related work experience equivalent to one quarter of full-time work. This can be accomplished by a seasonal job, volunteer work, or the completion of an internship or cooperative education course. Work experience for academic credit must be documented by work supervisor and approved by student's academic adviser.

Graduates qualify for such positions as forester, environmental interpreter, urban forester, environmental specialist, park administrator, resource manager, park ranger, resource planner, watershed manager, and fire management specialist.

Cal Poly graduates are employed throughout the world: establishing, managing and regenerating forests and urban wildland areas; providing opportunities for recreation use of forests; teaching; extension; research; harvesting forest crops; developing, processing and marketing wood products; and protecting and managing the environment.

Cal Poly provides the practical and analytical skills to meet the demands of tomorrow and helps students develop a strong foundation in forest and natural resources management principles.

Forest and natural resources facilities assist in the development of field skills. Special campus sites include Christmas tree plantations, weather station, greenhouses, woodlots, biomass energy plantations, logging competition arena, experimental watershed and reservoirs. The forest at SwantonPacific, an off-campus site near Santa Cruz, offers many educational opportunities for coursework and special studies on its 3200 acres of forests, wildlands and agricultural land areas. The site includes hardwood and redwood forest types, diverse ecosystems, streams and riparian habitat zones. In addition, the 70-acre Atlee School Forest and other nearby private resource areas, regional and State parks, and National Forests also provide opportunities for practical field experiences.

The curriculum provides a full range of courses in the humanities and the basic sciences and requires the completion of a concentration in a field of specialization to meet professional and employment requirements. Pregraduation employment in a natural resources area and internships reinforce classroom and laboratory experiences, and enhance opportunities for employment after graduation.

Opportunities for graduate studies are also available. Students may choose to develop thesis programs with an emphasis in selected fields of forest and natural resources, such as watershed and fire management, forest management, recreation, chaparral and hardwood ecosystem management, urban forestry, and environmental studies. The Master of Science degree is awarded with a specialization in General Agriculture. In addition, an agroforestry study program can be developed through the Master of Science degree program with a specialization in International Agricultural Development. For additional information, see the M.S. Agriculture section.

Cal Poly is a candidate institution for accreditation by the Society of American Foresters. Also, employment as a forester with the Federal Government is recognized by the U.S. Office of Personnel Management.

#### CURRICULAR CONCENTRATIONS

Concentrations prepare students for entry into the profession of forestry and natural resources. The curriculum provides broad training in forest and natural resource management with emphasis in urban forestry, watershed, chaparral and fire management, hardwood management, parks and forest recreation, environmental management, and wood energy systems. Extensive field training occurs concurrently with classroom instruction.

#### **Environmental Management**

The environmental management concentration prepares students for employment as professionals in the fields of forestry and natural resources management planning, environmental impact assessment and evaluation, and environmental policy analysis. Individual student programs are developed.

#### Forest Resources-Management

Specialized areas of study are available through an emphasis in Hardwood Management or individualized studies in such

areas as agroforestry, environmental studies, fish and wildlife management, parks and outdoor recreation, computer science, journalism, business administration, Spanish, and marketing.

Hardwood Management: The protection, utilization, and regeneration of hardwood communities as well as the principles of hardwood management that are necessary to meet the rising demand for the multiple use of hardwood forests and oak woodlands are studied.

#### Forest Resources--Urban Forestry

Management problems resulting from the continued trend of urbanization into the urban-wildland interface are studied. Urban Forestry focuses on the urban ecosystem including lesser vegetation, wildlife, and open space, as well as the trees. The curriculum emphasizes the application of forestry skills for management of urban forest ecosystems.

## Forest Resources-Watershed, Chaparral and Fire Management

Students examine all aspects of water resource management in various forest ecosystems. The effects of watershed and fire management practices in chaparral and other Mediterranean-type ecosystems are studied in particular.

#### **Parks and Forest Recreation**

The parks and forest recreation concentration prepares students for employment in the planning, interpretation, development, and management of governmental and private resource-based parks and other recreational lands.

#### **OTHER CONCENTRATIONS AVAILABLE**

The Wildlife Biology concentration offered by the Biological Sciences Department is available to Forestry and Natural Resources majors and prepares students for employment in the fish and wildlife areas of law enforcement, management, and production. FNR majors following this concentration will meet the Wildlife Society's certification education requirements or the certification requirements of the American Fisheries Society based on choice of restricted electives. Prerequisite courses in zoology are required of students entering this concentration. Students in the Wildlife Biology concentration may deviate up to 17 units of designated courses toward prerequisites with prior written approval of adviser. See concentration description in Biological Sciences for curricular requirements.

#### **B.S. FORESTRY AND NATURAL RESOURCES**

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

#### Freshman

FNR 112 Parks and Outdoor Recreation	3
FNR 140 Career Development and Planning in	
Natural Resources Management	1
FNR 201 Forest Resources	3
SS 121 Introductory Soil Science	4
ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
BOT 121 General Botany (B.1.b.)	4
AG 250 Computer Application to Agriculture or	
CSC 113 Computers and Computer Applications:	
Macintosh (F.1.)	3
ENGL 114 Writing: Exposition (A.1.)	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking	
(A.2.)	3
<sup>1</sup> MATH 120 Pre-Calculus Algebra and Trig. (B.2.)	5
POLS 210 American and California Govt. (D.1.)	3
PSY 201/202 General Psychology (E.1.)	3
BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC	
100 elective (E.2.)	2
<sup>2</sup> Fine and performing arts elective (C.2.)	3
<sup>3</sup> Courses to complete concentration	3
Electives	3
	50

#### Sophomore

FNR 208 Dendrology	4
FNR 304 Ecology of Resource Areas	4
AE 237 Engineering Surveying L	2
CHEM 121 General Chemistry (B.1.a.)	4
ECON 201 Survey of Economics (D.3.)	3
ENGL 218 Professional Writing: Argumentation and	
Reports (A.4.)	4
HIST 204 History of American Ideals and	
Institutions (D.1.)	3
PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
SPC 201 Public Speaking or	
SPC 202 Prin. of Speech Communication (A.3.).	3
STAT 211 Elem. Probability and Statistics (B.2.)	3
STAT 212 Statistical Methods	3
Adviser approved science course sequence (B.1.a	
or B.1.b.) (BOT 123, BOT 326/BOT 333 or	
CHEM 122, CHEM 326 or ZOO 131, PHYS	
104/PHYS 121)	8
Courses to complete concentration	4
Electives	2
—	50
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#### Junior

FNR 302 Natural Resources Policy	3
FNR 303 Forest Protection	5
FNR 305 Forest Harvesting	3
FNR 314 Forest Mensuration	5
FNR 316 Growth and Yield	3
FNR/LA 318 Appl. GIS Natural Resources	2
AE 345 Aerial Photogram. & Remote Sensing	3

	ASCI 331 Applied Range Management or	
	CONS 120 Fisheries and Wildlife Management	2
	STAT 313 or College calculus	3
	HIST 315 Modern World History (D.2.)	3
2	ANT/BUS/ECON/GEOG/POLS/SOC elective	
	(300–400 level) (D.4.b.)	3
2	Critical reading electives (C.1.)	6
2	Lit., phil., arts elective (300-400 level) (C.3.)	3
3	Courses to complete concentration	3
	Electives	3
		50

#### Senior

	FNR 401 Natural Resource Economics	3
	FNR 403 Environmental Impact Analysis	3
	FNR 406 Natural Resources Administration	3
	FNR 407 Silviculture and Vegetation Management	4
	FNR 415 Forest Resources Valuation	3
	FNR 418 Forest Mgt. & Multiple-Use Planning	4
	FNR 440 Watershed Management	3
	FNR 442 Watershed Protection	2
	FNR 461 Senior Project	3
	FNR 463 Undergraduate Seminar	1
2	Arts and humanities elective (Area C)	3
3	Courses to complete concentration	16
		48

۱M,	ATH	118 ar	nd MAT	H 119 v	will subs	titute for	MATH	120	and a	re taug	ght at a
	slov	wer pa	ce for th	ose who	o need n	nore revi	ew. Also	, MA	TH 11	16 and	MATH
	117	' will su	ubstitute	for MA	TH 118	for those	e people	who	need	extra	review
			1.1		1.1 .1	~	1 - 1				

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 86 of this catalog.)

<sup>3</sup> Courses to be chosen with prior written approval of the adviser. Concentration contracts must be approved and filled out in junior year.

#### **CONCENTRATIONS** (Select one)

#### **Environmental Management Concentration**

FNR 339/FNR 400	4
FNR 404 Environmental Law	3
FNR 408 Water Resource Law and Policy	3
CRP 212 Introduction to Urban Planning	3
ENVE 330 Environmental Quality Control	3
SS 433 Land Use Planning Restricted electives with prior written approval o	3 f
adviser	7
	26

#### Forest Resources-Management Concentration

FNR 332/FNR 434/FNR 438	2
FNR 333 Hardwood Management	3
FNR 100/339/AG 485 (prior written approval	
required)	4
FNR 342 Fire Ecology	3
Restricted electives with prior written approval of	
adviser	14
-	26

#### Forest Resources-Urban Forestry Concentration

FNR 325 Woodlot and Christmas Tree Mgt	3
FNR 333 Hardwood Management	3

FNR 350 Urban Forestry	3
FNR 450 Community Forestry	3
Restricted electives with prior written approval of	
adviser	14
	26

#### Forest Resources-Watershed, Chaparral, and Fire **Management Concentration**

FNR 204 Resource Fire Control
FNR 250 Survey & Mgt. of Mediter. Ecosystems
FNR 340 Resource Fire Management
FNR 342 Fire Ecology
FNR 345 Chaparral Management
FNR 441 Forest and Range Hydrology
SS 440 Forest and Range Soils
Restricted electives with prior written approval of
adviser

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#### Parks and Forest Recreation Concentration

FNR 100/339/AG 485 (prior written approval	
required)	4
FNR 311 Environmental Interpretation	4
LA 363 Rec. Open Space Planning & Design	3
REC 210 Programming for Leisure	4
Restricted electives with prior written approval of	
adviser	11
	26

#### **B.S. FORESTRY AND NATURAL RESOURCES**

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

		Units
М	AJOR COURSES	71
	FNR 112, 140, 201, 208, 302, 303, 304, 314, 316, 401, 403, 406, 407, 415, 418, 440, 442, 461, 463	
	FNR/LA 318	
	AE 237	
	ASCI 331/CONS 120	
	SS 121	
ŝι	JPPORT COURSES	65
	Adviser approved science course sequence (B.1.a	
	or B.1.b.) (8) (BOT 123, 326/333 or CHEM	
	122, 326 or ZOO 131, PHYS 104/121)	
	AE 345	
	BOT 121 (B.1.b.)	
	CHEM 121 (B.1.a.)	
	ECON 201 (D.3.)	
	FNR 305	
1	MATH 120 (B.2.)	
	STAT 211 (B.2.)	
	STAT 212	
	STAT 313 or College calculus (3)	
	Concentration (select one):	
	Environmental Management Concentration (26)	
	FNR 339/400, 404, 408; CRP 212; ENVE 330;	
	SS 433	

Restricted electives with prior written approval of adviser (7) Forest Resources-Management Conc. (26) FNR 332/434/438, 333, 100/339/AG 485, 342 Restricted electives with prior written approval of adviser (14) Forest Resources—Urban Forestry Conc. (26) FNR 325, 333, 350, 450 Restricted electives with prior written approval of adviser (14) Forest Resources-Watershed, Chaparral, and Fire Management Concentration (26) FNR 204, 250, 340, 342, 345, 441; SS 440 Restricted electives with prior written approval of adviser (7) Parks and Forest Recreation Concentration (26) FNR 100/339/AG 485, 311; LA 363; REC 210 Restricted electives with prior written approval of adviser (11) **GENERAL EDUCATION AND BREADTH** REQUIREMENTS.....

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300-400 level. Additional GEB courses are listed under Support Courses.

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- Area A: (14) ENGL 114 (A.1.) ENGL 125/PHIL 125/SPC 125 (A.2.) SPC 201/SPC 202 (A.3.) ENGL 218 (A.4.)
- Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300-400 level) (C.3.) Arts and humanities elective (Area C)

Area D: (15) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.)

Area E: (5) PSY 201/PSY 202 (E.1.) BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100 elective (E.2.) Area F: (3)

AG 250/CSC 113 (F.1.) ELECTIVES

<sup>1</sup> MATH 118 and 119 will substitute for MATH 120 and are taught at a slower pace for those who need more review. Also, MATH 116 and 117 will substitute for MATH 118 for those people who need extra review.

## **ORNAMENTAL HORTICULTURE DEPARTMENT**

Agricultural Sciences Bldg. (11), Room 244 (805) 756-2279

#### Faculty

#### Interim Department Head, Stephen F. Angley

Patricia H. Breckenridge Charlotte B. Burns James A. D'Albro Thomas E. Eltzroth David W. Hannings Daniel E. Lassanske William E. Noble Virginia R. Walter Michael D. Zohns

#### Programs

B.S. Ornamental Horticulture with Concentrations in:

Floriculture and Nursery Production Horticulture Sales and Services Landscape Industry

The Bachelor of Science degree in Ornamental Horticulture offers the student a comprehensive preparation for attractive positions in the nursery, greenhouse, landscape, and florist industries. This includes both the production and salesservice areas of these major fields. The curriculum stresses production and marketing of nursery plants, fresh flowers, flowering plants, and foliage plants; landscape contracting, design, installation and management; and floral design and marketing.

Graduates of the Ornamental Horticulture Department are in demand for management and sales positions within the dynamic nursery and floriculture industries, as well as the large and diverse areas within the landscape industries.

Cal Poly graduates are employed nationally and internationally as business owners, growers, managers, researchers, educators, salespersons, designers, landscape contractors, extension agents, agricultural commissioners, consultants, and park and golf course superintendents.

The facilities of the department include a student-operated commercial greenhouse range and nursery in which students carry on a project program involving wholesale and retail sales and a student-operated florist shop in which, in addition to plant sales, students design and sell floral pieces. Also included are 35,000 square feet of greenhouses, including a solar-heated house; 7,500 square feet of shadehouses; and an extensive field container growing area. The department also has several modern, well-equipped laboratories including: Tissue Culture, Landscape Industries with CAD, Floral Design, and Plant Materials. In addition to 200 acres of land-scaped campus, an arboretum is also utilized as an outdoor laboratory. The campus is planted with many interesting and unusual trees and shrubs from all over the world, as well as native plant materials.

Also available are the latest models of equipment necessary in nurseries, greenhouses, parks and grounds, landscaping, and florist shops. An extensive list of periodicals covering the field of ornamental horticulture is available to students. Through the staff, affiliation in several national and state horticultural organizations is maintained.

#### CURRICULAR CONCENTRATIONS

#### **Floriculture and Nursery Production**

This concentration is designed to educate and prepare the student for production and management in the floriculture and nursery industries.

#### Horticulture Sales and Services

This concentration is designed to educate the student in the business world as it relates to the specialized field of ornamental horticulture.

#### Landscape Industry

This concentration is designed to educate and prepare the student to be versatile in the fields of landscape contracting, design, installation, maintenance and management.

#### **CURRICULUM FOR B.S. ORNAMENTAL** HORTICULTURE

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

Units

#### **MAJOR COURSES**

OH 101 Principles of Landscape Drafting	3
OH 110 Orientation to Ornamental Horticulture	1
OH 126 Ornamental Horticulture Construction	2
OH 131, OH 132 Fund. of Ornamental Hort. I, II	4,3
OH 133 Plant Propagation, Fundamentals III	4
OH 134 Landscape Maintenance, Fundamentals IV.	3
OH 231, OH 232 Plant Materials	4,4
OH 301 Principles of Landscape Design	3
OH 315 Advanced Plants Materials	4
OH 427 Diseases & Pest Control Sys. Ornam.	
Plants	5
OH 461 Senior Project	2
OH 462 Senior Project	2
OH 463 Senior Seminar	1
Concentration courses (See below)	25
	70

#### SUPPORT COURSES

ACTG 211 Financial Accounting for Nonbusiness

Majors	4
BOT 121 General Botany (B.1.b.)	4
BOT 223 Introductory Plant Taxonomy (B.1.b.)	4
BOT 322 Introductory Plant Physiology (B.1.b.)	4
BOT 324 Ornamental and Forest Pathology	4
BUS 201 Business Law Survey	3
CHEM 121 General Chemistry (B.1.a.)	4
CHEM 122 General Chemistry (B.1.a.)	4
CHEM 326 Survey of Organic Chemistry	4
ENT 220 Agricultural Entomology or	
CRSC 311 Insect Pest Management	4
SS 121 Introductory Soil Science	4
SS 221 Fertilizers	4
CSC 110 Computers & Computer Appl.: MS-DOS	
or	
AG 250 Computer Appl. to Agriculture (F.1.)	3
CRSC/FRSC/VGSC elective (200-400 level)	4
Science elective (selected with adviser approval)	4
-	58

#### **GENERAL EDUCATION AND BREADTH** REQUIREMENTS

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300-400 level. Additional GEB courses are listed under Support Courses.

A.1. ENGL 114 Writing: Exposition	4
A.2. ENGL 125/PHIL 125/SPC 125 Critical	
Thinking	3
A.3. SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	3
A.4. ENGL 215 Writing: Argumentation or	
ENGL 218 Professional Writing: Argumentation	
and Reports	4

B.2. MATH 118 Pre-Calculus Algebra (or MATH	
116 & MATH 117)	4
B.2. STAT 130 Intro. to Statistical Reasoning or	
STAT 211 Elem. Probability and Statistics	3
C.1. PHIL 230/PHIL 231 Philosophical Classics	3
C.1. Critical reading electives	6
C.2. Fine and performing arts elective	3
C.3. Literature, philosophy, arts elective	
(300-400 level)	3
Area C Arts and humanities elective	3
D.1. HIST 204 History of American Ideals and	
Institutions	3
D.1. POLS 210 American and California	
Government	3
D.2. HIST 315 Modern World History	3
D.3. ECON 201/ECON 211	3
D.4.a. ANT 201/GEOG 150/SOC 105	3
D.4.b. ANT/BUS/ECON/GEOG/POLS/SOC	
(300-400 level) elective	3
E.1. PSY 201/PSY 202 General Psychology	3
E.2. BIO 220/FSN 210/HE 210/PE 250/PSY	
304/REC 100 elective	2
-	62
ELECTIVES	8
=	100
	198

#### **CONCENTRATIONS** (select one):

#### Floriculture and Nursery Production Concentration

OH 340 Principles of Greenhouse Environment	5
OH 342 Potted Plant Production	4
OH 424 Wholesale Nursery Management or	
OH 443 Greenhouse Management	4
Select from the following:	12
AE 131; AG 339; OH 324, 325, 341, 381, 400,	
424, 425, 426, 443, 470/471	
	23

#### Horticultural Sales and Services Concentration

OH 302 Ornamental Horticulture Sales & Service	3
OH 324 Foliage Plant Culture	4
OH 402 Adv. Ornamental Horticulture Sales &	
Service	4
AGB 201 Agribusiness Sales and Service	3
Select from the following:	11
AG 339; AGB 310, 323, 404; OH 125, 251, 252,	
253, 321, 325, 328/329, 341, 342, 400, 401, 424,	
435, 470/471	

#### Landscape Industry Concentration

OH 243 Turf Management	4
OH 331 Landscape Contracting	4
OH 434 Landscape Management	3
AE 131 Agricultural Surveying or	
AE 237 Engineering Surveying 1	2
AE 337 Landscape Irrigation	3
Select from the following	9
AE 141; AG 339; OH 320, 321, 322, 324, 332,	
333, 337, 381, 400, 421, 435, 454, 470/471; SS	
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## SOIL SCIENCE DEPARTMENT

Science Bldg. (52), Room A-10 (805) 756-2261

#### Faculty

#### Department Head, Terry L. Smith

Gaston Amedee Delmar D. Dingus Brent G. Hallock Royce L. Lambert Thomas J. Rice, Jr. Thomas A. Ruehr Ronald D. Taskey

#### Programs

B.S. Soil Science with Concentrations in:

Environmental Management Environmental Science and Technology Land Resources

Three-fourths of the world's food and nearly all of its fiber come from the fragile, thin skin of the land's surface-the soil. Moreover, soil absorbs and transmits rain and snow which replenish our groundwater; and it captures untold quantities of environmental wastes. Soil scientists are the most knowledgeable and best trained people responsible for the management of soil, one of our most precious natural resources.

The Bachelor of Science degree in Soil Science provides fundamental knowledge and skills needed for field, laboratory, management, and teaching positions, as well as for graduate studies. Concentrations are offered in Land Resources, Environmental Management, and Environmental Science and Technology. These high quality programs help ensure that our graduates are well prepared for the diverse opportunities awaiting them. Moreover, graduates can meet educational requirements for professional certification by the American Registry of Certified Professionals in Agronomy, Crops and Soils, and as Certified Professional Erosion and Sediment Control Specialists.

Students are encouraged to reinforce their education, develop professional contacts, and strengthen their career potential by participating in any of the following activities: the Soils Club and the Soil and Water Conservation Society, each of which is nationally affiliated; the Soil Judging Team, which often qualifies for national competition; the Soil Testing Enterprise Program, which analyzes soil and water samples for local growers and gardeners; and internships and cooperative education programs with government and industry. Students also are encouraged to investigate opportunities for international education. Please see the Study Abroad programs.

Facilities of the department include laboratories having up-todate analyzers, a glasshouse and a computer room. The department has access to several thousand acres of agricultural, forest and range land managed by the School of Agriculture. All of the facilities, equipment and land, which allow practical application of classroom knowledge, are for student use. Even though the Soil Science Department is small, it is highly personable and our undergraduate program ranks among the largest and strongest in the nation. Our graduates are employed from Alaska to Mexico, Maine to Hawaii, and on every continent. Their Cal Poly experience has provided them with the strong scientific foundation, practical skills and balanced general education needed to be flexible and competitive in today's diverse, and often unpredictable, job market.

Undergraduate and graduate students majoring in soil science earn a solid, useful education; likewise, students from other fields who select soil science courses as electives can augment their skills and knowledge, making them more adaptable to changing professional opportunities. Moreover, all students can discover soil's vital role in their lives, and the human dependence on the quality of soil for quality of life.

Cal Poly offers a Master of Science degree in Agriculture with a specialization in Soil Science. For information regarding this degree program, please refer to the M.S. Agriculture section.

#### **CURRICULAR CONCENTRATIONS**

#### Land Resources

This concentration prepares students for professional opportunities in soil and water conservation, farm advisement, fertilizer and agricultural chemicals industries, forest and range soils, urban land enhancement, laboratory analysis, soil surveying, environmental issues, and international agriculture. The flexibility of this concentration allows students to pursue one of several approved minors, and to prepare for graduate studies.

#### **Environmental Management**

This concentration offers a solid scientific background melded with environmental policy and administration, site analysis, and resource planning. The program helps prepare students for managerial positions dealing with today's complicated environmental problems and opportunities.

#### **Environmental Science and Technology**

This concentration provides the strongest foundation for evaluating and solving complex environmental problems, including land and water degradation and contamination by hazardous wastes. Additionally, the concentration includes courses needed for admission to rigorous graduate programs.

#### **CURRICULUM FOR B.S. SOIL SCIENCE**

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

#### **MAJOR COURSES**

Units

SS 110 Orientation in Soil Science
SS 121 Introductory Soil Science
SS 121 Introductory Son Science
SS 221 Fertilizers and Plant Nutrition
SS 223 Rocks and Minerals
SS 312 Agricultural Climatology
SS 321 Soil Morphology
SS 322 Soil Fertility
SS 323 Soil Fertility Laboratory
SS 422 Soil Microbiology
SS 423 Soil and Water Chemistry
SS 431 Soil Resource Inventory
SS 432 Soil Physics
SS 461 Soils Senior Project
SS 462 Soils Senior Project
SS 463 Undergraduate Soils Seminar
BOT 121 General Botany (B.1.b.)
GEOL 201 Physical Geology

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#### SUPPORT COURSES

	AE 340/AE 415/AE 435/AE 440	3
	AG 250 Computer Application to Agriculture or CSC 111 Intro. to Computer Applications (E1)	3
	BACT 224 General Microbiology (B.1.b.)	4
	BACT/BIO/BOT restricted elective (300–400)	4
	CHEM 127 General Chemistry (B.1.a.)	4
	CHEM 128 General Chemistry (B.1.a.)	4
	CHEM 129 General Chemistry	4
1	CHEM 328/PHYS 122/PHYS 132	4
1	MATH 118 Pre-Calculus Algebra or	
	MATH 131 Technical Calculus (B.2.)	4
	(Environmental Science and Technology	
	concentration students take MATH 131 and	
	MATH 132)	
	MATH 119 Pre-Calculus Trigonometry or	
	MATH 132 Technical Calculus (B.2.)	3
1	PHYS 121 College Physics or	
	PHYS 131 General Physics (B.1.a)	4
	Concentration courses (see below)	38

#### GENERAL EDUCATION AND BREADTH REQUIREMENTS

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Major and Support courses.

A.1. ENGL 114 Writing: Exposition	4
A.2. ENGL 125/PHIL 125/SPC 125 Critical	
Thinking	3
A.3. SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communic	ation 3

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<sup>1</sup> Students in the Environmental Science and Technology concentration take PHYS 131, PHYS 132, MATH 131 and MATH 132.

#### **CONCENTRATIONS** (select one):

#### Land Resources Concentration

CHEM 326 Survey of Organic Chemistry	4
CRSC 311 Insect Pest Management	4
CRSC 411 Experimental Techniques and Analysis	4
STAT 211 Elem. Probability and Statistics (B.2.)	3
Additional courses selected from approved list,	
with at least four courses from School of	
Agriculture. These units may be selected to	
apply toward an approved minor	23
-	38

#### **Environmental Management Concentration**

AG 339 Internship in Agriculture <i>or</i> SS 400 Special Problems Advanced Undergrads	
(designed for this concentration & faculty	
approved)	3
CHEM 326 Survey of Organic Chemistry	4
CRP 212 Introduction to Urban Planning	3
ENVE 330 Environmental Quality Control	3
FNR 403 Environmental Impact Analysis	3
FNR 405 Applied Resource Analysis	4
FNR 404 Environmental Law or	
FNR 408 Water Resource Law and Policy	3
SS 433 Land Use Planning	3
Select 2: CRSC 411/STAT 211/STAT 212	6
Select 2: ECON 431/432; POLS 314/404/405	6

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#### **Environmental Science and Technology Concentration**

CHEM 316 Organic Chemistry	4
CHEM 317 Organic Chemistry	5
CHEM 318 Organic Chemistry	5
CHEM 331 Quantitative Analysis I	5
ENVE 434 Water Quality Measurements	2
ENVE 436 Introduction to Hazardous Waste	
Management or	
ENVE 439 Solid Waste Management	3
MATH 133 Technical Calculus	4
STAT 321 Statistical Analysis	3
STAT 322 Statistical Analysis	4
Select from the following: BOT 322, CHEM 341,	
CSC 251, STAT 324, ZOO 131 or other faculty	
approved courses	3
-	38

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# School of Architecture and Environmental Design

#### **DEGREE PROGRAMS**

- **B.S.** Architectural Engineering
- B.Arch. Architecture
- B.S. City and Regional Planning
- **B.S.** Construction Management
- B.S. Landscape Architecture
- M.S. Architecture
- M.C.R.P. City and Regional Planning

## SCHOOL OF ARCHITECTURE AND ENVIRONMENTAL DESIGN

Architecture and Environmental Design Bldg. (05), Room 212 (805) 756-1321

#### Paul R. Neel, FAIA, Dean K. Richard Zweifel, Associate Dean

The School of Architecture and Environmental Design offers a Bachelor of Architecture degree, and four bachelor of science degree programs: Architectural Engineering, City and Regional Planning, Construction Management and Landscape Architecture. The student is kept aware that all five of these programs have a common objective and that they are all aimed at the betterment of the human physical environment. These programs endeavor to give the student a set of social values, a technical background, and training which result in creative expressions that are effective both professionally and personally.

Two graduate programs are offered: the Master of Science in Architecture and the Master of City and Regional Planning. These programs are designed for students interested in advanced professional studies.

The excellent school facilities include design laboratories. grading galleries, soils laboratory, stress laboratory, construction shop, project yard, instructional resource center, computer laboratories, multi-media laboratory, and photo presentation laboratory. An outlying area of 12 acres known as the "Canyon" is available for extensive experimental construction. The location of the campus between the great population centers of San Francisco and Los Angeles is ideal for environmental studies ranging from rural to large metropolitan complexes. There is a continual stream of visiting lecturers. Field trips are arranged to various parts of the State as required work. Additionally, the school offers several opportunities through departmentally sponsored programs for directed foreign study as a part of curricular offerings, in addition to regular participation in The California State University's International Programs in Denmark and Italy.

Departments are members of their respective professional associations, namely, the Association of Collegiate Schools of Architecture, the Council of Educators in Landscape Architecture, the Association of Collegiate Schools of Planning, and the Associated Schools of Construction. Likewise, students maintain active chapters of the professional organizations of the American Institute of Architects, the American Society of Landscape Architects, the Associated General Contractors, the Structural Engineering Association of California, the American Planning Association, and the National Society of Architectural Engineers.

Advanced professional and inter-professional studies by students and faculty undertaken as applied investigations and community service are organized under the school's Design Institute through its research and service units on Barrier-Free Design, Computer-Aided Design, Earthquake-Resistant Building Systems, Geographic Information System Technology, Small Town and Rural Planning Issues and Community Service.

Students interested in pursuing one of the five undergraduate program offerings within the school should familiarize themselves with the appropriate curriculum flow chart, available through the University Admissions Office and the Student Services Coordinator, Architecture and Environmental Design Bldg. (05), Room 212. Special attention is directed to the strict sequencing of courses and prerequisite requirements. Students who plan to transfer from a California community college should schedule classes to maximize transfer units. Reference should be made to the "Articulation Agreement" located in the community college counseling center.

All student work submitted for course credit becomes school property and will be returned only at the discretion of the instructor.

## **ARCHITECTURAL ENGINEERING DEPARTMENT**

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

#### Faculty

#### Department Head, Mark Berrio

Thomas J. Ballew Michael R. Botwin John W. Edmisten Jacob Feldman David S. Hatcher Hong Ting Liu Satwant S. Rihal

#### Programs

**B.S. Architectural Engineering** 

The four-year program in Architectural Engineering leads to the Bachelor of Science degree and has its major emphasis in the structural engineering of buildings. Students are encouraged to develop aptitudes in science and mathematics for creative engineering accomplishments. Graduates of this program will generally seek professional registration as civil and structural engineers. The Architectural Engineering curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (A.B.E.T.).

The curriculum prepares the student to enter the field of architectural engineering, structural engineering, and the technically oriented aspects of architecturally related fields. In addition, students are prepared to pursue graduate studies in the fields of structural engineering, structural mechanics, and foundation engineering.

#### **CURRICULUM FOR B.S. ARCHITECTURAL ENGINEERING**

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

#### Freshman

	ARCH 106 Materials of Construction	3
	ARCH 111 Introduction to Drawing and	
	Perspective	3
	ARCH 112 Basic Graphics	3
	ARCH 113 Graphic Analysis and	
	Communication Skills for Designers	3
	EDES 101 Introduction to Architecture and	
	Environmental Design	2
	ENGL 114 Writing: Exposition (A.1.)	4
	ENGL 125/PHIL 125/SPC 125 Critical Thinking	
	(A.2.)	3
	MATH 141 Calculus I (B.2.)	4
	MATH 142 Calculus II (B.2.)	4
	MATH 143 Calculus III	4
	PHYS 131 General Physics (B.1.a.)	4
	PHYS 132 General Physics	4
	PSY 201/PSY 202 General Psychology (E.1.)	3
	SPC 201 Public Speaking or	
	SPC 202 Principles of Speech Communication	
	(A.3.)	3
1	Fine and performing arts elective (C.2.)	3
1	Life science elective (B.1.b.)	3
	-	53

#### Sophomore

ARCE 221 Elementary Structures	3
ARCE 222 Mechanics of Structural Members I	3
ARCE 223 Mechanics of Structural Members	
	3
ARCE 227 Structural Analysis I	2
ARCH 208 Architectural Design Basics	2
ARCH 209 Architectural Design Basics	2
ARCH 231 Architectural Practice	3
ARCH 457/ARCH 458/ARCH 459	2
MATH 241 Calculus IV	4
MATH 242 Differential Equations	4
PHYS 133 General Physics	4
CHEM 124 General Chemistry (B.1.a.)	4
CSC 251 Digital Computer Applications (F.1.)	2
ECON 201 Survey of Economics or	
ECON 211 Principles of Economics (D.3.)	3
ENGL 215 Writing: Argumentation or	
ENGL 218 Writing: Argumentation and Reports	
(A.4)	4
HIST 204 History of American Ideals and	
Institutions (D.1.)	3
POLS 210 American and California Government	
(D.1.)	3
-	
	51

#### Junior

	ARCE 302 Structural Analysis II	3
	ARCE 303 Steel Design	3
	ARCE 304 Timber Design	3
	ARCE 305 Masonry Design	2
	ARCE 306 Matrix Analysis of Structures	3
	ARCE 325 Dynamics	4
	ARCE 351 Structural Computing Applications 1	1
	ARCE 352 Structural Computing Applications II	1
	ARCE 352 Structural Computing Applications III	1
	ARCE 371 Structural Systems Laboratory	2
	ARCE 372 Steel Structures Design Laboratory	3
	ARCE 421 Soil Mechanics	3
	ARCE 481 Structural Models Laboratory	1
	CSC 331 Numerical Linear Analysis	3
	GEOL 201 Physical Geology	3
	MF 302 Thermodynamics	3
	ARCH 317/ARCH 318/ARCH 319 (C 3 )	6
	MATH 318/STAT 211/GEOL 205	3
	BIO 220/FSN 210/HF 210/PF 250/PSY 304/RFC	5
	100 elective (E.2.)	2
1	Critical reading elective $(C_1)$	3
		54

#### Senior

	ARCE 422 Foundation Design and	
	ARCE 444 Reinforced Concrete Lab	3,3
	ARCE 451 Timber and Masonry Structures Design	
	Laboratory	3
	ARCE 452 Concrete Structures Design Laboratory	3
	ARCE 453 Senior Project Laboratory	3
	ARCE 483 Seismic Analysis and Design	4
	EE 311 Electrical Circuit Theory	3
	CM 433 Economic Analysis for Engineers	2
	ME 341 Fluid Mechanics	3
	ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
	HIST 315 Modern World History (D.2.)	3
	PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
1	ANT/BUS/ECON/GEOG/POLS/SOC elective	
	(300-400 level) (D.4.b.)	3
1	Critical reading elective (C.1.)	3
	Approved technical electives	10
	-	52

See COURSES OF INSTRUCTION section of this catalog for description of courses in Architectural Engineering and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 86 of this catalog.)

#### **B.S. ARCHITECTURAL ENGINEERING**

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

1 Inits MAJOR COURSES 67 ARCE 221, 222, 223, 227, 302, 303, 304, 305, 306, 325, 351, 352, 353, 371, 372, 421, 422, 444, 451, 452, 453, 481, 483 ARCH 111, 112 SUPPORT COURSES 85 ARCH 106, 113, 208, 209, 231, 457/458/459 CHEM 124 (B.1.a.) CM 433 CSC 251 (F.1.), 331 **EDES 101** EE 311 **GEOL 201** MATH 141 (B.2.), 142 (B.2.), 143, 241, 242 MATH 318/STAT 211/GEOL 205 ME 302, 341 PHYS 131 (B.1.a.), 132, 133 Approved technical electives (10) **GENERAL EDUCATION AND BREADTH** REQUIREMENTS..... 58 Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300-400 level. Additional GEB courses are listed under Support Courses. Area A: (14) ENGL 114 (A.1.) ENGL 125/PHIL 125/SPC 125 (A.2.) SPC 201/SPC 202 (A.3.) ENGL 215/ENGL 218 (A.4.) Area B: (3) Life sciences elective (B.1.b.) Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) ARCH 317/318/319 (C.3.) Area D: (18) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/211/222 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.) Area E: (5) PSY 201/PSY 202 (E.1.) BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100 elective (E.2.) ELECTIVES ..... 0 210

## **ARCHITECTURE DEPARTMENT**

Architecture and Environmental Design Bldg. (05), Room 212 (805) 756-1316

#### Faculty

Department Head (Interim), James R. Bagnall

Associate Department Head for Articulation and Admissions, Position Vacant

#### Associate Department Head for Operations, Don E. Swearingen

loseph C. Amanzio Sharad D. Atre Ronald E. Batterson William R. Benedict Carl H. Bovill David A. Brodie William H. Brown Arthur J. Chapman Allan R. Cooper M. Polly Cooper M. Bilgi Denel Serim Denel G. Day Ding Donna P. Duerk Merrill C. Gaines Bradford C. Grant Donald P. Grant Terry C. Hargrave John E. Harrigan, Jr. George Hasslein

Patrick D. Hill Laura V. Joines George K. Ikenoyama Brian B. Kesner Kenneth M. Kohlen Sandra D. Lakeman John H. Lange Larry H. Loh David Lord Margot McDonald Sandra D. Miller Paul R. Neel Daniel L. Panetta lens G. Pohl Charles W. Quinlan Howard Weisenthal Paul M. Wolff Donald S. Woolard Christopher Yip

#### Programs

B.Arch. Architecture

M.S. Architecture

The objective of the five-year Bachelor of Architecture degree program is to develop design and related skills necessary for entry into the professional field of architecture. Preparation for architecture spans several disciplines and requires a range of aptitudes. As the architect has a responsibility for solving problems of the built environment involving people, an understanding and sensitivity to human needs is required. Therefore, programs in architecture are broad in nature. With careful selection of elective work, areas of specialization can be included. The Bachelor of Architecture degree is accredited by the National Architectural Accrediting Board.

#### **CURRICULUM FOR BACHELOR OF** ARCHITECTURE

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

#### **1st Year**

ARCH 101 Survey of Architectural Education and	
Practice	2
ARCH 106 Materials of Construction	3
ARCH 111 Introduction to Drawing and	
Perspective	3
ARCH 112 Basic Graphics	3
ARCH 113 Graphics Analysis and	
Communication Skills	3
EDES 101 Introduction to Architecture and	
Environmental Design	2
ENGL 114 Writing: Exposition (A.1.)	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking	
(A.2.)	3
ENGL 215 Writing: Argumentation or	
ENGL 218 Writing: Argumentation and Reports	
(A.4)	4
MATH 141 Calculus I (B.2.)	4
MATH 142 Calculus II (B.2.)	4
PHVS 122 Conoral Physics (P.1.a.)	4
POLS 210 American and California Covernment	4
(D1)	2
Critical reading elective (C1)	3
	- 49

#### 2nd Year

	ARCH 207 Environmental Control Systems 1	4
	ARCH 231 Architectural Practice and Laboratory	3
	ARCH 250 Computer Applications (F.1.)	3
	ARCH 251 Environmental Design Fundamentals	5
	ARCH 252, ARCH 253 Architectural Design	
	Fundamentals	5,5
	ARCE 221 Elementary Structures	3
	ARCE 222 Mechanics of Structural Members 1	3
	ARCE 226 Structural Systems for Architects HIST 204 History of American Ideals and	3
	Institutions (D.1.) SPC 201 Public Speaking or	3
	SPC 202 Principles of Speech Communication	
	(A.3.)	3
1	Critical reading elective (C.1.)	3
	Electives	3
	-	46

#### **3rd Year**

ARCH 307 Environmental Control Systems II	4
AKCH 317, AKCH 318, AKCH 319 HISTORY OF	
Architecture	3,3,3
ARCH 341, ARCH 342 Architectural Practice	4,4
ARCH 351, ARCH 352, ARCH 353 Architectural	
Design	5,5,5
ARCE 321 Timber Design	3
ARCE 322 Steel Design	3
ARCE 323 Concrete and Masonry Design	3
, 3	-

	PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
	DIO 220/FSN 210/HE 210/PE 250/PSY 304/REC	_
	100 elective (E.2.)	2
	-	50
41	h Year	
	ARCH 407 Environmental Control Systems III	4
	ARCH 441, ARCH 442 Professional Practice	3.3
	ARCH 451, ARCH 452, ARCH 453 Architectural	-,-
	Design	555
2	Architectural history elective	3,3,5
	ANT 201/GEOG 150/SOC 105 $(D_4 = 1)$	2
	HIST 315 Modern World History (D.2.)	2
	PSV 201/PSV 202 Conoral Psychology (E.1.)	ר כ
1	ANT/RUS/ECON/CEOC/ROUS/SOC alactive	3
	(200, 400  level) (D.4 h.)	2
	(300–400 level) (D.4.0.)	3
1	Arts and humanities elective (Area C)	3
1	Economics elective (D.3.)	3
1	Fine and performing arts elective (C.2.)	3
1	Life sciences elective (B.1.b.)	3
	-	
		52

#### 5th Year

	ARCH 481 Senior Architectural Design Thesis Project	6.6.6
1	Literature, philosophy, arts electives (300–400	-,-,-
	level) (C.J.)	3
3	Adviser approved professional electives	24
	Electives	6
	-	51
	=	248

- To be selected in accordance with the General Education-Breadth require-<sup>2</sup> To be selected with department approval and must be at the 300 level or
- above. ARCH 319 prerequisite.
- <sup>3</sup> To be selected with department approval and must include 3 units from each of the departments of the SAED (ARCE 221, 222, 223, 321, 322 or 323 fulfill this requirement for ARCE). 18 of the 24 units required must be 300 level or above.

#### **BACHELOR OF ARCHITECTURE**

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

Units

,

MAJOR COURSES	<b>3</b> 5
352, 353, 441, 442, 451, 452, 453, 481 SUPPORT COURSES	96
<ul> <li>ARCE 221, 222, 226, 321, 322, 323</li> <li>ARCH 111, 112, 113, 207, 250 (F.1.), 307, 317, 318, 319, 407</li> <li>EDES 101</li> <li>MATH 141 (B.2.), 142 (B.2.)</li> <li>PHYS 131 (B.1.a.), 132 (B.1.a.)</li> <li>Adviser approved professional electives (24)</li> <li>To be selected with department approval and must include 3 units from each of the departments of the SAED (ARCE 221, 222, 223, 321, 322 or 323 fulfill this requirement for ARCE). 18 of the 24 units required must be 300 level or above.</li> <li>Architectural history elective (3)</li> <li>To be selected with department approval and must be at the 300 level or above. ARCH 319 prerequisite.</li> <li>GENERAL EDUCATION AND BREADTH PEOUBEMENTS</li> </ul>	5.9
REQUIREMENTS	58
Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level.	9
Area A: (14) ENGL 114 (A.1.) ENGL 125/PHIL 125/SPC 125 (A.2.) SPC 201/SPC 202 (A.3.) ENGL 215/ENGL 218 (A.4.)	
Area B: (3) Life sciences elective (B.1.b.)	
<ul> <li>Area C: (18)</li> <li>PHIL 230/PHIL 231 (C.1.)</li> <li>Critical reading electives (C.1.)</li> <li>Fine and performing arts elective (C.2.)</li> <li>Literature, philosophy, arts elective (300–400 level) (C.3.)</li> <li>Arts and humanities elective (Area C)</li> </ul>	
Area D: (18) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/211/222 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.)	
Area E: (5) PSY 201/PSY 202 (E.1.) BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100 elective (E.2.)	~
ELEC IIVES	9
24	48

#### MASTER OF SCIENCE IN ARCHITECTURE

#### **Professional Practice Specialization**

This specialization is for applicants holding an accredited architecture degree wishing to pursue advanced studies with a strong professional practice orientation.

The Master of Science in Architecture is a post-professional specialized degree in the broad field of architecture with an emphasis on professional practice. Common core studies aim to establish a central professional focus for advanced study and research, while sub-core studies and directed electives provide for the development of in-depth study chosen by candidates.

#### **Environmental Design Specialization**

This specialization is for applicants holding a degree in one of the several cognate environmental design disciplines, engineering, or computer science, wishing to pursue advanced studies with a strong inter-professional orientation. This is a post-professional specialized degree in the inter-professional field of environmental design, with special reference to its three primary contributory disciplines of Architecture, City and Regional Planning, and Landscape Architecture. The common core curriculum aims to establish a central focus for advanced study and research, while sub-core studies and directed electives provide for the development of in-depth study in one of the contributory disciplines of Architecture, City and Regional Planning, Architectural Engineering, Landscape Architecture and Construction Management.

#### **CURRICULUM FOR M.S. ARCHITECTURE**

Units

Core Curriculum	24
ARCH 519 Theory of Architecture (3)	
ARCH 532 Quantitative Methods in Arch. (3) or	
ARCH 537 Principles of Development (3)	
ARCH 561 Advanced Design (9)	
ARCH 598 Master's Design Project (9) or	
ARCH 599 Master's Thesis (9) or	
A comprehensive examination with 9	
additional units of approved graduate level	
coursework	
Courses in Area of Specialization	12
A minimum of 12 units selected from a list of	12
approved courses	
Directed Electives	9
A maximum of 9 units of adviser approved elective	
courses may be included in a student's formal	
program of study.	
	45

For further information contact the Graduate Program Coordinator, Architecture Department, School of Architecture and Environmental Design, Cal Poly, San Luis Obispo, CA 93407.

See COURSES OF INSTRUCTION section of this catalog for description of courses in Architecture and other subjects.

## **CITY AND REGIONAL PLANNING DEPARTMENT**

Dexter Bldg. (34), Room 251 (805) 756-1315

#### Faculty

#### Department Head, Linda C. Dalton

David T. Dubbink	Joseph M. Kourakis
Steven P. French	Michael E. McDougall
William A. Howard	Prem P. Pangotra

#### **Programs**

B.S. City and Regional Planning

M.C.R.P. Master of City and Regional Planning

City and Regional Planning emphasizes an understanding of urban and regional processes, supported by courses in computer applications, economics, management, natural environment, political science, and statistics. In addition, both the undergraduate and graduate programs offer an opportunity for students to apply their learning to practical situations in a series of laboratory courses, internships, and final student projects.

The degree programs prepare students for professional careers in the design of human settlements in harmony with the natural environment and the needs of society. Practicing planners work in public agencies and private consulting firms, preparing comprehensive plans for projects, neighborhoods, cities, and entire regions. They deal with the use of land, housing, transportation, public facilities, and open space. In addition, they are responsible for finding the means to make their plans become a reality by budgeting for public projects and programs and by reviewing and regulating private development.

The curriculum leading to the Bachelor of Science in City and Regional Planning provides a broad, interdisciplinary education as well as competency in physical planning with a specialization in urban and regional design. The Master of City and Regional Planning degree builds on a general undergraduate preparation in the humanities, social sciences or natural sciences, and offers two areas of emphasis: urban land planning, and regional and environmental planning.

# CURRICULUM FOR B.S. CITY AND REGIONAL PLANNING

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

#### Freshman

	CRP 101 Introduction to the Profession of City and	
	Regional Planning	1
	CRP 111 Introduction to Drawing and Perspective.	3
	CRP 112 Basic Graphics	3
	CRP 211 Introduction to Urbanization	3
	CRP 212 Introduction to Urban Planning	3
	EDES 101 Introduction to Architecture and	
	Environmental Design	2
	ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
	CSC 110 Computers and Computer Applications	
	(F.1.)	3
	ENGL 114 Writing: Exposition (A.1.)	4
	ENGL 125/PHIL 125/SPC 125 Critical Thinking	
	(A.2.)	3
	HIST 204 History of American Ideals and	
	Institutions (D.1.)	3
	MATH 118 Pre-Calculus Algebra (B.2.)	4
	PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
	PSY 201/PSY 202 General Psychology (E.1.)	3
	SPC 201 Public Speaking or	
	SPC 202 Principles of Speech Communication	
	(A.3.)	3
	BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC	
	100 (E.2.)	2
1	Life science elective (B.1.b.)	3
		49

#### Sophomore

CRP 201, CRP 202 Environmental Design	
Fundamentals	3,3
CRP 203 Applied Design and Planning	
Fundamentals	3
CRP 213 Population and Housing Studies	3
CRP 214 Land Use and Transportation Studies	3
CRP 216 Computer Applications for Planning	3
LA 213 Site and Terrain Analysis	4
FNR 304 Ecology of Resource Areas	4
ECON 211 Principles of Economics (D.3.)	3
ECON 212 Principles of Economics	3
ENGL 218 Writing: Argumentation and Reports	
(A.4.)	4
GEOL 201 Physical Geology (B.1.a.)	3
POLS 210 American and California Government	
(D.1.)	3
STAT 211 Elementary Probability and Statistics	
(B.2.)	3
STAT 212 Statistical Methods (B.2.)	3
Elective	2
-	50

#### Junior

	CDD 214 Diamaing Theory	2
	CKP 314 Planning Theory	3
	CRP 315 Economic and Fiscal Analysis for	
	Planning	3
	CRP 347, CRP 348 Urban and Regional Design	3,3
	CRP 351, CRP 352, CRP 353 Community Planning	,
	Laboratory	4.4.4
	CRP 420 Planning Law	., ., .
		-
	POLS 403 Municipal Government	4
1	Critical reading electives (C.1.)	6
1	Fine and performing arts elective (C.2.)	3
1	Physical or life sciences elective (with laboratory)	
	(B.1.)	3
	Advisor annuound algorithms	ć
	Adviser approved electives	6
		50

#### Senior

	CRP 409 Planning Internship	2
	CRP 430 Planning Administration	3
	CRP 451, CRP 452 Regional and Environmental	
	Planning Laboratory	4,4
	CRP 461, CRP 462 Senior Project	2,2
	CRP 463 Undergraduate Seminar	2
	MGT 317/POLS 441/PSY 302	4/3
	HIST 315 Modern World History (D.2.)	3
1	ANT/BUS/ECON/GEOG/POLS/SOC elective	
	(300-400 level) (D.4.b.)	3
1	Arts and humanities elective (Area C)	3
1	Literature, philosophy, arts elective	
	(300-400 level) (C.3.)	3
	Adviser approved electives	7/8
	Electives	7
	-	49
	=	109
		130

<sup>1</sup> To be selected in accordance with General Education-Breadth requirements. (Please see page 86 of this catalog.)

#### **B.S. CITY AND REGIONAL PLANNING**

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

MAJOR COURSES 78 CRP 101, 111, 112, 201, 202, 203, 211, 212, 213, 214, 216, 314, 315, 347, 348, 351, 352, 353, 409, 420, 430, 451, 452, 461, 462, 463 SUPPORT COURSES 53 CSC 110 (F.1.) ECON 211 (D.3.), 212 **EDES 101 FNR 304** GEOL 201 (B.1.a.) LA 213 MATH 118 (B.2.) MGT 317/POLS 441/PSY 302 **POLS 403** STAT 211 (B.2.), 212 (B.2.) Adviser approved electives (13/14) **GENERAL EDUCATION AND BREADTH** REQUIREMENTS.....

58

Units

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300-400 level. Additional GEB courses are listed under Support Courses.

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

Area B: (6) Physical or life sciences elective (with lab) (B.1.) Life science elective (B.1.b.)

Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300-400 level) (C.3.) Arts and humanities elective (Area C)

Area D: (15) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.) Area E: (5)

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

9 198

Units

#### MASTER OF CITY AND REGIONAL PLANNING

#### **General Characteristics**

The Master of City and Regional Planning degree program (MCRP) is professionally oriented and is open to students with high standards of academic achievement who wish to pursue careers in city and regional planning. It is structured to prepare graduates with competence to function in a general context of planning, as well as in a particular area of emphasis. The MCRP core courses cover planning theory, methods, law, formulation and implementation of plans and policies.

Two principal areas of study are emphasized: urban land planning, focused on comprehensive physical planning and urban design; and regional and enrivonmental planning, focused on natural systems and development impacts.

The master's program is structured to meet the needs of those who have earned baccalaureate degrees in a variety of disciplines including, but not limited to, economics, geography, architecture, landscape architecture, civil engineering, political science, environmental or urban studies, natural resources management, and ecology. The program is six quarters (two years) in duration and consists of 72 approved units (not including courses necessary to compensate for deficiencies). Because of the sequencing of courses, students admitted to the program are expected to begin their studies in the fall guarter. Students with prerequisite coursework deficiencies and those with backgrounds allowing waivers of first-year core courses may be admitted in other guarters. The degree culminates in a thesis, or synthesis course (CRP 597) and comprehensive exam.

The MCRP Program offers students an opportunity to develop close working relationships with the planning faculty. Self-directed study, tailored to the student's interests and needs, is also encouraged.

#### **Prerequisites**

Students entering the MCRP Program are expected to bring with them a background in certain basic subject areas or to make up deficiencies in these basic subject areas after admission. These include the following Cal Poly courses or their equivalents:

STAT 211	Elementary Probability and Statistics
CSC 110	Computers and Computer Application

Applicants for admission to the Master of City and Regional Planning program are expected to:

- 1. Have earned a bachelor's degree from an accredited university or college,
- 2. Have attained a grade point average of 3.0 in last 90 units of undergraduate work,
- 3. Provide the CRP Graduate Review Committee with the results of the Graduate Record Examination Aptitude Test.
- 4. Give indications of motivation, maturity, and high standards of academic involvement through work and ref-

erences (three letters required) and submission of a project or paper demonstrating writing ability,

5. Provide a statement (maximum of 300 words) addressing your understanding of and areas of interest in city and regional planning, your career objectives, and your educational objectives.

Applicants lacking prerequisites or other background requirements for classified standing requirements may be admitted on a conditionally classified basis, depending on the results of an individual analysis of their applications.

#### CURRICULUM FOR MASTER OF CITY AND **REGIONAL PLANNING**

#### Core Courses..... 45

#### First Year

<ul> <li>CRP 501 Foundations of Urban and Regional Planning (4)</li> <li>CRP 510 Planning Theory (4)</li> <li>CRP 513 Survey and Research Methods (4)</li> <li>CRP 514 Computer Applications for MCRP (2)</li> <li>CRP 515 Graphic Communication for Planners (3)</li> <li>CRP 516 Quantitative Methods in Planning (4)</li> <li>CRP 525 Plan Implementation (3)</li> <li>CRP 552 Community Planning Laboratory (4)</li> <li>POLS 401 State and Local Government <i>or</i> POLS 403 Municipal Government (4)</li> </ul>	
Second Year	
<ul> <li>CRP 409 Planning Internship (2)</li> <li>CRP 420 Planning Law (4)</li> <li>CRP 530 Planning Agency Management (3)</li> <li>CRP 597 Policy, Planning, and Management (4) and comprehensive exam <i>or</i> CRP 599 Thesis/Project (6)</li> </ul>	
Emphasis Area (select one)	19
Urban Land Planning CRP 520 Feasibility Studies in Planning (4) CRP 548 Principles of Urban Design (3) CRP 553 Project Planning Laboratory (4) Urban electives (8)	
Regional and Environmental Planning CRP 407 Environmental Law (3) CRP 505 Principles of Regional Planning (4) CRP 554 Regional Planning Laboratory (4) Environmental electives (8)	
Adviser approved electives	8
	72
Son COLIDEES OF INISTRUCTION cartion of this patalog for description	

COURSES OF INSTRUCTION section of this catalog for description of courses in City and Regional Planning and other subjects.

## **CONSTRUCTION MANAGEMENT DEPARTMENT**

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

#### Faculty

#### Department Head, James A. Rodger

Harold A. Johnston	David R. Pierce, Jr.
John C. Mouton	Matthias R. Wall

#### Programs

**B.S.** Construction Management

The curriculum in Construction Management leads to the Bachelor of Science degree which is accredited by the American Council for Construction Education. Major emphasis is placed on organizing and managing the construction phase of society's efforts to improve the environment. The constructor is an important member of the building team and requires a professional knowledge of techniques, materials, equipment, job planning and cost control to add to the contributions of the planning and design professions. Graduates of this program can help supply the urgent needs of the construction industry and its related fields.

#### **CURRICULUM FOR B.S. CONSTRUCTION** MANAGEMENT

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

#### Freshman

ARCH 106 Materials of Construction	3
ARCH 111 Introduction to Drawing and	
Perspective	3
ARCH 112 Basic Graphics	3
EDES 101 Introduction to Architecture and	
Environmental Design	2
ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
BIO 220 Physiology and Biological Adaptation	
(B.1.b., E. 2.)	4
ENGL 114 Writing: Exposition (A.1.)	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking	
(A.2.)	3
HIST 204 History of American Ideals and	
Institutions (D.1.)	3
MATH 141 Calculus I (B.2.)	4
MATH 142 Calculus II (B.2.)	4
PHYS 131 General Physics (B.1.a.)	4
PHYS 132 General Physics	4
POLS 210 American and California Government	
(D.1.)	3
PSY 201/PSY 202 General Psychology (E.1.)	3
—	
	- 50

#### Sophomore

CM 201 Introduction to Construction Management.	3
AE 237 Engineering Surveying	2
ARCE 221 Elementary Structures	3
ARCE 222 Mechanics of Structural Members I	3
ARCE 226 Structural Systems for Architects	3
ARCH 208 Architectural Design Basics	2
ARCH 209 Architectural Design Basics	2
ARCH 231 Architectural Practice	3
BUS 201 Business Law Survey	3
CRP 212 Introduction to Urban Planning	3
GEOL 201 Physical Geology	3
LA 212 Site Analysis	3
ARCH 250 Computer Applications or	
CSC 110 Computers and Computer Applications	
(F.1.)	3
CHEM 121 General Chemistry	4
ECON 201/ECON 211/ECON 222 (D.3.)	3
ENGL 215 Writing: Argumentation or	
ENGL 218 Writing: Argumentation and Reports	
(A.4.)	4
PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	·
(A.3.)	3
-	53

#### lunior

CM 321 Concrete Technology	2
CM 322 Concrete Technology Laboratory	1
CM 331 Construction Cost Control	3
CM 332 Cost Alternatives Evaluation	4
CM 333 Construction Contract Administration	3
CM 341 Residential and Light Commercial	
Construction Practices	3
CM 342 Commercial, Institutional and Industrial	-
Construction Practices	3
CM 343 Earthwork and Civil Works Construction	-
Practices	3
CM 351, CM 352, CM 353 Building Support	
System Construction Practices	333
ARCE 321 Timber Design	3,5,5
ARCE 322 Steel Design	3
ARCE 322 Occurrence and Masonry Design	2
ARCE 421 Soil Mechanics	2
FNGL 310 Corporate Communications	ر ۸
	47

#### Senior

	CM 443 Principles of Construction Management	3
	CM 444 Concrete Formwork and Temporary	
	Structures	3
	CM 445 Principles of Heavy Construction	2
	CM 452 Project Controls	4
	CM 453 Project Development	4
	CM 454 Building Estimating	4
	CM 461 Senior Project	2
	CM 462 Senior Project	1
	HIST 315 Modern World History (D.2.)	3
1	ANT/BUS/ECON/GEOG/POLS/SOC elective	
	(300–400 level) (D.4.b.)	3
1	Arts and humanities elective (Area C)	3
1	Critical reading electives (C.1.)	6
1	Fine and performing arts elective (C.2.)	3
1	Literature, philosophy, arts elective (300-400	
	level) (C.3.)	3
	300-400 level MGT or FIN elective	4
	-	48
	-	

See COURSES OF INSTRUCTION section of this catalog for description of courses in Construction Management and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 86 of this catalog.)

#### **B.S. CONSTRUCTION MANAGEMENT**

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

Units MAJOR COURSES 75 CM 201, 321, 322, 331, 332, 333, 341, 342, 343, 351, 352, 353, 443, 444, 445, 452, 453, 454 ARCE 221, 222, 226 ARCH 106, 111, 112, 231 SUPPORT COURSES 44 AE 237 ARCE 321, 322, 323, 421 ARCH 208, 209 **BUS 201 CHEM 121** CM 461, 462 CRP 212 **EDES 101 ENGL 310** LA 212 300-400 level MGT or FIN elective (4) **GENERAL EDUCATION AND BREADTH** REQUIREMENTS..... 79 Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300-400 level. Area A: (14) ENGL 114 (A.1.) ENGL 125/PHIL 125/SPC 125 (A.2.) SPC 201/SPC 202 (A.3.) ENGL 215/ENGL 218 (A.4.) Area B: (18) PHYS 131, 132 (B.1.a.) BIO 220 (B.1.b.) MATH 141, 142 (B.2.) Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300-400 level) (C.3.) Arts and humanities elective (Area C) Area D: (18) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/211/222 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.) Area E: (5) PSY 201/PSY 202 (E.1.) BIO 220 (E.2.) Area F: (3) ARCH 250/CSC 110 (F.1.) ELECTIVES ..... 0 198

## LANDSCAPE ARCHITECTURE DEPARTMENT

Dexter Bldg.(34), Room 251 (805) 756-1319

#### **Faculty**

#### Department Head, Gerald L. Smith

Alice C. Loh
Roger J. Osbaldeston
Ronald R. Stoltz
Dale A. Sutliff
Walter M. Tryon

Affiliate Faculty: Thomas J. Rice, Jr., Soils Scientist

#### Programs

#### B.S. Landscape Architecture

The profession of landscape architecture is primarily involved with the design, planning, and protection of the natural and developed environments. The Bachelor of Science degree program in Landscape Architecture is accredited by the American Society of Landscape Architects and recognized by the California State Board of Landscape Architects.

An emphasis is placed on a process oriented approach to design and planning while developing an awareness and sensitivity to community and human values as they relate to environmental conditions. Students majoring in landscape architecture will acquire technical competencies and creative design skills through a range of projects which represent the breadth of the profession. Specialization may be elected through advisement in different areas. Please consult with departmental advisers for details.

Graduates of the program are prepared for positions in private practice, consulting, governmental agencies at the national, state or local levels, industry and construction firms. Graduate study is encouraged for those students interested in pursuing areas of specialization.

Majors who are in their last two years of study and have at least a 3.2 grade point average may have the opportunity to join Theta Chapter of Sigma Lambda Alpha, the national scholastic honor society for landscape architecture.

#### **CURRICULUM FOR B.S. LANDSCAPE** ARCHITECTURE

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

#### Freshman

LA 110 Graphic Communication for Landscape	
Architects	3
LA 111 Three Dimensional Graphics for	
Landscape Architects	3
LA 112 Graphic Communication Techniques	
for Landscape Architects	3
LA 152 Fundamentals of Design and Planning in	
Landscape Architecture	4
LA 153 Fundamentals of Design and Planning in	
Landscape Architecture	3
AE 237 Engineering Surveying	2
EDES 101 Introduction to Architecture and	
Environmental Design	2
SS 121 Introductory Soil Science (F.2.)	4
BOT 121 General Botany (B.1.b.)	4
ENGL 114 Writing: Exposition (A.1.)	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking	
(A.2.)	3
MATH 120 Pre-Calculus Algebra and Trigonometry	
(B.2.)	5
POLS 210 American and California Government	
(D.1.)	3
PSY 201/PSY 202 General Psychology (E.1.)	3
SPC 201 Public Speaking or	
SPC 202 Princ. of Speech Communication	
(A.3.)	3
Computer literacy elective (F.1.)	3

#### Sophomore

LA 202 Fundamentals of Design and Planning in	
Landscape Architecture	3
LA 203 Applied Design and Planning Fund	3
LA 214 Landscape Analysis and Planning	4
LA 231 Landscape Architecture Construction I	3
LA 247 Landscape Plant Composition	3
LA 310 Intro. to Computing in Landscape Arch	2
LA 311 History of Landscape Architecture	3
LA 341 Landscape Architecture Construction II	3
AE 337 Landscape Irrigation	3
BOT 238 Native Plant Materials	3
OH 238 Landscape Plants 1	3
ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
ENGL 215 Writing: Argumentation or	
ENGL 218 Writing: Argumentation and Reports	
(A.4.)	4
HIST 204 History of American Ideals and	
Institutions (D.1.)	3
PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC	•
100 elective (E.2.)	2
Critical reading elective (C.1.)	3
rnysical or life science elective (B.1.)	3
	54

#### Junior

LA 323 History of Twentieth Century Landscape	
Architecture	3
LA 342 Landscape Architecture Construction III	3
LA 348 Advanced Landscape Plant Composition	3
LA 351, LA 352, LA 353 Design for Landscape	
Architects	5,5,5
ARCE 311 Structures for Landscape Architects	3
CRP 212 Introduction to Urban Planning	3
OH 308 Landscape Plants II	3
ECON 201 Survey of Economics or	
ECON 211 Principles of Economics (D.3.)	3
ANT/BUS/ECON/GEOG/POLS/SOC elective	
(D.4.b.)	3
Critical reading elective (C.1.)	3
Mathematics or statistics elective (B.2.)	3
-	15
	- 40

#### Senior

	LA 321 Concepts in Environmental Decision	
	Making	3
	LA 441, LA 442 Professional Practice I, II	2,2
	LA 451 Regional Landscape Assessment	6
	LA 452 Urban Design for Landscape Architects	5
	LA 461 Senior Design Project	5
	LA 463 Undergraduate Seminar	2
	CM 325 Construction Management Practice	3
	HIST 315 Modern World History (D.2.)	3
1	Arts and humanities elective (Area C)	3
1	Fine and performing arts elective (C.2.)	3
1	Literature, philosophy, arts elective (300-400	
	level) (C.3.)	3
1	Physical sciences elective (B.1.)	3
	Adviser approved SAED professional elective	4
	-	47
	=	198

See COURSES OF INSTRUCTION section of this catalog for description of courses in Landscape Architecture and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 86 of this catalog.)

#### **B.S. LANDSCAPE ARCHITECTURE**

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

Units

0 198

MAJOR COURSES ..... 71 LA 152, 153, 202, 203, 214, 231, 247, 311, 323, 341, 342, 348, 351, 352, 353, 441, 451, 452, 461 SUPPORT COURSES 60 AE 237. 337 **ARCE 311** BOT 121 (B.1.b.), 238 CM 325 CRP 212 **EDES 101** LA 110, 111, 112, 310, 321, 442, 463 MATH 120 (B.2.) OH 238, 308 SS 121 (F.2.) Adviser approved SAED professional elective (4) **GENERAL EDUCATION AND BREADTH** REQUIREMENTS..... 67

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

Area A: (14) ENGL 114 (A.1.) ENGL 125/PHIL 125/SPC 125 (A.2.) SPC 201/SPC 202 (A.3.) ENGL 215/ENGL 218 (A.4.) Area B: (9) Physical and life sciences electives (B.1.) Mathematics or statistics elective (B.2.) Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300-400 level) (C.3.) Arts and humanities elective (Area C) Area D: (18) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/211 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.) Area E: (5) PSY 201/PSY 202 (E.1.) BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100 elective (E.2.) Area F: (3) Computer literacy elective (F.1.) ELECTIVES .

#### CURRICULUM FOR BACHELOR OF LANDSCAPE ARCHITECTURE

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

Note: The offering of this degree is subject to approval of regulation by the Office of Administrative Law which is expected by Fall 1992.

#### **First Year**

LA 110 Graphic Communication for Landscape	
Architects	3
LA 111 Three Dimensional Graphics for	
Landscape Architects	3
LA 112 Graphic Communication Techniques	
for Landscape Architects	3
LA 152 Fundamentals of Design and Planning in	
Landscape Architecture	4
LA 153 Fundamentals of Design and Planning in	
Landscape Architecture	3
EDES 101 Introduction to Architecture and	
Environmental Design	2
SS 121 Introductory Soil Science (F.2.)	4
BIO 128 Natural History: Animal Communities	
(B.1.)	3
BOT 121 General Botany (B.1.b.)	4
ENGL 114 Writing: Exposition (A.1.)	4
HIST 204 History of American Ideals and	
Institutions (D.1.)	3
MATH 120 Pre-Calculus Algebra and Trigonometry	
(B.2.)	5
Computer literacy elective (F.1.)	3
Fine and performing arts elective (C.2.)	3
Physical science elective (B.1.a.)	3
-	50

#### Second Year

LA 202 Fundamentals of Design and Planning in	
Landscape Architecture	3
LA 203 Applied Design and Planning Fund	3
LA 214 Landscape Analysis and Planning	4
LA 231 Landscape Architecture Construction L	3
LA 247 Landscape Plant Composition	3
IA 310 Intro. to Computing in Landscape Arch.	2
LA 311 History of Landscape Architecture	3
LA 341 Landscape Architecture Construction II	3
AF 237 Engineering Surveying	2
ARCH 317 History of Architecture (C.3.)	3
BOT 238 Native Plant Materials	3
OH 238 Landscape Plants L	3
ENGL 125/PHIL 125/SPC 125 Critical Thinking	-
(A.2.)	3
ENGL 215 Writing: Argumentation or	Ŭ
ENGL 218 Writing: Argumentation and Reports	
(A 4 )	4
PHIL 230/PHIL 231 Philosophical Classics (C1)	3
SPC 201 Public Speaking or	9
SPC 202 Princ of Speech Communication (A 3)	3
	48

#### Third Year

	LA 323 History of Twentieth Century Landscape	-
	Architecture	1
	LA 348 Advanced Landscape Plant Composition	3
	LA 351, LA 352, LA 353 Design for Landscape	
	Architects	5,5,5
	AE 337 Landscape Irrigation	3
	ARCE 311 Structures for Landscape Architects	3
	CRP 212 Introduction to Urban Planning	3
	OH 308 Landscape Plants II	3
	POLS 210 American and California Government	
	(D.1.)	3
	STAT 211 Elementary Probability and Statistics	
	(B.2.)	3
	BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC	
	100 elective (E.2.)	2
1	Critical reading elective (C.1.)	3
	-	47

#### Summer

LA 300 Internship	3
-	3

#### Fourth Year

	LA 321 Concepts in Environmental Decision	
	Making	3
	LA 441, LA 442 Professional Practice I, II	2,2
	LA 451 Regional Landscape Assessment	6
	LA 452 Urban Design for Landscape Architects	5
	LA 461 Senior Design Project	5
	CM 325 Construction Management Practice	3
	ECON 201 Survey of Economics or	
	ECON 211 Principles of Economics (D.3.)	3
	HIST 315 Modern World History (D.2.)	3
	PSY 201/PSY 202 General Psychology (E.1.)	3
1	ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
1	ANT/BUS/ECON/GEOG/POLS/SOC elective	
	(300–400 level) (D.4.b.)	3
1	Arts and humanities elective (Area C)	3
1	Critical reading elective (C.1.)	3
	-	47

#### **Fifth Year**

LA 454, 455, 456 Design for Landscape Architects	4,4,4
LA 463 Undergraduate Seminar	2
Courses to complete concentration	18
Electives	9
-	41
=	236

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 86 of this catalog.)

See COURSES OF INSTRUCTION section of this catalog for description of courses in Landscape Architecture and other subjects.

#### **CONCENTRATIONS** (select one)

#### **Recreation and Open Space**

LA 363 Recreation and Open Space Planning and	
Design	3
LA 411 Regional Landscape History	3
LA 481 Visual Resource Management Methods	3
LA 482 Evaluation Mehtods in Environmental	
Design	3
Adviser approved electives	6
-	18

#### **Regional Landscape Assessment**

LA 411 Regional Landscape History	3
LA 481 Visual Resource Management Methods	3
LA 482 Evaluation Mehtods in Environmental	
Design	3
CRP 407 Environmental Law	3
Adviser approved electives	6
	18

#### **Envrionmental Design**

LIB 301 Library Resources and Literature Searches.	1
LA 483 Special Studies in Architecture	12
Adviser approved electives	5
	10
	10

#### **BACHELOR OF LANDSCAPE ARCHITECTURE**

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

Units

MAJOR COURSES	88
LA 110, 111, 152, 153, 203, 214, 231, 247, 311,	
323, 341, 342, 348, 351, 352, 353, 441, 442, 451,	
452, 454, 455, 456, 461	
SUPPORT COURSES	81
LA 112, 201, 202, 300, 310, 321, 463	
AE 237, 337	
ARCE 311	
ARCH 317 (C.3.)	
BIO 128 (B.1.b.)	
BOT 121 (B.1.b.), 238	
CM 325	
CRP 212	
EDES 101	
MATH 120 (B.2.)	
OH 238, 308	
SS 121 (F.2.)	
STAT 211 (B.2.)	
Concentration or adviser approved electives (18)	
Recreation and Open Space	
LA 363, 411, 481, 482, adviser approved	
electives (6)	
Regional Landscape Assessment	
LA 411, 481, 482; CRP 407; adviser approved	
electives (6)	
Environmental Design	
LA 483; LIB 301; adviser approved electives (6)	
GENERAL EDUCATION AND BREADTH	
REQUIREMENTS	58

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

Area A: (14) ENGL 114 (A.1.) ENGL 125/PHIL 125/SPC 125 (A.2.) SPC 201/SPC 202 (A.3.) ENGL 215/ENGL 218 (A.4.)
Area B: (3) Physical science elective (B.1.a.)
Area C: (15) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Arts and humanities elective (Area C)
Area D: (18) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/211 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.)
Area E: (5) PSY 201/PSY 202 (E.1.) BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100 elective (E.2.)
Area F: (3) Computer literacy elective (F.1.) ELECTIVES



# **School of Business**

### **DEGREE PROGRAMS**

#### **B.S.** Business Administration

Accounting Department

Accounting Concentration

**Business Administration Department** 

Financial Management Concentration

Marketing Management Concentration

Management Department

Human Resources Management Concentration

International Business Management Concentration

Management Concentration

Management Information Systems Concentration

Production and Operations Management Concentration

**B.S.** Economics

Business and Industrial Economics Concentration

International Trade and Development Concentration

Quantitative Economics Concentration

M.B.A. Business Administration Agribusiness Specialization M.B.A./M.S. in Engineering with a Specialization in Engineering Management

#### MINORS

Business

Economics

## SCHOOL OF BUSINESS

Business Bldg. (03), Room 372 (805) 756-2704

#### William J. Boyes, Dean Mary Beth Armstrong, Associate Dean

The mission of the School of Business at Cal Poly is to provide quality business education which prepares students to take their roles as responsible citizens, able to serve society through their chosen professions.

In pursuing this mission, the school is committed to maintaining and improving upon the following:

- · tradition of teaching excellence in the school;
- professional stature of the school faculty by stimulating research, publication and other professional development activities;
- faculty involvement in providing service to the university and community which enhances their teaching and research abilities.

All of the baccalaureate and graduate programs in the school are accredited by the American Assembly of Collegiate Schools of Business. The objective of accreditation is to foster high quality in the educational programs offered by schools of business.

The school is organized into four departments-Accounting, Business Administration, Economics, and Management. This organizational structure allows for traditional programs of study in each of the functional fields of business and economics, and also allows for ease of coordination in the offering of programs that require study from a cross-section of these disciplines.

Programs leading to degrees of Bachelor of Science in Business Administration, Master of Business Administration, and Bachelor of Science in Economics are offered. The School also offers an Economics Minor and a Business Minor. A pre-law advisement service is available to all university students.

The school's educational philosophy follows the Cal Poly tradition-that of enlisting maximum student involvement in the learning process through case analysis, special projects, internships, computer simulations and other learn-by-doing exercises. The school has state-of-the-art computer facilities which are available to students to meet their coursework needs. Educational programs are designed to help the student achieve maximum personal development, to prepare the student for entry into the business world, and to foster citizenship, leadership, and constructive community living. The curriculum includes general education requirements and specialized studies in the student's major field. Optional areas of concentration within each major enable the student to select the program most closely suited to the chosen career field.

#### **CURRICULUM FOR BUSINESS MINOR**

The Business Minor provides non-business students with an introduction to the body of knowledge expected of persons pursuing careers in business. A business minor will give a student a competitive edge when applying for certain jobs, by providing concepts, tools and skills which will enhance one's progress in a career. In addition, students who plan on a career in the non-business sector will gain a greater appreciation of the challenges and opportunities facing business, now and in the future.

Enrollment in the Business Minor is limited, and selection will be made based upon the applicant's performance in the prerequisite courses listed below. After admission to the Minor, the student must complete the remaining required courses. At least 16 units must be completed *after* admission to the program.

#### Prerequisites

The following courses must be taken *before* admission to the minor. Since admission is competitive, selection will be based on performance in these courses.

ACTG 211 Financial Accounting for Nonbusiness Majors (4) or ACTG 221 Financial Accounting I (4)
BUS 207 Business Law (4)
ECON 221 Microeconomics (4)
ECON 222 Macroeconomics (D.3.) (4)
MATH 124 Finite Mathematics (B.2.) (3)
STAT 251 Statistical Inference for Management I (B.2.) (4)
STAT 252 Statistical Inference for Management II (B.2.) (4)

#### **Required** courses

The following courses comprise the Business Minor. At least 16 units must be completed after admission to the minor.

1	ACTG 211 Financial Accounting for Nonbusiness	
	Majors or ACTG 221 Financial Accounting I	4
	ACTG 301 Managerial Accounting	4
1	BUS 207 Business Law	4
	FIN 342 Financial Management	4
	MGT 312/MGT 314/MGT 317	4
	MIS 321 Management Information Systems or	
	MGT 301 Production and Operations	
	Management	4
	MKTG 301 Principles of Marketing	4
	-	28
		20

<sup>1</sup> These courses will have been taken prior to admission to the Business Minor, but will count as part of the Business Minor.

## **Master of Business Administration**

#### **General Characteristics**

The Cal Poly MBA program is designed to prepare students to enter successful management positions of high responsibility. The program is based on the recognition that future business leaders must function in an environment (a) that places more emphasis on technology, (b) that is facing more globalization in markets and organizations, and (c) that is placing increased importance on societal factors such as pollution, equal rights, ethical behavior and corporate citizenship. The primary objectives of the MBA program are:

- To provide students with a broad-based understanding of fundamental concepts, principles and practices in multiple business disciplines;
- To instill in students an integrated understanding of business dynamics for effective responses to the changing global business environment;
- To help the students acquire skills in formulating, analyzing and implementing significant business decisions; and
- To develop in students the skills that are necessary to work with other people in effective organizations in a changing global environment.

#### Prerequisites

With the exception of prior background in quantitative analysis, there are no specific prerequisite courses for the MBA program. See the MBA curriculum for details.

#### Admission to the MBA Program:

Admission to the MBA program is based upon:

- a) Successful completion of an accredited undergraduate program of study;
- b) The student's undergraduate record, with particular emphasis placed on performance during the last 90 units (or equivalent);
  - c) Achievement on the Graduate Management Admission Test (GMAT); and
  - d) Prior work experience.

For more information on the MBA Program and for application materials specific to the program, please contact the office of Graduate Programs, School of Business.

#### **Program of Study**

The MBA program entails a two-year program of graduate work. The first year of the program offers students an integrated understanding of concepts and tools of the various business disciplines. The courses offered contain material that is commonly referred to as the core of business knowledge. The first year provides a collaborative learning environment in which future business managers can acquire basic knowledge and skills in all business disciplines. Ethical and international business issues are specifically addressed in many courses. The second year of the program consists primarily of elective courses. This structure is based on the belief that people learn best when their past experiences and training can be made an integral part of the learning process. Various sequences of elective courses are offered to allow students to specialize in particular fields. Students are also permitted to develop their own sequences of elective courses. Because the intent is to provide the training and education necessary for the MBA graduate to be successful, the second year elective sequences undergo continuous review for currency and relevance. Satisfactory completion of a comprehensive examination is a requirement of the MBA program.
## CURRICULUM FOR MASTER OF BUSINESS ADMINISTRATION

## FIRST YEAR

Units

Students are encouraged to challenge first-year GSB courses based on their previous work.

Fall	16
GSB 511 Financial Accounting (4)	
1 GSB 512 Quantitative Analysis (4)	
GSB 513 Organization Behavior (4)	
GSB 514 Business, Government and Society (4)	
Winter	16
GSB 521 Managerial Accounting (4)	
GSB 522 Management Science (4)	
GSB 523 Managerial Economics (4)	
GSB 524 Marketing Management (4)	
Spring	16
GSB 531 Managerial Finance (4)	
GSB 532 Information Systems (4)	
GSB 533 Aggregate Economics (4)	
GSB 534 Production and Operations Mgmt. (4)	

#### SECOND YEAR

Students must select from: GSB 578, GSB 587, BUS 490, ECON 401, MKTG 401, *or* AGB 563 to satisfy one of the following four-unit GSB electives.

As a policy, MBA students will not be permitted to take more than two classes at the 400 level.

Fall	16
GSB Electives (16)	
Winter	16
GSB Electives (16)	
Spring	16
GSB 562 Business Strategy and Policy (4)	
GSB Electives (12)	
-	96

<sup>1</sup> Based on individual's knowledge in quantitative analysis, the MBA adviser may require students to take GSB 502, Foundations for Quantitative Analysis, as a prerequisite for GSB 512.

# Curriculum for Master of Business Administration with Specialization in Agribusiness

This specialization is offered in conjunction with the Agribusiness Department, School of Agriculture. It requires the completion of six graduate courses taught by the Agribusiness Department. These courses are taken in lieu of electives in the MBA program. Satisfactory completion of a comprehensive examination is required. The MBA Agribusiness Specialization is designed for those interested in agribusiness management careers. Graduates will be prepared for large farm and ranch management as well as for positions in supporting agribusiness industries such as commodity marketing or food Processing.

#### FIRST YEAR

Students are encouraged to challenge first-year GSB courses based on their previous work.

<ul> <li>GSB 511 Financial Accounting (4)</li> <li><sup>1</sup> GSB 512 Quantitative Analysis (4)</li> <li>GSB 513 Organization Behavior (4)</li> <li>AGB 514 Agribusiness Managerial Leadership and</li> <li>Communication (4)</li> <li>Winter</li></ul>	Fall	16
<ul> <li><sup>1</sup> GSB 512 Quantitative Analysis (4) GSB 513 Organization Behavior (4) AGB 514 Agribusiness Managerial Leadership and Communication (4)</li> <li>Winter</li></ul>	GSB 511 Financial Accounting (4)	
GSB 513 Organization Behavior (4)AGB 514 Agribusiness Managerial Leadership and Communication (4)WinterWinterGSB 521 Managerial Accounting (4)GSB 522 Management Science (4)GSB 523 Managerial Economics (4)GSB 524 Marketing Management (4)SpringSpringGSB 531 Managerial Finance (4)GSB 532 Information Systems (4)GSB 533 Aggregate Economics (4)	1 GSB 512 Quantitative Analysis (4)	
AGB 514 Agribusiness Managerial Leadership and Communication (4) 16 GSB 521 Managerial Accounting (4) GSB 522 Management Science (4) GSB 523 Managerial Economics (4) GSB 524 Marketing Management (4) Spring	GSB 513 Organization Behavior (4)	
Communication (4)16Winter16GSB 521 Managerial Accounting (4)16GSB 522 Management Science (4)16GSB 523 Managerial Economics (4)16GSB 524 Marketing Management (4)16Spring16GSB 531 Managerial Finance (4)16GSB 532 Information Systems (4)68GSB 533 Aggregate Economics (4)16	AGB 514 Agribusiness Managerial Leadership and	
Winter16GSB 521 Managerial Accounting (4)16GSB 522 Management Science (4)16GSB 523 Managerial Economics (4)16GSB 524 Marketing Management (4)16Spring16GSB 531 Managerial Finance (4)16GSB 532 Information Systems (4)16GSB 533 Aggregate Economics (4)16	Communication (4)	
GSB 521 Managerial Accounting (4) GSB 522 Management Science (4) GSB 523 Managerial Economics (4) GSB 524 Marketing Management (4) Spring	Winter	16
GSB 522 Management Science (4) GSB 523 Managerial Economics (4) GSB 524 Marketing Management (4) Spring	GSB 521 Managerial Accounting (4)	
GSB 523 Managerial Economics (4) GSB 524 Marketing Management (4) Spring	GSB 522 Management Science (4)	
GSB 524 Marketing Management (4) Spring	GSB 523 Managerial Economics (4)	
Spring	GSB 524 Marketing Management (4)	
GSB 531 Managerial Finance (4) GSB 532 Information Systems (4) GSB 533 Aggregate Economics (4)	Spring	16
GSB 532 Information Systems (4) GSB 533 Aggregate Economics (4)	GSB 531 Managerial Finance (4)	
GSB 533 Aggregate Economics (4)	GSB 532 Information Systems (4)	
	GSB 533 Aggregate Economics (4)	
GSB 534 Production and Operations Mgmt. (4)	GSB 534 Production and Operations Mgmt. (4)	

## Second Year

Students must select from: GSB 578, GSB 587, BUS 490, ECON 401, MKTG 401, *or* AGB 563 to satisfy one of the following four-unit GSB electives.

As a policy, students will not be permitted to take more than two classes at the 400-level.

Fall GSB 514 Business, Government and Society (4) AGB 543 Ag. Policy and Program Analysis (4) GSB electives (8)	16
Winter	16
AGB 554 Managing Price Risk in Agribusiness (4)	
AG 539 Graduate Internship in Agriculture (4)	
AGB 555 Technological and Economic Change in	
Agribusiness (4)	
GSB elective (4)	
Spring	16
GSB 562 Business Strategy and Policy (4)	
AGB 563 International Agricultural Trade and	
Market Development (4)	
GSB electives (8)	
-	96

<sup>1</sup> Based on individual's knowledge in quantitative analysis, the MBA adviser may require students to take GSB 502, Foundations for Quantitative Analysis, as a prerequisite for GSB 512.

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Graduate Studies in Business (GSB).

## JOINT M.B.A./M.S. ENGINEERING, SPECIALIZATION IN ENGINEERING MANAGEMENT

The joint Engineering Management specialization is an interdisciplinary program linking the MBA and MS in Engineering degree programs. It is a cooperative effort between the Schools of Business and Engineering. Students are required to have a prerequisite degree in engineering, computer science, or a similar technical degree to be admitted to both the School of Engineering and the School of Business, and to be enrolled in both degree programs. Successful participants will be awarded both MBA and MS in Engineering degrees each with a specialization in Engineering Management.

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

Units

1 - 10

## **FIRST YEAR**

r 11

Students are encouraged to challenge any of the following first-year GSB courses based on previous work.

Fall	12-10
GSB 511 Financial Accounting (4)	
GSB 513 Organization Behavior (4)	
GSB 514 Business, Government and Society (4)	
<sup>1</sup> Technical Elective (3-4)	
Winter	16
GSB 521 Managerial Accounting (4)	
GSB 522 Management Science (4)	
GSB 523 Managerial Economics (4)	
IE 557 Technological Assessment and Planning (4)	
Spring	16
GSB 531 Managerial Finance (4)	
GSB 532 Information Systems (4)	
GSB 533 Aggregate Economics (4)	
GSB 534 Production and Operations Mgmt. (4)	
Summer	8
GSB 598 Graduate Internship in Business (8)	

#### SECOND YEAR

Students must select from: GSB 578, GSB 587, BUS 490, ECON 401, MKTG 401, *or* AGB 563 to satisfy one of the following four-unit GSB electives.

As a policy, students will not be permitted to take more than two classes at the 400 level.

Fall	13-15
IE 545 Advanced Topics in Simulation (3)	
GSB elective or technical elective (3-4)	
GSB elective (4)	
Technical elective (3-4)	

Winter	16
GSB 524 Marketing Management (4)	
IE 555 Computer Integrated Manufacturing (4)	
IE 558 Engineering Decision Making (4)	
GSB elective (4)	
Spring	15-16
GSB 562 Business Strategy and Policy (4)	
IE 556 Technological Project Management (4)	
GSB elective (4)	
Technical elective (3-4)	
<sup>2</sup> Summer	8
GSB electives (8)	
Minimum total units required	107

<sup>1</sup> Technical electives to be selected with School of Engineering adviser's approval. GSB electives to be selected with School of Business adviser's approval.

<sup>2</sup> May be taken earlier if other courses waived.

## ACCOUNTING DEPARTMENT

Business Bldg. (03), Room 306 (805) 756-1384

## Faculty

#### Department Head, position vacant

James A. Anderson Charles T. Andrews Mary Beth Armstrong Lawrence E. Baur, Jr. William C. Boynton Janice L. Carr Douglas C. Cerf M. Zafar Iqbal Earl C. Keller Charles R. (Tad) Miller David E. Nutter John C. Robison

## Programs

B.S. Business Administration with Concentration in: Accounting

The primary objectives of the Accounting Department are to: 1) provide students within the School of Business with a knowledge of the accounting information and systems relevant to business decisions; 2) prepare students for careers as professional accountants; and 3) provide a service to other students from other schools within the university with an introduction to accounting and its uses.

## CURRICULAR CONCENTRATION

#### Accounting

This concentration prepares students for accounting careers in public accounting, industry, and government. Students in the advanced stages of the program may gain practical experience by participating in the university's Cooperative Education program or obtaining an internship position.

The concentration builds on the principles of financial and managerial accounting coursework (ACTG 221, ACTG 222, and ACTG 301) included in the core program of the business major. The concentration requires 28 additional units of accounting study consisting of 20 required units and 8 units of accounting electives. The elective courses afford students an opportunity to pursue further study in auditing, cost accounting, micro-computer applications, and taxation.

## **CURRICULUM FOR B.S. BUSINESS ADMINISTRATION**

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

All of the courses listed below except the concentrations and electives are common to the Business Administration Department, Management Department, and Accounting Department curricula required for the B.S. in Business Administration.

## Freshman

BUS 101 The Business Enterprise	4
ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
CSC 120 Principles of Business Data Processing	
(F.1.)	4
ENGL 114 Writing: Exposition (A.1.)	4
ENGL 125/PHIL 125/SPC 125 Critical	
Thinking (A.2.)	3
MATH 124 Finite Mathematics (B.2.)	3
MATH 221 Calculus for Business and Economics	
(B.2.)	4
PSY 201/PSY 202 General Psychology (E.1.)	3
SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	
(A.3.)	3
BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC	
100 elective (E.2.)	2
Critical reading elective (C.1.)	3
Life and physical science electives (one each, one	
with lab) (B.1.)	9
Technology elective (F.2.)	2

## Sophomore

	ACTC 221 Financial Accounting	Δ
	ACTG 222 Financial Accounting II	
	BUS 207 Business Law	4
	FCON 221 Microeconomics	4
	FCON 222 Macroeconomics (D.3.)	4
	ENGL 215 Writing: Argumentation or	· r
	ENGL 218 Professional Writing: Argumentation	
	and Reports (A 4)	4
	HIST 204 History of American Ideals and	т
	Institutions (D1)	3
	PHIL 230/PHIL 231 Philosophical Classics (C1)	3
	POLS 210 American and California Government	5
	(D1)	3
	STAT 251 Statistical Inference for Management I	
	(B.2.)	4
	STAT 252 Statistical Inference for Management II	4
1	Critical reading elective (C.1.)	3
1	Fine and performing arts elective (C.2.)	3
1	Literature, philosophy, arts elective (300–400	-
	level) (C.3.)	3
	Electives and courses to complete major	1
	—	F 1
		51

#### Junior

ACTG 301 Managerial Accounting	4
ECON 337 Money, Banking and Credit	4
FIN 342 Financial Management	4
MGT 301 Production and Operations Management	4
MGT 312 Organization and Management Theory	4
MGT 317 Organizational Behavior	4
MIS 321 Management Information Systems	4
MKTG 301 Principles of Marketing	4
ANT/ECON/GEOG/POLS/SOC elective (300-400	
level) (D.4.b.)	3
Electives and courses to complete major	16
-	51
	ACTG 301 Managerial Accounting ECON 337 Money, Banking and Credit FIN 342 Financial Management MGT 301 Production and Operations Management MGT 312 Organization and Management Theory MGT 317 Organizational Behavior MIS 321 Management Information Systems MKTG 301 Principles of Marketing ANT/ECON/GEOG/POLS/SOC elective (300–400 level) (D.4.b.) Electives and courses to complete major

#### Senior

	ACTG 461 Senior Project ACTG 462 Senior Project BUS 404 Governmental and Social Influences on	1 3
	Business	4
	MGT 406 Multinational Business Operations	. 4
	MGT 414 Business Strategy and Policy Seminar	4
	HIST 315 Modern World History (D.2.)	3
1	Arts and humanities elective (Area C)	3
	Electives and courses to complete major	27
	-	49

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Accounting, Business, Economics, Financial Management, Management, Marketing and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 86 of this catalog.

## **Accounting Concentration**

#### lunior

ACTG 304 Tax Accounting	4
ACTG 321 Intermediate Accounting I	4
ACTG 322 Intermediate Accounting II	4
ACTG 323 Intermediate Accounting III	4
Senior	
ACTG 446 Auditing	4
Adviser approved electives	8
· · · · · · · · · · · · · · · · · · ·	

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## **B.S. BUSINESS ADMINISTRATION**

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

	Units
MAIOR COURSES	60
ACTG 221, 222, 301, 461, 462	
BUS 101, 207, 404	
FIN 342	
MGT 301, 312, 317, 406, 414	
MIS 321	
MKTG 301	-
	59
CSC = 120 (F.I.)	
ECON 221, 222 (D.S.), 557 MATH 124 (R.2.) 221 (R.2.)	
STAT 251 (B.2.) 252	
Accounting Concentration (28)	
ACTG 304, 321, 322, 323, 446	
Adviser approved electives (8)	
GENERAL EDUCATION AND BREADTH	
REQUIREMENTS	63
Please see page 86 for selection of General Education a Breadth (G.E.B.) electives. At least 12 units must be at 300–400 level. Additional GEB courses are listed under jor, Support, Concentration, General Education and Bre and Electives.	nd the Ma- adth,
Area A: (14) ENGL 114 (A.1.) ENGL 125/PHIL 125/SPC 125 (A.2.) SPC 201/SPC 202 (A.3.) ENGL 215/ENGL 218 (A.4.)	
Area B: (9) Physical and life sciences electives (one with lab) (B.1.)	
<ul> <li>Area C: (18)</li> <li>PHIL 230/PHIL 231 (C.1.)</li> <li>Critical reading electives (C.1.)</li> <li>Fine and performing arts elective (C.2.)</li> <li>Literature, philosophy, arts elective (300–400 level) (C.3.)</li> <li>Arts and humanities elective (Area C)</li> </ul>	
Area D: (15) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.)	
Area E: (5) PSY 201/PSY 202 (E.1.) BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100 elective (E.2.)	
Area F: (2) Technology elective (F.2.) ELECTIVES	16
_	198

## **BUSINESS ADMINISTRATION DEPARTMENT**

Business Bldg. (03), Room 310 (805) 756-2822

## Faculty

## Department Head, John C. Rogers

Dan Bertozzi, Jr.
Norm A. Borin
Lee B. Burgunder
James M. Buxbaum
Raymond Cross
Jeffrey E. Danes
John Dobson
D. Jan Duffy
R. Krishnan

John R. Lindvall Lynn E. Metcalf Walter W. Perlick Kenneth D. Riener Luc A. Soenen Teresa Swartz Harry S. Watkins Alan M. Weatherford

## Programs

B.S. Business Administration with Concentrations in:

Financial Management Marketing Management

The department offers an undergraduate program leading to the Bachelor of Science degree in Business Administration with concentrations available in Financial Management and Marketing Management.<sup>1</sup>

The objective of the Business Administration Department is to prepare graduates for rewarding careers in the fields of marketing and/or finance. Within the concentrations there is sufficient flexibility to allow each student the opportunity to develop proficiency in subject matter uniquely suited for the student's occupational goals.

The department provides service courses to many departments of the university, notably in Business Law and Public Policy. The department also provides major staff support for the Master's degree program in Business Administration. See Master of Business Administration for details of this program.

#### CURRICULAR CONCENTRATIONS

#### **Financial Management**

This concentration provides both depth of exposure in finance as well as breadth of exposure to related fields for students interested in careers in finance. Students are exposed to specialized coursework in corporate finance, investments, real estate, and financial markets. In addition, coursework in computer science, management information systems, accounting, and economics is encouraged to provide broader familiarity with these important "tool" areas of finance. Successful graduates are much in demand for positions in banking, corporate financial planning, real estate, and many other business areas.

#### **Marketing Management**

This concentration emphasizes coursework in all of the many areas traditionally covered in the marketing function. These areas include marketing research, sales management, physical distribution, promotion, buyer behavior, and services marketing. Students must take the majority of their elective courses from Marketing. Graduates of this concentration are in demand for positions in marketing intelligence, research, advertising, and sales management.

<sup>&</sup>lt;sup>1</sup> The Agricultural Business Major is distinguished from a major in Business Administration. Agricultural Business emphasizes training in management for careers in agriculture. The program focuses on preparation of students for careers in firms that supply inputs and services to agricultural production enterprises and by those engaged in the processing, marketing, financing, distribution, and sales of agricultural products. In addition, there is a concentration available in the management of farms and ranches as a business enterprise. Thirty units of coursework in production agriculture are required.

## **CURRICULUM FOR B.S. BUSINESS ADMINISTRATION**

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

All of the courses listed below except the concentrations and electives are common to the Business Administration Department, Management Department, and Accounting Department curricula required for the B.S. in Business Administration.

#### Freshman

BUS 101 The Business Enterprise	4
ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
CSC 120 Principles of Business Data Processing	
(F.1.)	4
ENGL 114 Writing: Exposition (A.1.)	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking	
(A.2.)	3
MATH 124 Finite Mathematics (B.2.)	3
MATH 221 Calculus for Business and Economics	
(B.2.)	4
PSY 201/PSY 202 General Psychology (E.1.)	3
SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	
(A.3.)	3
BIO 220/FSN 210//HE 210/PE 250/PSY 304/REC	
100 elective (E.2.)	2
Critical reading elective (C.1.)	3
Life and physical science electives (one each, one	
with lab) (B.1.)	9
Technology elective (F.2.)	2
	47

## Sophomore

BUS 207 Business Law	4
ACTG 221 Financial Accounting I	4
ACTG 222 Financial Accounting II	4
ECON 221 Microeconomics	4
ECON 222 Macroeconomics (D.3.)	4
ENGL 215 Writing: Argumentation or	
ENGL 218 Professional Writing: Argumentation	
and Reports (A 4)	4
HIST 204 History of American Ideals and	•
Institutions (D1)	3
PHIL 230/PHIL 231 Philosophical Classics (C1)	3
POLS 210 American and California Government	
(D1)	3
STAT 251 Statistical Inference for Mgmt 1 (B.2.)	4
STAT 252 Statistical Inference for Mgmt II	4
Critical roading elective (C1)	2
Fine and performing arts elective (C.1.)	2
Literature philosophy arts elective (C.2.)	3
Literature, philosophy, and elective (300–400	2
rever) (C.S.)	د ۱
Electives and courses to complete major	
	51

#### Junior

	ACTG 301 Managerial Accounting	4
	ECON 337 Money, Banking, and Credit	4
	FIN 342 Financial Management	4
	MGT 301 Production and Operations Management	4
	MGT 312 Organization and Management Theory	4
	MGT 317 Organizational Behavior	4
	MIS 321 Management Information Systems	4
	MKTG 301 Principles of Marketing	4
	HIST 315 Modern World History (D.2.)	3
1	ANT/ECON/GEOG/POLS/SOC elective (300-400	
	level) (D.4.b.)	3
	Electives and courses to complete major	12
	-	50

#### Senior

	BUS 404 Government and Social Influences on	А
	BUS 461 Senior Project	
	BUS 462 Senior Project	2
	MGT 406 Multinational Operation	4
	MGT 414 Business Strategy and Policy Seminar	4
1	Arts and humanities elective (Area C)	3
	Electives and courses to complete major	31
	-	50

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See COURSES OF INSTRUCTION section of this catalog for descriptions of courses of Accounting Business, Economics, Financial Management, Management, Marketing and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 86 of this catalog.

## **CONCENTRATIONS** (select one)

#### **Financial Management Concentration**

ACTG 321 Intermediate Accounting I	4
FIN 411 Securities Analysis and Portfolio	
Management	4
FIN 388 Financial Management II	4
FIN 389 Financial Management III	4
Adviser approved electives	12
-	28
Marketing Management Concentration	

4
4
12
0
4
28

## **B.S. BUSINESS ADMINISTRATION**

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

Units

MAJOR COURSES 60 ACTG 221, 222, 301 BUS 101, 207, 404, 461, 462 **FIN 342** MGT 301, 312, 317, 406, 414 **MIS 321 MKTG 301** SUPPORT COURSES 59 CSC 120 (F.1.) ECON 221, 222 (D.3.), 337 MATH 124 (B.2.), 221 (B.2.) STAT 251 (B.2.), 252 Concentration (select one): Financial Management Concentration (28) ACTG 321 FIN 411, 388, 389 Adviser approved electives (12) Marketing Management Concentration (28) MKTG 302, 303, 406 Electives (12) selected from: MKTG 305, 401, 402, 404, 405, 412, 450, 470 Adviser approved electives (4) **GENERAL EDUCATION AND BREADTH** REQUIREMENTS..... 63

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

Area A: (14) ENGL 114 (A.1.) ENGL 125/PHIL 125/SPC 125 (A.2.) SPC 201/SPC 202 (A.3.) ENGL 215/ENGL 218 (A.4.) Area B: (9) Physical and life sciences (one with lab) (B.1.) Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300-400 level) (C.3.) Arts and humanities elective (Area C) Area D: (15) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.) Area E: (5) PSY 201/PSY 202 (E.1.) BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100 elective (E.2.) Area F: (2) Technology elective (F.2.)

## ECONOMICS DEPARTMENT

Business Bldg. (03), Room 314 (805) 756-2783

## Faculty

## Department Head, Artemis Papakyriazis

George L. Beardsley, Jr. George M. Eastham Timothy W. Kersten Michael L. Marlow Panagiotis Papakyriazis Walter E. Rice Alden F. Shiers Fuad H. Tellew Daniel J. Villegas Daniel P. Williamson

## Programs

B.S. Economics with Concentrations in: Adviser Approved Electives Business and Industrial Economics International Trade and Development Quantitative Economics

#### Minor: Economics

The Economics Department has two broad purposes: it serves all schools of the campus by offering courses which will help students to understand the overall functioning of the American economy; and secondly, it offers an undergraduate program leading to the Bachelor of Science degree in Economics. The department also offers an Economics Minor.

The Economics Department supports the concept of international education and encourages its students to investigate opportunities for overseas study.

The Economics degree program will prepare students for employment in the private and public sectors of both the domestic and international levels as economists, analysts and general managers. The teaching of economics in high school is another occupational field for the economist. Finally, the program will prepare students to undertake graduate study in economics, law, business administration and related fields in the social sciences.

#### CURRICULAR CONCENTRATIONS

Economics majors may take any concentration offered by the School of Business or the Political Science or Social Sciences departments in lieu of the economics concentrations described below, provided appropriate prerequisites are satisfied. Students may also choose to select Adviser Approved Electives in place of a concentration.

## **Business and Industrial Economics**

The Business and Industrial Economics concentration, designed for those students who intend to seek business and industrial application of the economics discipline, provides a balanced program of economic and business theory and application.

#### International Trade and Development

This concentration provides a core of trade and development theory, plus study in ancillary elective fields that meet the occupational needs of students. It is designed for those students interested in working in an international area in the public or private sectors.

#### **Quantitative Economics**

This concentration will offer a combination of mathematics, statistics, and quantitative economics courses. As a unit they are designed to provide the graduate with a background adequate for employment in a variety of business and other situations where the economic decision makers rely on the precision of the mathematician's tools, or for entrance to graduate study in such fields as economics, business administration, or operations research.

## **Adviser Approved Electives**

Students have the option of choosing one of the above mentioned concentrations or 24 units of adviser approved electives. Students can study the interrelationships among different disciplines. The world is rapidly changing and the technological and sociological prototypes might not be applicable any longer. Evolution in science and technology is changing the social and economic structure and the student is encouraged to explore these changes. Students select courses according to individual talents and interests.

## **CURRICULUM FOR B.S. ECONOMICS**

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

## Freshman

	ACTG 221 Financial Accounting I	4
	ACTG 222 Financial Accounting II	4
	ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
	CSC 120 Principles of Business Data Processing	•
	(F1)	4
	ENICI 114 Writing Expection (A 1)	
	ENGL 114 Writing: Exposition (A.T.)	4
	ENGL 125/PHIL 125/SPC 125 Critical Thinking	
	(A.2.)	3
	MATH 124 Finite Mathematics	3
	STAT 251 Statistical Inference for Management I	
	(B.2.)	4
	POLS 210 American and California Government	•
	(D1)	3
		J
	BIO 220/FSN 210//FIE 210/PE 250/PSY 304/KEC	_
	100 elective (E.2.)	2
1	Critical reading elective (C.1.)	3
1	Life and physical Science electives (one each, one	
	with lab) (B.1.)	9
1	Technology elective (F.2.)	2
	Flective	2
		51

## Sophomore

	BUS 207 Business Law	4
	STAT 252 Statistical Inference for Management II	4
	ECON 221 Microeconomics	4
	ECON 222 Macroeconomics (D.3.)	4
	ENGL 215 Writing: Argumentation or	
	ENGL 218 Professional Writing: Argumentation	
	and Reports (A.4.)	4
	HIST 204 History of American Ideals and	
	Institutions (D.1.)	3
	MATH 221 Calculus for Business and Economics	
	(B.2.)	4
	MATH 222 Math Analysis for Economics and	
	Business (B.2.)	4
	PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
	PSY 201/PSY 202 General Psychology (E.1.)	3
	SPC 201 Public Speaking or	
	SPC 202 Principles of Speech Communication	
	(A.3.)	3
	Arts and humanities elective (Area C)	3
	Critical reading elective (C.1.)	3
	Fine and performing arts elective (C.2.)	3
,	Literature, philosophy, arts electives (300–400	•
	level) (C.3.)	3
	_	52

#### Junior

ECON 311, ECON 312 Intermediate	
Microeconomics and	
ECON 313 Intermediate Macroeconomics	4,4,4
ECON 337 Money, Banking and Credit	4

	ECON 338 Stochastic Modeling in Decision Making Systems	4
	GEOG 315 Geography of Resource Utilization	3
1	HIST 315 Modern World History (D.2.) ANT/BUS/GEOG/POLS/SOC elective (300–400	3
	level) (D.4.b.)	3
	Restricted electives to be selected from: ECON 105, 301, 304, 306, 323, 324, 325, 339, 401, 402,	-
	403, 410, 413, 431, 432, 433, 434	12
	Electives and courses to complete major or	
	concentration	7
	-	48
Se	enior	
	ECON 314 Monetary and Fiscal Policy	4
	ECON 417 Development of Economic Analysis	3
	ECON 461 Senior Project	2
	ECON 462 Senior Project	2
	ECON 463 Undergraduate Seminar	2
	Electives and courses to complete major or	
	concentration	34
	-	47

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 86 of this catalog.

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#### **CONCENTRATIONS/ADVISER APPROVED ELECTIVES** (select one)

## **Business and Industrial Economics Concentration**

ACTG 301 Managerial Accounting	4
ECON 301 Introduction to Managerial Economics	4
ECON 306 Applied Forecasting	4
ECON 403 Industrial Organization	4
ECON 413 Labor Economics	4
MGT 312 Organization and Management Theory or	
MIS 318 Modeling Systems	4
-	
I to mathematication of Development Constants	24
International Trade and Development Concentratio	n
ECON 325 Underdevelopment and Economic	
Growth	3
ECON 401 International Trade	4
ECON 402 International Monetary Economics	4
Foreign language	4
Adviser approved electives	9
To be selected from upper division courses in	
ECON, FIN, MGT, MKTG, or any other discipline	
with approval of adviser.	
·	24
Quantitative Economics Concentration	
ECON 306 Applied Forecasting	4
ECON 339 Econometrics	4
Adviser approved electives	16
-	24
	<u> </u>
Advisor Approved Floctives	

#### Adviser Approved Electives

Students s	select	courses	with	adviser	approval	24

## **B.S. ECONOMICS**

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

	Units
MAJOR COURSES	70
ACTG 221, 222	
ECON 221, 222 (D.3.), 311, 312, 313, 314, 337,	
338, 417, 461, 462, 463	
MATH 221 (B.2.), 222 (B.2.)	
12 units of restricted electives to be selected from:	
ECON 105, 301, 304, 306, 323, 324, 325, 339,	
401, 402, 403, 410, 413, 431, 432 433, 434	
SUPPORT COURSES	43
BUS 207	
CSC 120 (F.1.)	
GEOG 315	
MATH 124	
STAT 251 (B.2.), 252	

Concentration or adviser approved electives (select one):

Business and Industrial Economics Concentration (24) ACTG 301

ECON 301, 306, 403, 413 MGT 312/MIS 318

International Trade and Development Concentration (24) ECON 325, 401, 402 Foreign language (4) Adviser approved electives (9)

Quantitative Economics Concentration (24) ECON 306, 339 Adviser approved electives (16)

Adviser approved electives (24)

## **GENERAL EDUCATION AND BREADTH** REQUIREMENTS.....

63

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300-400 level. Additional GEB courses are listed under Major and Support courses.

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

Area B: (9)

Physical and life sciences elective (one with lab)

Area C: (18)

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

Arts and humanities elective (Area C)

Area D: (15) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.)
Area E: (5) PSY 201/PSY 202 (E.1.) BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100 elective (E.2.)
Area F: (2) Technology elective (F.2.) ELECTIVES

#### CURRICULUM FOR ECONOMICS MINOR

This minor is designed to give students from other majors a general competency in economics. Its principle intent is to help meet the growing demand for secondary school teachers of economics. Students completing the minor will satisfy the state requirements for a supplementary authorization to teach economics in California high schools. The minor consists of 25-27 units of coursework, 19 of which are of required courses. For more information, contact the Economics Department.

19 Required courses..... ECON 105 Personal and Consumer Economics (3) ECON 211 Principles of Economics (D.3.) (3) ECON 212 Principles of Economics (3) ECON 304 Comparative Economic Systems (D.4.b.) (3) ECON 324 American Economic History (3) ECON 337 Money, Banking and Credit (4) Approved electives (choose any two courses) ...... 6 ECON 323 European Economic History (3) ECON 325 Underdevelopment and Economic Growth (D.4.b.) (3) ECON 431 Environmental Economics (4) ECON 432 Economics of Energy and Resources (4) ECON 401 International Trade (4) ECON 413 Labor Economics (4)

25

Units

See COURSES OF INSTRUCTIONS section of this catalog for descriptions of courses in Economics and other subjects.

# MANAGEMENT DEPARTMENT

Business Bldg. (03), Room 318 (805) 756-1301

## Faculty

## Department Head, David A. Peach

Joseph Biggs Rebecca Ellis Barry Floyd Robert Grant Ray M. Haynes Eldon Y. Li Vijaya Narapareddy Rolf E. Rogers James Sena Abraham B. Shani Michael Stebbins

## Programs

B.S. Business Administration with Concentrations in: Human Resources Management International Business Management Management Management Information Systems Production and Operations Management

The objectives of the Management Department are to provide knowledge and skills of modern management theory and practice through the study of subjects critical to management performance (including general management, human resources management, international management, management information systems, and production and operations management); to develop in the student knowledge and skills of a second area or function to facilitate initial employment and subsequent career development; to help the student to acquire an appreciation of cultural, economic, political and technological trends which affect the role of managers in contemporary society; to help professionally oriented students use theories, concepts, research findings, problem-solving techniques, and analytical skills in management situations; and to provide a broad background and generalist viewpoint by encouraging study of individual courses in several knowledge and skill areas (including labor, economics, and social and political science).

The degree awarded is the Bachelor of Science in Business Administration with a concentration in Human Resources Management, International Business Management, Management, Management Information Systems, or Production and Operations Management.

## CURRICULAR CONCENTRATIONS

#### **Human Resources Management**

The two areas of interest within this concentration relate to labor management relations and personnel management. Students learn how to perform the functions of recruitment, selection, development, compensation, contract negotiations, and administration.

#### **International Business Management**

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

## Management

This concentration stresses the managerial process and decision making fundamental to all levels and functional areas of the business and industrial enterprise. The management program offers both quantitative and general management emphases to satisfy the individual needs of the student relative to business or academic ambitions.

#### **Management Information Systems**

This concentration is designed to prepare students for careers involving the analysis, design, and operation of business information systems within industry and government. It provides training and practice in administrative data processing and in the analysis of managerial information requirements.

#### **Production and Operations Management**

This concentration prepares students for careers in production and operations management with business or service organizations. It provides training in purchasing; cost, quality, and inventory control; materials planning; and other production or operations management functions.

# CURRICULUM FOR B.S. BUSINESS ADMINISTRATION

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

All of the courses listed below except the concentrations and electives are common to the Business Administration Department, Management Department, and Accounting Department curricula required for the B.S. in Business Administration.

## Freshman

BUS 101 The Business Enterprise	4
ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
CSC 120 Principles of Business Data Processing	
(F.1.)	4
ENGL 114 Writing: Exposition (A.1.)	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking	
(A.2.)	3
MATH 124 Finite Mathematics (B.2.)	3
MATH 221 Calculus for Business and Economics	
(B.2.)	4
PSY 201/PSY 202 General Psychology (E.1.)	3
SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	
(A.3.)	3
BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC	
100 elective (E.2.)	2
Critical reading elective (C.1.)	3
Life and physical science electives (one each, one	
with lab) (B.1.)	9
Technology elective (F.2.)	2
-	47

## Sophomore

ACTG 221 Financial Accounting L.	4
ACTG 222 Financial Accounting II	4
BLIS 207 Business Law	4
FCON 221 Microeconomics	4
FCON 222 Macroeconomics (D 3)	4
ENGL 215 Writing: Argumentation or	•
ENGL 218 Professional Writing: Argumentation	
and Reports (A.4.)	4
HIST 204 History of American Ideals and	
Institutions (D.1.)	3
PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
POLS 210 American and California Government	
(D.1.)	3
STAT 251 Statistical Inference for Mgmt. I (B.2.)	4
STAT 252 Statistical Inference for Mgmt. II	4
Critical reading elective (C.1.)	3
Fine and performing arts elective (C.2.)	3
Literature, philosophy, arts elective (300-400	
level) (C.3.)	3
	50

#### Junior

		50
	Electives and courses to complete major	12
	level) (D.4.b.)	3
1	ANT/ECON/GEOG/POLS/SOC elective (300–400	
	HIST 315 Modern World History (D.2.)	3
	MKTG 301 Principles of Marketing	4
	MIS 321 Management Information Systems	4
	MGT 317 Organizational Behavior	4
	MGT 312 Organization and Management Theory	4
	MGT 301 Production and Operations Management	4
	FIN 342 Financial Management	4
	ECON 337 Money, Banking and Credit	4
	ACTG 301 Managerial Accounting	4

## Senior

BUS 404 Government and Social Influences on	
Business.	4
MGT 406 Multinational Business Operations	4
MGT 414 Business Strategy and Policy Seminar	4
MGT 461, MGT 462 Senior Project	2,2
Arts and humanities elective (Area C)	3
Electives and courses to complete major	
depending on concentration	32
	51
	198

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Accounting, Business, Economics, Financial Management, Management, Marketing and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300–400 level). Please see page 86 of this catalog.

## **CONCENTRATIONS** (select one)

## Human Resources Management Concentration

MGT 310 History of Management, Labor and	
Capitalism in the U.S	4
MGT 314 Human Resources Management	4
MGT 410 Compensation	4
MGT 415 Advanced Personnel Management	4
Adviser approved electives	16
	32

#### **International Business Management Concentration**

4
4
4
4
4
4
7

63

#### Management Concentration

MGT 314 Human Resources Management	4
MGT 331 Organization Design and Analysis	4
MGT 332 International Cross Cultural Management	4
MGT 488 Small Business Administration	4
Adviser approved electives	15

31

Units

#### **Management Information Systems Concentration**

CSC 118 Fundamentals of Computer Science I	4
CSC 218 Fundamentals of Computer Science II	3
CSC 203 COBOL Programming	3
CSC 345 Data Structures	3
MGT 314 Human Resources Management	4
MIS 412 Information Management and Database	
Systems	4
MIS 422 Information Systems Analysis & Design	4
MIS 432 Information Systems Design and	
Implementation	4
Adviser approved electives	8
-	37

#### **Production and Operations Management Concentration**

ACTG 402 Advanced Cost Accounting	4
MGT 314 Human Resources Management	4
MGT 440 Service Operations Management	4
MGT 441 Operations Planning and Control	4
MGT 442 Purchasing and Materials Management	4
MGT 445 Advanced Operations Management	4
MGT 487 Seminar in Quality Management	4
Adviser approved electives	9
-	37

## **B.S. BUSINESS ADMINISTRATION**

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

MAJOR COURSES ACTG 221, 222, 301 BUS 101, 207, 404	60
FIN 342 MGT 301, 312, 317, 406, 414, 461, 462	
MIS 321 MKTG 301 SUPPORT COURSES	68
CSC 120 (F.1.) ECON 221, 222 (D.3.), 337 MATH 124 (B.2.), 221 (B.2.)	
STAT 251 (B.2.), 252 Concentration (select one:) Human Resources Management Conc. (32)	
Adviser approved electives (16) International Business Management Conc. (31)	
ECON 402/FIN 430 MGT 332, 314, 489 MKTG 401 Adviser approved electives (7)	

Management Concentration (31)
MGT 314, 331, 332, 488
Adviser approved electives (15)
Management Information Systems Concentration
(37)
CSC 118, 218, 203, 345
MGT 314
MIS 412, 422, 432
Adviser approved electives (8)
Production and Operations Management
Concentration (37)
ACTG 402
MGT 314, 440, 441, 442, 445, 487
Adviser approved electives (9)
GENERAL EDUCATION AND BREADTH
REQUIREMENTS

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level.

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

Area B: (9) Physical and life sciences electives (one with lab) (B.1.)

Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300–400 level) (C.3.) Arts and humanities elective (Area C)

Area D: (15) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.)

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

Area F: (2)	
Technology elective (F.2.)	
ELECTIVES	7-13
-	198





# **School of Engineering**

## **DEGREE PROGRAMS**

- B.S. Aeronautical Engineering
  - Aeronautics Concentrations

Astronautics Concentration

- **B.S. Civil Engineering**
- **B.S.** Computer Engineering
- **B.S.** Computer Science
- **B.S. Electrical Engineering**
- **B.S. Electronic Engineering**
- B.S. Electronic Engineering Technology
- **B.S. Engineering Science**
- B.S. Engineering Technology

Mechanical Technology Concentration

- **B.S. Environmental Engineering**
- **B.S. Industrial Engineering**

Manufacturing Concentration

Systems Integration Concentration

- **B.S.** Materials Engineering
- **B.S.** Mechanical Engineering

General Mechanical Engineering Concentration

Heating, Ventilating, Air Conditioning, and Solar Concentration

Petroleum Concentration

- M.S. Aeronautical Engineering
- M.S. Civil and Environmental Engineering
- M.S. Computer Science
- M.S. Electronic and Electrical Engineering Computer Engineering Specialization Electrical Engineering Specialization Electronic Engineering Specialization
- M.S. Engineering

**Biochemical Engineering Specialization** 

Industrial Engineering Specialization

Materials Engineering Specialization

Mechanical Engineering Specialization

M.B.A./M.S. Engineering, Engineering Management Specialization

## MINORS

Computer Science Integrative Technology

## Recommended Community College Preparation for Engineering, Computer Science and Engineering Technology Curricula

Recommended C.C. Preparation in	Qtr.	Qtr.         CAL POLY MAJORS REQUIRING VARIOUS COURSES												
Terms of Cal Poly Courses	Units	Aero	CE	CPE	CSC	EE	EL.	EngrSc	EET	ET	EnvE	IE	ME	MATE
MathematicsMATH 120College Algebra and TrigonometryMATH 131Technical CalculusMATH 132Technical CalculusMATH 133Technical CalculusMATH 133Technical CalculusMATH 141Calculus IMATH 142Calculus IIMATH 143Calculus IIIMATH 143Calculus IIIMATH 206Linear Algebra IMATH 241Calculus IV	5 4 4 4 4 4 4 4 4	X X X X	X X X X	X X X X	X X X X X	x x x x	X X X X	X X X X	X X X X X	X X X X	X X X X	x x x x	X X X X	X X X X
MATH 242 Differential Equations	4	х	Х	Х		X	X	X			Х	х	х	Х
PhysicsPHYS 121College PhysicsPHYS 122College PhysicsPHYS 123College PhysicsPHYS 131General PhysicsPHYS 132General PhysicsPHYS 133General PhysicsPHYS 133General PhysicsPHYS 211Modern Physics	4 4 4 4 4 4	X X X X	X X X	X X X X	X X X	X X X X	X X X X	X X X	x x x	x x x	X X X	x x x	x x x	X X X
Chemistry CHEM 121 General Chemistry CHEM 124 General Chemistry CHEM 125 General Chemistry CHEM 129 General Chemistry	4 4 4 4	х	x x	x	X X	x x	X X	x x	x	x	X X X	x x	X X	X X
Engineering, Computer Science & Supporting Courses Engineering Drafting Digital Computer Programming Manufacturing Processes		2 2 2	0 0 0	0 2 0	0 2 0	2 2 0	2 2 0	2 2 4	2 3 3	2 3 4	0 • 0 0	2 2 4	2 2 5	0 2 4
Strength of Materials	-	6	6	0	0	0	0	6	0	0	5	3	6	6
Engineering Statics and Dynamics Circuits and Electronics (engineering calculus based)	-	6	6 4	6 10	0	6 10	6 10	8	3	7 0	6 4	6 4	6 4	6 4
based) Descriptive Geometry Materials Engineering Surveying	- - - -	0 2 3 0	0 2 4 4	0 0 0 0	0 0 0 0	0 0 3 0	0 0 0 0	0 0 4 0	11 0 0 0	8 2 4 0	0 2 0 0	0 0 0 0	0 2 4 0	0 0 4 0
<i>General Education-Breadth</i> Units vary. See appropriate degree curriculum.														
Maximum Transfer Units	-	105	105	105	105	105	105	105	105	105	105	105	105	105

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## SCHOOL OF ENGINEERING

Engineering Bldg. (13), Room 266 (805) 756-2131

Peter Y. Lee, Dean J. Kent Butler, Associate Dean Daniel W. Walsh, Associate Dean

The School of Engineering offers programs leading to the Bachelor of Science degree in ten engineering disciplines, and in the disciplines of computer science and engineering technology. It also offers programs leading to the Master of Science degree in Aeronautical Engineering, Civil and Environmental Engineering, Computer Science, Electrical and Electronic Engineering, and the Master of Science degree in Engineering with specializations in Biochemical Engineering, Industrial Engineering, Materials Engineering, and Mechanical Engineering.

The School of Engineering (Industrial Engineering Department) and the School of Business offer a joint Engineering Management Specialization, an interdisciplinary program linking the M.B.A. and the M.S. in Engineering degree programs.

Engineering and computer science at Cal Poly are strongly oriented toward preparing students for immediate entry into professional practice upon graduation from one of the bachelor's degree programs. Each student selects a major at entrance and generally takes at least one course in that major each quarter. This early introduction increases motivation to master the mathematics, basic science, and engineering science or computer science which constitute a very important portion of each curriculum.

Cal Poly engineering and computer science graduates are in great demand and find a large variety of challenges awaiting them. They enter professional occupations such as engineering design, computer hardware and software engineering, test and evaluation, systems analysis, modeling and simulation, manufacturing, applied research, development, sales, and field engineering. Graduates pursue careers in a broad crosssection of industry, government agencies, public utilities, marketing groups, and educational institutions.

Engineering degree curricula offered in the School of Engineering leading to the Bachelor of Science degree are: Aeronautical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, Electronic Engineering, Engineering Science, Environmental Engineering, Industrial Engineering, Mechanical Engineering, and Materials Engineering. These engineering disciplines provide the education for entry to the engineering profession and for continued academic work toward advanced degrees. Many of our graduates enter graduate school at Cal Poly or another institution.

The Accreditation Board for Engineering and Technology (ABET) defines engineering as "the profession in which a knowledge of the mathematical and natural sciences gained by study, experience, and practice is applied with judgment to develop ways to utilize economically the materials and forces of nature for the benefit of mankind."

The School of Engineering also offers Bachelor of Science degree programs in Electronic Engineering Technology and Engineering Technology. The Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC/ABET) defines engineering technology as follows: "Engineering technology is part of a continuum extending from the craftsman to the engineer. Located nearest the engineer, it requires the application of scientific and engineering principles in support of engineering activities."

The School of Engineering also offers the Bachelor of Science degree in Computer Science which is designed in accordance with the model computer science curricula of the Computing Sciences Accreditation Board (CSAB). Numerous laboratory and project experiences enhance the practical skills of the graduate. They are equally prepared for the practice of computer science and graduate study.

Attention is directed to the preceding chart on recommended community college preparation for engineering, computer science, and engineering technology major curricula. This chart should be studied and followed in order to prevent loss of time in completing the program after transferring to Cal Poly.

The master's degree programs in the School of Engineering are built upon the excellence of Cal Poly's undergraduate engineering and computer science programs. Industry most often considers the master's degree as an important requirement for the design, development, applied research and analysis occupations in engineering and computer science. The master's degree allows entry into these occupations at higher levels of technical skills and responsibilities.

The M.S. in Computer Science has special provisions for students whose undergraduate degree is in a field other than computer science. Students from a wide variety of fields have earned the M.S. in Computer Science by following a carefully designed remedial curriculum prior to enrolling in graduate courses. A similar program is available in the engineering master's degree program for students whose undergraduate degree is in a closely related field of science.

# Master of Science Degree in Engineering

## with Specializations in:

Biochemical Engineering Industrial Engineering Materials Engineering Mechanical Engineering

## **General Characteristics**

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

- Job-entry education for the more complex areas of engineering, such as research and development, innovative design, systems analysis and design, and engineering management;
- Updating and upgrading opportunities for practicing engineers;
- Graduate preparation for further study in engineering, leading to the Doctor of Engineering or Ph.D. degree;
- A base which 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 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, School of Engineering.

## **Program of Study**

Graduate students must file a formal study plan with their adviser, department, school and university graduate studies office by no later than the end of the quarter in which the 12th unit of approved courses is completed.

The formal program of study must include a minimum of 45 units (at least 24 of which must be at the 500 level) with a specialization in one of the following areas: Biochemical Engineering, Industrial Engineering, Mechanical Engineering, Materials Engineering.

The broad curriculum requirements for the Master of Science degree in Engineering are:

a) a minimum of 24 units in the field of specialization, with at least 18 units at the 500 level;

- b) a minimum of 9 units from an approved list of mathematics, statistics, computer science, or analytic engineering courses, with at least 3 units at the 500 level;
- c) the remaining units taken from a list of approved electives;
- d) at least 24 units of the 45 unit program at the 500 level.

In some specializations, two program options are available for M.S. in Engineering students: a thesis program which requires coursework, a thesis and oral defense of thesis; *or* a nonthesis option which involves additional coursework and a comprehensive examination. The nonthesis option is normally allowed only for those students who have completed an undergraduate senior project or have had significant engineering project experience.

## **Other Graduate Programs**

In addition to the M.S. degree in Engineering, the school also offers several other graduate programs: M.S. Aeronautical Engineering, M.S. Civil and Environmental Engineering, M.S. Computer Science, and M.S. Electronic and Electrical Engineering. Information regarding these programs is listed with the respective department. In addition, the school offers the joint Engineering Management Specialization, an interdisciplinary program linking the M.B.A. and the M.S. Engineering.

Units

## M.S. ENGINEERING, SPECIALIZATION IN BIOCHEMICAL ENGINEERING

Core Courses	9
Analytical methods for engineering (6)	2
Advanced mathematics (3)	
Courses in Specialization	28
Select from the following:	
ME 541 Advanced Thermodynamics (4)	
ME 552 Conductive Heat Transfer (3)	
ME 553 Convective Heat Transfer (3)	
CHEM 572 Advanced Biochemistry (3)	
CHEM 573 Advanced Biochemistry (3)	
ENVE 421 Mass Transfer Operations (3)	
ENGR 581 Biochemical Engineering L (4)	
ENGR 582 Biochemical Engineering II (4)	
ENGR 583 Biochemical Engineering III (4)	
ENGR 599 Design Project (Thesis) (2) (2) (5) or	
9 units of approved technical electives and	
written comprehensive examination	
Approved Electives	8
	45

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## M.S. ENGINEERING, SPECIALIZATION IN INDUSTRIAL ENGINEERING

INDUSTRIAL ENGINEERING	Units
Core Courses	12
Analytical methods for engineering	
Required Courses in Specialization	24
IE 426 Engineering Test Design and Analysis (4)	
IE 544 Advanced Topics in Engineering Economy	
(3)	
IE 541 Advanced Operations Research (3)	
IE 542 Reliability Engineering (3)	
IE 543 Advanced Human Factors (4)	
IE 545 Advanced Topics in Simulation (3)	
IE 555 Computer Integrated Manufacturing (4)	
IE 599 Design Project (Thesis) (2) (2) (5) or	
9 units of approved technical electives and	
written comprehensive examination	
Approved electives	9
	45

# M.S. ENGINEERING, SPECIALIZATION IN MATERIALS ENGINEERING

Core Courses
Analytical methods for engineering (6)
Advanced mathematics (3)
Required Courses in Specialization
To be selected from the following:
MATE 421 Materials Thermodynamics 1 (4)
MATE 424 Ceramic Materials (3)

Units

9

24

Units

To be selected from the following:	
MATE 421 Materials Thermodynamics 1 (4)	
MATE 424 Ceramic Materials (3)	
MATE 562 Mechanical Behavior of Materials (4)	
MATE 564 Fracture Mechanics (3)	
MATE 599 Design Project (Thesis) (2) (2) (5) or	
9 units of approved technical electives and	
written comprehensive examination	
PHYS 412 Solid State Physics (3)	
Approved Electives	12
	45

# M.S. ENGINEERING, SPECIALIZATION IN MECHANICAL ENGINEERING

Core Courses Analytical methods for engineering/advanced mathematics	9
Required Courses in Specialization ME 599 Design Project (Thesis) (2) (2) (5) or 9 units of approved technical electives and written comprehensive examination 18 units to be selected from the following: ME 502 Stress Analysis (4) ME 517 Advanced Vibrations (4) ME 541 Advanced Thermodynamics (4) ME 542 Dynamics and Thermodynamics of Compressible Flow (4) ME 551 Mechanical Systems Analysis (4) ME 552 Conductive Heat Transfer (3) ME 554 Computational Heat Transfer (3) Approved electives	27
	45

## JOINT M.B.A./M.S. ENGINEERING, SPECIALIZATION IN ENGINEERING MANAGEMENT

The joint Engineering Management specialization is an interdisciplinary program linking the MBA and MS in Engineering degree programs. It is a cooperative effort between the School of Engineering (Industrial Engineering Department) and the School of Business. Students are required to have a prerequisite degree in engineering, computer science, or similar technical degree to be admitted to both the School of Engineering and the School of Business, and to be enrolled in both degree programs. Successful participants will be awarded both MBA and MS in Engineering degrees each with a specialization in Engineering Management.

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

Units

#### **FIRST YEAR**

Students are encouraged to challenge any of the following first-year GSB courses based on previous work.

Fall	15-16
GSB 511 Financial Accounting (4)	
GSB 513 Organization Behavior (4)	
GSB 514 Business Government and Society (4)	
<sup>1</sup> Technical Elective (3-4)	
Winter	16
GSB 521 Managerial Accounting (4)	
GSB 522 Management Science (4)	
GSB 523 Managerial Economics (4)	
IE 557 Technological Assessment and Planning (4)	
Spring	16
GSB 531 Managerial Finance (4)	
GSB 532 Information Systems (4)	
GSB 533 Aggregate Economics (4)	
GSB 534 Production and Operations Management	
(4)	
Summer	8
GSB 598 Graduate Internship in Business (8)	

#### SECOND YEAR

Students must select from GSB 578, GSB 587, BUS 490, ECON 401, or MKTG 401 to satisfy one of the following four-unit GSB electives.

Fall..... 13-15

- IE 545 Advanced Topics in Simulation (3) <sup>1</sup> GSB elective *or* technical elective (3-4)
- <sup>1</sup> GSB elective (4)
- <sup>1</sup> GSB elective (4)
- <sup>1</sup> Technical elective (3-4)

Winter CSB 524 Marketing Management (4) IE 555 Computer Integrated Manufacturing (4) IE 558 Engineering Decision Making (4) CSB elective (4)	16
Spring CSB 562 Business Strategy and Policy (4) IE 556 Technological Project Management (4) CSB elective (4)	15-16
<sup>1</sup> Technical Elective (3-4) Summer <sup>1</sup> Business Elective (4) (4) Minimum total units required	8
-	107

<sup>1</sup> Technical electives to be selected with School of Engineering adviser's approval. GSB electives to be selected with School of Business adviser's approval.

## AERONAUTICAL ENGINEERING DEPARTMENT

Aeronautical Engineering Department Office Engineering Bldg. (13), Room 260 (805) 756-2562 FAX: (805) 756-2376

## Faculty

## Department Chair, Doral R. Sandlin

Daniel J. Biezad Russell M. Cummings Jon A. Hoffmann Faysal A. Kolkailah Ruben Rojas-Oviedo Jin Tso

## Programs

B.S. Aeronautical Engineering with Concentrations in:

Aeronautics Astronautics

M.S. Aeronautical Engineering

The Bachelor of Science degree in Aeronautical Engineering prepares students for engineering work related to aerodynamics, flight testing, structures, propulsion, control systems, dynamics, stability and control, and flight simulation for both fixed and rotary wing aircraft, missiles, and spacecraft. The problems faced by the aerospace industry offer an unusual engineering challenge. Much of the analysis and testing must be accomplished at the very frontiers of knowledge. Nevertheless, products must be designed and manufactured; thus, an exceptionally wide range of engineering abilities is required within the industry and government.

Graduates in aeronautical engineering obtain employment in all phases of the aerospace industry such as general design, aerodynamics, stress analysis, flight testing, flight simulation, dynamics, and stability and control.

The B.S. curriculum in Aeronautical Engineering is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology. It places emphasis on both analysis and design. Supplementary to both is the basic work in graphics and laboratory. Throughout the entire curriculum there is constant interplay between theory and application. Opportunities are available for advanced elective work in the student's field of special interest.

There are laboratory facilities for fabrication, propulsion, structural test, aerodynamics, dynamics, flight simulation and flight test, and design. There is also a hangar and aircraft with an adjoining airstrip.

There are three student chapters of the national societies-the American Institute of Aeronautics and Astronautics, the American Helicopter Society, and the Society for the Advancement of Material and Process Engineering. There is also a student chapter of the national aerospace engineering honor society, Sigma Gamma Tau. Aeronautical Engineering Advising Center Engineering East Bldg. (20), Room 215 (805) 756-1461

The department supports the concept of international education and encourages students to investigate opportunities for overseas study. For further information, the Study Abroad programs.

## **CURRICULUM FOR B.S. AERONAUTICAL ENGINEERING**

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

#### Freshman $\sim$

AERO 121 Aerospace Fundamentals	1
ETME 141 Applied Descriptive Geometry	2
ETMP 121 Manufacturing Survey	1
BIO 220 Physiology and Biological Adaptation	
(B.1.b., E.2.)	4
CHEM 124 General Chemistry (B.1.a.)	4
CSC 251 Digital Computer Applications (F.1.)	2
ENGL 114 Writing: Exposition (A.1.)	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking	
(A.2.)	3
ENGL 218 Professional Writing:	
Argumentation and Reports (A.4.)	4
MATH 141 Calculus I (B.2.)	4
MATH 142 Calculus II (B.2.)	4
MATH 143 Calculus III	4
PHYS 131 General Physics (B.1.a.)	4
PHYS 132 General Physics	4
PSY 201/PSY 202 General Psychology (E.1.)	3
Fine and performing arts elective (C.2.)	3
-	51

## Sophomore

AERO 215 Aerospace Engineering Analysis I	2
CE 204 Strength of Materials	3
CE 205, CE 206 Strength of Materials and	
Laboratory	2,1
EE 311, EE 351 Electric Circuit Theory and	
Laboratory	3,1
ME 211 Engineering Statics	3
ME 212 Engineering Dynamics	3
PHYS 133 General Physics	4
PHYS 211 Modern Physics I	4
ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
ECON 201 Survey of Economics or	
ECON 211 Principles of Economics (D.3.)	3
MATH 241 Calculus IV	4
MATH 242 Differential Equations	4
CSC 311 Numerical Engineering Analysis	4
SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	
(A.3.)	3
Critical reading elective (C.1.)	3
Manufacturing processes elective, to be selected	
from ETMP 144, ETWT 144, IE 141, or IT 141	1
-	51
	•••

## lunior

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3

	AERO 307 Wind Tunnel and Flight Test Laboratory	3
	AERO 315 Aerospace Engineering Analysis II	3
	AERO 320 Fundamentals of Guidance and Control.	3
	AERO 330 Stress Analysis	4
	EE 321, EE 361 Electronics and Laboratory	3,1
	MATE 306 Materials Engineering	3
	PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
	HIST 204 History of American Ideals and	
	Institutions (D.1.)	3
	HIST 315 Modern World History (D.2.)	3
	POLS 210 American and California Government	
	(D.1.)	3
1	ANT/BUS/ECON/GEOG/POLS/SOC elective	
	(300–400 Level) (D.4.b.)	3
1	Literature, philosophy, arts elective (300-400	
	level) (C.3)	3
		- 56

#### Senior

	AERO 401 Propulsion Systems AERO 404 Gas Dynamics AERO 420 Stability and Control of Aerospace	4 3
	VENICIES	4 4
	AERO 432 Experimental Stress Analysis	1
	AERO 461 Senior Project	2
	AERO 462 Senior Project	3
1	Arts and humanities elective (Area C)	3
1	Critical reading elective (C.1.)	3
	Required and elective courses to complete	
	concentration	25
	-	52
	=	210

<sup>1</sup> To be selected in accordance with the General Education-Breadth and A.B.E.T. requirements. See adviser and page 86 of this catalog.

## **CONCENTRATIONS** (select one)

## **Aeronautics Concentration**

AERO 405 Aerodynamics II	3
AERO 443 Flight Vehicle Design	4
AERO 444 Flight Vehicle Design	4
AERO 445 Flight Vehicle Design	2
Aeronautics electives	12
	25

## **Astronautics Concentration**

AERO 451 Orbital Mechanics I	3
AERO 447 Spacecraft Design	4
AERO 448 Spacecraft Design	4
AERO 449 Spacecraft Design	2
Astronautics electives	
—	25

## **B.S. AERONAUTICAL ENGINEERING**

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

Units MAJOR COURSES 70 AERO 121, 301, 302, 303, 304, 306, 307, 320, 330, 401, 461, 462 CE 204, 205, 206 EE 311, 351 PHYS 131 (B.1.a.), 132, 211 Concentrations (select one:) Aeronautics Concentration (10) AERO 443, 444, 445 Astronautics Concentration (10) AERO 447, 448, 449 SUPPORT COURSES 83 AERO 215, 315, 404, 420, 430, 432 CHEM 124 (B.1.a.) CSC 251 (F.1.), 311 EE 321, 361 **ETME 141 ETMP 121** MATH 141 (B.2.), 142, 143, 241, 242 (B.2.) ME 211, 212 **MATE 306 PHYS 133** Adviser approved Aeronautical Engineering electives (12) Manufacturing processes elective (ETMP 144, ETWT 144, IE 141, or IT 141) Concentrations (select one:) Aeronautics Concentration (3) **AERO 405** Astronautics Concentration (3) **AERO 451 GENERAL EDUCATION AND BREADTH** 57 REQUIREMENTS.....

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300-400 level. Additional GEB courses are listed under Major and Support courses.

Area A: (14) ENGL 114 (A.1.) ENGL 125/PHIL 125/SPC 125 (A.2.) SPC 201/SPC 202 (A.3.) ENGL 218 (A.4.) Area B: (2) BIO 220 (B.1.b.) Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300-400 level) (C.3.) Arts and humanities elective (Area C) Area D: (18) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/211/222 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.)

#### ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.) Area E: (5) PSY 201/PSY 202 (E.1.) BIO 220 (E.2.) ELECTIVES ..... 0 210

See COURSES OF INSTRUCTION section of this catalog for description of courses in Aeronautical Engineering and other subjects.

## MASTER OF SCIENCE DEGREE IN AERONAUTICAL ENGINEERING

## **General Characteristics**

The Master of Science program in Aeronautical Engineering prepares the student for entry into a well established field of aeronautical engineering. In addition, the subject matter relative to flight simulation and controls, structures, and aerothermal sciences has been integrated into the program. The M.S. program in Aeronautical Engineering emphasizes engineering science and research activity. The degree increases a student's capability for more complex research, development, and innovative design, and prepares the student for future graduate study in engineering, leading to the Doctor of Engineering or Ph.D. degree.

## Prerequisites

For admission as a classified graduate student, an applicant must hold a bachelor's degree in engineering (preferably aeronautical engineering) or a closely related physical science with a minimum grade point average of 3.0 in the last 90 guarter units (60 semester units) attempted.

Applicants are required to submit satisfactory scores for the General (Aptitude) Test and Subject (Advanced) Test of the Graduate Record Examination in engineering.

An applicant who meets these standards but lacks prerequisite coursework may be admitted as a conditionally classified student and must make up any deficiencies before advancement to classified graduate standing.

Information pertaining to specific requirements for admission to graduate standing (classified or conditionally classified) may be obtained from the Graduate Coordinator, Department of Aeronautical Engineering.

#### **Program of Study**

Graduate students must file a formal study plan with their adviser, department, school and university graduate studies office by no later than the end of the quarter in which the 12th unit of approved courses is completed.

The formal program of study must include a minimum of 45 units (at least 24 of which must be at the 500 level).

A thesis or project is required as a culminating experience.

## M.S. AERONAUTICAL ENGINEERING

Required Courses	25
AERO 515 Continuum Mechanics (3)	
AERO 520 Theoretical Aerodynamics (3)	
AERO 522 Boundary Layer Theory (3)	
AERO 535 Advanced Aerospace Structural Analysis	
(3)	
AERO 550 Analysis and Design of Flight Control	
Systems (3)	
AERO 590 Graduate Seminar (1)	
AERO 599 Design Project (Thesis) (2) (2) (5)	
Adviser approved electives	12
Advanced Mathematics/Analytical Methods for	
Engineers	8
MATH 501, MATH 502 Methods of Applied	
Mathematics I and II (4) (4)	

45

Units

# CIVIL AND ENVIRONMENTAL ENGINEERING DEPARTMENT

Engineering Bldg. (13), Room 263 (805) 756-2947

## Faculty

#### Chair, Stephen L. M. Hockaday

Harold M. Cota Jay S. DeNatale Carl C. F. Hsieh Robert J. Lang Stuart E. Larsen Kurt C. K. Lo H. Mallareddy Sara Moazzami Edward A. Nowatzki Robert E. Sennett S. Somayaji Edward C. Sullivan Samuel A. Vigil

## Programs

**B.S.** Civil Engineering

**B.S. Environmental Engineering** 

M.S. Civil and Environmental Engineering

## **CIVIL ENGINEERING**

The Board of Directors of the American Society of Civil Engineers has defined Civil Engineering as "...the profession in which a knowledge of the mathematical and physical sciences gained by study, experience, and practice is applied with judgment to develop ways to utilize, economically, the materials and forces of nature for the progressive well-being of mankind in creating, improving and protecting the environment, in providing facilities for community living, industry and transportation, and in providing structures for the use of mankind."

The Bachelor of Science degree in Civil Engineering emphasizes the study of engineering principles and the application of scientific knowledge and technology for the betterment of humankind. The program stresses the team design concept and systems approach to problem solving and is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

Graduates of the program are trained for the expanding needs of society in transportation, geotechnical engineering, water resources, structures and the environment under the broad Civil Engineering degree. The emphasis is on preparation for immediate entry into the profession. Students completing the program find a wide variety of positions available in local, state, and federal government service or with private engineering firms. These positions involve the planning, design, and construction of civil engineering projects.

The curriculum includes surveying, structural engineering, hydraulics, geotechnical engineering, sanitary engineering, and transportation planning-all based upon broad coverage of the engineering sciences and basic sciences, mathematics, social sciences, and humanities. The program is oriented toward the practical problems of the industrial world, and adequate scientific depth is maintained so that graduates are readily accepted into graduate programs in civil engineering.

#### **ENVIRONMENTAL ENGINEERING**

The Bachelor of Science degree in Environmental Engineering is concerned with the interrelation of people, materials, and processes in a complex and changing environment. The broad field of environmental engineering includes control of air and water pollution, industrial hygiene, noise and vibration control, and solid waste and hazardous waste management. Cal Poly has one of the few undergraduate programs in this field.

The program offers a sound background in the fundamentals of thermodynamics, heat transfer, fluid mechanics, mass transfer, water resources and geotechnical engineering. The problem-oriented approach to instruction, in modern wellequipped laboratories, provides an excellent opportunity to gain understanding and experience. The curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

The Society of Environmental Engineers offers technical programs and other activities, including field trips each year to the Los Angeles and San Francisco areas to study typical installations of systems. Student memberships also are available in the Air and Waste Management Association, the California Water Pollution Control Association, and the Water Pollution Control Federation.

An engineering approach to the subject enables graduates to pursue careers in industry, consulting firms, and public agencies concerned with air and water pollution control, groundwater, potable water treatment, solid waste management, and hazardous waste management.

## **CURRICULUM FOR B.S. CIVIL ENGINEERING**

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser. Obtain flow chart at department office. Courses listed below are grouped by year.

## Freshman

CE	111,	CE	112	Civil	Engineering	Fundamentals	١,	lt
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## Sophomore

CE 204 Strength of Materials	3
CE 205, CE 206 Strength of Materials and	
Laboratory	2.1
CE 221 Fundamentals of Transportation Engineering	4
AE 237 Engineering Surveying I	2
AE 238 Engineering Surveying II	2
BIO 220 Physiology and Biological Adaptation	_
(B.1.b., E.2.)	4
GEOL 201 Physical Geology	3
MATH 241 Calculus IV	4
MATH 242 Differential Equations	4
ME 211 Engineering Statics	3
ME 212 Engineering Dynamics	3
ME 341 Fluid Mechanics	3
ECON 211 Principles of Economics (D.3.)	3
ETME 141 Applied Descriptive Geometry	2
PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
PHYS 133 General Physics	4
POLS 210 American and California Government	
(D.1.)	3
	- 53

## Junior

CE 259 Civil Engineering Materials	2
CE 336 Water Resources Engineering	4
CE 337 Hydraulics Laboratory	1
CE 352, CE 353 Structural Analysis I and II	3,3
CE 381 Geotechnical Engineering	4
CE 453 Structural Steel Design	3
EE 311 Electric Circuits Theory	3
ENVE 331 Introduction to Environmental	
Engineering	3
ME 302 Thermodynamics	3

MATE 306, MATE 341 Materials of Engineering and	
ANT 201/GEOG 150/SOC 105 (D.4.a.)	3,1 3
CSC 331/CSC 332/IE 314	3
HIST 204 History of American Ideals and	
Institutions (D.1.)	3
HIST 315 Modern World History (D.2.)	3
PSY 201/PSY 202 General Psychology (E.1.) ANT/BUS/ECON/GEOG/POLS/SOC elective	3
(300–400 level) (D.4.b.)	3
Fine and performing arts elective (C.2.)	3
	54

#### Senior

	CE 355 Reinforced Concrete Design	3
	CE 407 Structural Dynamics	4
	CE 421 Traffic Engineering or another 400-level	
	transportation course	4
	CE 440 Hydraulic Systems Engineering	3
	CE 454 Structural Design	4
	CE 461 Senior Project	2
	CE 462 Senior Project	2
	CE 481 Analysis and Design of Shallow	
	Foundations	4
	ENVE 438 Water and Wastewater Treatment	
	Design	3
	SPC 201 Public Speaking or	
	SPC 202 Principles of Speech Communication	
	(A.3.)	3
	STAT 312 Statistical Methods for Engineers (B.2.)	3
1	Arts and humanities elective (Area C)	3
1	Literature, philosophy, arts elective (300-400	
	level) (C.3.)	3
	Adviser approved technical electives	11
		52
		209

 $^{\rm T}$  To be selected in accordance with the General Education-Breadth and A.B.E.T. requirements. (Please see page 86 of this catalog.)

## **B.S. CIVIL ENGINEERING**

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

Units MAIOR COURSES 67 CE 111, 112, 204, 205, 206, 221, 259, 336, 337, 352, 353, 355, 381, 407, 440, 453, 454, 461, 462, 481 CE 421 or another transportation course Adviser approved technical electives (8) SUPPORT COURSES 85 AE 237, 238 CHEM 124 (B.1.a.), 125 CSC 251/CSC 204 (F.1.) EE 311 ENVE 331, 438 **ETME 141 GEOL 201** MATE 306, 341 MATH 141 (B.2.), 142, 143, 241, 242 ME 211, 212, 302, 341 PHYS 131 (B.1.a.), 132, 133 STAT 312 (B.2.) CSC 331/CSC 332/IE 314 Approved technical electives (3) **GENERAL EDUCATION AND BREADTH** REQUIREMENTS..... 57

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

Area A: (14) ENGL 114 (A.1.) ENGL 125/PHIL 125/SPC 125 (A.2.) SPC 201/SPC 202 (A.3.) ENGL 218 (A.4.) Area B: (2) BIO 220 (B.1.b.) Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300-400 level) (C.3.) Arts and humanities elective (Area C) Area D: (18) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/211/222 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300--400) (D.4.b.) Area E: (5) PSY 201/PSY 202 (E.1.) BIO 220 (E.2.) ELECTIVES .....

## **CURRICULUM FOR B.S. ENVIRONMENTAL ENGINEERING**

Indented courses to be taken in sequence. For course prerequisites, please refer to the "Course Descriptions" section of this catalog. In scheduling your courses each quarter, consult with your academic adviser. Obtain flow chart at department office. Courses listed below are grouped by year.

## Freshman

ETME 141 Applied Descriptive Geometry2BIO 220 Physiology and Biological Adaptation4(B.1.b., E.2.)4CHEM 124 General Chemistry (B.1.a.)4CHEM 125 General Chemistry.4CHEM 129 General Chemistry4ENGL 114 Writing: Exposition (A.1.)4ENGL 125/PHIL 125/SPC 125 Critical Thinking3MATH 141 Calculus I (B.2.)4MATH 142 Calculus II4PHYS 131 General Physics (B.1.a.)4PHYS 132 General Physics4	CE 112 Civil Engineering Fundamentals II	2
BIO 220 Physiology and Biological Adaptation4(B.1.b., E.2.)4CHEM 124 General Chemistry (B.1.a.)4CHEM 125 General Chemistry.4CHEM 129 General Chemistry.4ENGL 114 Writing: Exposition (A.1.)4ENGL 125/PHIL 125/SPC 125 Critical Thinking3MATH 141 Calculus I (B.2.)4MATH 142 Calculus II4MATH 143 Calculus III.4PHYS 131 General Physics (B.1.a.)4PHYS 132 General Physics.4	ETME 141 Applied Descriptive Geometry	2
(B.1.b., E.2.)       4         CHEM 124 General Chemistry (B.1.a.)       4         CHEM 125 General Chemistry.       4         CHEM 129 General Chemistry.       4         ENGL 114 Writing: Exposition (A.1.)       4         ENGL 125/PHIL 125/SPC 125 Critical Thinking       3         MATH 141 Calculus I (B.2.)       3         MATH 142 Calculus II       4         PHYS 131 General Physics (B.1.a.)       4         PHYS 132 General Physics.       4	BIO 220 Physiology and Biological Adaptation	
CHEM 124 General Chemistry (B.1.a.)4CHEM 125 General Chemistry4CHEM 129 General Chemistry4ENGL 114 Writing: Exposition (A.1.)4ENGL 125/PHIL 125/SPC 125 Critical Thinking3(A.2.)3MATH 141 Calculus I (B.2.)4MATH 142 Calculus II4PHYS 131 General Physics (B.1.a.)4PHYS 132 General Physics4	(B.1.b., E.2.)	4
CHEM 125 General Chemistry4CHEM 129 General Chemistry4ENGL 114 Writing: Exposition (A.1.)4ENGL 125/PHIL 125/SPC 125 Critical Thinking3(A.2.)3MATH 141 Calculus I (B.2.)4MATH 142 Calculus II4MATH 143 Calculus III4PHYS 131 General Physics (B.1.a.)4PHYS 132 General Physics4	CHEM 124 General Chemistry (B.1.a.)	4
CHEM 129 General Chemistry4ENGL 114 Writing: Exposition (A.1.)4ENGL 125/PHIL 125/SPC 125 Critical Thinking3(A.2.)3MATH 141 Calculus I (B.2.)4MATH 142 Calculus II4MATH 143 Calculus III4PHYS 131 General Physics (B.1.a.)4PHYS 132 General Physics4	CHEM 125 General Chemistry	4
ENGL 114 Writing: Exposition (A.1.)4ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.)3MATH 141 Calculus I (B.2.)4MATH 142 Calculus II4MATH 143 Calculus III4PHYS 131 General Physics (B.1.a.)4PHYS 132 General Physics4	CHEM 129 General Chemistry	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.)3MATH 141 Calculus I (B.2.)4MATH 142 Calculus II4MATH 143 Calculus III4PHYS 131 General Physics (B.1.a.)4PHYS 132 General Physics4	ENGL 114 Writing: Exposition (A.1.)	4
(A.2.)       3         MATH 141 Calculus I (B.2.)       4         MATH 142 Calculus II       4         MATH 143 Calculus III       4         PHYS 131 General Physics (B.1.a.)       4         PHYS 132 General Physics       4	ENGL 125/PHIL 125/SPC 125 Critical Thinking	
MATH 141 Calculus I (B.2.)4MATH 142 Calculus II4MATH 143 Calculus III4PHYS 131 General Physics (B.1.a.)4PHYS 132 General Physics4	(A.2.)	3
MATH 142 Calculus II4MATH 143 Calculus III4PHYS 131 General Physics (B.1.a.)4PHYS 132 General Physics4	MATH 141 Calculus I (B.2.)	4
MATH 143 Calculus III	MATH 142 Calculus II	4
PHYS 131 General Physics (B.1.a.) 4 PHYS 132 General Physics 4	MATH 143 Calculus III	4
PHYS 132 General Physics 4	PHYS 131 General Physics (B.1.a.)	4
	PHYS 132 General Physics	4
Critical reading elective (C.1.)	Critical reading elective (C.1.)	3

#### Sophomore

CE 204 Strength of Materials
CE 205 Strength of Materials
CE 221 Fundamentals of Transportation Engineering
ME 211 Engineering Statics
ME 212 Engineering Dynamics
ME 302 Thermodynamics
CHEM 326 Survey of Organic Chemistry
MATH 241 Calculus IV
MATH 242 Differential Equations
PHYS 133 General Physics
CSC 251 Digital Computer Applications or
CSC 204 C and UNIX (F.1.)
ECON 211 Principles of Economics (D.3.)
ENGL 218 Professional Writing: Argumentation and
Reports (A.4.)
POLS 210 American and California Government
STAT 312 Statistical Methods for Engineers (B.2.)
Critical reading elective (C.1.)

## Junior

CE 336 Water Resources Engineering	4
CE 337 Hydraulics Laboratory	1
CE 381 Geotechnical Engineering	4
ENVE 304 Thermodynamics of Processes	3
ENVE 309 Noise and Vibration Control	3
ENVE 316 Automatic Process Control	2
ENVE 325 Environmental Air Quality	3
ENVE 426 Air Quality Measurements	3
ENVE 434 Water Quality Measurements	2
EE 311 Electric Circuit Theory	3

	EE 351 Electric Circuit Laboratory	1
	ME 313 Heat Transfer	3
	ME 341 Fluid Mechanics	3
	ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
	HIST 204 History of American Ideals and	
	Institutions (D.1.)	3
	SPC 201 Public Speaking or	
	SPC 202 Principles of Speech Communication	
	(A.3.)	3
	PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
	PSY 201/PSY 202 General Psychology (E.1.)	3
1	Fine and performing arts elective (C.2.)	3
		53

#### Senior

1 1	<ul> <li>ENVE 438 Water and Wastewater Treatment Design</li> <li>ENVE 439 Solid Waste Management</li> <li>ENVE 439 Solid Waste Management</li> <li>ENVE 442 Advanced System Design</li> <li>ENVE 461, ENVE 462 Senior Project</li> <li>ME 456 HVAC Systems Design</li> <li>HIST 315 Modern World History (D.2.)</li> <li>ANT/BUS/ECON/GEOG/POLS/SOC elective (300–400 level) (D.4.b)</li> <li>Arts and humanities elective (Area C)</li> <li>Literature, philosophy, arts elective (300–400 level) (C.3.)</li> <li>Approved technical electives.</li> </ul>	3 3 2,2 3 3 3 3 3 3 8
	CE 434 Groundwater Hydraulics and Hydrology CE 440 Hydraulic Systems Engineering ENVE 411 Air Pollution Control ENVE 421 Mass Transfer Operations ENVE 435 Principles of Water and Wastewater Engineering ENVE 436 Introduction to Hazardous Waste Management ENVE 428 Water and Wastewater Transmost	3 3 3 3 3 3 3

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Civil Engineering, Environmental Engineering, and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 86 of this catalog.)

## **B.S. ENVIRONMENTAL ENGINEERING**

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

Units MAJOR COURSES 66 CE 112, 204, 205, 221, 434, 440 ENVE 304, 309, 316, 325, 411, 421, 426, 434, 435, 436, 438, 439, 442, 461, 462 Approved technical electives (8) SUPPORT COURSES 86 CE 336, 337, 381 CHEM 124 (B.1.a.), 125, 129, 326 EE 311, 351 **ETME 141** MATH 141 (B.2.), 142, 143, 241, 242 ME 211, 212, 302, 313, 341, 456 PHYS 131 (B.1.a.), 132, 133 STAT 312 (B.2.) CSC 251/CSC 204 (F.1.) GENERAL EDUCATION AND BREADTH REQUIREMENTS..... 57

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300-400 level. Additional GEB courses are listed under Support Courses.

Area A: (14) ENGL 114 (A.1.) ENGL 125/PHIL 125/SPC 125 (A.2.) SPC 201/SPC 202 (A.3.) ENGL 218 (A.4.) Area B: (2) BIO 220 (B.1.b.) Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300-400 level) (C.3.) Arts and humanities elective (Area C) Area D: (18) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/211/222 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.) Area E: (5) PSY 201/PSY 202 (E.1.) BIO 220 (E.2.)

ELECTIVES .....

# MASTER OF SCIENCE DEGREE IN CIVIL AND ENVIRONMENTAL ENGINEERING

#### **General Characteristics**

The Master of Science program in Civil and Environmental Engineering has the following objectives:

- Job-entry education for the more complex areas of engineering, such as research and development, innovative design, systems analysis and design, and managerial engineering;
- Updating and upgrading opportunities for practicing engineers;
- Graduate preparation for further study in engineering, leading to the Doctor of Engineering or Ph.D. degree;
- A base which allows graduates to maintain currency in their fields.

#### **Prerequisites**

For admission as a classified graduate student, an applicant must hold a bachelor's degree in engineering or a closely related physical science with a minimum grade point average of 3.0 in the last 90 quarter units (60 semester units) attempted. Applicants for graduate engineering programs are required to submit satisfactory scores for the General (Aptitude) Test of the Graduate Record Examination. An applicant who meets these standards but lacks prerequisite coursework may be admitted as a conditionally classified student and must make up any deficiencies before advancement to classified graduate standing.

Information pertaining to specific requirements for admission to graduate standing (classified or conditionally classified) may be obtained from the Graduate Coordinator, Civil and Environmental Engineering Department.

#### **Program of Study**

Graduate students must file a formal study plan with their adviser, department, school and university graduate studies office by no later than the end of the quarter in which the 12th unit of approved courses is completed.

The formal program of study must include a minimum of 45 units (at least 24 of which must be at the 500 level). With the graduate adviser's approval, students will be expected to select their elective units in one of the following areas of study: geotechnical engineering, transportation and planning, or water resources and environmental engineering.

The broad curriculum requirements for the M.S. in Civil and Environmental Engineering are:

- a) a core of 14 units as required;
- b) a minimum of 22 units of adviser approved electives within the major;
- c) a minimum of 9 units of adviser-approved electives outside the major;
- d) at least 24 units of the 45 unit program at the 500 level; and
- e) a comprehensive written examination (course work option) or an oral defense examination (thesis option).

Two program options are available for M.S. in Civil and Environmental Engineering students. The thesis option involves 36 units of adviser-approved coursework, 9 units of CE 599 thesis research/design, and an oral thesis defense examination administred by a panel of three faculty. The non-thesis option involves 45 units of adviser-approved coursework and a written comprehensive examination administered by a panel of three faculty. A student will have a maximum of three opportunities to pass this written comprehensive examination.

## CURRICULUM FOR M.S. CIVIL AND ENVIRONMENTAL ENGINEERING

Required Courses..... CE 574 Computer Applications in Civil Engineering (3) Units

14

22

CE 591 Graduate Seminar (2)

CE 599/ENVE 599 Design Project (Thesis) (9) or additional 9 units of adviser approved analysis and design electives within the major (nonthesis option) and Comprehensive Examination. Adviser approved analysis and design electives within

- the major (to be selected from the following list after consultation with your academic adviser and the CE/ENVE graduate coordinator):.....
  - CE 405 Advanced Strength of Materials (3)
  - CE 407 Structural Dynamics (4)
  - CE 421 Traffic Engineering (4)
  - CE 422 Highway Geometrics and Design (4)
  - CE 424 Public Transportation (4)
  - CE 431 Coastal Hydraulics (3)
  - CE 434 Ground Water Hydraulics and Hydrology (3)
  - CE 440 Hydraulic Systems Engineering (3)
  - CE 453 Structural Steel Design (3)
  - CE 454 Structural Design (4)
  - CE 481 Analysis & Design of Shallow Foundations (4)
  - CE 521 Airfield and Highway Pavement Design (4)
  - CE 522 Advanced Transportation Design (4)
  - CE 523 Transportation Systems Planning (4)
  - CE 525 Airport Planning and Design (4)
  - CE 527 Traffic Engineering Operations and Controls (4)
  - CE 528 Transportation Analysis (4)
  - CE 529 Modeling and Simulation in Transportation (4)
  - CE 533 Advanced Water Resources Engineering (3)
  - CE 554 Matrix Analysis of Structures (3)
  - CE 555 Advanced Civil Engineering Materials Laboratory (2)
  - CE 558 Introduction to Finite Element Analysis (3)
  - CE 559 Advanced Structural Design (3)
  - CE 571 Selected Advanced Laboratory (1-3)
  - CE 573 Public Works Administration (3)
  - CE 581 Advanced Geotechnical Engineering (3)
  - CE 582 Advanced Geotechnical Testing (3)
  - CE 583 Soil Dynamics (3)
  - CE 584 Lateral Support Systems (3)
  - CE 585 Slope Stability Analysis (3)
  - CE 587 Analysis and Design of Deep Foundations (3)
  - CE 599 Design Project Thesis (9)
  - ENVE 411 Air Pollution Control (3)
  - ENVE 421 Mass Transfer Operations (3)
  - ENVE 434 Water Quality Measurements (2) ENVE 435 Principles of Water and Wastewater
  - Engineering (3)
  - ENVE 436 Introduction to Hazardous Waste Management (3)

ENVE 438 Water and Wastewater Treatment	
Design (3)	
ENVE 439 Solid Waste Management (3)	
ENVE 465 Environmental Management and Urban	
Systems (2)	
ENVE 534 Advanced Design of Pollution Control	
Systems (3)	
ENVE 535 Advanced Wastewater Treatment (3)	
ENVE 536 Biological Wastewater Treatment	
Processes Engineering (3)	
ENVE 541 Resource and Energy Recovery (3)	
ENVE 551 Environmental Unit Operations (4)	
Adviser approved analysis electives outside the major	
(to be selected after consultation with your	
academic adviser and the CE/ENVE Graduate	
Coordinator)	9

## **COMPUTER ENGINEERING**

CPE Advising Center, Engineering East Bldg. (20), Room 215 (805) 756-1461

## Faculty

#### Coordinator, Zane C. Motteler

James L. Beug Roger C. Camp Michael Fitzpatrick Joseph Grimes James G. Harris John Hsu Wayne E. McMorran Carl A. MacCarley S. Ronald Oliver Clinton A. Staley James H. W. Tseng

## Programs

B.S. Computer Engineering

The goal of the B.S. program in Computer Engineering is the education of those students with an interest in designing computer based systems. The study of both hardware and software builds upon the resources of a balanced computer engineering course of study.

The program offers a firm foundation in both electronic engineering and computer science. This balanced background allows the graduate to make intelligent decisions in the area of the definition and design of systems, hardware, software and the trade-offs among these components of design.

Graduates are well-rounded in hardware, software, and the mathematics of real-time computing, allowing them to work effectively in such areas as digital systems simulation and digital control systems. Knowledge and skills in the technical areas of computer architecture and structures will provide the basic understanding necessary to work with computer networks and communications. A thorough knowledge of modern microprocessors enables the graduate to apply these machines to such diverse fields as robotics and data acquisition. Twelve units of technical electives allow the student to specialize in an area of software or hardware.

In addition to a sound theoretical background in the field of computer engineering, the student will encounter many practical design courses and problems. Laboratory courses supplement the program to bring "hands on" skills in all areas of study. Technical electives allow specialization in those areas of special interest of the students and expertise of the faculty.

The faculty support the concept of international education and encourage students to investigate opportunities for overseas study. For further information, see the Study Abroad programs.

## **CURRICULUM FOR B.S. COMPUTER ENGINEERING**

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

## Freshman

CSC 118 Fundamentals of Computer Science I	
(F.1.)	4
CSC 218 Fundamentals of Computer Science II	3
EE 112 Electric Circuit Analysis I	2
EE 219 Logic and Switching Circuits	3
EE 259 Logic and Switching Circuits Laboratory	1
ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
CHEM 124 General Chemistry (B.1.a.)	4
ENGL 114 Writing: Exposition (A.1.)	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking	
(A.2.)	3
ENGL 215 Writing: Argumentation or	
ENGL 218 Professional Writing:	
Argumentation and Reports (A.4.)	4
MATH 141 Calculus I (B.2.)	4
MATH 142 Calculus II	4
MATH 143 Calculus III	4
PHYS 131 General Physics (B.1.a.)	4
PHYS 133 General Physics	4
=	51

## Sophomore

CSC 215 Computer Architecture 1	4
CSC 245 Discrete Structures	3
CSC 345 Data Structures	3
EE 211, EE 241 Electric Circuit Analysis II and	
Laboratory	3,1
EE 212, EE 242 Electric Circuit Analysis III and	
Laboratory	3,1
EE 208, EE 248 Electronic Devices and	
Laboratory	3,1
MATH 241 Calculus IV	4
MATH 242 Differential Equations	4
MATH 317 Topics in Engineering	
Mathematics	4
ME 211 Engineering Statics	3
PHYS 132 General Physics	4
PHYS 211 Modern Physics	4
POLS 210 American and California Government	
(D.1.)	3
SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	
(A.3.)	3
STAT 312 Statistical Methods for Engineers (B.2.)	3
-	54

## Junior

CSC 240 Programming Environments 1	3
CSC 315 Computer Architecture II	4
CSC 351 Programming Languages I: Design	3
EE 301, EE 341 Linear Systems Analysis and	
Laboratory	3,1

	EE 302, EE 342 Linear Control Systems and	
	Laboratory	3,1
	EE 307, EE 347 Digital Integrated Electronics and	
	Laboratory	3,1
	EE 319, EE 359 Digital System Design and	
	Laboratory	3,1
	BIO 220 Physiology and Biological Adaptations	
	(B.1.b. and E.2.)	4
	ECON 201/ECON 211/ECON 222 (D.3.)	3
	HIST 204 History of American Ideals and	
	Institutions (D.1.)	3
	PSY 201/PSY 202 General Psychology (E.1.)	3
1	Critical reading electives (C.1.)	6
2	Technical electives	6
	-	51

## Senior

	CPE 461 Senior Project	3
	CPE 462 Senior Project	2
	CPE 463 Undergraduate Seminar	1
	CSC 316 Computer Architecture III	4
	CSC 404 Computer Networks	4
	CSC 440 Software Engineering L.	3
	CSC 450 Programming Languages II: Description	
	and Analysis	4
	CSC 453 Introduction to Operating Systems	4
	EE 404 Microprocessor System Design	
	Methodologies	3
	EE 446 Microprocessor Interfacing Laboratory	1
	HIST 315 Modern World History (D.2.)	3
	PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
I	ANT/BUS/ECON/GEOG/POLS/SOC elective	
	(300–400 level) (D.4.b.)	3
I	Arts and humanities elective (Area C)	3
1	Fine and performing arts elective (C.2.)	3
1	Literature, philosophy, arts elective (300-400	
	level) (C.3.)	3
2	Technical electives	6
		53
	_	

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Computer Engineering, Computer Science, Electrical Engineering, Electronic Engineering, and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 86 of this catalog.)

<sup>2</sup> Special interest electives to be chosen with the approval of the adviser.

## **B.S. COMPUTER ENGINEERING**

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

	Units
MAJOR COURSES	70
CPE 461, 462, 463	
CSC 118 (F.1.), 215, 218, 315, 440, 450, 453	
EE 112, 208, 211, 212, 248, 301, 302, 307, 319, 341,	
342, 347, 359, 404	
Adviser approved technical electives (7)	
SUPPORT COURSES	
CHEM 124 (B.1.a.)	
CSC 240, 245, 316, 345, 351, 404	
EE 219, 241, 242, 259, 446	
MATH 141 (B.2.), 142, 143, 241, 242, 317	
ME 211	
PHYS 131 (B.1.a.), 132, 133, 211	
STAT 312 (B.2.)	
Technical electives (5)	
GENERAL EDUCATION AND BREADTH	
REQUIREMENTS	57

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Major and Support Courses.

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

Area B: (2) BIO 220 (B.1.b.)

Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300–400 level) (C.3.) Arts and humanities elective (Area C)

Area D: (18) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/211/222 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.) Area E: (5) PSY 201/PSY 202 (E.1.) BIO 220 (E.2.) ELECTIVES
# **COMPUTER SCIENCE DEPARTMENT**

Computer Science Advising Center, Engineering East Bldg. (20), Room 215 (805) 756-1461

# Faculty

# Department Chair, Patrick O. Wheatley

Emile E. Attala James L. Beug Raymond E. Boche Lois H. Brady W. Chris Buckalew Roger C. Camp Laurian M. Chirica John B. Connely Charles H. Dana James N. Etheredge Gene Fisher Joseph E. Grimes John Y. Hsu Elmo A. Keller Sham S. Luthra Zane C. Motteler Leonard D. Myers S. Ronald Oliver Cornel K. Pokorny Clinton A. Staley Daniel J. Stearns Daniel F. Stubbs Neil W. Webre

# Programs

B.S. Computer ScienceB.S. Computer EngineeringM.S. Computer ScienceMinor: Computer Science

The department offers a program leading to the Bachelor of Science degree in Computer Science, a graduate program leading to a Master of Science degree in Computer Science, and a minor in Computer Science.

The undergraduate program provides an in-depth study of computer science fundamentals and practice. This material includes programming, operating systems, computer architecture, languages and translators, database systems, telecommunications, and software engineering. The undergraduate curriculum is accredited by the Computing Sciences Accreditation Board.

Adequate numbers of elective units are provided so that students can specialize in various aspects of computation and its applications. Typical areas of emphasis are artificial intelligence, computer graphics, computer systems, scientific computation, business computation, computer hardware and computer simulation.

Practice is emphasized in addition to the study of theory and concepts. The curriculum is project-oriented and is designed to develop an ability to solve problems through efficient utilization of modern computer concepts. Students can expect to complete many assigned projects on a variety of computer systems and in a variety of programming languages. Students completing the course of study are well prepared to become practicing computer scientists. They are also well prepared for graduate study. During their last year of study, undergraduate students must complete a significant project experience through enrollment in the senior project, a two-quarter course. The project may be done either as an individual or as a member of a team.

Graduates of the computer science program are sought by the computer industry for positions as systems engineers, applications programmers, program analysts and sales representatives.

A wide variety of computing equipment is available on campus. Lower division courses are usually conducted using the equipment of the university's Academic Computing Services. These central campus resources consist of several mainframe and mini-computers in a time-sharing environment as well as workstations, and a variety of micro-computers. Upper division courses are usually conducted using the facilities of the department's Computer Systems Laboratory. This laboratory, administered by the Computer Science Department, has a variety of advanced workstations, mini- and microcomputers, and a parallel computer. It also houses a graphics laboratory and several research systems which provide an environment suitable for advanced studies.

The department has active student chapters of the Association for Computing Machinery, and Upsilon Pi Epsilon (computer science honor society).

#### **COMPUTER ENGINEERING**

For information regarding this program, please refer to Computer Engineering. This program is jointly administered by the Computer Science Department and the Electronic and Electrical Engineering Department.

# **CURRICULUM FOR B.S. COMPUTER SCIENCE**

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

#### Freshman

CSC 118 Fundamentals of Computer Science I	
(F.1.)	4
CSC 218 Fundamentals of Computer Science II	3
CSC 215 Computer Architecture I	4
CHEM 124 General Chemistry	4
EE 219 Logic and Switching Circuits	3
ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
ENGL 114 Writing: Exposition (A.1.)	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking	
(A.2.)	3
MATH 141 Calculus I	4
MATH 142 Calculus II (B.2.)	4
MATH 143 Calculus III	4
SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	
(A.3.)	3
Electives	6
	49

# Sophomore

	CSC 240 Programming Environments 1	3
	CSC 245 Discrete Structures	3
	CSC 315 Computer Architecture II	4
	CSC 332 Numerical Analysis L	3
	CSC 345 Data Structures	3
	CSC 346 File Structures	3
2	MATH 206 Linear Algebra I	4
	ENGL 215 Writing: Argumentation or	
	ENGL 218 Professional Writing: Argumentation	
	and Reports (A.4.)	4
	HIST 204 History of American Ideals and	
	Institutions (D.1.)	3
	PHYS 131 General Physics (B.1.a.)	4
	PHYS 132 General Physics	4
	PHYS 133 General Physics (B.1.a.)	4
	POLS 210 American and California Government	
	(D.1.)	3
1	Fine and performing arts elective (C.2.)	3
	Electives	4
		52
		~ ~ ~

# Junior

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3
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3
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4
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3
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3
3,4

1	Critical reading electives (C.1.) Electives	6 3
	-	49

#### Senior

	CSC 404 Computer Networks	4
	CSC 450 Programming Languages II: Description	
	and Analysis	1
	alla Allaiysis	Ŧ
	CSC 451 Programming Languages III: Complier	
	Implementation	4
	CSC 461 Senior Project	2
	CSC 462 Senior Project	3
	CSC 463 Undergraduate Seminar	2
	PSY 201/PSY 202 General Psychology (E.1.)	3
1	ANT/BUS/ECON/GEOG/POLS/SOC elective	
	(200, 400  level) (D4 h)	3
	(500-400  level) (D.4.0.)	
1	Arts and humanities elective (Area C)	3
1	Literature, philosophy, arts electives (300–400	
	level) (C.3.)	3
3	Technical electives	15
	Floctives	2
		48
	-	198

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 86 of this catalog.) <sup>2</sup> As an alternative to MATH 206, students may select MATH 241 and MATH

242 thereby decreasing free electives by 4 units.

<sup>3</sup> Must be selected with the approval of the student's adviser in one field in which computer science is applied.

# **B.S. COMPUTER SCIENCE**

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

MAJOR COURSES	70
CSC 118 (F.1.), 215, 218, 240, 315, 345, 346, 347,	
351, 404, 440, 441, 445, 450, 451, 453, 461, 462,	
463	
EE 219	
MATH 141	
SUPPORT COURSES	
CHEM 124	
CSC 245, 332	
MATH 142 (B.2.), 143, 206 (or 241 & 242)	
PHYS 131 (B.1.a.), 132, 133 (B.1.a.)	
STAT 321, 322 (B.2.)	
Adviser approved technical electives (15)	
GENERAL EDUCATION AND BREADTH	
REQUIREMENTS	57
REQUIREMENTS	57

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Major and Support Courses.

```
Area A: (14)
  ENGL 114 (A.1.)
  ENGL 125/PHIL 125/SPC 125 (A.2.)
  SPC 201/SPC 202 (A.3.)
  ENGL 215/218 (A.4.)
Area B: (2)
  B10 220 (2) (B.1.b.)
Area C: (18)
  PHIL 230/PHIL 231 (C.1.)
  Critical reading electives (C.1.)
  Fine and performing arts elective (C.2.)
  Literature, philosophy, arts elective (300-400
    level) (C.3.)
  Arts and humanities elective (Area C)
Area D: (18)
  HIST 204 (D.1.), POLS 210 (D.1.)
  HIST 315 (D.2.)
  ECON 201/211/222 (D.3.)
  ANT 201/GEOG 150/SOC 105 (D.4.a.)
  ANT/BUS/ECON/GEOG/POLS/SOC elective
    (300-400 level) (D.4.b.)
Area E: (5)
  PSY 201/PSY 202 (E.1.)
  BIO 220 (2) (E.2.)
ELECTIVES .....
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15 198

Units

# CURRICULUM FOR COMPUTER SCIENCE MINOR

Nearly all disciplines need to integrate and utilize the capabilities of computers. The computer science minor consists of a core of 13 to 14 units and the choice of a track for specialized study. The core is to provide the common knowledge and skills that all need who wish to advance further in computer science. The track consists of several required courses and one or two restricted electives.

CSC 118 Fundamentals of Computer Science 1 (4) CSC 218 Fundamentals of Computer Science II (3) CSC 345 Data Structures (3) CSC 215 Computer Architecture I (4) or CSC 240 Programming Environments 1 (3) Tracks (select one) ...... 11-14 Database and Application Development (11) CSC 347 Introduction to Database Systems (4) CSC 440 Software Engineering 1 (3) Upper-division restricted electives (4) Computer Architecture (14) EE 219 Logic and Switching Circuits (3) CSC 315 Computer Architecture II (4) CSC 316 Computer Architecture III (4) Upper-division restricted electives (3) Numerical Applications (11) CSC 332 Numerical Analysis I (3) CSC 333 Numerical Analysis II (3) Upper-division restricted electives (5) Analysis and Simulation of Systems (11) CSC 350 Discrete Dynamic Systems (3) CSC 360 Continuous Dynamic Systems (3) Upper-division restricted electives (5) Artificial Intelligence (11) CSC 420 Artificial Intelligence (4) CSC 421 Knowledge Based Systems (4) Upper-division restricted electives (3) Computer Based Training (11) CSC 413 Authoring Languages (4) CSC 414 Authoring Languages/Systems (4) Upper-division restricted electives (3) Graphics (11)

CSC 455 Computer Graphics I (4) CSC 456 Computer Graphics II (4)

Upper-division restricted electives (3)

24-28

# MASTER OF SCIENCE IN COMPUTER SCIENCE

The department offers a program leading to a Master of Science in Computer Science with particular emphasis in the following areas: computer systems and software, computer graphics, numerical analysis, computer modeling and simulation, expert systems, information processing and computer architecture. The program is designed for maximum flexibility to allow the student to concentrate in one particular area of study or to blend coursework in several areas. Graduate lectureships for quarter-time teaching assignments are generally available, but are usually awarded to students already in residence. Special features of the program include its emphasis on applications of computers to current industrial problems.

A close association with industry is typified by the practicum, which involves students and their advisers in a problem of interest to a specific industrial organization, and the School of Engineering Student/Faculty Internship Program, which provides for individual contracting of students with a specific company.

All students are required to complete a thesis or a practicum. These are scholarly investigations or projects which culminate students' classroom and laboratory learning. The theses and practica allow students to demonstrate in practice their mastery of the field of computer science.

In addition to the several systems provided by the university's Academic Computing Services, the department has its own Computer Systems Laboratory. The laboratory is supported by industry and has a variety of different computer systems. The largest is the Pyramid 98X which runs UNIX. In addition, the CSL has Sun workstations, Hewlett Packard 6400's, and a Sequent with 10 processors for parallel programming. In addition there are several graphics workstations, terminals, and printers.

Outstanding students who did not major in computer science at the undergraduate level are encouraged to apply for admission and finish the prerequisites for graduate work before beginning the program requirements. The Department strongly encourages women and underrepresented minorities to apply.

Foreign applicants must take the TOEFL exam and the TWE (Test of Written English). For admission as a classified graduate student, an applicant must hold a bachelor's degree in computer science or a closely related technical field with a minimum grade point average of 3.0 in the last 90 quarter units (60 semester units) attempted and must have satisfactory scores on the TOEFL and the TWE. Applicants meeting these standards, but with a bachelor's degree in a field not closely related to computer science, may be admitted as conditionally classified students and must complete all prerequisite coursework before advancement to classified graduate standing. Advancement to Candidacy requires approval of an advisory committee and completion of 12 units of coursework specified in the student's formal program of study with a minimum grade point average of 3.0.

The student must take at least 45 units of work beyond the undergraduate degree chosen to include:

# CURRICULUM FOR M.S. COMPUTER SCIENCE

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For further information or advisement students should communicate with the Graduate Coordinator of the Computer Science Department.

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

# ELECTRONIC AND ELECTRICAL ENGINEERING DEPARTMENT

School of Engineering Advising Center, Engineering East Faculty Offices (20), Room 215 (805) 756-1461

# Faculty

#### Department Chair, Martin E. Kaliski

Samuel O. Agbo Amr F. Assal Jerome R. Breitenbach Michael M. Cirovic Samir K. Datta Eugene D. Fabricius Michael J. Fitzpatrick Saul Goldberg James G. Harris William F. Horton Carl A. MacCarley Wayne E. McMorran Shien-Yi Meng Ahmad Nafisi Mahmood Nahvi Ali O. Shaban Cheng Sun Shyama C. Tandon James H. W. Tseng Gustav N. Wassel Donley J. Winger Michael T. Wollman Chuan-Sung Yeh

# Programs

B.S. Electrical EngineeringB.S. Electronic EngineeringB.S. Computer EngineeringM.S. Electronic and Electrical Engineering

The Department offers two degree programs which are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology: the B.S. in Electronic Engineering and the B.S. in Electrical Engineering. When applying for admission, one of the two majors must be selected. These two majors have identical curricula through the sophomore year with minor differences in the junior year. Consequently, the student may elect a major change from one to the other as late as the junior year.

The main objective of the department is to prepare the student for engineering; i.e., pursuing solutions to urgent problems in reshaping the environment to meet human needs while being responsibly aware of all implications. The curriculum provides a sound theoretical background along with current, practical engineering knowledge. The student begins the major in the first quarter with orientation and generally has one or more major courses each quarter until graduation. The many laboratory courses provide practical experience and lead logically into design which begins in the third year.

Senior students select specialized technical courses which make them more attractive to industry as early contributors. The student wishing to pursue graduate work may select appropriate senior courses in keeping with this goal. In the required senior design project, students demonstrate their understanding of engineering knowledge and their ability to apply that knowledge creatively to practical problems.

Students are encouraged to participate in appropriate professional clubs such as: Eta Kappa Nu, Amateur Radio Club, Audio Engineering Society, the Electronic and Electrical Engineering Council, the Student Branch of the Institute of Electrical and Electronics Engineers (IEEE), International Society of Hybrid Microelectronics (ISHM), Society of Photo-Optical Instrumentation Engineers (SPIE), Poly Phase Club, and Power Engineering Society.

The Department supports the concept of international education and encourages students to investigate opportunities for overseas study. For further information, see the Study Abroad programs.

# **COMPUTER ENGINEERING**

For information regarding this program, please refer to Computer Engineering. This program is jointly administered by the Electronic and Electrical Engineering Department and the Computer Science Department.

#### ELECTRICAL ENGINEERING

Electrical engineering deals with industrial process control systems and with generation, distribution, control and utilization of electric power. The curriculum includes basic circuit, field and device theory accompanied by control systems and power system analysis and is responsive to current technical advancements in engineering and science. Senior elective courses provide specialized preparation in a selected area such as advanced control systems, energy conversion, power system analysis, protection and stability and solid state motor control. There are appropriate laboratories equipped to support the program. They provide not only hands-on instrumentation experience, but also design experience.

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.

# ELECTRONIC ENGINEERING

Electronic engineering deals with the development, design and application of circuits, devices and systems for communication, computers, controls, information processing and display, and system instrumentation. The curriculum includes circuit, field and device theory accompanied by logic and switching circuit design and is responsive to current technical advancements in engineering and science. Senior elective courses provide specialized preparation in a selected area such as active and passive network synthesis, advanced communications systems, computer system design, microelectronic circuit engineering, microprocessor systems applications, microwave engineering, electro-optics, and solid state devices.

There are appropriate laboratories equipped to support the program. They provide not only hands-on instrumentation experience, but also design experience.

# BASIC CURRICULUM FOR B.S. ELECTRICAL ENGINEERING AND B.S. ELECTRONIC ENGINEERING

The first two years of the Electronic Engineering and Electrical Engineering curricula introduce the student to material basic to both of these disciplines.

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

#### Freshman

EE 110 Orientation	1
EE 112 Electric Circuit Analysis I	2
ETMP 157 Electronic Manufacturing	3
ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
CHEM 124 General Chemistry (B.1.a.)	4
CHEM 125 General Chemistry	4
CSC 204 C and UNIX (F.1.)	3
ENGL 114 Writing: Exposition (A.1.)	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking	
(A.2.)	3
ENGL 215 Writing: Argumentation or ENGL	
218 Professional Writing: Argumentation	
and Reports (A.4.)	4
MATH 141 Calculus I (B.2.)	4
MATH 142 Calculus II (B.2.)	4
MATH 143 Calculus III	4
PHYS 131 General Physics (B.1.a.)	4
PHYS 133 General Physics	4
SPC 201 Public Speaking or	
SPC 202 Princ. of Speech Communication (A.3)	3
	54

# Sophomore

EE 211, EE 241 Electric Circuit Analysis and	
Laboratory II	3,1
EE 212, EE 242 Electric Circuit Analysis and	
Laboratory III	3,1
EE 208, EE 248 Electronic Devices and	
Laboratory	3,1
EE 219, EE 259 Logic and Switching Circuits, and	
Laboratory	3,1
MATH 241 Calculus IV	4
MATH 242 Differential Equations	4
MATH 317 Topics in Engineering Math	4
ME 211 Engineering Statics	3
ME 212 Engineering Dynamics	3
PHYS 132 General Physics	4
PHYS 211 Modern Physics	4
ECON 201/ECON 211/ECON 222 (D.3.)	3
PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
PSY 201/PSY 202 General Psychology (E.1.)	3

# CURRICULUM FOR B.S. ELECTRICAL ENGINEERING

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

#### Junior

EE 301, EE 341 Linear Systems Analysis and Lab	3,1
EE 302, EE 342 Linear Control Systems and	
Laboratory	3,1
EE 303 Power Transmission	3
EE 304 Random Signals and Noise	3
EE 307, EE 347 Digital Integrated Electronics and	
Lab	3,1
EE 308, EE 348 Electronic Circuits and Lab	3,1
EE 309, EE 349 Integrated Electronic Circuits	·
and Laboratory	3,1
EE 319 Digital System Design	3
EE 325, EE 365 Energy Conversion	
Electromagnetics and Laboratory	3,1
EE 328 Discrete Time Systems	3
EE 334 Electromagnetic Fields I	3
EE 359 Digital System Design Laboratory	1
MATE 306 Materials Engineering	2
BIO 220 Physiology and Biological Adaptation	,
(P1b E2)	1
(D.I.D., E.Z.)	
HIST 204 HISTORY OF AMERICAN IDEALS and	2
Institutions (D.I.)	3
Fine and performing arts elective (C.2.)	3
	53

#### Senior

1

	EE 406 Power System Analysis I	4
	EE 461 Senior Project	3
	EE 462 Senior Project	2
	EE 463 Undergraduate Seminar	1
	ME 302 Thermodynamics	3
	ME 341 Fluid Mechanics	3
	HIST 315 Modern World History (D.2.)	3
	POLS 210 American and California Govt. (D.1.)	3
1	ANT/BUS/ECON/GEOG/POLS/SOC elective	
	(300–400 level) (D.4.b.)	3
1	Arts and humanities elective (Area C)	3
1	Critical reading electives (C.1.)	6
1	Literature, philosophy, arts elective (300–400	
	level) (C.3.)	3
2	Approved technical electives	13
	. –	50

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 86 of this catalog.)

# **B.S. ELECTRICAL ENGINEERING**

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

	Units
MAIOR COURSES	70
EE 112, 208, 211, 212, 248, 301, 302, 303, 304, 307,	
308, 309, 319, 325, 334, 341, 342, 347, 348, 349,	
359, 365, 406, 461, 462, 463	
PHYS 133	
<sup>1</sup> Approved technical electives (7)	
SUPPORT COURSES	84
CHEM 124 (B.1.a.), 125	
CSC 204 (F.1.)	
EE 110, 219, 241, 242, 259, 328	
ETMP 157	
MATE 306	
MATH 141 (B.2.), 142 (B.2.), 143, 241, 242, 317	
ME 211, 212, 302, 341	
PHYS 131 (B.1.a.), 132, 211	
ANT/BUS/ECON/GEOG/POLS/SOC elective	
(300–400 level) (D.4.b.) (3)	
<sup>1</sup> Approved technical electives (6)	
GENERAL EDUCATION AND BREADTH	
REQUIREMENTS	54

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Major and Support Courses.

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

Area B: (2) BIO 220 (B.1.b.)

208

Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300–400 level) (C.3.) Arts and humanities elective (Area C)

Area D: (15) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/211/222 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.)

<sup>1</sup> A minimum of two senior design laboratories with EE prefix and two design lecture courses in the major is required. To be approved by major adviser.

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<sup>&</sup>lt;sup>2</sup> A minimum of two senior design labs with EE prefix and two design lecture courses in the major is required. To be approved by major adviser.

# CURRICULUM FOR B.S. ELECTRONIC ENGINEERING

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

#### Junior

	EE 301, EE 341 Linear Systems Analysis and Lab EE 302, EE 342 Linear Control Systems and	3,1
	Laboratory	21
	EE 313, EE 353 Signal Transmission and	3,1
	Laboratory	3.1
	EE 304 Random Signals and Noise	3
	EE 307, EE 347 Digital Integrated Electronics and	
	Lab	3,1
	EE 308, EE 348 Electronic Circuits and Lab	3,1
	EE 309, EE 349 Integrated Electronic Circuits	
	and Laboratory	3,1
	EE 319 Digital System Design	3
	EE 325, EE 365 Energy Conversion	
	Electromagnetics and Laboratory	3,1
	EE 328 Discrete Time Systems	3
	EE 334 Electromagnetic Fields I	3
	EE 359 Digital System Design Laboratory	1
	MATE 306 Materials Engineering	3
	BIO 220 Physiology and Biological Adaptation	
	(B.1.b., E.2.)	4
	HIST 204 History of American Ideals and	
	Institutions (D.1.)	3
1	Fine and performing arts elective (C.2.)	3
	-	54

# Senior

	EE 401 Electromagnetic Fields II	3
	EE 414 Introduction to Communication Systems	3
	EE 461 Senior Project	3
	EE 462 Senior Project	2
	EE 463 Undergraduate Seminar	1
	ME 302 Thermodynamics	3
	HIST 315 Modern World History (D.2.)	3
	POLS 210 American and California Govt. (D.1.)	3
1	ANT/BUS/ECON/GEOG/POLS/SOC elective	
	(300–400 level) (D.4.b.)	3
1	Arts and humanities elective (Area C)	3
1	Critical reading electives (C.1.)	6
1	Literature, philosophy, arts elective (300-400	
	level) (C.3.)	3
2	Approved technical electives	14
		50
	=	209

See COURSES OF INSTRUCTION section for description of courses in Electrical Engineering, Electronic Engineering, and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 86 of this catalog.)

<sup>2</sup> A minimum of 2 senior design labs with EE prefix and two design lecture courses in the major is required. To be approved by major adviser.

# **B.S. ELECTRONIC ENGINEERING**

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

	Units
MAJOR COURSES	70
EE 112, 208, 211, 212, 301, 302, 304, 307, 308, 309,	
313, 319, 325, 334, 341, 342, 347, 348, 349, 353,	
359, 365, 401, 414, 461, 462, 463	
PHYS 133	
<sup>1</sup> Approved technical electives (5)	
SUPPORT COURSES	85
CHEM 124 (B.1.a.), 125	
CSC 204 (F.1.)	
EE 110, 219, 241, 242, 248, 259, 328	
ETMP 157	
MATE 306	
MATH 141 (B.2.), 142 (B.2.), 143, 241, 242, 317	
ME 211, 212, 302	
PHYS 131 (B.1.a.), 132, 211	
ANT/BUS/ECON/GEOG/POLS/SOC elective	
(300–400 level) (D.4.b.) (3)	
<sup>1</sup> Approved technical electives (9)	
GENERAL EDUCATION AND BREADTH	
REQUIREMENTS	54

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Major and Support Courses.

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

Area B: (2) BIO 220 (B.1.b.) Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300-400 level) (C.3.) Arts and humanities elective (Area C) Area D: (15) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/211/222 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) Area E: (5) PSY 201/PSY 202 (E.1.)

<sup>1</sup> A minimum of two senior design laboratories with EE prefix and two design lecture courses in the major is required. To be approved by major adviser.

# MASTER OF SCIENCE DEGREE IN ELECTRONIC AND ELECTRICAL ENGINEERING

#### **General Characteristics**

The Master of Science program in Electronic and Electrical Engineering has the following objectives:

- Job-entry education for the more complex areas of engineering, such as research and development, innovative design, systems analysis and design, and managerial engineering;
- Updating and upgrading opportunities for practicing engineers;
- Graduate preparation for further study in engineering, leading to the Doctor of Engineering or Ph.D. degree;
- A base which allows graduates to maintain currency in their fields.

#### Prerequisites

For admission as a classified graduate student, an applicant must hold a bachelor's degree in engineering or a closely related physical science with a minimum grade point average of 3.0 in the last 90 quarter units (60 semester units) attempted. Applicants for graduate engineering programs are required to submit satisfactory scores for the General (Aptitude) Test of the Graduate Record Examination. An applicant who meets these standards but lacks prerequisite coursework may be admitted as a conditionally classified student and must make up any deficiencies before advancement to classified graduate standing.

Information pertaining to specific requirements for admission to graduate standing (classified or conditionally classified) may be obtained from the Graduate Coordinator, Electronic and Electrical Engineering Department.

#### **Program of Study**

Graduate students must file a formal study plan with their adviser, department, school and university graduate studies office by no later than the end of the quarter in which the 12th unit of approved courses is completed. The formal program of study must include a minimum of 45 units (at least 24 of which must be at the 500 level and the remainder at the 400 level) with a specialization in one of the following areas: Computer Engineering, Electrical Engineering, Electronic Engineering.

The broad curriculum requirements for the M.S. in Electronic and Electrical Engineering are:

- a) a core of 19 units as required;
- b) a minimum of 14 units in the field of specialization;
- c) the remaining units from a list of approved electives;
- d) at least 24 units of the 45 unit program at the 500 level.

Two program options are available for M.S. in Electronic and Electrical Engineering students: a thesis program which requires coursework, a thesis and oral defense of thesis; *or* a nonthesis option which involves additional coursework and a comprehensive examination. The nonthesis option is normally allowed only for those students who have completed an undergraduate senior project or have had significant engineering project experience.

# M.S. Electronic and Electrical Engineering, Specialization in Computer Engineering

Core Courses	19
EE 525 Stochastic Processes for Engineers (4)	
EE 599 Design Project (Thesis) (2) (2) (5) or	
9 units of approved technical electives and a	
comprehensive written examination	
Approved courses from: MATH, STAT, CSC (6)	
Recommended courses in specialization	14
To be selected from:	
EE 515 Discrete Time Filters (4)	
EE 523 Digital Systems Design (3)	
EE 521 Computer Systems (4)	
EE 522 Microprocessor-Based Digital Sys. Des. (4)	
EE 526 Digital Communications (4)	
Approved technical electives (400-500 level)	12
=	45

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# M.S. Electronic and Electrical Engineering, Specialization in Electrical Engineering

Core Courses	
EE 525 Stochastic Processes for Engineers (4)	
EE 599 Design Project (Thesis) (2) (2) (5) or 9	
units of approved technical electives and	
comprehensive written examination	
Approved courses from: MATH, STAT, CSC (6)	
Recommended courses in specialization	
To be selected from:	
EE 511 Electric Machines Theory (3)	
EE 513 Control Systems Theory (4)	
EE 518 Advanced Power System Analysis (3)	
EE 519 Power System Design (4)	
EE 520 Solar-Photovoltaic Systems Design (3)	
Approved technical electives	
· · · · · · · · · · · · · · · · · · ·	-

# M.S. Electronic and Electrical Engineering, Specialization in Electronic Engineering

	C.m.
Core Courses	19
EE 525 Stochastic Processes for Engineers (4)	
EE 599 Design Project (Thesis) (2) (2) (5) or 9	
units of approved technical electives and	
comprehensive written examination	
Approved courses from: MATH, STAT, CSC (6)	
Recommended courses in specialization	14
To be selected from:	
EE 515 Discrete Time Filters (4)	
EE 523 Digital Systems Design (3)	
EE 524 Solid State Electronics (3)	
EE 526 Digital Communications (4)	
EE 528 Digital Image Processing (4)	
Approved technical electives (400-500 level)	12
. –	45

# **ENGINEERING SCIENCE**

An Interdisciplinary Curriculum in Engineering Science and Emerging Technologies

Coordinator, Daniel W. Walsh Engineering Bldg. (13), Room 266 (805) 756-2131

# **Programs**

#### **B.S. Engineering Science**

The Bachelor of Science degree in Engineering Science is designed to allow students the latitude in course selection required to educate themselves either in the classical study of engineering science or in new and evolving interdisciplinary technologies. The curriculum builds a sound foundation in the fundamental principles of engineering and engineering systems during the early years of study. During their final quarters of study, students customize their study plan with the help of a faculty adviser and are given the opportunity to focus their education while still at the undergraduate level. A B.S. degree in Engineering Science is, therefore, a direct path to employment in a classic engineering field or in an area of emerging technology. It is also a natural step toward a professional or a graduate degree.

All practitioners of engineering must have an understanding of the physical sciences and mathematics. Further, they must have a firm grasp of engineering sciences. The basic engineering sciences are (1) mechanics of solids and fluids, (2) electrical science, encompassing electric and magnetic fields, and circuits, (3) thermodynamics and statistical mechanics, (4) materials science, (5) information transmission, (6) logic and computing devices, (7) systems analysis, and (8) transfer and rate processes. The engineering science curriculum provides the framework for this matrix of understanding, upon which the practitioner may begin to develop a unique area of expertise.

The curriculum in engineering science emphasizes practical applications as well as principles. The laboratories in many of the courses are constantly evolving, so students benefit from frequent exposure to a variety of state-of-the-art equipment.

Engineering Science is a curriculum for directed, highly motivated students. The technical elective courses should be consistent with a sharply defined career goal. Each student will be required to submit a study plan to the coordinator prior to the end of the first quarter of their junior year. Study plans selected in the past have emphasized engineering physics, biomedical engineering, geological engineering, ocean engineering, and atmospheric science. Plans that are currently popular include biochemical engineering, modeling and simulation, computer integrated manufacturing and engineering for extraterrestrial environments. School of Engineering Advising Center Engineering East Bldg. (20), Room 215 (805) 756-1461

## **GRADUATE PROGRAMS**

The following graduate engineering programs are offered at Cal Poly. Please refer to the appropriate department or the School of Engineering.

- M.S. Aeronautical Engineering
- M.S. Civil and Environmental Engineering
- M.S. Computer Science
- M.S. Electronic and Electrical Engineering Computer Engineering Specialization Electrical Engineering Specialization Electronic Engineering Specialization
- M.S. Engineering Biochemical Engineering Specialization Industrial Engineering Specialization Mechanical Engineering Specialization Materials Engineering Specialization
- Joint M.B.A./M.S. Engineering with Specialization in Engineering Management

# **CURRICULUM FOR B.S. ENGINEERING SCIENCE**

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

#### Freshman

EE 112 Electric Circuit Analysis I	2
ETME 141 Applied Descriptive Geometry	2
ETME 240 CAD Project Laboratory	1
BIO 220 Physiology and Biological Adaptation	
(B.1.b., E.2.)	4
CHEM 124 General Chemistry (B.1.a.)	4
CHEM 125 General Chemistry	4
CSC 204 C and UNIX or	
CSC 251 Digital Computer Applications (F.1.)	3–2
ENGL 114 Writing: Exposition (A.1.)	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking	
(A.2.)	3
MATH 141 Calculus I (B.2.)	4
MATH 142 Calculus II (B.2.)	4
MATH 143 Calculus III	4
PHYS 131 General Physics	4
PHYS 132 General Physics	4
SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	
(A.3.)	3
Required and elective courses to complete major	2–3
. –	52

## Sophomore

CE 204 Strength of Materials	3
CE 205, CE 206 Strength of Materials and	
Laboratory	2,1
EE 211, EE 241 Electric Circuit Analysis and	
Laboratory II	3,1
MATH 241 Calculus IV	4
MATH 242 Differential Equations	4
MATH 317 Topics in Engineering	
Mathematics	4
ME 211 Engineering Statics	3
ME 212 Engineering Dynamics	3
PHYS 133 General Physics	4
Physical science elective	4
ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
CSC 112 Pascal Programming (F.1.)	3
ECON 201 Survey of Economics or	
ECON 211 Principles of Economics (D.3.)	3
ENGL 218 Professional Writing: Argumentation and	
Reports (A.4.)	4
HIST 204 History of American Ideals and	
Institutions (D.1.)	3
-	
	- 52

#### Junior

CSC 332 Numerical Analysis I	3
EE 208, EE 248 Electronic Devices and Laboratory	3,1
IE 314 Engineering Economics	3
ME 302 Thermodynamics	3
ME 313 Heat Transfer	3
ME 318 Mechanical Vibrations	4

	MATE 306, MATE 341 Materials Engineering and	21
	POLS 210 American and California Covernment	3,1
	(D.1.)	3
	PSY 201/PSY 202 General Psychology (E.1.)	3
2	Arts and humanities elective (Area C)	3
2	Critical reading electives (C.1.)	6
1	Required and elective courses to complete major	12
	-	51

#### Senior

	ME 341 Fluid Mechanics	3
~	MATE 401 Electronic Properties of Materials	3
3	Senior Project	2,2
	HIST 315 Modern World History (D.2.)	- 3
	PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
2	ANT/BUS/ECON/GEOG/POLS/SOC elective	
	(D.4.b.)	3
2	Fine and performing arts elective (C.2.)	3
2	Literature, philosophy, arts elective (300-400	
	level) (C.3.)	3
1	Required and elective courses to complete major	16
	Electives	8
	-	49

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

<sup>1</sup> Emphasis area elective units must be chosen with the approval of the adviser.
 <sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 86 of this catalog.)
 <sup>3</sup> To be selected in an appropriate engineering discipline.

# **B.S. ENGINEERING SCIENCE**

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

	Units
MAJOR COURSES	70
CE 204, 205, 206	
CSC 112, 204/251 (F.1.), 332	
EE 112, 211, 241	
EE 208, 248	
ETME 141, 240	
MATE 306, 341, 401	
ME 211, 212, 302, 313, 318, 341	
Senior Project in appropriate engineering discipline	
(2,2)	
Technical electives (12/13)	
SUPPORT COURSES	69
CHEM 124 (B.1.a.), 125	
MATH 141 (B.2.), 142 (B.2.), 143, 241, 242, 317	
PHYS 131 (B.1.a.), 132, 133	
Physical science elective	
IE 314	
Emphasis electives to be selected with adviser's	
approval (18)	
GENERAL EDUCATION AND BREADTH	
REQUIREMENTS	57
	,

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Major and Support Courses.

Area A: (14) ENGL 114 (A.1.) ENGL 125/PHIL 125/SPC 125 (A.2.) SPC 201/SPC 202 (A.3.) ENGL 218 (A.4.) Area B: (2) BIO 220 (B.1.b.) Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300-400 level) (C.3.) Arts and humanities elective (Area C) Area D: (18) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/211 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) Area E: (5) PSY 201/PSY 202 (E.1.) BIO 220 (E.2.) ELECTIVES .....

8

# ENGINEERING TECHNOLOGY DEPARTMENT

Computer Science Bldg. (14), Room 240 (805) 756-1138

# Faculty

## Interim Department Head, Kim Davis

Franklin P. Abshire	Michael Hawes
Nan A. Byars	William R. Hodges
Neill V. Clark	Karl D. Lilje
James R. Ehrenberg	Charles G. Lomas
Fred S. Friedman	Robert L. Rogers
Gary A. Granneman	Omar Zia

# **Programs**

B.S. Electronic Engineering Technology

B.S. Engineering Technology with Concentration in: Mechanical Technology

Both programs are accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology.

The objective of both programs is to provide a curriculum that is current in theoretical and applied concepts and practices. The emphasis however is placed on the practical aspects of engineering rather than abstract concepts or theories. In meeting this objective, the engineering technology faculty emphasize using well-documented and proven theoretical concepts in design, modification and application of existing technologies.

The engineering technologist is somewhat more specialized than the engineer, focusing on a technical field within a traditional discipline. Compared to engineering, there is less breadth and rigor in underlying engineering sciences, mathematics, and basic sciences. There is more study in knowledge and skills related to production, routine design, equipment selection and modification, service, and maintenance. Emphasis is given to application of state-of-the-art technology.

Engineering technology students are prepared not only for immediate employment but for continuing development as citizens and responsible human beings as well. This is accomplished by requiring appropriate courses in technical fields, communication, and humanistic-social studies. Engineering technology graduates are occupationally ready with salable skills and potential for growth to meet defined technical needs of industry, business and service agencies.

The programs are structured to optimize transfer credit from associate engineering technology programs offered by the California community colleges. Many of our students have transferred from these institutions.

Deviation Request forms submitted for consideration of substituting courses from other colleges for possible equivalent Cal Poly engineering technology courses must be submitted within the first two quarters, except summer, of being a major in the Engineering Technology Department.

# ELECTRONIC ENGINEERING TECHNOLOGY

Electronic Engineering Technology graduates possess a combination of theoretical and practical understanding which makes them immediately employable with minimal job training. The demand for new commercial and industrial application of electronics is increasing. New ideas that are born in research laboratories need to be developed and manufactured, which can best be accomplished by the Electronic Engineering Technologist. Recent graduates have received placement in such departments of major engineering companies as research and development, component and system design, test engineering, manufacturing engineering, field engineering, and quality control engineering.

# **ENGINEERING TECHNOLOGY**

The Bachelor of Science degree in Engineering Technology leads to careers in manufacturing, quality assurance, design support, field service, product testing and evaluation, maintenance, technical aspects of marketing, and other areas of technical support of engineering activity.

## **CURRICULAR CONCENTRATION**

## **Mechanical Technology Concentration**

Emphasizes the application of current technology, including computer-aided methods, in support of design of mechanical equipment and systems; a second emphasis area is fluid power, engines, process control, and product evaluation and modification.

*Note:* The Engineering Technology concentrations in Manufacturing Processes and Welding Technology are available only for students enrolled prior to January 1992. See the Industrial Engineering curriculum for information regarding their Manufacturing concentration.

# **CURRICULUM FOR B.S. ELECTRONIC ENGINEERING TECHNOLOGY**

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

# Freshman

EET 124 Introduction to Electronic Circuits	4
EET 125 Introduction to Electronic Devices	4
ETME 142 Engineering Drawing I	1
ETME 143 Engineering Drawing II	1
ETMP 157 Electronic Manufacturing	3
CHEM 121 General Chemistry (B.1.a.)	4
CSC 110 Computers and Computer Applications	
(F.1.)	3
ENGL 114 Writing: Exposition (A.1.)	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking	
(A.2.)	3
ENGL 218 Professional Writing:	
Argumentation and Reports (A.4.)	4
MATH 120 Pre-Calculus Algebra and Trigonometry	5
MATH 131 Technical Calculus (B.2.)	4
MATH 132 Technical Calculus (B.2.)	4
PHYS 121 College Physics (B.1.a.)	4
PHYS 122 College Physics	4
-	52

#### Sophomore

EET 218 Digital Circuits I	3
EET 226 Fundamentals of Electrical Power Systems.	4
EET 231 Passive Network Analysis	4
EET 232 Electronic Circuits and Devices I	4
EET 233 Electronic Circuits and Devices II	4
ETME 205 Statics for Engineering Technology	3
ETME 302 Heat Transfer for Engineering	
Technology	3
IF 222 Engineering Analysis	ž
MATH 133 Technical Calculus	4
PHYS 123 College Physics	4
BIO 220 Physiology and Biological Adaptation	
(R1h F2)	4
SPC 201 Public Sneaking or	7
SPC 202 Principles of Speech Communication	
(A 2)	2
$(\Lambda, J_{i})$	נ י
Critical reading elective (C.I.)	3
ACTG/BUS/MGT/MKTG/IE elective (200–400	
level)	3
Digital computer programming elective with	
adviser approval	3
	52
	<ul> <li>EET 218 Digital Circuits 1</li> <li>EET 226 Fundamentals of Electrical Power Systems.</li> <li>EET 231 Passive Network Analysis</li> <li>EET 232 Electronic Circuits and Devices 1</li> <li>ETME 205 Statics for Engineering Technology</li> <li>ETME 302 Heat Transfer for Engineering Technology</li> <li>IE 222 Engineering Analysis</li></ul>

### lunior

EET 305 Advanced Electronic CAD/CAE	2
EET 310 System and Circuit Analysis	4
EET 311 Transmission Lines and Antennas	4
EET 312 Active Linear Circuits	4
EET 330 Electric Machinery	4
EET 334 Digital Circuits II	4
EET 335 Communications I	4

	EET 338 Fundamentals of Computer Technology ECON 201 Survey of Economics <i>or</i>	4
	ECON 211 Principles of Economics (D.3.)	3
	HIST 204 History of American Ideals and	Ű
	Institutions (D.1.)	3
	PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
	POLS 210 American and California Government	
	(D.1.)	3
	PSY 201/PSY 202 General Psychology (E.1.)	3
2	Critical reading elective (C.1.)	- 3
2	Fine and performing arts elective (C.2.)	3
	4	51

#### Senior

EET 422 Automatic Control	
EET 432 Automatic Control	4
EET 435 Communications II	4
ET 461 Senior Project	2
ET 462 Senior Project	3
ET 463 Undergraduate Seminar	2
IE 314 Engineering Economics	3
ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
BUS 404 Governmental and Social Influences on	-
Business (D4h)	4
HIST 315 Modern World History (D 2)	2
PHIL 227 Professional Ethics or	<b>_</b>
FILL 337 FIDIESSIONAL ELITICS OF	
HUM 402 Values and Technology (C.3.)	3
Arts and humanities elective (Area C)	- 3
EET electives (400-level courses in Electronics)	16
-	50
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	205

<sup>1</sup> 200-level or higher statistics course taught by the Math or Stat Department may

 <sup>2</sup> To be selected in accordance with the General Education-Breadth and TAC/ABET requirements. Skills courses are not acceptable. (Please see <sup>3</sup> Elective(s) are to be selected with the approval of the student's adviser. IE

courses must be of a management nature.

# **B.S. ELECTRONIC ENGINEERING TECHNOLOGY**

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

Units MAJOR COURSES 70 EET 124, 125, 218, 226, 231, 232, 233, 305, 310, 311, 312, 330, 334, 335, 338, 432, 435 ET 461, 462 SUPPORT COURSES 74 ET 463 ETME 142, 143, 205, 302 **ETMP 157** IE 222 (or 200-level adviser approved statistics course), 314 MATH 120, 131 (B.2.), 132 (B.2), 133 PHYS 121 (B.1.a.), 122, 123 CHEM 121 (B.1.a.) ACTG/BUS/MGT/MKTG/IE adviser approved elective (200-400 level) (3) Digital computer programming elective with adviser approval (3) EET electives (400-level courses in electronics) (16)GENERAL EDUCATION AND BREADTH REQUIREMENTS..... 61 Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300-400 level. Area A: (14) ENGL 114 (A.1.) ENGL 125/PHIL 125/SPC 125 (A.2.) SPC 201/SPC 202 (A.3.) ENGL 218 (A.4.) Area B: (2) BIO 220 (B.1.b.) Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) PHIL 337/HUM 402 (C.3.) Arts and humanities elective (Area C) Area D: (19) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/ECON 211 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) BUS 404 (D.4.b.) . Area E: (5) PSY 201/PSY 202 (E.1.) BIO 220 (E.2.) Area F: (3) CSC 110 (F.1.) ELECTIVES 0 205

# **CURRICULUM FOR B.S. ENGINEERING TECHNOLOGY**

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

# Freshman

EET 124 Introduction to Electronic Circuits	4
EET 125 Introduction to Electronic Devices	4
ETME 141 Applied Descriptive Geometry	2
ETME 142 Engineering Drawing I	1
ETME 143 Engineering Drawing II	1
ETAD 144 Manufacturing Drawing Handhining I	
ETMP 144 Manufacturing Processes: Machining 1	2
ETWT 144 Manufacturing Processes: Welding	2
IE 141 Manufacturing Processes	1
CSC 110 Computers and Computer Applications	
(F.1.)	3
Digital computer programming elective with	
adviser approval	2
ENGL 114 Writing: Exposition (A.1.)	4
MATH 120 Pre-Calculus Algebra and Trigonometry	5
MATH 131 Technical Calculus (B.2.)	4
MATH 132 Technical Calculus (B 2)	4
PHVS 121 Collogo Physics (B 1 2)	1
PHT5 121 College Flysics (b.i.d.)	7
PHYS 122 College Physics	4
Fine and performing arts elective (C.2.)	3
-	50

### Sophomore

	EET 226 Fundamentals of Electrical Power Systems.	4
	ETME 205 Statics for Engineering Technology	3
	ETME 206 Dynamics for Engineering Technology	4
	ETMP 158 Introduction to Robotics	2
	CE 204 Strength of Materials	3
	CE 205, CE 206 Strength of Materials and	
	Laboratory	2,1
2	IE 222 Engineering Analysis	3
	MATE 306 Materials Engineering	3
	MATE 341 Materials Engineering Laboratory	1
	MATH 133 Technical Calculus	4
	CHEM 121 General Chemistry (B.1.a.)	4
	PHYS 123 College Physics	4
	ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
	ENGL 125/PHIL 125/SPC 125 Critical Thinking	
	(A.2.)	3
	ENGL 218 Professional Writing: Argumentation	
	and Reports (A.4.)	4
	HIST 204 History of American Ideals and	
	Institutions (D.1.)	3
	-	
		51

### Junior

ETME 302 Heat Transfer for Engineering	
Technology	3
ETME 311 Fluid Mechanics for Engineering	
Technology	3
ETME 303 Applied Mechanics Lab	1
ETME 335 Selection of Engineering Materials	2
ETME 344 Design Systems and Practices	2

	ETWT 335 Nondestructive Evaluation IE 314 Engineering Economics	3 3
	BIO 220 Physiology and Biological Adaptation	
	(B.1.b., E.2.)	4
	PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
	PSY 201/PSY 202 General Psychology (E.1.)	3
	SPC 201 Public Speaking or	
	SPC 202 Principles of Speech Communication	
	(A.3.)	3
3	ACTG/BUS/MGT/MKTG/IE elective (200-400	
	level)	3
1	Critical reading elective (C.1.)	3
	Courses to complete concentration	17
	-	53

## Senior

	ET 461 Sonior Project	2
	ET 401 Sellior Floject	2
	E1 462 Senior Project	5
	ET 463 Undergraduate Seminar	2
	BUS 404 Governmental and Social Influences on	
	Business (D.4.b.)	4
	ECON 201 Survey of Economics or	
	ECON 211 Principles of Economics (D.3.)	3
	HUM 402 Values and Technology or	
	PHIL 337 Professional Ethics (C.3.)	3
	HIST 315 Modern World History (D.2.)	3
	POLS 210 American and California Government	
	(D.1.)	3
1	Arts and humanities elective (Area C)	3
1	Critical reading elective (C.1.)	3
	Courses to complete concentration	22
		51
		205
	_	

<sup>1</sup> To be selected in accordance with the General Education-Breadth and TAC/ABET requirements. Skills courses are not acceptable. (Please see page 86 of this catalog.)

<sup>2</sup> 200-level or higher statistics course taught by the Math or Stat Department may be acceptable. Consult with your adviser.

<sup>3</sup> Elective(s) are to be selected with the approval of the student's adviser. IE courses must be of a management nature.

# **Mechanical Technology Concentration**

EET 330 Electric Machinery	4
ETME 301 Thermodynamics for Engineering	
Technology	3
ETME 320 Mechanisms	3
ETME 333 Industrial Hydraulics and Pneumatics	4
ETME 337 Instrumentation of Mechanical Systems	3
ETME 338 Industrial Engines	4
ETME 406 Vibrations for Technology	2
ETME 421, ETME 422 Applied Machine Design I, II	4,4
ETME 437 Applied Fluid Power Systems	4
ETME 443 Mechanical Systems	4
-	39

# **B.S. ENGINEERING TECHNOLOGY**

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

Units MAIOR COURSES 72 EET 124, 125, 226 ET 461, 462, 463 ETME 205, 206, 311, 335, 344 Concentration courses Mechanical Technology Concentration (39) **EET 330** ETME 301, 320, 333, 337, 338, 406, 421, 422, 437.443 SUPPORT COURSES 75 ETME 141, 142, 143, 302, 303 ETMP 144, 158 ETWT 144, 335 CE 204, 205, 206 IE 141, 222 (or 200-level adviser approved statistics course), 314 MATE 306, 341 MATH 120, 131 (B.2.), 132 (B.2.), 133 PHYS 121 (B.1.a.), 122, 123 CHEM 121 (B.1.a.) ACTG/BUS/MGT/MKTG/IE adviser approved elective (200-400 level) (3) CSC 110 (F.1.) Digital computer programming adviser approved elective (2) **GENERAL EDUCATION AND BREADTH** REQUIREMENTS..... 58 Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300-400 level. Area A: (14) ENGL 114 (A.1.) ENGL 125/PHIL 125/SPC 125 (A.2.) SPC 201/SPC 202 (A.3.) ENGL 218 (A.4.) Area B: (2) BIO 220 (B.1.b.) Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) PHIL 337/HUM 402 (C.3.) Arts and humanities elective (Area C) Area D: (19) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/ECON 211 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) BUS 404 (D.4.b.)

Area E: (5) PSY 201/PSY 202 (E.1.) BIO 220 (E.2.) ELECTIVES

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# INDUSTRIAL ENGINEERING DEPARTMENT

Graphic Arts Bldg. (26), Room 100 (805) 756-2341

# Faculty

# Department Chair, H. Jo Anne Freeman

K. N. Balasubramanian Kenneth L. Brown J. Kent Butler Archie D. Cheda Mark A. Cooper Anthony K. Mason Unny Menon A. Reza Pouraghabagher Paul E. Rainey Ahmad K. Seifoddini Richard A. Strahl Donald E. White Tao H. Yang

# **Programs**

B.S. Industrial Engineering with Concentrations in: Manufacturing Systems Integration

#### Minor: Integrative Technology

Industrial Engineering is the profession concerned with solving engineering and management problems by applying scientific logic, systems methodology, and by utilizing information, energy, materials, facilities, and personnel most effectively. Its objective is to improve quality and efficient production of goods and services and to act as the interface between technology and humans. Engineering methods and practical knowledge are used in formulating decision models for the optimum application of engineering and management principles.

Industrial engineering graduates can choose from a most challenging range of career activities: operations research and analysis, production planning and scheduling, plant design, management, human factors engineering design, data processing and analysis, measurement, quality control and reliability assurance, technical economic planning, resource conservation, productivity measurement, increasing productivity using computer integrated manufacturing techniques, robotics, and, in general, systems analysis and design. The physical, engineering, and social sciences form the broad base for these endeavors.

The curriculum leading to the Bachelor of Science in Industrial Engineering degree is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology. The program is oriented to provide graduates with the capability of producing results with a minimum of additional training. Graduates also are well prepared for successful postgraduate study. Health care industries, banks, retail chains, farms, airlines, mines, computer firms, as well as government and traditional manufacturing industries, employ graduates of this discipline. There are active student chapters of the Institute of Industrial Engineers; Alpha Pi Mu, the national honorary society for industrial engineers; Omega

# School of Engineering Advising Center Engineering East Bldg. (20), Room 215 (805) 756-1461

Rho, the national honor society for operations research; and APICS, the American Production and Inventory Control Society.

Department and university laboratories and equipment, including computers and programmable processors, are integrated into coursework from matriculation until graduation to investigate, test, and apply theoretical principles learned in the classroom.

# CURRICULAR CONCENTRATIONS

#### Manufacturing

A selection of courses stressing the manufacturing process utilizing statistics, economics, operations research, social sciences, human factors, principles of management, and manufacturing methods.

#### **Systems Integration**

A selection of courses stressing the analysis integration and synthesis of systems, utilizing mathematical and statistical models for management planning and control including the concepts of human factors, information theory, and data feedback as applied to productive systems.

# INTEGRATIVE TECHNOLOGY MINOR

The Integrative Technology minor is an interdisciplinary program jointly sponsored by Industrial Engineering, Industrial Technology, and Psychology and Human Development departments. The minor is for non-engineering students who wish to pursue their professional career in a corporate setting and want to learn more about the impact of technology. The minor will acquaint students with how factories operate and how technology is integrated into corporate operations. For more information, see School of Professional Studies.

#### **GRADUATE PROGRAMS**

The following graduate engineering programs are offered at Cal Poly. Please refer to the appropriate department or the School of Engineering.

- M.S. Aeronautical Engineering
- M.S. Civil and Environmental Engineering
- M.S. Computer Science
- M.S. Electronic and Electrical Engineering Computer Engineering Specialization Electrical Engineering Specialization Electronic Engineering Specialization
- M.S. Engineering Biochemical Engineering Specialization Industrial Engineering Specialization Mechanical Engineering Specialization Materials Engineering Specialization
- Joint M.B.A./M.S. Engineering with Specialization in Engineering Management

# **CURRICULUM FOR B.S. INDUSTRIAL ENGINEERING**

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

# Freshman

IE 101 Introduction to Industrial Engineering	1
IE 141 Manufacturing Processes	1
IE 223 Work Design and Measurement	4
ETME 142 Engineering Drawing I	1
ETME 143 Engineering Drawing II	1
ETMP 144 Manufacturing Processes	2
ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
BIO 220 Physiology and Biological Adaptation	
(B.1.b., E.2.)	4
CHEM 124 General Chemistry (B.1.a.)	4
CHEM 125 General Chemistry	4
CSC 204 C and UNIX (F.1.)	3
ENGL 114 Writing: Exposition (A.1.)	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking	
(A.2.)	3
ENGL 218 Professional Writing:	
Argumentation and Reports (A.4.)	4
MATH 141 Calculus I (B.2.)	4
MATH 142 Calculus II	4
MATH 143 Calculus III	4
PSY 201/PSY 202 General Psychology (E.1.)	3
_	54

# Sophomore

	-
IE 239 Industrial Costs and Controls	3
IE 251 Manufacturing Engineering	3
IF 314 Engineering Economics	3
MATH 241 Calculus IV	Ă
NATTI 241 Calculus IV	7
MATH 242 Differential Equations	4
ME 211 Engineering Statics	- 3
ME 212 Engineering Dynamics	3
ECON 201/ECON 211/ECON 222 (D.3.)	3
HIST 204 History of American Ideals and	
Institutions (D1)	3
PHVS 121 Conoral Physics (B 1 a)	Δ
PLIVE 122 Concerned Physics (D.1.a.)	
PHYS 132 General Physics	4
PHYS 133 General Physics	4
POLS 210 American and California Government	
(D1)	3
SPC 201 Public Speaking or	-
CDC 202 Duty sigles of Greech Communication	
SPC 202 Principles of Speech Communication	-
(A.3.)	3
Critical reading elective (C.1.)	3
. –	50
	IE 239 Industrial Costs and Controls IE 251 Manufacturing Engineering IE 314 Engineering Economics MATH 241 Calculus IV MATH 242 Differential Equations ME 211 Engineering Statics ME 212 Engineering Dynamics ECON 201/ECON 211/ECON 222 (D.3.) HIST 204 History of American Ideals and Institutions (D.1.) PHYS 131 General Physics (B.1.a.) PHYS 132 General Physics PHYS 133 General Physics PHYS 133 General Physics POLS 210 American and California Government (D.1.) SPC 201 Public Speaking <i>or</i> SPC 202 Principles of Speech Communication (A.3.) Critical reading elective (C.1.)

#### Junior

IE 301 Operations Research I
IE 305 Operations Research II
IE 312 Data Management and System Design
IE 319 Human Factors Engineering
IE 335 Computer-Aided Engineering
IE 421 Manufacturing Organization

IE 426 Engineering Test Design and Analysis	4
ME 341 Fluid Mechanics	3
EE 311 Electric Circuits Theory	3
ME 302 Thermodynamics or	
MATE 306 Materials Engineering	3
PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
STAT 321 Statistical Analysis (B.2.)	3
Technical electives	6
Courses to complete concentration	6
	52

# Senior

	IE 410 Inventory Control Systems	4
	IE 429 Ergonomics Lab	1
	IE 430 Ouality Engineering	4
	IE 442 Fundamentals of Supervision	1
	IE 443 Facilities Planning and Design	4
	IE 461 Senior Project	2
	IE 462 Senior Project	3
	IE 463 Undergraduate Seminar	2
	EE 321 Electronics	3
	HIST 315 Modern World History (D.2.)	3
1	ANT/BUS/ECON/GEOG/POLS/SOC elective	
	(300-400 level) (D.4.b.)	3
1	Arts and humanities elective (Area C)	3
1	Critical reading elective (C.1.)	3
	Fine and performing arts elective (C.2.)	3
	Literature, philosophy, arts elective (300–400	
	level) (C.3.)	3
	Courses to complete concentration	12
		54
	=	210

<sup>1</sup> To be selected in accordance with the General Education-Breadth and A.B.E.T. requirements. (Please see page 86 of this catalog.) <sup>2</sup> Choose technical electives from the following: IE 411, 433, 435, 437, PSY 494

or current listing.

## **CONCENTRATIONS** (select one)

# **Manufacturing Concentration**

IE 316 Manufacturing Automation	4
IE 418 Manufacturing Process Design	4
IE 422 Manufacturability Engineering	4
Electives chosen from the following:	6
IE 413, IE 416, IE 454, IE 455, IE 456 or current	
listing with academic adviser's approval	
-	18

# Systems Integration Concentration

IE 303 Project Organization and Management	4
IE 407 Operations Research III	4
IE 420 Simulation and Expert Systems	4
Electives chosen from the following: IE 408, IE 409, CSC 420, MGT 406, MATH 306 or current listing with academic adviser's approval	6
-	18

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

# **B.S. INDUSTRIAL ENGINEERING**

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

Units

MAJOR COURSES 65 IE 223, 251, 301, 305, 314, 319, 335, 410, 421, 426, 429, 430, 442, 443, 461, 462, 463 Concentrations (select one:) Manufacturing Management Concentration (18) IE 316, 418, 422 Restricted electives (6) Systems Integration Concentration (18) IE 303, 407, 420 Restricted electives (6) SUPPORT COURSES 88 CE 204/ME 341 CHEM 124 (B.1.a.), 125 CSC 204 (F.1.) EE 311, 321 ETME 142, 143 **ETMP 144** IE 101, 141, 239, 312 MATH 141 (B.2.), 142, 143, 241, 242 ME 211, 212 ME 302/MATE 306 PHYS 131 (B.1.a.), 132, 133 STAT 321 (B.2.) Technical electives (IE 411, 433, 435, 437, PSY 494 or current listing) (6) **GENERAL EDUCATION AND BREADTH** REQUIREMENTS..... 57

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

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Area A: (14)
  ENGL 114 (A.1.)
  ENGL 125/PHIL 125/SPC 125 (A.2.)
  SPC 201/SPC 202 (A.3.)
  ENGL 218 (A.4.)
Area B: (2)
  BIO 220 (B.1.b.)
Area C: (18)
  PHIL 230/PHIL 231 (C.1.)
  Critical reading electives (C.1.)
  Fine and performing arts elective (C.2.)
  Literature, philosophy, arts elective (300-400
    level) (C.3.)
  Arts and humanities elective (Area C)
Area D: (18)
  HIST 204 (D.1.), POLS 210 (D.1.)
  HIST 315 (D.2.)
  ECON 201/211/222 (D.3.)
  ANT 201/GEOG 150/SOC 105 (D.4.a.)
  ANT/BUS/ECON/GEOG/POLS/SOC elective
    (300-400 level) (D.4.b.)
Area E: (5)
  PSY 201/PSY 202 (E.1.)
  BIO 220 (E.2.)
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ELECTIVES	0

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# MATERIALS ENGINEERING DEPARTMENT

George T. Murray

Linda S. Vanasupa

Daniel W. Walsh

Air Conditioning Engineering Bldg. (12), Room 107-C (805) 756-2568 FAX: (805) 756-2299

# **Faculty**

#### Department Head, Robert H. Heidersbach, Jr.

William D. Forgeng Robert B. Leonesio Anny Morrobel-Sosa

Programs

**B.S.** Materials Engineering

Materials engineers deal with materials spanning the spectrum from steels for large bridges, buildings, pipelines and similar structures to the ultralight, high-strength materials used in modern aerospace applications. Increasing numbers of materials engineers find employment in research related to ultrapure electronic materials and components. Materials engineers are heavily involved in the advances being made with high-temperature, superconducting ceramics.

Because virtually all engineering designs are limited by the availability and cost of materials, materials engineers work closely with all other engineering disciplines. They use knowledge of science, engineering, and state-of-the-art analytical instruments to make recommendations on virtually all major engineering designs. The ability to communicate with a wide variety of people with differing backgrounds is very important to the successful practice of materials engineering.

Materials engineers find employment in many industries offering a number of challenging career opportunities. Many graduates are employed in the aerospace, electronic, chemical and petroleum industries. Some work as consultants for large or small organizations. Others become executives in industries ranging from defense contracting to biomedicaldevice manufacturing. A significant number of materials engineers are involved in research; many technological advances are limited by materials, and new materials are needed for virtually all evolving technologies.

The curriculum in materials engineering emphasizes practical applications as well as principles. The laboratories are constantly evolving, and our students benefit from frequent exposure to a wide variety of materials testing and analysis equipment. The curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology. Our students have a reputation for being immediately productive in industry, and they are also actively sought by graduate programs throughout the country.

Materials engineering students participate in a variety of professional societies on campus. They are especially active in the Student Chapters of Society for the Advancement of Material and Process Engineering and ASM International (formerly American Society for Metals).

#### **GRADUATE PROGRAMS**

The following graduate engineering programs are offered at Cal Poly. Please refer to the appropriate department or the School of Engineering.

- M.S. Aeronautical Engineering
- M.S. Civil and Environmental Engineering
- M.S. Computer Science
- M.S. Electronic and Electrical Engineering Computer Engineering Specialization Electrical Engineering Specialization Electronic Engineering Specialization
- M.S. Engineering Biochemical Engineering Specialization Industrial Engineering Specialization Mechanical Engineering Specialization Materials Engineering Specialization
- Joint M.B.A./M.S. Engineering with Specialization in Engineering Management

# **CURRICULUM FOR B.S. MATERIALS ENGINEERING**

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

# Freshman

	MATE 121 Introduction to Materials Engineering	1
	MATE 122 Introduction to Materials Engineering	
	Analysis	1
i	ETME 142 Engineering Drawing I	1
	ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
	CHEM 124 General Chemistry (B.1.a.)	4
	CHEM 125 General Chemistry	4
	MATH 141 Calculus   (B.2.)	4
	MATH 142 Calculus II (B.2.)	4
	MATH 143 Calculus III	4
	ENGL 114 Writing: Exposition (A.1.)	4
	ENGL 125/PHIL 125/SPC 125 Critical Thinking	
	(A.2.)	3
	HIST 204 History of American Ideals and	
	Institutions (D.1.)	3
	PHYS 131 General Physics (B.1.a.)	4
	POLS 210 American and California Government	
	(D.1.)	3
_	PSY 201/PSY 202 General Psychology (E.1.)	3
2	Fine and performing arts elective (C.2.)	3
\$	Manufacturing processes electives	2,2
	-	53

# Sophomore

	MATE 224 Metallography	3
4	MATE 226, MATE 246 Physical Metallurgy and	
	Laboratory	6
4	MATE 306, MATE 341 Materials Engineering and	
	Laboratory	4
	CE 204 Strength of Materials	3
5	CSC 251 Digital Computer Applications (F.1.)	2
	MATH 241 Calculus IV	4
	MATH 242 Differential Equations	4
	ME 211 Engineering Statics	3
	PHYS 132 General Physics	4
	PHYS 133 General Physics	4
	BIO 220 Physiology and Biological Adaptation	
	(B.1.b., E.2.)	4
	ENGL 215 Writing: Argumentation or	
	ENGL 218 Professional Writing: Argumentation	
	and Reports (A.4.)	4
	SPC 201 Public Speaking or	
	SPC 202 Principles of Speech Communication	
	(A.3.)	3
2	Arts and humanities elective (Area C)	3
	-	51
		<u> </u>

# Junior

	MATE 401 Electronic Properties of Materials	3
4	MATE 402, MATE 412 Mechanical Behavior of	
	Materials and Laboratory	6
	MATE 403 Materials Inspection	3

MATE 404 Failure Analysis MATE 427 Composites MATE 428 Polymers MATE 429 Instrumental Analysis MF 212 Engineering Dynamics	
MATE 427 Composites MATE 428 Polymers MATE 429 Instrumental Analysis MATE 429 Instrumental Analysis	3
MATE 428 Polymers MATE 429 Instrumental Analysis MF 212 Engineering Dynamics	3
MATE 429 Instrumental Analysis MF 212 Engineering Dynamics	3
ME 212 Engineering Dynamics	3
	3
<sup>4</sup> CE 205, CE 206 Strength of Materials and	
Laboratory	3
<sup>4</sup> EE 311, EE 351 Electric Circuits Theory and	
Laboratory	4
6 IE 314 Engineering Economics	3
ME 313 Heat Transfer	3
CHEM 305 Physical Chemistry	3
CHEM 306 Physical Chemistry	3
HIST 315 Modern World History (D.2.)	3
<sup>2</sup> Critical reading elective (C.1.)	3
	52

## Senior

	MATE 421 Materials Thermodynamics !	2
	MATE 422 Materials Thermodynamics II	3
	MATE 422 Matchais methodynamics minimum	2
	MATE 425 Corrosion Engineering	1
	MATE 425 Contosion Engineering	ר כ
	MATE 420 Flacture of Materials	3
	MATE 430 Microelectronics Materials Processing	3
	MATE 441 Advanced Materials Laboratory I	1
	MATE 442 Advanced Materials Laboratory II	1
	MATE 443 Advanced Materials Laboratory III .	1
	MATE 434 Welding Engineering I	3
	MATE 461 Senior Project	1
	MATE 462 Senior Project	4
	MATE 463 Undergraduate Seminar	1
	ECON 201/ECON 211/ECON 222 (D.3.)	3
	PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
2	ANT/BUS/ECON/GEOG/POLS/SOC elective	
	(300-400  level) (D 4 b)	3
2	Critical reading elective (C1)	3
2	Literature philosophy arts elective (300-400	
	lovel) (C.2.)	2
7	Nathematica algoritus	3
'		3
	Electives	1
	-	52

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

<sup>1</sup> ETME 141 or ETME 143 or other drafting course may be substituted. <sup>2</sup> To be selected in accordance with the General Education-Breadth and EAC-ABET requirements. (Please see page 86 of this catalog.)

<sup>3</sup> Select a total of 4 units from the following: ETWT 144, ETMP 144, IT 302, IT 141, IE 141.

<sup>4</sup> To be taken concurrently. <sup>5</sup> May substitute CSC 112, CSC 118, CSC 204

<sup>6</sup> IE 426 may be substituted.

<sup>7</sup> Any 300-level or higher MATH, STAT, or CSC course in linear algebra, advanced calculus, or statistics.

#### **B.S. MATERIALS ENGINEERING**

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

MAJOR COURSES 70 MATE 121, 122, 224, 226, 246, 306, 341, 401, 402, 403, 404, 412, 421, 422, 424, 425, 426, 427, 428, 429, 430, 434, 441, 442, 443, 461, 462, 463 SUPPORT COURSES 78 CE 204, 205, 206 CHEM 124 (B.1.a.), 125, 305, 306 CSC 251 (F.1.) (or CSC 112, 118, 204) EE 311, 351 ETME 142 (or ETME 141, 143 or other drafting course) IE 314 (or IE 426) MATH 141 (B.2.), 142 (B.2.), 143, 241, 242 ME 211, 212, 313 PHYS 131 (B.1.a.), 132, 133 300-400 level MATH, STAT or CSC course in linear algebra, advanced calculus or statistics (3)Manufacturing processes electives (ETWT 144, ETMP 144, IT 302, IT 141, IE 141) (2,2) **GENERAL EDUCATION AND BREADTH** 

REQUIREMENTS.....

57

Units

To be selected according to GEB and EAC/ABET requirements. Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

Area A: (18) ENGL 114 (A.1.) ENGL 125/PHIL 125/SPC 125 (A.2.) SPC 201/SPC 202 (A.3.) ENGL 215/218 (A.4.) Area B: (2) BIO 220 (B.1.b.) Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300-400 level) (C.3.) Arts and humanities elective (Area C) Area D: (18) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/211/222 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.) Area E: (5) PSY 201/PSY 202 (E.1.) BIO 220 (E.2.) ELECTIVES .....

3 208

# **MECHANICAL ENGINEERING DEPARTMENT**

Engineering Bldg. (13), Room 252 (805) 756-1334

# Faculty

#### Department Head, Ronald L. Mussulman

James G. Andresen Edward H. Baker Ernest W. Blattner Thomas W. Carpenter Donald R. Chivens William E. Clark Otto C. Davidson Edward R. Garner Harold E. Gascoigne Raymond G. Gordon Michael A. Iannce Mark S. Johnson James G. LoCascio Fredrick B. Malmborg James M. Meagher Amrollah Mehdizadeh Safwat M. A. Moustafa Ronald S. Mullisen Lawrence H. Nelson Saeed B. Niku Philip W. B. Niles William B. Patterson Ramesh T. Shah Jack D. Wilson Yuen Cjen Yong

# Programs

B.S. Mechanical Engineering with Concentrations in: General Mechanical Engineering Heating, Ventilating, Air Conditioning, and Solar Petroleum

The Bachelor of Science degree in Mechanical Engineering concerns itself primarily with the design, construction, and use of a wide variety of equipment ranging from manufacturing machinery and power generation equipment to consumer goods. Of primary concern to the mechanical engineer is the proper application of solid mechanics, fluid mechanics, and thermodynamics in the design, manufacturing, and use of this equipment.

Graduates obtain employment primarily with manufacturers, contractors, public utilities, and governmental agencies. Types of work performed by graduates include design, engineering sales, engineering testing, engineering management, supervision of manufacturing and construction.

The curriculum gives the student a thorough grounding in mechanical engineering and a choice of a curricular concentration in heating, ventilating, air conditioning and solar engineering (HVAC/solar) or petroleum engineering or in general mechanical engineering. Engineering courses are found in all years. In the junior and senior years, the professional specialities include such courses as turbomachinery, robotics, advanced mechanics, mechanical design, heat and mass transfer, mechanical control systems, and solar systems. The programs are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

Laboratories are an important part of the student's education. The student is enrolled in engineering laboratories from the beginning of the freshman year until graduation. These laboratories include work in power generation, fluid flow, heat transfer, vibration, strength of materials, electronics, controls, and others.

There are six organized student clubs associated with Mechanical Engineering: student branches of the American Society of Mechanical Engineers, the Society of Petroleum Engineers, the Society of Automotive Engineers, the American Society of Heating, Refrigerating and Air Conditioning Engineers, the Pi Tau Sigma honorary society, and the Alternative Energy Club. These clubs offer students an active program of professional and social activity.

# **CURRICULAR CONCENTRATIONS**

# **General Mechanical Engineering**

This is a broad program of study which allows the student some opportunity to pursue his or her particular interest. Five courses in this concentration are specified, and three courses may be chosen (with adviser approval) from approximately thirty advanced courses. These courses cover the wide range of faculty interests and expertise.

### Heating, Ventilating, Air Conditioning, and Solar

This concentration prepares students to enter those phases of engineering dealing with thermal and solar systems and their control. These applications include: heating, ventilating and air conditioning of buildings; energy conservation and management; active and passive solar heating; and cooling and industrial refrigeration.

#### Petroleum

This concentration places emphasis on the engineering necessary for the production and field development of petroleum reserves.

#### **GRADUATE PROGRAMS**

The following graduate engineering programs are offered at Cal Poly. Please refer to the appropriate department or the School of Engineering.

- M.S. Aeronautical Engineering
- M.S. Civil and Environmental Engineering
- M.S. Computer Science
- M.S. Electronic and Electrical Engineering Computer Engineering Specialization Electrical Engineering Specialization Electronic Engineering Specialization
- M.S. Engineering Biochemical Engineering Specialization Industrial Engineering Specialization Mechanical Engineering Specialization Materials Engineering Specialization
- Joint M.B.A./M.S. Engineering with Specialization in Engineering Management

# **CURRICULUM FOR B.S. MECHANICAL ENGINEERING**

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

# Freshman

ME 134 Mechanical Systems (Transfer students	
must take ME 234)	3
ETME 141 Applied Descriptive Geometry	2
ETME 142 Engineering Drawing I	1
ETME 143 Engineering Drawing II	1
ETMP 144 Manufacturing Processes: Machining I	2
ETWT 144 Manufacturing Processes: Welding	2
ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
CHEM 124 General Chemistry (B.1.a.)	4
CHEM 125 General Chemistry	4
ENGL 114 Writing: Exposition (A.1.)	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking	
(A.2.)	3
HIST 204 History of American Ideals and	
Institutions (D.1.)	3
MATH 141 Calculus I (B.2.)	4
MATH 142 Calculus II	4
MATH 143 Calculus III	4
PHYS 131 General Physics (B.1.a.)	4
PHYS 132 General Physics	4
Manufacturing Processes elective	
	53

#### Sophomore

ME 211 Engineering Statics	3
ME 212 Engineering Dynamics	3
ME 236 Thermal Systems	3
CE 204 Strength of Materials	3
CE 205 CE 206 Strength of Materials and	5
Laboratory	21
MATE 306, MATE 341 Materials Engineering and	2,1
Laboratory	3,1
PHYS 133 General Physics	4
CSC 251 Digital Computer Applications (F.1.)	2
ECON 201 Survey of Economics (D.3.)	3
ENGL 218 Professional Writing: Argumentation and	
Reports (A.4.)	4
MATH 241 Calculus IV	4
MATH 242 Differential Equations	4
MATH 318 Advanced Engineering	
Mathematics (B.2.)	4
POLS 210 American and California Government	
(D.1.)	3
PSY 201/PSY 202 General Psychology (E.1.)	3
SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	
(A.3.)	3
-	
	53
Junior	
ME 202 Thermodynamics	2
ME 302 THEIHOUYINHINGS	3 2
IVIE 313 FIEDE FIDINE	

	ME 318 Mechanical Vibrations	4
	ME 326 Intermediate Dynamics	4
	ME 328 Introduction to Design	4
	ME 341 Fluid Mechanics	3
	ME 342 Fluid Mechanics	3
	ME 343 Thermal Science Laboratory	1
	ME 344 Thermal Engineering	4
	ME 345 Fluid Mechanics Laboratory	1
	EE 311, EE 351 Electric Circuit Theory and	
	Laboratory	3,1
	EE 321, EE 361 Electronics and Laboratory	3,1
	BIO 220 Physiology and Biological Adaptation	
	(B.1.b., E.2.)	4
	HIST 315 Modern World History (D.2.)	3
2	Critical reading elective (C.1.)	3
	Required and elective courses to complete	
	concentration	4

# Senior

	ME 422 Mechanical Control Systems	4
	ME 461 Senior Project	2
	ME 462 Senior Project	3
	ME 463 Undergraduate Seminar	1
	PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
2	ANT/BUS/ECON/GEOG/POLS/SOC elective	
	(300–400 level) (D.4.b.)	3
2	Arts and humanities elective (Area C)	3
2	Critical reading elective (C.1.)	3
2	Fine and performing arts elective (C.2.)	3
2	Literature, philosophy, arts elective (300-400	
	level) (C.3.)	3
	Required and elective courses to complete	
	concentration	24
	-	
		52
	=	210
		210

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

<sup>1</sup> Choose one unit from IT 141, IE 141 or IT 327.

<sup>2</sup> To be selected in accordance with General Education-Breadth and A.B.E.T. requirements. (Please see page 86 of this catalog.)

# **CONCENTRATIONS** (select one)

# **General Mechanical Engineering Concentration**

ME 329 Intermediate Design	4
ME 428 Design	4
ME 440 Thermal System Design	4
EE 325 Energy Conversion Electromagnetics	3
EE 365 Energy Conversion Laboratory	1
Adviser approved electives	12
-	

### Heating, Ventilating, Air Conditioning, and Solar Concentration

ME	350	Thermal Environmental Engineering	4
ME	351	Active Solar System Analysis and Design	4
ME	451	Passive Solar System Analysis and Design	3
ME	452	Solar Engineering Design	2
ME	455	Thermal Environmental Experimentation	2
ME	456,	ME 457, ME 458 HVAC System Design	3,3,3

ME 459 Advanced Thermal Environmental	
Engineering Design	4
	28

# **Petroleum Concentration**

ME 329 Intermediate Design	4
ME 424 Design of Piping Systems	4
ME 432 Petroleum Reservoir Engineering	4
ME 434 Enhanced Oil Recovery	4
ME 435 Drilling Engineering	4
ME 436 Petroleum Production Surface Operations	
Engineering	4
ME 440 Thermal Systems Design	4
	28

# **B.S. MECHANICAL ENGINEERING**

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

Units

MAJOR COURSES	84
ETME 141, 142, 143	
ME 134, 211, 212, 236, 302, 313, 318, 326, 328,	
341, 342, 343, 344, 345, 422, 461, 462, 463	
Concentrations (select one:)	
General Mechanical Engineering Concentration	
(28)	
ME 329, 428, 440	
EE 325, 365	
Adviser approved electives (12)	
Heating, Ventilating, Air Conditioning, and Solar	
Concentration (28)	
ME 350, 351, 451, 452, 455, 456, 457, 458, 459	
Petroleum Concentration (28)	
ME 329, 424, 432, 434, 435, 436, 440	
SUPPORT COURSES	69
CE 204, 205, 206	
CHEM 124 (B.1.a.), 125	
CSC 251 (F.1.)	
EE 311, 321, 351, 361	
ETMP 144	
ETWT 144	
MATE 306, 341	
MATH 141 (B.2.), 142, 143, 241, 242, 318 (B.2.)	
PHYS 131, (B.1.a.) 132, 133	
Manufacturing Processes elective (IT 141, IE 141,	
IT 327) (1)	
GENERAL EDUCATION AND BREADTH	
REQUIREMENTS	57

To be selected according to GEB and ABET requirements. Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

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

Area B: (2) BIO 220 (B.1.b.)	
<ul> <li>Area C: (18)</li> <li>PHIL 230/PHIL 231 (C.1.)</li> <li>Critical reading electives (C.1.)</li> <li>Fine and performing arts elective (C.2.)</li> <li>Literature, philosophy, arts elective (300–400 level) (C.3.)</li> <li>Arts and humanities elective (Area C)</li> </ul>	
Area D: (18) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/211/222 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.)	
Area E: (5) PSY 201/PSY 202 (E.1.) BIO 220 (E.2.) ELECTIVES	0
-	210



# **School of Liberal Arts**

# **DEGREE PROGRAMS**

# B.S. Applied Art and Design Graphic Design Concentration Photography Concentration

- B.A. English
- B.A. History
- B.S. Human Development Applied Developmental Psychology Concentration Applied Social Psychology Concentration Early Childhood Education Concentration Family Studies Concentration
- B.A. Music
- B.S. Journalism Agricultural Journalism Concentration Broadcast Journalism Concentration News-Editoral Concentration Public Relations Concentration
- **B.A.** Liberal Studies
- B.A. Philosophy Ethics and Society Concentration
- B.A. Political Science International Affairs Concentration Pre-Law Concentration Public Administration Concentration Teaching Concentration Urban Studies Concentration
- B.S. Social Sciences Criminal Justice Concentration Cross-Cultural Studies Concentration Organizations Concentration Social Sciences (Teaching) Concentration Social Services Concentration
- B.A. Speech Communication
- M.A. English
- M.S. Psychology

# MINORS

Anthropology-Geography

Art

Dance

English

French

German

History

International Relations

Linguistics

Music

Philosophy

Psychology

Public Administration

Spanish

Speech Communication

Theatre

Women's Studies

# SCHOOL OF LIBERAL ARTS

Faculty Office Bldg. (47), Room 31 (805) 756-2706

Dean, Sidney Ribeau Associate Dean, Harry Sharp, Jr. Director, Ethnic Studies, Robert F. Gish

The School of Liberal Arts provides a record of imaginative, and reflective human experience. The school seeks to relate itself to the technological disciplines in a way that will help contribute to the solution of human problems. Accordingly, a wide range of courses is offered to serve every thoughtful individual without regard to specialized professional interests.

The school includes disciplines which represent four broad areas of knowledge: the fine and performing arts, communications, humanities, and social sciences. While the school has great breadth and diversity, unity is found in a study of the most engaging subject of all . . . human endeavor. Whether the focus is on imagination, politics, creativity, or rationality, there is a settled purpose: to help each student know herself or himself, to understand human values and human potential, and to understand our society and its institutions.

The departments in the school are Art and Design, English, Foreign Languages and Literatures, History, Journalism, Music, Philosophy, Political Science, Psychology and Human Development, Social Sciences, Speech Communication, and Theatre and Dance. Bachelor's degree programs are offered in each department except Foreign Languages and Literatures and Theatre and Dance. Academic minors are offered in these departments as well as in Anthropology–Geography, Art, English, Linguistics, Public Administration, Speech Communication and Women's Studies. The Bachelor of Arts in Liberal Studies is offered in connection with the teacher education program. The English Department offers a Master of Arts degree.

Departmental offerings are supplemented by courses designated as Humanities. These courses, offered under the direction of a Humanities Coordinator, aim to heighten the student's sense of the interdisciplinary nature of humanistic studies and to increase awareness of humanistic values. The school also participates in the training of teachers by providing waiver programs. For further information regarding teacher credential programs, please see the University Center for Teacher Education section.

The School of Liberal Arts administers Study Abroad programs in London and Paris. For further information, see the section on Study Abroad programs.

In addition to extensive involvement in the instructional program, the school has a major responsibility for activities which enhance the cultural and intellectual environment of the campus. Through Cal Poly Arts, the school sponsors a full range of cultural programs, including exhibits, concerts, literary presentations, and dramatic productions; and encourages and fosters artistic development and accomplishment across the campus. Students with other talents are attracted to the school's cocurricular programs such as KCPR Radio, *Mustang Daily*, Model United Nations, Foreign Languages Club, creative writing contests, or intercollegiate forensics and debate. In addition, the school regularly sponsors an Arts and Humanities Lecture Series, a similar series with a focus on political science and supports both the Center for Practical Politics and the Center for the Arts.

# WOMEN'S STUDIES MINOR

The Women's Studies minor is designed to provide students with an understanding of women's contributions to various areas and to women's place in history and society. The minor is multidisciplinary and offers a comprehensive perspective of women as a principal category of scholarly investigation. The minor centers on an ability to analyze the interactions of women in political, economic, and social arenas. Students are provided with a focused academic foundation appropriate to advanced study and career opportunities related to social science and services, health science and services, and disciplines requiring an understanding of women from a scholarly perspective.

	Units
Core Courses	15
<ul> <li>WS 301 Introduction to Women's Studies (3)</li> <li>WS 401 Seminar in Women's Studies (3)</li> <li>WS 411 Women, Race and Class (3)</li> <li>HIST 434 American Women's History to 1870 (3)</li> <li>or HIST 435 American Women's History since 1870 (3)</li> <li>PSY 314 Psychology of Women (3)</li> </ul>	
<b>Electives</b> The remaining courses in the minor may be chosen from the following list. Other courses considered applicable will be chosen by the student with approval of a Women's Studies adviser.	12
<ul> <li>ANT 360 Human Cultural Adaptation (D.4.b.) (3)</li> <li>ANT 444 Sex, Death, and Human Nature (3)</li> <li>ENGL 345 Women Writers (4)</li> <li>HD 103 Pairing and Marriage (3)</li> <li>SOC 311 Sociology of Sex Roles (3)</li> <li>PSY 315 Psychology of Men (3)</li> <li>Special Problems for Advanced Undergraduates (1-2) from appropriate disciplines</li> <li>Internship (2-4) from appropriate disciplines</li> </ul>	
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# ART AND DESIGN DEPARTMENT

Dexter Bldg. (34), Room 170 (805) 756-1148

# Faculty

#### Department Chair, Charles W. Jennings

Robert S. Densham Keith W. Dills Clarissa Hewitt Robert Howell George D. Jercich Eric B. Johnson Mary LaPorte Norman Lerner John P. Mendenhall Daniel D. Piel Robert Reynolds Joanne Beaule Ruggles Henry Wessels

# Programs

B.S. Applied Art and Design with Concentrations in: Graphic Design Photography

#### Minor: Art

The Art and Design Department offers a curriculum leading to the Bachelor of Science degree in Applied Art and Design which prepares students for professional participation in the fields of graphic design or photography. The department also offers an Art Minor.

Both the graphic design and photographic concentrations support creative and aesthetic growth and require the development of technical skills as a foundation for personal direction and enrichment. In support of the department's professional concentration and its continued commitment to the enhancement of non-art majors, a selection of courses is offered in the areas of art history and appreciation, studio art, and 3-dimensional design.

Because art and design are increasingly relevant to many professional fields, art courses are frequently required within various university majors and the department provides this service through a strong and diversified program.

In addition to the major and support programs, general education courses are available for all students to enrich their understanding, appreciation, and practical skills.

#### **Curricular Concentrations**

#### Graphic Design <sup>1</sup>

The curriculum in graphic design offers a foundation study of basic design, typography and design history, with specialized courses in corporate identity, packaging graphics, advertising, layout and illustration. Emphasis is placed on the development of visual problem-solving methodology and acquisition of specific skills needed in the design profession. Graphic design students have the unique opportunity to work with students in the applied photography programs as well, gaining practical experience in the art director and photographer relationship. Coursework in computer-assisted design allows for an exploration of new technology, while classes in graphic communication provide technical knowledge of print production. The graphic design program culminates in the study of professional practices and the preparation of a portfolio, enabling students to pursue a career in the area of their particular interest.

## Photography

The photography concentration is a diversified program in commercially oriented photography stressing careers in advertising, product illustration, portraiture, corporate and editorial communications and fashion. Creative problem solving is emphasized within a context of a wide range of visual communication and expressive projects. Studio and location lighting are emphasized as well as the development of professional quality printing skills. Courses progress from black and white to both negative and positive color printing, largeformat photography, multimedia, corporate editorial, fashion and illustration. Development of the individual student's creative, expressive abilities is a key ingredient throughout the program. The concentration also includes a study of the history of photography as well as current professional practices and computerized electronic imaging technology.

<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.

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# CURRICULUM FOR B.S. APPLIED ART AND DESIGN

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

Units

# **MAJOR COURSES**

ART 101 Fundamentals of Drawing	4
ART 131 2-Dimensional Design Fundamentals	3
ART 132 Beginning Color Theory	3
ART 133 Color and Design	3
ART 134 3-Dimensional Design I	3
ART 211 Art History: Prehistoric through the	
European Middle Ages	4
ART 212 Art History: European Renaissance—	
Baroque Eras or ART 213 Art History:	
European 18th and 19th Century Art	4
ART 221 Basic B/W Photography	3
ART 222 35mm Intermediate B/W Photography	3
ART 224 35mm Advanced B/W Photography	3
ART 311 Art History—Modern Art	4
ART 312 Art History—Contemporary Art	4
ART 460 Professional Practices	2
ART 461 Senior Project	3
ART 462 Senior Portfolio Project	1
ART 463 Undergraduate Seminar	2
Concentration courses (see below)	21
-	70

# SUPPORT COURSES

ART 135 3-Dimensional Design II	3
MKTG 204/BUS 101/BUS 207	4
Concentration courses (see below)	28/26
	35/33

# GENERAL EDUCATION AND BREADTH REQUIREMENTS

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level.

A.1. ENGL 114 Writing: Exposition	4
A.2. ENGL 125/PHIL 125/SPC 125 Critical	
Thinking	3
A.3. SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	3
A.4. ENGL 215 Writing: Argumentation or	
ENGL 218 Professional Writing: Argumentation	
and Reports	4
B.1. Physical and life sciences (one with lab)	3,3,3
B.2. Mathematics elective	3
B.2. Mathematics or statistics elective	3
Area B Science, mathematics or statistics elective	. 3
C.1. PHIL 230/PHIL 231 Philosophical Classics	3
C.1. Critical reading electives	6
C.2. DANC 221/MU 101/MU 204/TH 210	3
C.3. Literature, philosophy, arts (except ART)	
electives (300-400 level)	3
Area C Arts and humanities elective	. 3
D.1. HIST 204 History of American Ideals and	
Institutions	. 3

D.1. POLS 210 American and California Govt	3
D.2. HIST 315 Modern World History	3
D.3. ECON 201/ECON 211/ECON 222	3
D.4.a. ANT 201/GEOG 150/SOC 105	3
D.4.b. ANT/BUS/ECON/GEOG/POLS/SOC	
(300-400 level elective	3
E.1. PSY 201/PSY 202 General Psychology	3
E.2. BIO 220/FSN 210/HE 210/PE 250/PSY	
304/REC 100 elective	2
F.1. Computer literacy elective	3
F.2. Technology elective (300-400 level)	3
-	79
ELECTIVES	14/16
-	

# **CONCENTRATIONS** (select one)

Courses denoted *major* or *support* satisfy the requirements for the designated area.

# **Graphic Design Concentration**

ART 201 Inter. Drawing or elective (support)	3
ART 204 Watercolor (support)	3
ART 231 Computer Assisted Graphic Design	
(support)	3
ART 232 Beginning Graphic Design (major)	3
ART 301 Advanced Drawing (support)	3
ART 302 Life Drawing   (support)	3
ART 313 Design History (support)	3
ART 331 Typographic Design (major)	3
ART 332 Symbology (major)	3
ART 333 Corporate Identity (major)	3
ART 430 Advanced Typographic Design (support).	3
ART 431 Package Design (major)	3
ART 432 Advertising Design (major)	3
ART 433 Editorial Design (major)	3
GRC 223 Copy Preparation (support)	3
GRC 300 Typography (support)	4
·	49

#### **Photography Concentration**

ART 228 35mm Color Slide Photography (support)	2
ART 314 History of Photography (support)	4
ART 320 Fashion Photography (support)	3
ART 321 Photographic Expression: B/W (support)	4
ART 322 Color Photography I, Negative (major)	3
ART 323 Color Photography II, Positive (major)	3
ART 325 4x5 Camera Techniques, B/W (major)	3
ART 326 4x5 Camera/Commercial (major)	3
ART 327 Portraiture B/W (major)	3
ART 329 Editorial and Corporate Photo (support)	3
ART 424 Multimedia Photography (support)	4
ART 426 Illustration Photography I, B/W (major)	3
ART 427 Illustration Photography II, Color (major)	3
ART 428 Commercial Photography (support)	4
ART 465 Contemporary Photography Seminar	
(support)	2
-	17

# CURRICULUM FOR ART MINOR

Department adviser, complete a minimum of 3 units from one of the two options below ..... 2-D Option ART 201 Intermediate Drawing (3) <sup>1</sup> ART 204 Beginning Watercolor (3) 3-D Option ART 242 Glassblowing (3) or ART 243 Glassforming (3) 1 ART 245 Ceramics 1(3) ART 255 lewelry Design (3) After consultation with an Art and Design Department adviser, complete 12 units from one of the two options below ..... 2-D Option ART 301 Advanced Drawing (3)

ART 302 Life Drawing I (3) ART 303 Life Drawing II (3) ART 304 Advanced Watercolor (3) ART 305 Painting Techniques (3) ART 311 Art History–Modern Art (4) ART 313 Design History (3) 3–D Option

ART 308 Sculpture (3) ART 343 Glass Casting (3) ART 345 Ceramics II (3) ART 346 Ceramics III (3) ART 355 Metalsmithing (3) ART 356 Jewelry Casting (3) ART 311 Art History–Modern Art (4) ART 313 Design History (3)

30

3

12

<sup>1</sup> Recommended support courses in Interior Design.

# **ENGLISH DEPARTMENT**

Faculty Office Bldg. (47), Room 32-E (805) 756-2596

# Faculty

#### Department Chair, Brent Keetch

Kathleen A. Balglev John Battenburg Carl R. V. Brown Kenneth J. Brown Kevin Clark Susan Currier Isaac Elimimian Angela M. Estes Katharine S. Gittes Mary F. Godfrey Linda H. Halisky John C. Hampsey John F. Harrington Robert L. Inchausti David J. Kann Douglas Keesev Alfred Landwehr

Kathleen M. Lant Donald P. Lazere Nancy Lucas Carol MacCurdy Steven R. Marx Matthew S. Novak Michael P. Orth Mona G. Rosenman Habib Sheik James E. Simmons Richard K. Simon Douglas B. Smith Charles W. Strong Gerald J. Sullivan Evelvn M. Torres Patricia Troxel Michael I. Wenzl

#### Programs

B.A. English

M.A. English

Minor: English

**Minor: Linguistics** 

Certificate: Teaching English as a Second Language

Certificate: Technical Communication

The English Department serves students through courses in writing, in technical communication, in literature, and in linguistics. The aim of the department is to provide students with greater expressive power, and with understanding and appreciation of literature. The department also endeavors to develop in students abilities valuable in the professional and business world and in private life: the abilities of reading critically, of organizing a large body of information, and of expressing the results in clear, forceful prose.

The department offers general education courses, courses for elective credit, minors in English and Linguistics, and the Bachelor of Arts and the Master of Arts programs. An English major or minor is valuable as preparation for law, for business, for teaching, and for other careers in which handling and expressing ideas are essential. The department also offers upper-division certificate programs in teaching English as a second language and technical communication. Students interested in any of these programs should write or visit the department office for details.

In cooperation with the University Center for Teacher Education, the English Department prepares undergraduates and graduates for careers in secondary school teaching. Students interested in English teaching careers should contact the Coordinator of English Education, (English Department), to learn more about the California single subject credential. English majors who have an interest in teaching at the elementary level are advised to complete concurrently the waiver requirements for Liberal Studies. For more information regarding teaching credential programs, see the University Center for Teacher Education section.

The department supports the concept of international education and encourages students to investigate opportunities for overseas study. For further information, see the Study Abroad programs.

# **CURRICULUM FOR B.A. ENGLISH**

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

Units

# **MAJOR COURSES**

ENGL 302 Writing: Advanced Composition or	
ENGL 326 Literary Criticism	4
ENGL 330/ENGL 331/ENGL 332 British Literature	4,4
ENGL 333/ENGL 334 British Literature	4
ENGL 339 Introduction to Shakespeare	3
ENGL 340, ENGL 341 American Literature	4,4
ENGL 350/ENGL 351/ENGL 352 Modern Novel,	
Poetry, or Drama	3
ENGL 390/ENGL 395/ENGL 495/ENGL 497/ENGL	
498	4
ENGL 460 Senior Project Seminar	1
ENGL 461 Senior Project	3
English elective (300-400 level)	3
English electives (400 level)	19
	60

# SUPPORT COURSES

World Literature (C.1.)	3 4
	4
ENGL 290 Introduction to Linguistics	
ENGL 325 Creative Writing	4
ENGL 345 Women Writers or	
ENGL 346 Ethnic American Literature	4
Foreign language (200 level or above)	4
1	9

# GENERAL EDUCATION AND BREADTH REQUIREMENTS

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level.

A.1. ENGL 114 Writing: Exposition	4
A.2. ENGL 125/PHIL 125/SPC 125 Critical	
Thinking	3
A.3. SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	3
A.4. ENGL 215 Writing: Argumentation or	
ENGL 218 Professional Writing: Argumentation	
and Reports	4
B.1. Physical and life sciences electives (one	
with lab)	3,3,3
B.2. Mathematics elective	3
B.2. Mathematics or statistics elective	3
Area B Science, mathematics or statistics elective	3
C.1. PHIL 230/PHIL 231 Philosophical Classics	3
C.1. Critical reading electives	3
C.2. Fine and performing arts elective	3
C.3. Literature, philosophy, arts elective	
(300–400 level)	3
Area C Arts and humanities elective	3
D.1. HIST 204 History of American Ideals and	
Institutions	3
D.1. POLS 210 American and California	
Government	3

D.2. HIST 315 Modern World History	3
D.3. ECON 201/ECON 211/ECON 222	3
D.4.a. ANT 201/GEOG 150/SOC 105	3
D.4.b. ANT/BUS/ECON/GEOG/POLS/SOC	
(300-400 level) elective	3
E.1. PSY 201/PSY 202 General Psychology	3
E.2. BIO 220/FSN 210/HE 210/PE 250/PSY	
304/REC 100 elective	2
F.1. Computer literacy elective	3
F.2. Technology elective (300-400 level)	3
-	76
ELECTIVES	31
2	186
# **CURRICULUM FOR ENGLISH MINOR**

	Units
Required Courses ENGL 253 Great Books (3)	14
ENGL 302 Advanced Composition or	
ENGL 326 Literary Criticism (4)	
ENGL 339 Introduction to Shakespeare (3)	
ENGL 390 Modern English Grammar <i>or</i>	
ENGL 395 History of the English Language (4)	
Select <i>one</i> of the following British literature courses ENGL 330 British Literature: Medieval Period	4
(C.3.) ENCL 231 British Literature, The Densistance	
(C 3)	
ENGL 332 British Literature: The Enlightenment	
(C.3.)	
ENGL 333 British Literature: The Romantic	
Movement (C.3.)	
ENGL 334 British Literature: The Victorians (C.3.)	
Select one of the following American literature	
courses	4
ENGL 340 American Literature to 1860 (C.3.)	
ENGL 341 American Literature 1860-1914 (C.3.)	
ENGL 342 American Literature 1914 to the Present (C.3.)	
Select one of the following courses	3
ENGL 350 Modern Novel (C.3.)	
ENGL 351 Modern Poetry (C.3.)	
ENGL 352 Modern Drama (C.3.)	
	25

#### **CURRICULUM FOR LINGUISTICS MINOR**

	0
Required courses ENGL 290 Introduction to Linguistics (4) ANT 333 Language and Culture (3)	7
Language structuring courses ENGL 390 Modern English Grammar (4) ENGL 395 History of the English Language (4) SPC 300 Voice and Phonetics (4)	12
Choose one of the following areas of emphasis	7
Language Development: SPC 303 Development of Speech and Language (3) SPC 302 Introduction to Communicative Disorders (4)	
Orientation to Non-native Use of Language: ENGL 497 Theories of Language Learning and Teaching (4)	

SPC 316 Intercultural Communication (3)

26

1 Inits

# TEACHING ENGLISH AS A SECOND LANGUAGE CERTIFICATE

The Teaching English as a Second Language (TESL) Certificate provides individuals with specialized training to teach successfully in a wide variety of ESL programs. Both undergraduate and graduate students currently enrolled in any degree program at Cal Poly may pursue this certificate. The TESL Certificate Program is comprised of courses from the departments of English, Social Sciences, and Speech Communication.

The TESL Certificate is designed for two career options:

- (1) The Post-Secondary/Adult option prepares individuals to teach in college level and adult education programs. Those wishing to teach at the college level are advised that an M.A. in English or a related field is the usual minimum requirement for full-time positions.
- (2) The K-12 option prepares individuals having a single or multiple subject credential to teach ESL in elementary and secondary schools. Certain courses in this TESL Certificate Program will assist persons in receiving the California Supplementary Authorization in ESL.

The TESL Certificate Program requires 29 units of study. This program provides prospective ESL teachers a solid background in theoretical and applied linguistics, cross-cultural communication, language and culture, second language acquisition, and methods of TESL. In addition, a practicum allows individuals supervised experience within the ESL classroom.

Questions concerning the TESL Certificate should be addressed to the Program Coordinator in the English Department.

#### TECHNICAL COMMUNICATION CERTIFICATE PROGRAM

This program requires between 26 and 30 units-about the same number as a minor. A current course list is available in the English Department office.

The certificate program is designed for men and women who have or want careers in technical writing, information development, or business communication, or who simply want to supplement their technical training with communication training. Students in the certificate program may already be enrolled in Cal Poly undergraduate or graduate degree programs, or, through Concurrent Enrollment, may be enrolled only in the certificate program.

Businesses and government agencies employ professional communicators in many roles: writers, editors, public relations officers, spokespeople, and so on. These professionals' skills center on using the written word effectively, but often include auxiliary skills, such as public speaking or publications design and production. They write regulations, brochures, forms, technical manuals, computer documentation, on-line training programs and corporate executives' speeches, for example. They edit company newsletters and magazines, and put technical information into understandable prose.

#### MASTER OF ARTS DEGREE IN ENGLISH

#### **General Characteristics**

This program includes the study of literary criticism, language, theory of composition, and literature. It is designed to provide students with the kind of knowledge and command of English that will prepare them specifically for:

- 1) teaching English at the elementary, secondary, or community college levels;
- 2) employment in business, industry, and government service where specific communication skills are demanded:
- 3) self-directed development in writing;
- 4) graduate work at other institutions.

#### Prerequisites

Admission with classified status requires that the student have a baccalaureate in English from an accredited institution (or the equivalent, as determined by the English Graduate Committee), have maintained a grade point average of 3.0 for the last 90 quarter units (60 semester units), and a writing sample submitted to the English Graduate adviser. Nonnative speakers should also submit TOEFL scores (Test of English as a Foreign Language). Advancement to candidacy requires approval of a formal program of study by the Graduate Committee and completion of 12 units with a grade point average of 3.0.

#### **Program of Study**

The formal program of study must include the following:

- 1) 48 units of graduate work approved by the Director of Graduate Studies and the Graduate Committee;
- 2) a grade point average of 3.0 or better in all courses taken subsequent to admission;
- 3) two years of a foreign language (e.g., French, Spanish, German) or certification of the equivalent;
- 4) a comprehensive examination at the end of 48 units of study.

The foreign language requirement must be satisfied before the comprehensive examination is taken. Students will elect an emphasis within the Master of Arts program: literature, linguistics, or writing.

#### Applications

Applications for admission and requests for further information should be directed to the Graduate Adviser, English Department.

All applications should include a sample of expository writing.

# **CURRICULUM FOR M.A. ENGLISH**

Required courses ENGL 501 Techniques of Literary Research (4) ENGL 502 Seminar in Critical Analysis (4) ENGL 504 Seminar in Applied English Linguistics (4) ENGL 505 Seminar in Composition Theory (4) ENGL 510 Seminar in Authors (4) <i>or</i> ENGL 513 Special Topics (4) ENGL 511 Seminar in American Literary Periods (4) (4) ENGL 512 Seminar in British Literary Periods (4) (4)	36
English electives Additional units in the English 400 and 500 series, selected with English Graduate Committee approval (at least half of the units at the 500 level)	8
Electives Elective units which may be taken at the 400 or 500 level in other departments, provided the English Graduate Committee approves	4
	48

Units

#### **Emphases**

Within the 12 elective units listed above, students will choose, under advisement, a series of courses to complete one of these emphases:

Literature-3 courses

Linguistics-3 courses (which must include ENGL 504) Writing-3 courses

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

# FOREIGN LANGUAGES AND LITERATURES DEPARTMENT

Faculty Office Bldg. (47), Room 28 (805) 756-1205

# Faculty

#### Department Head, William Little

Hernaán Castellano-Girón Odile Clause Bianca Rosenthal Alberto Urista (Alurista) Gloria Velásquez

## Programs

Minor: French Minor: German Minor: Spanish

The department offers coursework in French, German and Spanish. Elementary Italian and Japanese are also offered. Instruction at all levels emphasizes active language skills to prepare the student for technical, vocational, literary, and cultural needs in California, throughout the United States and abroad. Central to the instruction is active use of a state-ofthe-art language laboratory.

The department offers minors in French, German, and Spanish. Each minor consists of 28 quarter units of coursework specified by the department. A minimum of eighteen upper division units, including at least one 305 course, must be completed in residence and a minimum grade point average of 2.75 must be maintained. The minor is conferred concurrently with the baccalaureate degree. For general university requirements, please refer to "Minors." Information and application forms for the declaration of a French, German, or Spanish minor are available in the Department office.

The department is active in training students who wish to obtain a bilingual teaching credential and it administers the Bilingual Proficiency Exam in Spanish and the ZDAF German Proficiency Examination in conjunction with the Goethe Institute. For more information regarding teaching, please refer to Teacher Credential Programs. The department also supports such student clubs as the French Club, the German Club, the Italian Club, the Latin American Student Association, and MECHA (Movimiento Estudiantil Chicano de Aztlan.)

# CURRICULUM FOR FRENCH MINOR

Units

- FR 302 Advanced French Conversation and Grammar (4)

(C.3.) (4) FR 470 Selected Advanced Topics (1-4) (repeatable to 8) FORL 303 Culture (French) (3) or HUM 310 Humanities in World Cultures (French) (C.3.) (3) **CURRICULUM FOR GERMAN MINOR** Required courses ..... GER 201, GER 202 Intermediate German (4) (4) GER 233 Critical Reading in German Literature (C.1.) (4) GER 301 Advanced German Composition and Grammar (4) GER 305 Significant Writers in German (C.3.) (4) Electives to be chosen from the following:..... GER 302 Advanced German Conversation and Grammar (4) GER 405 German Literature in English Translation (C.3.) (4) GER 470 Selected Advanced Topics (1-4) (repeatable to 8) FORL 303 Culture (German) (3) or HUM 310 Humanities in World Cultures

FR 405 French Literature in English Translation

## CURRICULUM FOR SPANISH MINOR

(German) (C.3.) (3)

Required courses ..... 20 SPAN 201, SPAN 202 Intermediate Spanish (4) (4)SPAN 233 Critical Reading in Hispanic Literature (C.1.) (4) SPAN 301 Advanced Spanish Composition and Grammar (4) SPAN 305 Significant Writers in Spanish (C.3.) (4) Electives to be chosen from the following:..... 8 SPAN 330 Spanish for Bilingual Speakers (4) SPAN 405 Hispanic Literature in English Translation (C.3.) (4) SPAN 470 Selected Advanced Topics (1-4) (repeatable to 8) FORL 303 Culture (Hispanic) (3) or HUM 310 Humanities in World Cultures (Hispanic or Latin American) (C.3.) (3) 28

28

20

8

# HISTORY DEPARTMENT

Faculty Office Bldg. (47), Room 27C (805) 756-2543

# Faculty

#### Department Chair, Robert E. Burton

Timothy M. Barnes Lloyd N. Beecher Nancy L. Clark George B. Cotkin Manzar Foroohar Donald A. Grinde, Jr. Daniel E. Krieger Edward L. Mayo Max E. Riedlsperger John Snetsinger Carolyn Stefanco

# Programs

B.A. History

Minor: History

Historians study humans over time which gives them perspective on the present and the aptitude to plan intelligently for the future. Such an ability is crucial to all who wish to make thoughtful and wise decisions in a world undergoing constant change.

History broadens our understanding and tolerance of other peoples and cultures and deepens our knowledge of our-selves.

By majoring in history one can prepare for a teaching career and for advanced work in the discipline.

The skills of the historian are elementary to many other fields of endeavor. The way historians gather, synthesize, analyze and interpret evidence and then present their findings to a general audience in a concise, logical, coherent written and oral manner is a methodology common to lawyers, business executives, politicians, and administrators.

The study of history and the historical method facilitates and enhances decision-making, makes us more complete human beings, and prepares students for a wide range of careers. It provides a broad-based education in the liberal arts and humanities.

### CURRICULUM FOR HISTORY MINOR

Students choosing to add a strong historical dimension to their major field may enroll in the minor program in history. This 30-unit curriculum stresses reading and writing skills as well as the ability to weight evidence and think critically. Details and application forms are available from the History Department.

Required courses HIST 101, HIST 102, HIST 103 History of Western Civilization (3) (3) (3) HIST 201 United States History (3) HIST 300 Research Methods (3)	15
Select 3 units of upper-division United States history . HIST 385, 401, 402, 403, 404, 405, 406, 407	3
Select 6 units from outside the areas of U.S. and European history HIST 307, 314, 328, 329, 339, 340, 341, 381, 382, 415, 416, 417	6
Select 6 units in any 300-400 history courses (excluding HIST 315)	6

30

Units

# **CURRICULUM FOR B.A. HISTORY**

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

Units

### **MAJOR COURSES**

HIST 101 History of Western Civilization	3
HIST 102 History of Western Civilization	3
HIST 103 History of Western Civilization	3
HIST 201 United States History (D.1.)	3
HIST 300 Research Methods	3
HIST 301 Writing and Research Seminar in History	3
HIST 302 Historiography	3
HIST 460 Senior Project	2
HIST 461 Senior Project	2
History electives (300-400 level)	21
Foreign language requirement, select one:	
FR 202, GER 202, SPAN 202	4
-	50
	50

# SUPPORT COURSES

Electives (100–200 level)	11
Electives (300-400, including History)	23
	34

# GENERAL EDUCATION AND BREADTH REQUIREMENTS

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level.

A.1. ENGL 114 Writing: Exposition	4
A.2. ENGL 125/PHIL 125/SPC 125 Critical	
Thinking	3
A.3. SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	3
A.4. ENGL 215 Writing: Argumentation or	
ENGL 218 Professional Writing: Argumentation	
and Reports	4
B.1. Physical and life sciences electives (one	
with lab)	3,3,3
B.2. Mathematics elective	3
B.2. Mathematics or statistics elective	3
Area B Science, mathematics or statistics elective	3
C.1. PHIL 230/PHIL 231 Philosophical Classics	3
C.1. Critical reading electives	6
C.2. Fine and performing arts elective	3
$C_3$ Literature, philosophy, arts elective (300-400)	-
level)	3
Area C Arts and humanities elective	3
D.1 POLS 210 American and California	0
Covernment	3
D 2 HIST 315 Modern World History	3
D.3 ECON 201/ECON 211/ECON 222	3
D.3. ANT 201/CEOC 150/SOC 105	2
D.4.b. ANT/PUS/ECON/CEOC/POIS/SOC	J
platiun	2
Elective	2
E.I. FST 201/FST 202 GENERAL PSYCHOLOgy	د
E.2. DIO 220/FSN 210/HE 210/PE 250/PSY	2
304/ KEC 100 elective	2

F.1. F.2.	Computer literacy elective Technology elective (300–400 level)	3 3
	-	76
ELECTIVES		26
	=	186

# LIBERAL STUDIES An Interdisciplinary Program

Dexter Bldg. (34), Room 211 (805) 756-2935

# Faculty

Coordinator, Margaret J. Glaser

# Program

B.A. Liberal Studies

The Bachelor of Arts degree program in Liberal Studies provides students with a broad, interdisciplinary university education. Students who fulfill the specified degree requirements will also complete a waiver program approved by the California Commission on Teacher Credentialing. This waiver program satisfies the subject matter content required for a Multiple Subject Teaching Credential. By selecting free electives from a set of professional education courses, students may complete 15 units toward the credential, thus enabling them to complete requirements for a Professional Clear Credential in one year of postbaccalaureate study.

Multiple Subject Credential candidates will select an area of emphasis from among the following: art, English, life science, mathematics, music, physical education, physical science, or social science. Courses in these areas of emphasis will be selected with the approval of the adviser. In most cases, these units will be at the upper division level and will not be double-counted for courses taken to satisfy other curriculum requirements. This area of emphasis will give depth to the student's education in subject matter of his or her choice and may enable the credential candidate to achieve a supplemental authorization to teach a specific course at the junior high school level.

Students who choose not to pursue the Multiple Subject Teaching Credential or those who find the credential objective unrealistic, may obtain a B.A. in Liberal Studies by completing the core program and selecting a minor, in consultation with their adviser, which will prepare them for career options.

# **CURRICULUM FOR B.A. LIBERAL STUDIES**

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

#### Units

#### MAIOR COURSES

LS 101 Orientation to Liberal Studies	1
LS 461 Senior Project	3
LS 462 Senior Project	3
ART 104 Introduction to Art Materials or	
ART 111 Introduction to Art	3-4
BIO 103 Animal Biology	4
ENGL 330-352 (may not be counted for GEB Area	
C. ENGL 345/346 recommended for credential	
track)	4
ENGL 390/ENGL 395	4
ETHS 114/ETHS 210/SOC 315/SOC 316/SPC 316	3
ANT 202/HIST 314/HIST 340/HIST 381/HIST	
383/HIST 415	3
MATH 327 Introduction to Modern Mathematics	4
MATH 328 Introduction to Modern Mathematics	
(B.2.)	4
PHIL 331/PHIL 335/PHIL 337	3
PSC 101 The Physical Environment: Matter and	
Energy	4
PSC 103 The Physical Environment: Earth and the	
Universe	4
Foreign language electives	4,4
-	55-56

# **COURSES TO COMPLETE TRACK**

(see below)

53-54

#### **GENERAL EDUCATION AND BREADTH** REQUIREMENTS

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300-400 level. Additional GEB courses are listed under Major Courses

A.1. ENGL 114 Writing: Exposition	4
A.2. ENGL 125/PHIL 125/SPC 125 Critical	
Thinking	3
A.3. SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	3
A.4. ENGL 215 Writing: Argumentation or	
ENGL 218 Professional Writing: Argumentation	
and Reports	4
B.1.a. PSC 102 The Physical Environment: Atoms	
and Molecules	4
B.1.b. BIO 101 General Biology and BIO 105	
General Biology Lab	3,1
B.1.a/b. BIO 102 Plant Biology (B.1.b.)	4
B.2. MATH 118 Pre-Calculus Algebra	4
C.1. PHIL 230/PHIL 231 Philosophical Classics	3
C.1. Critical reading electives	6
C.2. Fine and performing arts elective	. 3
C.3. Literature, philosophy, art elective (300-400	
level)	3
Area C Arts and humanities elective	3

D.1. HIST 204 History of American Ideals and	
Institutions	3
D.1. POLS 210 American and California	
Government	3
D.2. HIST 315 Modern World History	3
D.3. ECON 201/ECON 211/ECON 222	3
D.4.a. ANT 201/GEOG 150/SOC 105	3
D.4.b. ANT/BUS/ECON/GEOG/POLS/SOC	
(300-400 level) elective (GEOG 308 required	
for credential track)	3
E.1. PSY 201/PSY 202 General Psychology	3
E.2. BIO 220/FSN 210/HE 210/PE 250/PSY	
304/REC 100 elective	2
F.1. Computer literacy elective	3
F.2. Technology elective (300-400 level)	3
-	
	//
-	100
	100

# **COURSES IN CREDENTIAL TRACK**

EDUC 300 Introduction to the Teaching Profession.	3
BIO 306 Applications of Biological Concepts or	
PSC 304 Applications of Physical Science	4
ENGL 260 Children's Literature	3
MATH 329 Mathematical Applications to	5
Flementary Teaching	3
MILI 301/SPC 310/TH 380	2
HD 208 Early and Middle Childhood	נ ר
MUL 100 Music Eurodemontale	د د
DE 210 Cargante la Diseñal Educativa	3
PE 310 Concepts in Physical Education	3
Restricted electives (area of emphasis)	18
Electives	10–11
Students seeking a Multiple Subjects Credential	
may wish to complete the following	
sequence of courses (for a total of 11 units):	
EDUC 301 The Learners and the Learning:	
Teaching Process in Elementary School (3)	
EDUC 303 Effective Teaching, Classroom	
Management and Discipline in the Elementary	
School (4)	
EDUC 401 Teaching Peading in the Elementary	
Colored (4)	
SCHOOL (4)	

#### 53-54

# COURSES IN NON-CREDENTIAL TRACK

Courses to complete a minor	24-30
Psychology adviser approved elective	3
Music adviser approved elective	3
Fine/performing arts adviser approved elective	3
Free electives	20-14
-	5354

# JOURNALISM DEPARTMENT

Graphic Arts Bldg. (26), Room 227 (805) 756-2508

# Faculty

Department Head, Nishan R. Havandjian

Clay Carter James H. Hayes Randall L. Murray

# Programs

B.S. Journalism with Concentrations in:

Agricultural Journalism Broadcast Journalism News-Editorial Public Relations

The Journalism Department offers a professional program leading to the Bachelor of Science degree in Journalism. All journalism majors must complete the basic journalism curriculum, which includes courses in the journalism core and supplementary courses in the humanities, natural sciences, and social sciences. Each major must also complete a specified number of required and elective courses in one of the following concentrations: Agricultural Journalism, Broadcast Journalism, News-Editorial, or Public Relations.

The Journalism Department requires that all majors successfully complete 12 quarter units of a foreign language.

The Journalism Department conforms to the rules of the Accrediting Council on Education in Journalism and Mass Communications (ACEJMC) which stipulate that of the 198 units required for a bachelor's degree, 131 quarter units must be taken in courses outside the major area of journalism, with no fewer than 94 quarter hours in liberal arts and sciences. Certain courses in art and graphics may be considered as professionally related to journalism and cannot be counted toward the 131 units outside the major. Students must consult advisers.

Transfer students may apply a maximum of 12 journalism and professionally related lower division units (including photography and graphics courses) to the major requirement. Students transferring into the program are advised to limit these units to equivalents for JOUR 218, JOUR 201, JOUR 203, or ART 221.

All journalism majors are expected to serve as staff members of departmental communications media, including *Mustang Daily*, the student newspaper, or KCPR, the FM-stereo radio station. They are also expected to participate in professional and scholarly organizations in their interests. The department sponsors campus chapters of the Society of Professional Journalists, the Public Relations Club, and the Agricultural Communicators of Tomorrow. The Brock Center for Agricultural Communication, a joint project of the School of Agriculture and the School of Liberal Arts, is directed by a faculty member from the Journalism Department.

## **CURRICULAR CONCENTRATIONS**

#### Agricultural Journalism

Prepares students for careers as writers and editors for agricultural magazines and newspapers; for public relations positions in agribusiness; or as communicators with government agencies, trade associations, or private agricultural operations.

#### Broadcast Journalism

Prepares students for careers as reporters and newscasters for radio and television. Emphasizes the acquisition of knowledge and skills necessary for initial employment upon graduation as well as those necessary for future growth to positions of responsibility in the news and public affairs aspects of the electronic media.

#### **News-Editorial**

Prepares students for reporting and editing jobs on the staffs of newspapers and wire services. Emphasizes acquisition of knowledge and skills necessary for initial employment upon graduation as well as those necessary for future growth to positions of responsibility in print media.

#### **Public Relations**

Prepares students for business, governmental, and institutional positions in public relations. Emphasizes the acquisition of knowledge and skills needed for future growth into management positions with the communications media and other institutions.

# **CURRICULUM FOR B.S. JOURNALISM**

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

#### Freshman<sup>1</sup>

	JOUR 203 Reporting I	4
	JOUR 218 Mass Media in Society	4
	BUS 101 Business Enterprise	4
	MGT 118 Intro. Human Relations in Business	3
	ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
	ENGL 114 Writing: Exposition (A.1.)	4
	ENGL 125/PHIL 125/SPC 125 Critical Think. (A.2.)	3
	PHIL 230/231 Philosophical Classics (C.1.)	3
2	Computer literacy elective (F.1.)	3
2	Critical reading elective (C.1.)	3
2	Mathematics elective (B.2.)	3
2	Physical and life sciences electives (one each, one	
	with lab) (B.1.)	3,3,3
	Elective	3
	_	

#### Sophomore

	IOUR 233 Copy Editing	4
	IOUR 304 Reporting I	4
	ART 221 Basic B/W Photography	3
	POLS 336 Judicial Process	4
	FCON 201/ECON 211/ECON 222 (D.3.)	3
	ENGL 215 Writing: Argumentation or	-
	FNGL 218 Professional Writing: Argumentation	
	and Reports (A.4.)	4
	HIST 204 History of American Ideals and	
	Institutions (D.1.)	3
	POLS 210 American and California Govt. (D.1.)	3
	PSY 201/PSY 202 General Psychology (E.1.)	3
	SPC 201 Public Speaking or	-
	SPC 202 Prin. of Speech Communication (A.3.).	3
	BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC	_
	100 elective (E.2.)	2
2	Critical reading elective (C.1.)	. 3
2	Fine and Performing Arts elective (C.2.)	3
2	Mathematics or statistics elective (B.2.)	3
2	Physical or life science elective or	
	MATH/STAT elective (Area B)	3
	Electives and courses to complete major	4
h	inior	52
,.	IOU P 201 /205 /221 /285 /407 /425	2
	101 IR 302 Mass Media Law	4
	IOUR 401 International Communication	4
	Foreign language requirement	444
	GEOG 305 Political Geography or	., ., .
	GEOG 308 Global Geography	3
	HIST 315 Modern World History (D.2.)	3
2	ANT/BUS/ECON/GEOG/POLS/SOC elective	•
	(300–400 level) (D.4.b.)	3
2	Technology elective (300-400 level) (F.2.)	3
	Electives and courses to complete major	18

# Senior

	JOUR 402 Social Responsibility of Mass Media	4
	JOUR 444 Media Internship	4
	IOUR 460 Senior Project	3
	POLS 401 State and Local Government or	
	POLS 403 Municipal Government	4
2	Arts and humanities elective (Area C)	3
2	Literature, philosophy, arts electives (300-400	
	level) (C.3.)	3
	Electives and courses to complete major	24
	• •	
		45
		198

<sup>1</sup> Unless already acceptable typists, majors will be required to attain typing proficiency during their freshman year.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 86 of this catalog.

#### **CONCENTRATIONS** (select one)

#### **Agricultural Journalism Concentration**

JOUR 205 Agricultural Communications	3
JOUR 352 Reporting Practice	3,3
ASCI 230 General Animal Science	4
CRSC 230 General Field Crops	4
FSN 230 Elements of Food Processing	4
SS 121 Introductory Soil Science	4
GRC 427 Desktop Publishing	3
-	28

#### **Broadcast Journalism Concentration**

JOUR 323 Photojournalism	3
JOUR 333 Broadcast News I	4
JOUR 346 Broadcast Announcing	4
JOUR 351 Broadcast Practice	3,3
JOUR 432 Broadcast News II	4
SPC 300 Voice and Phonetics	4
-	25

#### **News-Editorial Concentration**

JOUR 323 Photojournalism	3
JOUR 352 Reporting Practice	3,3
JOUR 405 Reporting III	4
JOUR 407 Feature Writing	3
JOUR 434 Advanced Editing	4
GRC 427 Desktop Publishing	3
-	23

#### **Public Relations Concentration**

JOUR 312 Introduction to Public Relations	4
JOUR 342 Public Relations Media	4
JOUR 352 Reporting Practice	3,3
JOUR 413 Advanced Public Relations	4
ENGL 310/SPC 301/SPC 213	4
MGT 201 Principles of Management or	
MKTG 204 Elements of Marketing	3/4
GRC 427 Desktop Publishing	3
	28/29

#### **B.S. IOURNALISM**

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

MAJOR COURSES

JOUR 201/205/331/407/425, 203, 218, 233, 302, 304, 401, 402, 444, 460 ART 221 **BUS 101** GEOG 305/308 **MGT 118** POLS 336, 401/403 Concentration (select one:) Agricultural Journalism Concentration (28) JOUR 205, 352 **ASCI 230 CRSC 230** FSN 230 **GRC 427** SS 121 Broadcast Journalism Concentration (25) JOUR 323, 346, 333, 351, 432 SPC 300 News-Editorial Concentration (23) JOUR 323, 352, 405, 407, 434 **GRC 427** Public Relations Concentration (28-29) JOUR 312, 342, 352, 413 ENGL 310/SPC 301/SPC 213 **GRC 427** MGT 201/MKTG 204 **GENERAL EDUCATION AND BREADTH** REQUIREMENTS.....

79

Units

58

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300--400 level.

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

Area B: (18) Physical and life sciences electives (one with lab) (B.1.) Mathematics elective (B.2.) Mathematics or statistics elective (B.2.) Science, mathematics or statistics elective (Area B) Area C: (18)

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

Area D: (18) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/211/222 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) Area E: (5) PSY 201/PSY 202 (E.1.) BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100 elective (E.2.) Area F: (6) Computer literacy elective (F.1.) Technology elective (300-400 level) (F.2.) 

Foreign language requirement (4,4,4)

# **MUSIC DEPARTMENT**

Davidson Music Center (45), Room 129 (805) 756-2406

# Faculty

#### Department Head, Clifton Swanson

Antonio G. Barata Thomas H. Davies William V. Johnson Frederick C. Lau Alyson McLamore Craig H. Russell John G. Russell William T. Spiller

#### Programs

B.A. Music Minor: Music

The Music Department offers a program which develops musical skills, encourages creativity, and cultivates vision for the future. A graduate of this program will be prepared to begin specialized study at the graduate level, to enter a wide variety of professional careers, or to apply for admission to the Teacher Education Credential Program subject to the prerequisite requirements and competency examinations.

The Bachelor of Arts in Music offered at Cal Poly introduces a student to the role of music in today's world, helps form personal goals, and provides the discipline, skills and knowledge to accomplish those goals. The University's polytechnic emphasis also provides an excellent opportunity to explore music in conjunction with a wide range of other fields.

In addition, the Music Department is a valuable resource for the non-music major. Its courses and performing ensembles are open to all students who wish to enrich their lives through music. Qualified students who wish to explore the subject in depth have the opportunity to minor in music.

The Cal Poly Music Department also serves as a cultural center for both the university and the community through a program of public performances by student and faculty groups and through clinics, workshops, concerts, and lectures by outstanding individuals from outside the university.

Acceptance into the music major program requires a demonstrated ability on an instrument, in voice, or talent through other musical media.

#### **Department Requirements**

 New students should contact the Music Department Office immediately upon arrival to arrange for placement examinations for music theory, keyboard proficiency, musicianship (dictation, sight singing), and a performance audition for applied study placement and assignment to performing ensembles. Regardless of courses taken prior to coming to Cal Poly, students will be required to remedy deficiencies before enrolling in advanced music theory or music history courses.

- 2. Each music major enrolled in at least 6 units of music courses must include a performance ensemble each quarter in order to qualify for applied study of voice or instruments. (See the Music Department for details regarding appropriate ensembles and applied study policies.)
- 3. Each student is required to attend a minimum of 6 concerts per quarter.
- 4. Each student must pass a piano proficiency examination in order to graduate. The examination must be taken by the end of the sophomore year and if it is not passed, the student is expected to continue to enroll in piano until it is passed.
- 5. Use of Music Department instruments, scheduled practice rooms, electronic studio, or lockers requires a Music Use Fee. See the Music Department Office for details.
- It is important that each student stay closely in touch with his/her adviser in order to progress through the music major program in the most efficient manner.
- The Music Department is not able to offer the full complement of performing ensembles and private instruction during the Summer Quarter, therefore it is important to take this into consideration when planning coursework for completion of the major.

A music major handbook giving complete details of the program, policies and forms is available from the Music Department.

# **CURRICULUM FOR B.A. MUSIC**

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

### **MAJOR COURSES**

Units

MU 102 Acoustic Communication	3
MU 103 Music Theory I	3
MU 104 Musicianship I	1
MU 105 Music Theory II	3
MU 106 Musicianship II	1
MU 201 Music Theory III	3
MU 202 Musicianship III	1
MU 203 Alternative Music Systems	3
MU 222 History of Jazz	3
MU 300 Contemporary Music Theory	3
MU 304 Introduction to Music Synthesis	3
MU 320 Music Resources and Writing	3
MU 321 Music History I	3
MU 322 Music History II	4
MU 323 Music History III	3
MU 325 America's Music	3
MU 420 Music History: Selected Topics	3
MU 461 Senior Project	3
Approved music lecture courses (300-400 level)	12
-	61

# SUPPORT COURSES

MU 120 Music Appreciation	4
MU 150 Applied Music	1,1,1
MU 250 Applied Music	1.1.1
MU 350 Applied Music	1.1.1
MU 450 Applied Music	1.1.1
Major Ensemble at 100 level with adviser approval.	6
Major Ensemble at 300 level with adviser approval.	6
-	28

# GENERAL EDUCATION AND BREADTH REQUIREMENTS

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level.

A.1.	ENGL 114 Writing: Exposition	4
A.2.	ENGL 125/PHIL 125/SPC 125 Critical	
Th	inking	3
A.3.	SPC 201 Public Speaking or	
SP	C 202 Principles of Speech Communication	3
A.4.	ENGL 215 Writing: Argumentation or	
EN	GL 218 Professional Writing: Argumentation	
	and Reports	4
B.1.	Physical and life sciences electives (one	
wi	th lab)	3,3,3
wi B.2.	th lab) Mathematics elective	3,3,3 3
wi B.2. B.2.	Mathematics elective Mathematics or statistics elective	3,3,3 3 3
Wi B.2. B.2. Area	Mathematics elective Mathematics or statistics elective B Science, mathematics or statistics elective	3,3,3 3 3 3
B.2. B.2. Area C.1.	Mathematics elective Mathematics or statistics elective B Science, mathematics or statistics elective PHIL 230/PHIL 231 Philosophical Classics	3,3,3 3 3 3 3 3
wi B.2. B.2. Area C.1. C.1.	Mathematics elective Mathematics or statistics elective B Science, mathematics or statistics elective PHIL 230/PHIL 231 Philosophical Classics Critical reading electives	3,3,3 3 3 3 3 3 6
wi B.2. B.2. Area C.1. C.1. C.2.	h lab) Mathematics elective Mathematics or statistics elective B Science, mathematics or statistics elective PHIL 230/PHIL 231 Philosophical Classics Critical reading electives DANC/ART/TH elective	3,3,3 3 3 3 3 6 3
wi B.2. B.2. Area C.1. C.1. C.2. C.3.	Mathematics elective Mathematics or statistics elective B Science, mathematics or statistics elective PHIL 230/PHIL 231 Philosophical Classics Critical reading electives DANC/ART/TH elective Literature, philosophy, arts (except Music	3,3,3 3 3 3 3 6 3
wi B.2. B.2. Area C.1. C.1. C.2. C.3. co	th lab) Mathematics elective Mathematics or statistics elective B Science, mathematics or statistics elective PHIL 230/PHIL 231 Philosophical Classics Critical reading electives DANC/ART/TH elective Literature, philosophy, arts (except Music urses) electives (300-400 level)	3,3,3 3 3 3 3 6 3 3 3 3 3

Area C Arts and humanities elective	3
D.1. HIST 204 History of American Ideals and	
Institutions	3
D.1. POLS 210 American and California	
Government	3
D.2. HIST 315 Modern World History	3
D.3. ECON 201/ECON 211/ECON 222	3
D.4.a. ANT 201/GEOG 150/SOC 105	3
D.4.b. ANT/BUS/ECON/GEOG/POLS/SOC	
(300-400 level) elective	3
E.1. PSY 201/PSY 202 General Psychology	3
E.2. BIO 220/FSN 210/HE 210/PE 250/PSY	
304/REC 100 elective	2
F.1. Computer literacy elective	3
F.2. Technology elective (300-400 level)	3
-	79
ELECTIVES	18
=	186

#### CURRICULUM FOR MUSIC MINOR

A 30-unit minor is available to students who desire documented competency in music. An individualized curriculum based on the following guidelines will be developed in consultation with a member of the music faculty. Information and application forms for the declaration of a Music minor are available in the Music Department Office.

Chosen from 300–400 level Music courses (or, in some cases, specific courses offered by other departments).

30

Units

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

# PHILOSOPHY DEPARTMENT

Faculty Office Bldg. (47), Room 37-B (805) 756-2041

# **Faculty**

#### Department Chair, Diane P. Michelfelder

Stephen W. Ball A. C. W. Bethel Stanislaus J. Dundon Charles T. Hagen Laurence D. Houlgate Russell A. Lascola Paul S. Miklowitz Frederick J. O'Toole Judy D. Saltzman Talmage E. Scriven Kendrick W. Walker

# Programs

B.A. Philosophy

Minor: Philosophy

The Philosophy Department offers coherent sequences of courses in the history of philosophy; in the traditional fields of philosophy (logic, ethics, metaphysics, epistemology); in the philosophical issues arising in other disciplines (e.g., philosophy of art and philosophy of science); and 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.

# CURRICULUM FOR PHILOSOPHY MINOR

Students may earn a minor in Philosophy by a coordinated course of study consisting of 24 units (12 specified, 12 chosen from an approved list) designed by the individual student and the Philosophy Department. Interested students are invited to contact the Philosophy Department.

Units

24

Required courses ENGL/PHIL/SPC 125 Critical Thinking (A.2.) (3) PHIL 230 Philosophical Classics (C.1.) (3) PHIL 231 Philosophical Classics (C.1.) (3) PHIL 311 History of Greek Philosophy (C.3.) (3)	12
Electives to be chosen from the following groups:	12
<ul> <li>One of the following:</li> <li>PHIL 312 History of Medieval Philosophy (C.3.) (3)</li> <li>PHIL 313 Continental Philosophy: Montaigne to Leibnitz (C.3.) (3)</li> <li>PHIL 314 British Philosophy: Bacon to Mill (C.3.) (3)</li> <li>PHIL 315 German Philosophy: Kant to Nietzsche (C.3.) (3)</li> </ul>	
One of the following: PHIL 316 Contemporary European Philosophy (C.3.) (3) PHIL 317 Contemporary British and American Philosophy (C.3.) (3)	
Two additional upper division philosophy courses (excluding PHIL 305, 306 and 308).	

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

# **CURRICULUM FOR B.A. PHILOSOPHY**

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

Units

#### **MAJOR COURSES**

PHIL 170 Problems of Philosophy	3
PHIL 225 Symbolic Logic	3
PHIL 230 Philosophical Classics (C.1.)	3
PHIL 231 Philosophical Classics (C.1.)	3
PHIL 311 History of Greek Philosophy	3
PHIL 313 Continental Philosophy: Montaigne to	
Leibnitz	3
PHIL 314 British Philosophy: Bacon to Mill	3
PHIL 315 German Philosophy: Kant to Nietzsche	3
PHIL 321 Philosophy of Science	3
PHIL 331 Ethics	3
PHIL 411 Metaphysics	3
PHIL 412 Epistemology	3
PHIL 460 Senior Project Seminar	3
PHIL 461 Senior Project	3
Concentration (see below) or 300-400 level PHIL	
electives	18
PHIL 461 Senior Project Concentration (see below) or 300–400 level PHIL electives	1

60

#### **GENERAL EDUCATION AND BREADTH** REQUIREMENTS

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300-400 level. Additional GEB courses are listed under Major Courses.

A.1. ENGL 114 Writing: Exposition	4
A.2. ENGL 125/PHIL 125/SPC 125 Critical	
Thinking	3
A.3. SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	3
A.4. ENGL 215 Writing: Argumentation or	
ENGL 218 Professional Writing: Argumentation	
and Reports	4
B.1. Physical and life sciences electives (one	
with lab)	3,3,3
B.2. Mathematics elective	<u>΄</u> 3
B 2 Mathematics or statistics elective	3
Area B Science, mathematics or statistics elective	3
C1 Critical reading electives	3
C 2 DANC/ART/TH elective	3
C 3 Literature philosophy arts electives	-
(300-400 level)	3
Area C Arts and humanities elective (except	
PHIL)	3
D 1 HIST 204 History of American Ideals and	5
Institutions	3
D 1 POLS 210 American and California	5
Covernment	3
D 2 WIST 215 Modern World History	2
D.2. FIGT 313 MODELL WORD TISLOFY	2
D.3. ECON 201/ECON 211/ECON 222	2
D.4.a. ANT 201/GEOG 150/50C 105	J
(200, 400 level) elective	2
(300-400 level) elective	3 7
E.I. PST 201/PSY 202 General Psychology	3

E.2. BIO 220/FSN 210/HE 210/PE 250/PSY	
304/REC 100 elective	2
F.1. Computer literacy elective	3
F.2. Technology elective (300-400 level)	3
	73
ELECTIVES	53
	186

# CONCENTRATION OR ELECTIVES

Select either the following concentration or 18 units of 300-400 level PHIL electives.

#### **Ethics and Society Concentration**

PHIL 332 History of Ethics	3
PHIL 333 Political Philosophy	3
PHIL 334 Jurisprudence	3
PHIL 335 Social Ethics	3
PHIL 337 Professional Ethics	3
PHIL 339 Biomedical Ethics	3
-	18
300-400 level PHIL electives	18

# POLITICAL SCIENCE DEPARTMENT

Faculty Office Bldg. (47), Room 14-A (805) 756-2984

# Faculty

#### Department Chair, Dianne N. Long

Randal L. Cruikshanks John H. Culver Philip L. Fetzer David L. George Reginald H. Gooden, Jr. Earl D. Huff Richard B. Kranzdorf Carl E. Lutrin Carroll R. McKibbin Allen K. Settle Joseph N. Weatherby

## Programs

B.A. Political Science with Concentrations in:

Individualized Course of Study International Affairs Pre-Law Public Administration Teaching Urban Studies

Minor: International Relations Minor: Public Administration

The Political Science Department offers undergraduate instruction leading to the Bachelor of Arts degree in Political Science. With a concern for theoretical principles as well as practical application, the degree requirements include both a common body of material and the completion of a curricular concentration in Political Science as listed below. Such curricular alternatives focus the training within the degree program toward career opportunities in government and other public agencies, in private enterprise, and in the legal profession.

In addition to the major in Political Science, the department offers minors in International Relations and Public Administration. Beyond that, the Political Science Department provides students in all curricula within the university with an understanding of the operations of local, state, and national government and the processes by which the individual and community interact in the several levels of government. The department supports internship opportunities in local, state, and federal agencies in addition to applied public policy research opportunities through the Center for Practical Politics.

Through the required and elective courses, the department seeks to expand each student's comprehension of the political process, to develop those understandings and skills which are essential for effective citizenship and for leadership positions in the public and private sectors.

### CURRICULAR CONCENTRATIONS

#### **International Affairs**

This concentration is designed to prepare students for careers in government, business and related agencies which deal in the many problems in international affairs and to prepare students to enter graduate studies in the field of international relations.

#### **Pre-Law**

This concentration is designed to prepare students for careers in the several fields of law. Some students who complete this concentration may seek admission to law school to continue their preparation for the legal profession. Others may seek careers in law-related professions such as law enforcement, judicial administration and legal assistance.

#### **Public Administration**

This concentration is designed to prepare students for careers in administrative work in government and related agencies and to prepare students to enter graduate studies in the field of administration.

## Teaching

This concentration is designed to prepare students for careers as social studies teachers in junior and senior high schools. With additional coursework as prescribed by the Education Department, political science graduates who have completed this concentration may obtain a California single subject teaching credential in Government or in Social Sciences. For more information regarding teacher credential programs, please see the University Center for Teacher Education section.

## **Urban Studies**

This concentration is designed to prepare students for careers in broad fields of planning within government and related agencies and to prepare students to enter advanced studies in the field of city and regional planning and urban administration.

#### Individualized Course of Study

This program is designed to provide career identity for students who do not select any of the above concentrations and to permit students with varying backgrounds and interests to pursue a course of study which meets their individual needs and interests. It consists of 27 units of coursework at the 300–400 level selected by the student and recommended by the student's academic adviser.

# CURRICULUM FOR B.A. POLITICAL SCIENCE

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

Units	
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#### **MAJOR COURSES**

POLS 100 Political Inquiry	4
POLS 105 Introduction to International Relations	4
POLS 204 Basic Concepts of Political Thought	4
POLS 305 Political Analysis	4
POLS 461 Senior Project	2
POLS 462 Senior Project	2
Political science electives (300-400 level)	17
Concentration courses (see below)	27
-	64

#### SUPPORT COURSES

HIST 102 History of Western Civilization	3
HIST 103 History of Western Civilization	3
Geography elective (300-400 level)	3
Anthropology/Sociology elective (300-400 level)	3
	12

# GENERAL EDUCATION AND BREADTH REQUIREMENTS

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level.

A 1 ENGL 114 Writing: Exposition	4
A 2 ENGL 125/PHIL 125/SPC 125 Critical	•
Thinking	3
A 3 SPC 201 Public Speaking or	5
SPC 202 Principles of Speech Communication	3
A 4 ENGL 215 Writing: Argumentation or	-
ENGL 218 Professional Writing: Argumentation	
and Reports	4
B 1 Physical and life sciences electives (one	•
with Job)	222
B 2 Mathematics elective	3,5,5
B.2. Mathematics elective	3
Area R. Science, mathematics or statistics elective	3
C 1 DUIL 220/DUIL 221 Philosophical Classics	3
C.1. Critical reading electives	5
C.1. Childer reading electives	2
C.2. Fine and performing arts elective	5
(200, 400 lovel)	2
(300–400 level)	3
Area C Arts and numanities elective	3
D.1. HIST 204 History of American Ideals and	2
Institutions	3
D.1. POLS 210 American and California	
Government	3
D.2. HIST 315 Modern World History	3
D.3. ECON 201/ECON 211/ECON 222	3
D.4.a. ANT 201/GEOG 150/SOC 105	3
D.4.b. ANT/BUS/ECON/GEOG/POLS/SOC	
(300-400 level) elective	3
E.1. PSY 201/PSY 202 General Psychology	3
E.2. BIO 220/FSN 210/HE 210/PE 250/PSY	
304/REC 100 elective	2

F.1. F.2.	Computer literacy elective Technology elective (300–400 level)	3 3
	-	79
ELECT	VES	31
	=	186

#### **CONCENTRATIONS** (select one)

#### **International Affairs Concentration**

POLS 312 International Politics	3
POLS 382 Comparative Politics	4
POLS 384 Politics of Developing Areas	3
POLS 411 Contemporary U.S. Foreign Policy	3
Adviser approved electives (4 units must be	
300–400 level)	14
. –	27

#### **Pre-Law Concentration**

ENGL 302 Writing: Advanced Composition	4
POLS 321 American Constitutional Law	3
POLS 322 Civil Liberties	3
POLS 334 Jurisprudence	3
POLS 336 Judicial Process	4
Pre-Law electives (300-400 level)	10
—	27

#### **Public Administration Concentration**

POLS 314 Public Administration	4
POLS 340 Government Internship	4
POLS 401 State and Local Government	4
POLS 405 Politics of Finance and Planning	3
POLS 425 Public Policy Analysis	4
POLS 441 Administrative Theory and Behavior	4
POLS 442 Public Personnel Administration	4
	27

#### **Teaching Concentration**

POLS 301 California State and Local Politics	3
POLS 307 American Political Thought	3
POLS 336 Judicial Process	4
POLS 382 Comparative Politics	4
ECON 304 Comparative Economic Systems	3
GEOG 250 Physical Geography	3
HIST 101 History of Western Civilization	3
HIST 402 American Revolution	3
Adviser approved elective	1
-	27

#### **Urban Studies Concentration**

POLS 303 Minority Group Politics	3
POLS 380 Political Behavior	3
POLS 401 State and Local Government	4
POLS 425 Public Policy Analysis	4
Adviser approved electives (3 units must be	
300–400 level)	13
****	

# CURRICULUM FOR PUBLIC ADMINISTRATION MINOR

Students interested in public sector careers may enroll in the minor program in Public Administration. The minor consists of 28 units of coursework and involves a supervised internship experience in a governmental agency. Details are available from the Political Science Department.

	Units
Required courses	23
POLS 314 Public Administration (4)	
POLS 340 Government Internship (4)	
POLS 405 Politics of Finance and Planning (3)	
POLS 425 Public Policy Analysis (4)	
POLS 441 Administration Theory and Behavior (4)	
POLS 442 Public Personnel Administration (4)	
Electives	6
6 units of adviser approved electives.	
	29

# CURRICULUM FOR INTERNATIONAL RELATIONS MINOR

Students interested in adding a strong international dimension to their major field of study may enroll in the minor program in International Relations. The minor consists of 28-30 units of coursework divided into three categories: 12 units of required coursework, 9-12 units in area of emphasis (Latin America, Middle East, Africa, Europe) and 7-12 units of general coursework. Details are available from the Political Science Department.

	Units
Required courses POLS 105 Introduction to International Relations (4)	13
<ul> <li>POLS 411 Contemporary U.S. Foreign Policy (3)</li> <li>ECON 325 Underdevelopment and Economic Growth (D.4.b.) (3)</li> <li>GEOG 308 Global Geography (D.4.b.) (3)</li> </ul>	
Area of emphasis Adviser approved coursework	9–12
Adviser approved electives	7–4
	29

# **PSYCHOLOGY AND HUMAN DEVELOPMENT DEPARTMENT**

Faculty Office Bldg. (47), Room 24 (805) 756-2033

# Faculty

#### Department Head, Laura A. Freberg

Margaret M. Berrio Robert L. Blodget Shawn Burn Robert A. Christenson Patrice L. Engle David L. Englund Basil A. Fiorito Laura M. King Daniel J. Levi J. Kelly Moreno Ann Morgan Linden L. Nelson Marilynn F. Rice Kathleen A. Ryan Donald H. Ryujin Ned W. Schultz Michael J. Selby Charles M. Slem Josephine S. Stearns W. Fred Stultz Bette W. Tryon Debra Valencia-Laver

#### Programs

B.S. Human Development with Concentrations in:

Applied Developmental Psychology Applied Social Psychology Early Childhood Education Family Studies

M.S. Psychology

Minors:

Psychology Integrative Technology Gerontology

The department consists of faculty with degrees in psychology, family studies, human development and education who direct programs leading to a B.S. degree in Human Development, M.S. Psychology, and minors in Psychology, Gerontology, and Integrative Technology, as well as a broad range of support courses which serve the entire university community.

Human Development majors study lifespan, human development, psychology, and research and intervention methods as preparation for work with children and adults. In this core program, students participate in department-operated infant, toddler, and preschool programs and psychology laboratories and complete internships in area schools, agencies, and business organizations as part of the "learn by doing" educational process. Students select a curricular concentration in Early Childhood Education, Family Studies, Applied Developmental Psychology, or Applied Social Psychology.

The Psychology and Human Development Department also provides courses which fulfill general education requirements, support other degree programs and serve as a personal development resource for all university students. These course offerings are designed to acquaint students with the facts, theories and contemporary trends in psychology and human development with a special emphasis on how these principles can be incorporated into a more coherent and meaningful understanding of oneself and of one's interactions with others.

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.

#### MINORS

#### **Psychology Minor**

The Psychology minor provides students with a broad background in the principles of psychology in order to develop an appreciation of the human element in the world around them, complement their professional training, and enhance their personal development and interpersonal effectiveness. Students whose primary job responsibilities will require dealing with people should find employment opportunities increased and career advancement enhanced.

#### **Integrative Technology Minor**

The Integrative Technology minor is an interdisciplinary program jointly sponsored by Industrial Engineering, Industrial Technology and Psychology and Human Development departments. The minor is for non-engineering students who wish to pursue their professional career in a corporate setting and want to learn more about the impact of technology. The minor will acquaint students with how factories operate and how technology is integrated into corporate operations. For more information, see School of Professional Studies.

#### Gerontology Minor and Certificate Program

The Gerontology minor and certificate program is an interdisciplinary program to upgrade the skills and increase the knowledge of persons already in the field of gerontology and to train students in various majors whose careers will be directly or indirectly related to gerontology. In addition, the certificate program trains interested persons in providing continuing education programs for senior adults and assuring the availability and accessibility of these programs to the elderly population through continuing education and peer educators. For more information, see School of Professional Studies.

#### **CURRICULAR CONCENTRATIONS**

#### **Applied Developmental Psychology**

This concentration is designed to prepare students for careers in human service agencies, health care settings, special needs programs, educational institutions and private or government organizations where practical aspects of human development are addressed. Students who choose this concentration study the nature of human development throughout the life span and learn to use psychological and developmental principles to assess and analyze behavior, to understand interpersonal relationships, and to implement behavior change and intervention techniques. The concentration also prepares students for graduate programs in psychology and counseling.

#### **Applied Social Psychology**

This concentration provides training in the methods and principles of social psychology relevant to occupations in business and industry, government agencies, and nonprofit research and advocacy organizations. Applied social psychologists are involved in research, evaluation of social intervention programs, consultation to business and government agencies, management of organizations, and social activism. The concentration prepares students for graduate school in social and applied social psychology, industrial/organizational psychology, environmental psychology, political psychology, community/health psychology, human resources management, public administration, and related disciplines.

#### **Early Childhood Education**

Students selecting this concentration prepare for careers in preschool and elementary teaching, caregiving, and administrative positions with public or private institutions or for graduate work leading to college or university teaching and research positions. These graduates may plan for careers in programs that serve infants, preschool and school-age children.

#### **Family Studies**

This concentration is an interdisciplinary program designed to provide the knowledge and experience necessary for a variety of careers in family, social service and counselingrelated agencies in the public and private sectors. The Family Studies concentration is particularly appropriate for students who wish to work in educational or helping agencies and who desire a family developmental focus rather than a broad social science perspective at the undergraduate level. Many students in this concentration will pursue further graduatelevel training in a variety of specializations.

# CURRICULUM FOR PSYCHOLOGY MINOR

The minor in Psychology consists of 27 units, 12 of which can fulfill General Education and Breadth requirements. Eighteen of the 27 units are specified, with the remaining 9 units chosen from an approved list in consultation with the minor adviser. Interested students are encouraged to contact the Psychology and Human Development Department for information and application forms.

Units

Required courses	18
PSY 201/202 General Psychology (E.1.) (3) PSY 304 Physiological Psychology (E.2.) (3)	
PSY 307 Abnormal Psychology (3)	
PSY 452 Personality (3)	
ANT 360 Human Cultural Adaptation (D.4.b.) (3)	
or	
PSY 350 Social Psychology (3)	
STAT 130/STAT 211/STAT 321 (B.2.) (3)	
Adviser approved psychology courses (300-400	
level)	9
-	27

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Human Development, Psychology and other subjects.

### **CURRICULUM FOR B.S. HUMAN DEVELOPMENT**

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

Units

#### Freshman

HD 102 Human Development: Introduction to	
Issues and Applications	3
HD 130 Supervised Study of Children	4
ETHS 114 Racism in American Culture or	
ETHS 210 Cultural Heritage	3
ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
ENGL 114 Writing: Exposition (A.1.)	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking	
(A.2.)	3
ENGL 215 Writing: Argumentation or	
ENGL 218 Professional Writing:	
Argumentation and Reports (A.4.)	4
HIST 204 History of American Ideals and	
Institutions (D.1.)	3
PSY 201/PSY 202 General Psychology (E.1.)	3
Fine and Performing Arts elective (C.2.)	3
Life science elective (B.1.b)	3
Mathematics elective (B.2.)	3
Physical or life sciences elective (with lab) (B.1.a.)	3
Electives	6
-	48
	HD 102 Human Development: Introduction to Issues and Applications

#### Sophomore

	HD 203 Family Development	3
	HD 253 Functional and Dysfunctional Family	
	Behavior	3
	HD 299 Early Development: Conception through	
	Childhood	5
	ECON 201/ECON 211/ECON 222 (D.3.)	3
	FSN 210/HE 210 Nutrition (E.2.) or	
	PSY 304 Physiological Psychology (E.2.)	3
	PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
	POLS 210 American and California Govt. (D.1.)	3
	SPC 201 Public Speaking or	
	SPC 202 Prin. of Speech Communication (A.3.).	3
	STAT 130/STAT 211/STAT 251/STAT 321 (B.2.)	3
1	Computer literacy elective (F.1.)	3
1	Critical reading electives (C.1.)	6
1	Physical science elective (B.1.a.)	3 3
	Electives and courses to complete concentration	8
	-	49
h	inior	
	LID 206 Adolescence	<b>`</b>
	UD 200 Adulthood	3

PSY 307 Abnormal Psychology or
PSY 456 Behavior Disorders in Children
PSY 323 The Helping Relationship
PSY 329 Research Methods in Psychology and
Human Development

1	BIO 302 Human Genetics (B.1.b.) HIST 315 Modern World History (D.2.) ANT/BUS/ECON/GEOG/POLS/SOC elective	3 3
	(300–400 level) (D.4.b.)	3
1	Literature, philosophy, arts elective (300–400 level) (C.3.)	3
1	Technology elective (F.2.)	3
	Electives and courses to complete concentration	20
	-	51

#### Senior

-		
	HD 330 Supervised Internship <i>or</i> HD 453/PSY 453 Supervised Fieldwork	6
	HD 430 Advanced Internship or	
	HD 454/PSY 454 Supervised Fieldwork	6
	HD 461 Senior Project	3
	HD 462 Senior Project	3
	HD 463 Senior Seminar	2
	PSY 350 Social Psychology	3
	PSY 351/HD 325/PSY 429	4
	PSY 452 Personality	3
	PSY 458 Learning and Memory	3
1	Arts and humanities elective (Area C)	3
	Electives and courses to complete concentration	14
		50
	=	198

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 86 of this catalog. Early Childhood Education concentration students see list of recommended courses for GEB areas B. and C.2.

#### **CONCENTRATIONS** (select one)

#### **Applied Developmental Psychology Concentration**

HD 421 Developmental Processes	3,3
PSY 307 Abnormal Psychology or	
PSY 456 Behaviorial Disorders in Children	3
PSY 459 Lifespan Theories	3
Select five of the following with adviser's approval:	
HD 413, HD/EDUC 444, PSY 304, 310, 359, 422,	
432, 460, 465	15
Select three of the following with adviser's approval:	
PSY 302, 314, 315, 317, 330, 429; HD 450; FSN	
310; SOC 344/402; ANT 401; WS 301; POLS	
425; PHIL 335	9
. –	36

# **Applied Social Psychology Concentration**

PSY 302 Behavior in Organizations	3
PSY 311 Environmental Psychology	3
PSY 317 Psychology of Stress	3
PSY 359 Applied Psychology Research Methods	4
PSY 432 Psychological Testing	3
PSY 494 Psychology of Technological Change	3
PSY 496 Applied Social Psychology	4
SOC 330/POLS 380/MGT 314	3
Adviser approved electives	9
-	35

#### **Early Childhood Education Concentration**

HD 228 Program Planning for Infants and Toddlers	3
HD 310 Early Childhood Learning: Applications for	
the Preoperational Period	5
HD 311 Early Childhood Learning: Applications for	
the Transitional Period	5
HD 324 Guiding Young Children	3
HD 401 History and Theories of Childhood	
Education	3
HD 404 Administration of Children's Programs	3
HD 421 Developmental Processes	3
FSN 310 Maternal and Child Nutrition	3
PE 280 First Aid and CPR	3
Select two courses from the following:	6
ART 104, ENGL 260, MU 100, PSC 103, TH 380,	
HD 405, 413, DANC 135, SPC 302, 303, 320,	
MATH 327, 328, ENGL 302	
	- 37

#### **Family Studies Concentration**

HD 303 Family Interaction	3
HD 351 American Families: Past, Present, and Future.	3
HD 450 Family Therapy and Crisis Intervention	4
HD 464 Issues in Family Life Education	3
HD 481 Family Theory	3
PSY 307 Abnormal Psychology or	
PSY 456 Behavior Disorders in Children	3
PSY 422 Lifespan Sexuality	3
Select from the following with adviser's approval	15
GEOG 308, HE 305, HIST 385, PE 250, 305, POLS	
382, PSY 302, 310, 318, 330, REC 328, SOC 301,	
302, 326, 402, 413	
	27
	3/

## **B.S. HUMAN DEVELOPMENT**

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

	Units
MAJOR COURSES	67
HD 102, 130, 203, 253, 299, 306, 308, 461, 462,	
463	
HD 330 or HD 453/PSY 453	
HD 430 or HD 454/PSY 454	
PSY 323, 329, 350, 452, 458	
PSY 307/PSY 456	
PSY 351/HD 325/PSY 429	
SUPPORT COURSES 51/50	)/52
BIO 302 (B.1.b.)	
ETHS 114/210	
FSN 210/HE 210/PSY 304 (E.2.)	
PSY 201/202 (E.1.)	
SIAI 130/211/251/321 (B.2.)	
Concentrations (select one:) (36/35/37/37)	
Applied Developmental Psychology Conc. (36)	
HD 421	
PSY 459	
PSY 307/456 Select F with a duiner(a summary of (15)	
Select 5 with adviser s approval (15):	
FID 415, FID/ED 444, FST 304, 310, 359, 422,	
432, 400, 403	

Select 3 with adviser's approval (9): PSY 302, 314, 315, 317, 330, 429; HD 450; FSN 310; SOC 344/402; ANT 401; WS 301; POLS 425; PHIL 335 Applied Social Psychology Concentration (35) PSY 302, 311, 317, 359, 432, 494, 496 SOC 330/POLS 380/MGT 314 Adviser approved electives (9) Early Childhood Education Concentration (37) **FSN 310** HD 310, 311, 324, 228, 401, 404, 421 PE 280 Select two courses (6): ART 104; DANC 135; ENGL 260, 302; HD 405, 413; MATH 327, 328; MU 100; PSC 103; SPC 302, 303, 320; TH 380 Family Studies Concentration (37) HD 303, 351, 450, 464, 481 PSY 422 PSY 307/456 Select with adviser's approval (15) GEOG 308; HE 305; HIST 385; PE 250, 305; POLS 382; PSY 302, 310, 318, 330; REC 328; SOC 301, 302, 326, 402, 413 **GENERAL EDUCATION AND BREADTH** REQUIREMENTS.....

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300-400 level. Additional GEB courses are listed under Support Courses.

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

Area B: (12) Physical and life sciences electives (one each, one with lab) (B.1.) Mathematics elective (B.2.) Science, math. or statistics elective (Area B) Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300-400 level) (C.3.) Arts and humanities elective (Area C) Area D: (18) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/211/222 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.) Area F: (6) Computer literacy elective (F.1.) (6) Technology elective (300-400 level) (F.2.) Electives ...... 12/13/11

# MASTER OF SCIENCE DEGREE IN PSYCHOLOGY

# **General Characteristics**

The Master of Science in Psychology provides graduate training in clinical counseling for candidates preparing for careers in agencies and/or seeking educational verification for the Marriage, Family and Child Counseling (MFCC) License. Admission to the program requires qualifying examinations, references, autobiographical information, an interview, and a minimum grade point average of 3.0 in the last 90 quarter units (60 semester units) attempted.

# **Program of Study**

The Master of Science in Psychology is required for students selecting the emphasis in Marriage, Family and Child Counseling (MFCC) and/or clinical training in agency counseling. Special coursework is required in child abuse, psychopharmacology, developmental psychology, ethics and law, psychopathology, diagnosis and treatment planning, sexual dysfunction, advanced MFC therapy, child therapy, and additional practicum and field experience, and other specific coursework as prescribed by the program and/or California legislation.

The candidate must maintain a grade point average of 3.0 (B) or better in all courses taken subsequent to 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 Counseling Coordination Committee.

The Master of Science degree in Psychology requires a culminating experience that includes either the completion of a thesis/project or the supervised comprehensives. Each candidate must file a formal program of study by the end of the first quarter as a classified graduate student. The student must complete one quarter in residence before applying for formal admission into the MS in Psychology, MFCC educational verification emphasis. The professional and personal growth of each graduate student is of major importance; consequently, candidates will be encouraged to seek the experience of personal therapy. Students must be very aware of course prerequisites and check the catalog carefully to assure enrollment in required courses.

## Prerequisites

Prerequisites are coursework in abnormal psychology, behavioral effects of psychoactive drugs, behavior disorders in children, physiological psychology, personality, and psychological testing. Candidates who have not completed such courses will not be denied admission to the university, but will be required to remove deficiencies 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 graduate student must have satisfactorily met the professional, personal, scholastic, and other standards for graduate study, including qualifying examinations, as the appropriate university authorities may prescribe. Only those applicants who show promise of success and fitness will be admitted, and only those who continue to demonstrate a satisfactory level of scholastic competence and who possess appropriate personal qualities will be eligible to continue in such a curriculum.

# **Conditionally Classified Standing**

The student may enroll in a graduate degree curriculum if in the opinion of the appropriate campus authority the student can remedy any deficiencies by additional preparation.

# Advancement to Candidacy

Advancement to master's degree candidacy requires completion of a minimum of 30 quarter units of required courses in residence, specified in a formal program of study, with a minimum grade point average of 3.0 and the formal recommendation of the specialization faculty. Students must maintain a minimum GPA of 3.0 in all coursework completed subsequent to admission to the program.

# **CURRICULUM FOR M.S. PSYCHOLOGY**

	Units
Human Development HD 450 Family Therapy and Crisis Intervention (4)	4
Education/Psychology EDUC/PSY 555 Counseling and Communication	56
EDUC 556 Ethnic Counseling (4) EDUC/PSY 560 Counseling Theories and	
Assessment (4) EDUC/PSY 561 Group Counseling (3) PSY 564 Ethics and the Law: MFC Counseling (3)	
PSY 565 Diagnosis/Treatment Psychopathology (3)	
PSY 566 Group Therapy (3) PSY 568 Cognitive Behavioral Counseling (3)	
<ul> <li>PSY 509 Counseling Clinic Practicum (6)</li> <li>PSY 573 Field Experience: Counseling (12) or PSY 576 Field Experience: Marital and Family Counseling (12)</li> </ul>	
PSY 585 Research Methods for Counseling Psychology (4) PSV 500 Research Applications in Psychology (4)	
<ul> <li>PSY 590 Research Applications in Psychology and Human Services (4)</li> <li>PSY 599 Thesis/Project (3) or</li> </ul>	
3 units of approved electives <i>and</i> written comprehensive examination	
Psychology	9
PSY 459 Lifespan Theories (3) PSY 504 Psychoneurology/Pharmacology (3) PSY 574 Applied Psychological Testing (3)	
<sup>3</sup> Adviser approved electives	20

#### **MFCC Emphasis**

Students who are interested in pursuing the MFCC emphasis will be required to complete the following courses as elective units to meet requirements prescribed by California legislation for MFCC licensure:

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PSY 569 Counseling Clinic Practicum (6) PSY 571 Advanced Marital and Family Therapy (4) PSY 572 Child Therapy (4)

PSY 575 Sexual Dysfunction Therapy (3) PSY 576 Field Experience: Marital and Family Counseling (12)

 Additional fieldwork will be required to meet on-site requirements of MFCC educational verification. Only 12 units will apply toward the M.S. degree.
 Must register for thesis/project credit each quarter of advisement.

<sup>&</sup>lt;sup>3</sup> Students seeking the MFCC emphasis within the M.S. in Psychology must meet the content area requirements prescribed by California legislation (see adviser).

# SOCIAL SCIENCES DEPARTMENT

Faculty Office Bldg. (47), Room 13-D (805) 756-2260

# Faculty

# Department Chair, Warren W. DeLey

James W. Coleman Barbara E. Cook Donald R. Floyd Robert L. Hoover Harold R. Kerbo Patrick C. McKim John A. McKinstry Barbara L. Mori Leo W. Pinard II William L. Preston Richard A. Shaffer George J. Suchand Calvin H. Wilvert

# Programs

B.S. Social Sciences with Concentrations in:

Criminal Justice Cross-Cultural Studies Individualized Course of Study Organizations Social Sciences (Teaching) Social Services

Minor: Anthropology-Geography

The Social Sciences Department provides a broadly based orientation to the study of society and its environment drawing on courses in anthropology, geography, and sociology. Students prepare for a wide range of careers in federal, state and local government; teaching; social services agencies; and criminal justice including probation, parole, law and law enforcement; as well as in business and industry. The flexible curriculum offers the student the opportunity for familiarization and analysis concerning the most sensitive and critical issues of the student's life.

The Social Sciences Department serves all of the schools of the campus in providing general education for citizenship. The department seeks to provide the student with a better understanding of the society in which we live, to develop in the student those skills and attitudes which are prerequisites for effective citizenship, and to prepare and encourage the individual toward intelligent and responsible social action.

The occupational objectives of the department are to prepare students for those numerous entry jobs in civil service, business, industry, and social welfare which require a bachelor's degree with a major in the social sciences, and to educate those who expect to teach social studies in elementary or secondary schools.

Students with majors in fields other than the social sciences may select courses which will aid in qualifying them for a variety of civil service positions. The department offers an Anthropology-Geography Minor.

The department offers the degree of Bachelor of Science in Social Sciences. This degree allows the student to choose among five concentrations leading to different careers.

## CURRICULAR CONCENTRATIONS

#### **Criminal Justice**

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 crosscultural contexts: international development agencies, the public health field, intercultural education, plus numerous careers overseas in private industries.

#### Individualized Course of Study

Provides students the opportunity to pursue a course of study which meets their individual needs and interests. It consists of 27 units at the 300–400 level. The student selects the courses in consultation with advising faculty and provides a written justification for the courses and the way they constitute a cohesive, integrated study. The list of courses is a contract between the student and the Department.

#### Organizations

Students learn to apply the general principles of human behavior to the understanding of modern organizations. It prepares them for careers in either business or government organizations.

#### **Social Services**

Provides students the general principles of human social behavior and specialized professional courses to prepare for careers in the helping professions such as social work and counseling.

#### Teaching

With additional coursework as prescribed by the University Center for Teacher Education students may pursue coursework leading to the Multiple Subject Credential for elementary school teachers or the Single Subject Credential for secondary school social science teachers of history, geography, political science and economics. Certain courses apply toward a "waiver" program which eliminates the National Teacher Examination requirement for the Single Subject credential. For more information regarding teacher credential programs, please see the University Center for Teacher Education section.

# **OTHER CONCENTRATIONS AVAILABLE**

The following concentrations outside the Social Sciences Department are also offered with prior consultation and approval of the Social Sciences Department and the department offering the concentration: Public Administration, Pre-Law, International Affairs or Urban Studies (Political Science Department), Human Resources Management, Management, or International Business Management (School of Business).

#### **CURRICULUM FOR B.S. SOCIAL SCIENCES**

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

#### Freshman

	ANT 201 Cultural Anthropology	- 3
	ANT 203 Physical Anthropology	3
	GEOG 150 Human Geography	3
	GEOG 250 Physical Geography	3
	SOC 105 Introduction to Sociology (D.4.a.)	3
	SOC 106 Social Problems	3
	ENGL 114 Writing: Exposition (A.1.)	4
	ENGL 125/PHIL 125/SPC 125 Critical Thinking	
	(A.2.)	3
	HIST 204 History of American Ideals and	
	Institutions (D.1.)	3
	LIB 101 Library Instruction	1
	SPC 201 Public Speaking or	
	SPC 202 Principles of Speech Communication	
	(A.3.)	3
1	Physical and life sciences electives (one with lab)	
	(B.1.)	12
2	Electives and courses to complete major	5

#### Sophomore

	ANT 202 World Prehistory	3
	GEOG 215 Human Impact on the Earth	3
	POLS 105 International Relations	4
	ENGL 215 Writing: Argumentation or	
	ENGL 218 Professional Writing: Argumentation	
	and Reports (A.4.)	4
	PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
	POLS 210 American and California Government	
	(D1)	3
	PSY 201/PSY 202 General Psychology (E.1.)	3
	STAT 211 Flementary Probability and Statistics	
	(B.2.)	3
	BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC	
	100 elective (F 2 )	2
1	Computer literacy elective (E.1.)	3
1	Critical reading electives (C.1.)	6
ı	Economics elective (D3)	3
1	Eine and Performing Arts elective $(C_2)$	3
1	Mathematics elective (B 2)	3
2	Floctives and courses to complete major	ž
	Lieuwes and courses to complete major maintain -	
		- 49

#### Junior

SOC 323 Social Stratification SOC 333 Social Research Methods I
SOC 334 Social Research Methods II
HIST 315 Modern World History (D.2.)
Arts and humanities elective (Area C)
Literature, philosophy, arts elective (300–400 level) (C.3.)
Technology elective (F.2.) Anthropology elective (300–400 level) Geography (300–400 level)

	History elective (300-400 level)	3
	Sociology elective (300-400 level)	3
2	Electives and courses to complete major	16
	-	49

#### Senior

	SOC 421 Social Theory	3 2
	SOCS 462 Senior Project	2
1	BUS/ECON/POLS elective (300-400 level)	
	(D.4.b.)	3
	Anthropology electives (300-400 level)	6
	Geography electives (300-400 level)	6
	History elective (300-400 level)	3
3	Political science elective (300-400 level)	3
	Sociology electives (300-400 level)	6
2	Electives and courses to complete major	17
	-	51
	=	198

- See COURSES OF INSTRUCTION sections of this catalog for descriptions of courses in Anthropology, Geography, Social Sciences, Sociology and other subjects.
- <sup>1</sup> To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 86 of this catalog.
- <sup>2</sup> 27 of the elective units must be chosen with the approval of the adviser in a field of concentration.

<sup>3</sup> May not be double-counted for GEB requirement.

#### **CONCENTRATIONS** (select one)

#### **Criminal Justice Concentration**

SOC 316 American Minorities	3
SOC 402 Crime and Delinguency	3
SOC 412 Treatment of Criminals and Delinquents	3
SOC 413 Methods of Social Work	3
SOCS 440 Supervised Fieldwork	3
Adviser approved electives	12
	27

#### **Cross-Cultural Studies Concentration**

Required courses (12 units)	
ANT 341 Comparative Societies	3
ANT 360 Human Cultural Adaptation	3
GEOG 308 Global Geography	3
SOC 309 World System	3
Development courses to be selected from	6
ANT 325, ANT 420, GEOG 315, GEOG 320	
Problems and Issues courses to be selected from	6
ANT 401, GEOG 305, GEOG 325, SOC 315	
Regions and Applications courses to be selected from	
approved list. See adviser	3
	27

#### **Organizations** Concentration

Select from the following courses:	20–21
SOC 310 Socialization: Self, Organizations and	
Society (3)	
SOC 350 Social Organization in Modern Japan (3	()
SOC 395 Sociology of Complex Organizations (3	) ''
SOCS 440 Supervised Fieldwork (3)	

MGT 312 Organization and Mgmt. Theory (4)	
MGT 314 Human Resource Management (4)	
MGT 317 Organizational Behavior (4) or	
PSY 302 Behavior in Organizations (3)	
Adviser approved electives	7–6

27

Units

#### **Social Services Concentration**

SOC 301 Social Work in the U.S.A.	3
SOC 302 Social Welfare Institutions	3
SOC 344 Sociology of Poverty	3
SOC 413 Methods of Social Work	3
SOCS 440 Supervised Fieldwork	6
Adviser approved electives	9
-	27

#### **Teaching Concentration**

GEOG 340 Geography of California	3
GEOG 350 Geography of the United States	3
SOC 316 American Minorities	3
SOCS 424 Organizing and Teaching Social Sciences	3
SOCS 440 Supervised Fieldwork or	
EDUC 300 Intr. Teaching Profession	3
HIST 101, HIST 102, HIST 103 History of Western	
Civilization	3,3,3
HIST 385 Topics in California History	3
-	27

# **B.S. SOCIAL SCIENCES**

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

MAJOR COURSES	67
ANT 201, 202, 203	
GEOG 150, 215, 250	
SOC 105 (D.4.a.), 106, 323, 333, 334, 421	
SOCS 461, 462	
Anthropology electives (300-400 level) (9)	
Geography electives (300-400 level) (9)	
Sociology electives (300-400 level) (9)	
SUPPORT COURSES	44
LIB 101	
POLS 105	
STAT 211 (B.2.)	
History electives (300-400 level) (6)	
Political science elective (300-400 level) (3)	
Concentration (select one:)	
Criminal Justice Concentration (27)	
SOC 316, 402, 412, 413, 440	
Adviser approved electives (12)	
Cross-Cultural Studies Concentration (27)	
ANT 341, 360	
GEOG 308	
SOC 309	s.
Development courses (6) to be selected from:	
ANT 325, 420; GEOG 315, 320	
Problems and Issues courses (6) to be selected	
from: ANT 401; GEOG 305, 325; SOC 315	
Regions and Applications courses (6) to be	
selected from approved list. See adviser. (3)	

Organizations Concentration (27)	
20-21 units to be selected from the following:	
SOC 310, 350, 395, 440; MGT 312, 314	
MGT 317/PSY 302	
Adviser approved electives (7-6)	
Social Services Concentration (27)	
SOC 301, 302, 344, 413	
SOCS 440	
Adviser approved electives (9)	
Teaching Concentration (27)	
GEOG 340, 350	
SOC 316	
SOCS 424	
SOCS 440/EDUC 300	
HIST 101, 102, 103, 385	
GENERAL EDUCATION AND BREADTH	
REQUIREMENTS	73

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Major and Support courses.

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

Area B: (15)
Physical and life sciences electives (one each, one with lab) (B.1.)
Mathematics elective (B.2.)

Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300–400 level) (C.3.) Arts and humanities elective (Area C) Area D: (15)

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

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

Area F: (6)	
Computer literacy elective (F.1.)	
Technology elective (300–400 level) (F.2.)	
ELECTIVES	14

## CURRICULUM FOR ANTHROPOLOGY-GEOGRAPHY MINOR

The Anthropology-Geography Minor provides the broadest possible spatial and cultural knowledge of our world. The 30-unit program consists of 12 units of required core courses, in addition to others that allow the student maximum flexibility in tailoring training to a wide variety of specific occupational needs. Many majors may find this minor of special interest, especially those planning teaching careers in History, Political Science, and Liberal Studies, or those interested in international aspects of agriculture, economics, or business.

At least 15 units must be selected from upper division courses, and at least two foundation courses must be completed before proceeding to upper division courses.

, , ,	Units
Foundation Courses ANT 201 Cultural Anthropology (D.4.a.) (3) ANT 203 Physical Anthropology (3) GEOG 150 Human Geography (D.4.a.) (3) GEOG 250 Physical Geography (3)	12
Global Courses (select 2) ANT 202 World Prehistory (3) ANT 325 Material Culture (3) ANT 341 Comparative Societies (3) GEOG 305 Political Geography (3) GEOG 308 Global Geography (D.4.b.) (3) GEOG 315 Resource Utilization (3)	6
<i>Ecological Courses</i> (select 2) ANT 360 Human Cultural Adaptations (D.4.b.) (3) GEOG 215 Human Impact on the Earth (3) GEOG 320 Geography of Hunger (3) GEOG 325 Climate and Humanity (3) AGB 307 World Agricultural Resources (3)	6
Area Courses (select 1) ANT 450 Area Studies (3) GEOG 340 California Geography (3) GEOG 350 Geography of the USA (3) GEOG 401 Area Geography (3) SOC 350 Sociology of Japan (3)	3
<ul> <li>Special Skills (select 1)</li> <li>ANT 310 California Archaeology (3)</li> <li>ANT 333 Language and Culture (3)</li> <li>ANT 401 Culture and Health (3)</li> <li>ANT 420 Development Anthropology (3)</li> <li>ANT 444 Sex, Death and Human Nature (3)</li> <li>GEOG 310 Urban Geography (3)</li> <li>AE 345 Aerial Photogrammetry and Remote Sensing (3)</li> <li>MSC 111 Orienteering (3)</li> </ul>	3

# SPEECH COMMUNICATION DEPARTMENT

Faculty Office Bldg. (47), Room 33 (805) 756-2553

# Faculty

#### Department Chair, Raymond F. Zeuschner

James R. Conway Bernard K. Duffy Susan Duffy Michael L. Fahs David Henry Lorraine D. Jackson Steven McDermott Alexis S. Olds Harry Sharp, Jr. Terrence C. Winebrenner

#### Programs

B.A. Speech Communication

#### Minor: Speech Communication

Understanding the process of communication is no less important in today's Information Age than it was during the Golden Age of Athens, when skill in oral communication determined one's success in life. The study of speech as a means of influence, entertainment, and information was at the foundation of Western Civilization in Classical Greece and Rome. Isocrates and Cicero were among those who credited speech with the development of civilization and culture. A course of study in speech communication, always one that required a knowledge of many cognate fields like psychology and logic, is still interdisciplinary in nature. Faculty in speech communication teach aesthetic, historical, and empirical methods for understanding communication.

The aims of the discipline are both conceptual and practical. The study of communication embodies the concerns of rhetoric, one of the three original liberal arts. In broad terms, students who enroll in a liberal arts curriculum do so to develop the ability to analyze and reason critically, write and speak effectively, and appreciate the influences of culture upon their lives. The first goal of the department is to advance these objectives.

Courses in the modern discipline of speech communication focus on the history and theory of communication. The field embraces communication in all contexts: political, organizational, debate, small group, intercultural, instructional, mass media, and performance of literature. The emphasis on developing theoretical insights unites these various fields.

The department offers fully articulated major and minor programs. Through the use of adviser approved electives, the major can be shaped to assist students in preparing for their educational and career objectives. Students use a speech communication major to prepare for careers in business, advertising and public relations, theatre, law, education, the mass media, and the clergy. In addition to providing students with an option to select from a broad range of internships and the opportunity to participate in the Teaching Credential Program, the department houses an extensive program in competitive debate and speaking. It also offers individual and sequenced courses to develop practical skills in oral composition, critical thinking, and effective human communication, as well as general education courses in the history and theory of speech communication.

# CURRICULUM FOR SPEECH COMMUNICATION MINOR

A 25-unit minor is available for students who desire documented competency in Speech Communication. After completing the core courses listed below, students may select the remainder of their courses from an approved list. Copies of the list and further information and application forms are available in the Speech Communication Department office.

Required courses	15
SPC 201 Public Speaking (3) or	
SPC 202 Principles of Speech Communication	
(A.3.) (3)	
SPC 212 Interpersonal Communication (4)	
SPC 312 Communication Theory (4)	
SPC 330 Classical Rhetorical Theory or	
SPC 331 Political Advocacy and Contemporary	
Rhetoric (C.3.) (4)	
Electives	10
10 units of Speech Communication of which at	
least 8 units must be 300-400 level.	

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

Units

## CURRICULUM FOR B.A. SPEECH COMMUNICATION

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

#### **MAJOR COURSES**

Units

SPC 101 Introduction to Speech Communication	.1
SPC 212 Interpersonal Communication	4
SPC 213 Organizational Communication	4
SPC 217 Small Group Communication	4
SPC 300 Voice and Phonetics	4
SPC 305 Performance of Literature	4
SPC 312 Communication Theory	4
SPC 322 Persuasion	4
SPC 330 Classical Rhetorical Theory	4
SPC 350 Advanced Forensic Activity	2
SPC 411 Communication Research	4
SPC 430 Rhetorical Criticism	4
SPC 460 Undergraduate Seminar	1
SPC 461 Senior Project	3
Speech Communication electives (300-400 level)	
to be selected with adviser approval	12
	59

# SUPPORT COURSES

ENGL 302 Writing: Advanced Composition or	
score of 10 or better on Writing Proficiency	
Exam	4
HIST 101 History of Western Civilization	3
HIST 102 History of Western Civilization	3
HIST 103 History of Western Civilization	3
SPC 250 Forensic Activity	1
Adviser approved electives, minimum of 7 units at	
300–400 level	14
-	28

# GENERAL EDUCATION AND BREADTH REQUIREMENTS

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level.

A.1. ENGL 114 Writing: Exposition	4
A.2. ENGL 125/PHIL 125/SPC 125 Critical	
Thinking	3
A.3. SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	3
A.4. ENGL 215 Writing: Argumentation or	
ENGL 218 Professional Writing: Argumentation	
and Reports	4
B.1. Physical and life sciences electives (one	
each, one with lab)	3,3,3
B.2. Mathematics elective	3
Do Adult at autotical attac	~
B.2. Mathematics or statistics elective	3
Area B Science, mathematics or statistics elective	3
Area B Science, mathematics or statistics elective C.1. PHIL 230/PHIL 231 Philosophical Classics	3 3 3
<ul> <li>B.2. Mathematics or statistics elective</li> <li>Area B Science, mathematics or statistics elective</li> <li>C.1. PHIL 230/PHIL 231 Philosophical Classics</li> <li>C.1. Critical reading electives</li> </ul>	3 3 3 6
<ul> <li>Area B Science, mathematics or statistics elective</li> <li>C.1. PHIL 230/PHIL 231 Philosophical Classics</li> <li>C.1. Critical reading electives</li> <li>C.2. Fine and performing arts elective</li> </ul>	3 3 3 6 3
<ul> <li>Area B Science, mathematics or statistics elective</li> <li>C.1. PHIL 230/PHIL 231 Philosophical Classics</li> <li>C.1. Critical reading electives</li> <li>C.2. Fine and performing arts elective</li> <li>C.3. Literature, philosophy, arts elective</li> </ul>	3 3 3 6 3

Area C Arts and humanities elective	3
D.1. HIST 204 HISTORY OF AMERICAN IDEALS and	2
Institutions	3
D.I. POLS 210 American and California	2
Government	3
D.2. HIST 315 Modern World History	3
D.3. ECON 201/ECON 211/ECON 222	3
D.4.a. ANT 201/GEOG 150/SOC 105	3
D4b_ANT/BUS/FCON/GEOG/POLS/SOC	-
(300-400 level) elective	3
F 1 DEV 201 /DEV 202 Concerd Bayebology	2
E.1. PSY 201/PSY 202 General Psychology	3
E.2. BIO 220/FSN 210/HE 210/PE 250/PSY	
304/REC 100 elective	2
F.1. Computer literacy elective	3
F.2. Technology elective (300-400 level)	3
-	79
ELECTIVES	20
=	186
	100

# THEATRE AND DANCE DEPARTMENT

Davidson Music Center (45), Room 104 (805) 756-1465

# Faculty

#### Department Head, Michael R. Malkin

Maria L. Junco Philipp C. Jung Alvin J. Schnupp Moon Ja Minn Suhr

#### Program

Minor: Dance

Minor: Theatre

The courses offered by the Theatre and Dance Department provide students with a well-balanced program of studies, useful as a solid foundation on which to build further graduate or professional studies, or as a way of expressing themselves creatively.

In the dance program, a full range of studio dance courses ballet, modern, jazz, folk, social—is available. Courses such as Dance Appreciation, Dance History, Dance Notation and Dance Production, as well as courses designed for future teachers of dance (primarily in elementary or secondary schools) are also offered.

In theatre, the major aspects of the discipline are covered-technical theatre, design, acting and directing. General Education and Breadth courses are available for the inquiring student in Introduction to Theatre and for the more advanced student in Theatre History and Literature. Courses in Children's Theatre are particularly designed for elementary or secondary teachers.

The department also acts as a cultural focus for the campus and community with its three mainstage dramatic productions and, since 1970, its annual Orchesis dance concert. Cal Poly students have the opportunity to participate in these productions through auditioning, volunteering, or coursework. Recent stage productions have included *Fiddler on the Roof, The Visit, Tartuffe*, and three world premieres. The department frequently sponsors guest lecturers and studentdirected productions. Minors are offered in both Dance and Theatre.

#### CURRICULUM FOR DANCE MINOR

The Dance Minor consists of 28 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.

	Cimo
Core courses	19
DANC 134 Beginning Social Dance (2)	
DANC 221 Dance Appreciation (C.2.) (3)	
DANC 231 Intermediate Ballet (2)	
DANC 232 Intermediate Modern Dance (2)	
DANC 320 Dance Notation (3)	
DANC 321 Dance History (C.3.) (3)	
DANC 381 Methods of Teaching Dance (4)	
Elective courses to be selected from	9
DANC 135 International Folk Dance (1)	
DANC 211 Dance Fundamentals (2)	
DANC 233 Intermediate Jazz (2)	
DANC 234 Intermediate Social Dance (2)	
DANC 340 Dance Improvisation and Composition	
(3)	
DANC 345 Choreography (3–9)	
DANC 346 Dance Production (3–12)	
DANC 400 Special Problems for Undergraduates	
(1-2)	
DANC 470 Selected Advanced Topic (1-3)	
DANC 471 Selected Advanced Laboratory (1-3)	

#### **CURRICULUM FOR THEATRE MINOR**

The Theatre Minor requires 28 units designed to provide the student with a sound foundation in the major aspects of theatre. 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.

#### 

- TH 345 Rehearsal and Performance (3-9)
- TH 350 Advanced Playwriting (3)
- TH 380 Children's Drama (3)
- TH 432 Introduction to Stage Design: Costume (3)
- TH 434 Introduction to Stage Design: Lighting and Sound (3)
- TH 470 Selected Advanced Topics (1-3)

1 Inite

28



# **School of Professional Studies**

# **DEGREE PROGRAMS**

B.S. Graphic Communication Computer and Printing Technology Concentration Design Reproduction Technology Concentration Printing Management Concentration **B.S.** Home Economics Interior Design Concentration Textiles and Clothing Merchandising Concentration B.S. Industrial Technology Industrial and Technology Education Concentration Industrial Management Concentration **B.S.** Physical Education Commercial/Corporate Fitness Concentration Health Education Concentration **Teaching Concentration** B.S. Recreation Administration Leisure Services Concentration Therapeutic Recreation Concentration M.S. Home Economics M.A. Industrial and Technical Studies M.S. Physical Education **MINORS** 

Gerontology Integrative Technology Packaging

# SCHOOL OF PROFESSIONAL STUDIES

Dexter Bldg. (34), Room 214 (805) 756-2338

# Harry J. Busselen, Dean

The School of Professional Studies offers several major curricula leading to Bachelor of Science, Master of Arts, and Master of Science degrees. In addition, each department provides courses which are designed to serve all other departments of the university in offering experiences to students that enhance their general education.

The School of Professional Studies is a unique school in that it is comprised of diverse disciplines with a common goal. This common goal is the preparation of students in career fields which are not oriented around a single discipline.

The departments in the school are: Graphic Communication, Home Economics, Industrial Technology, Military Science, and Physical Education and Recreation Administration. Each offers its specialized studies taught by faculty with academic expertise and professional experience. Academic minors are offered in Gerontology, Packaging and Psychology. The Integrative Technology minor is jointly administered by the departments of Human Development and Psychology, Industrial Engineering and Industrial Technology.

The unifying element within each department is the interdisciplinary studies that are taken by all students. Knowledge is gathered from many areas and consolidated into a specialized emphasis. Students who are interested in specialized careers pursue their goals under the guidance of faculty and staff who are themselves uniquely qualified and experts in the various areas of study.

The school has taken the leadership in the sponsorship or direction of numerous community oriented projects which are timed to meet social needs in cooperation with local, state and federal agencies.

The university supports a strong cocurricular program, and to this end the School of Professional Studies provides valuable experiences to its students through specialized cocurricular activities which include: American Home Economics Association, American Institute of Plant Engineers, American Society for Quality Control, American Society of Interior Designers, Association of Fitness in Business, California Association of Health, Physical Education, Recreation and Dance, Epsilon Pi Tau (Industrial Technology), Friends of Shakespeare Press, Home Economics Advisory Board, Industrial Technology Society, Mat Pica Pi (Graphic Communication), Military Science and Advisory Board, Phi Upsilon Omicron (Home Economics), Poly Association for Consumer Economics, Recondo Unit, Recreation Administration Majors Club, Rifle Team, Scabbard and Blade, Society for Packaging and Handling Engineers, Society of Future Physical Therapists, Society of Plastic Engineers, Style (Textiles/Clothing Merchandising), Technical Association of the Graphic Arts.

# GERONTOLOGY MINOR AND CERTIFICATE PROGRAM

#### An Interdisciplinary Program

This is an interdisciplinary program to upgrade the skills and increase the knowledge of persons already in the field of gerontology and to train students in various majors whose careers will be directly or indirectly related to gerontology. In addition, the program trains interested persons in providing continuing education programs for senior adults and assure the availability and accessibility of these programs to the elderly population through continuing education and peer educators.

The students acquire knowledge in the areas of the biological, psychological, and social aspects of aging; familiarity with changing roles and alternative roles; special housing and clothing needs of the frail elderly; stress related problems; retirement and leisure activities; and an understanding of the impact of an aging population on social, economic, and political institutions, and the impact of institutions on aging individuals. The focus of the curriculum will be on the majority of the elderly population (the independent, functioning older adult), while at the same time the program will recognize that a percentage of the elderly population have special needs due to mental and/or physical ailments.

Among the requirements for admission to the program is a minimum GPA of 3.00. All applicants will be reviewed by a faculty committee.

For more information, contact the Psychology and Human Development Department.

## CURRICULUM FOR GERONTOLOGY MINOR AND CERTIFICATE PROGRAM

	Units
Required Core	12
BIO 330 Biology of Aging (3)	
PE 408 Exercise and Health Promotion for Senior	
Adults (3)	
PSY 318 Psychology of Aging (3)	
SOC 326 Sociology of Aging (3)	
Adviser approved electives to be selected from the	
following	6
FSN 315 Nutrition in Aging (3)	
PSY 310 Death, Dying and Bereavement (3)	
REC 328 Aging and Leisure (3)	
Electives (to be selected with adviser's approval)	3
HD 308 Adulthood (3)	
HE 237 Fashion Analysis (3)	
HE 305 Housing and Society (3)	
HE 423 Clothing for Disabled People (3)	
PSY 317 Psychology of Stress (3)	
PSY 459 Lifespan Theories (3)	
POLS 425 Public Policy Analysis (4)	
<sup>1</sup> Fieldwork	3
	24

<sup>1</sup> Fieldwork may be fulfilled through the field placement/cooperative education /internship as an elective in the student's major (if related to gerontology), or it may be challenged due to previous work experience the student has had in gerontology.

# INTEGRATIVE TECHNOLOGY MINOR

This minor is an interdisciplinary program which is sponsored by three departments: Industrial Engineering, Industrial Technology, and Psychology and Human Development. The goal of the minor is to educate students about the technical, social and business issues related to the use of new technology by companies. However, the emphasis of this minor is to present to business, social sciences, and humanities students the technological issues which companies face when dealing with technological change. After completing the minor, students should be literate in the technological aspects of manufacturing so that they will be able to participate with engineers and technological managers in the management of technological change.

For more information, please consult with Dr. Dan Levi, Psychology and Human Development Department.

#### **Curriculum for Integrative Technology Minor**

	Units
Required courses ETMP 157 Electronic Manufacturing (3) ETMP 158 Introduction to Robotics (2) or IE 234 Robotics Assembly (2) IE 214 Production Control (2) IE 319 Human Factors Engineering (3) IT 350 Quality Systems Applications (3)	16
MGT 311 Industrial Relations (3) MGT 313 Industrial Relations (3)	3–4
HIST 384 Labor and Work in American History (3)	3
<ul> <li>HUM 402 Values and Technology (3)</li> <li>Select one from a set of Social and Behavioral Sciences electives</li> <li>BUS 404 Government and Social Influence on Business (4)</li> <li>PSY 302 Behavior in Organizations (3)</li> <li>SPC 213 Organizational Communication (3)</li> </ul>	3–4

25-27

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Engineering Technology-Manufacturing Processes, Industrial Engineering, Industrial Technology, Psychology and other subjects.
### PACKAGING MINOR

### **An Interdisciplinary Program**

The purpose of this interdisciplinary minor is to complement the student's degree major with a planned curriculum in packaging. The program is designed to capitalize on theories and skills learned in other disciplines thereby uniquely preparing students for success as packaging professionals in positions ranging from highly technical research and development through purchasing, production, sales and management.

Students gain the skills needed for the design of package forms and graphics, the specifications of materials and machinery to be used, the evaluation of package systems, as well as the planning and coordinating of packaging requirements. These specialized skills result from an integration of knowledge gained through the packaging curriculum with that of the major discipline. A significant understanding of packaging issues and their impact on the industry is also gained.

For more information, contact the Industrial Technology Department.

### **CURRICULUM FOR PACKAGING MINOR**

	Units
Required Core CHEM 121 General Chemistry (B.1.a.) (4) FSN 336 Food Packaging (3) IT 327 Plastics Technology (3) IT 330 Fundamentals of Packaging (3) PHYS 104 Introductory Physics (B.1.a.) (4) or PHYS 121 College Physics (B.1.a.) (4)	17
Restricted Electives Select three courses from the following list. Two courses must be 300–400 level to be selected with adviser's approval. FSN 217 Fundamentals of Food Processing Operations (4) FSN 230 Elements of Food Processing (4) FSN 332 Statistical Quality Control (3) GRC 437 Consumer Packaging (3) IT 334 Materials Handling and Packaging (3) IT 408 Protective Packaging (3) IT 409 Machinery for Packaging (3)	9
-	26

## **GRAPHIC COMMUNICATION DEPARTMENT**

Graphic Arts Bldg. (26), Room 205 (805) 756-1108

### Faculty

### Department Head, Harvey R. Levenson

Herschel L. Apfelberg Michael L. Blum Gary G. Field Henry J. Heesch James R. Hutchinson W. Stephen Mott Patrick A. Munroe Philip K. Ruggles

### Programs

B.S. Graphic Communication with Concentrations in:

Computers and Printing Technology Design Reproduction Technology Printing Management

The Graphic Communication Department offers a curriculum leading to the Bachelor of Science degree. The curriculum is designed to prepare graduates for positions of responsibility in the printing, publishing, and packaging industries, and allied professions.

The program provides courses in general education together with a core of printing technology and management courses. Courses which are specific to the curricular concentrations are also provided. The student is introduced to all stages of the printing processes, and chooses a specialized concentration in the graphic communication field at the appropriate time. Students are educated for leadership as managers and other skilled professionals who are well grounded in printing technology.

The Graphic Communication Department occupies 33,000 square feet of floor space in the Graphic Arts Building. Theory and practice are taught in modern classrooms incorporating the latest in teaching aids. Fourteen well-equipped laboratories of printing equipment provide the student with diverse experience in the practical aspects of the industry.

### **CURRICULAR CONCENTRATIONS**

### **Computers and Printing Technology**

The Computers and Printing Technology concentration is for those interested in modern prepress and color printing in all segments of the graphic arts. The emphasis of the concentration is on electronic color scanning, computer typesetting, computer imaging systems, digital proofing, and computerized press controls. The concentration prepares students for positions in quality control, integrated prepress systems management, technical sales, product development, technical and production management, and other positions requiring an understanding of computers and technology.

### **Design Reproduction Technology 1**

The Design Reproduction Technology concentration prepares technically oriented students for careers in design technology positions in graphic communication. Graduates prepare for a wide variety of positions in publication production, design reproduction, typography, mechanical and electronic preparation of art and copy for reproduction. The program combines a broad technological background in the graphic arts with the principles of design.

#### **Printing Management**

The Printing Management concentration is designed as a flexible program for the student interested in pursuing employment as a printing plant manager, planner, quality control specialist, production control specialist, estimator, or sales representative. The program also prepares the student for employment as a technical representative for manufacturers of graphic arts machinery and supplies.

The Art and Design Department's Graphic Design concentration focuses on creative problem solving and development of design and layout skills. The concentration leads to positions such as graphic designer, art director and creative director for advertising agencies, design studios, and corporate design departments.

<sup>&</sup>lt;sup>1</sup> The Design Reproduction Technology concentration of the Graphic Communication Department is distinguished from the Graphic Design concentration of the Art and Design Department. By focusing on the technical and electronic aspects of transforming design into suitable fashion for reproduction in print media, the concentration leads to positions such as account executive, sales representative, estimator, production coordinator and other positions requiring a technical understanding of design preparation and reproduction.

### **CURRICULUM FOR B.S. GRAPHIC COMMUNICATION**

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

MAJOR	COURSES
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GRC 101 Introduction to Graphic Communication.	4
GRC 300 Typography	4
GRC 301 Electronic Publishing Systems	3
GRC 311 Substrates and Ink	3
GRC 324 Finishing Processes	3
GRC 327 Graphic Arts Photography	4
GRC 328 Image Assembly and Platemaking	3
GRC 401 Printing Marketing and Sales	3
GRC 403 Printing Estimating	4
GRC 411 Printing Financial Management	3
GRC 414 Color Image Assembly	2
GRC 415 Sheetfed Lithographic Technology	5
GRC 416 Web Printing Technology	5
GRC 421 Printing Production Management	4
GRC 422 Printing Personnel Management	3
GRC 461 Senior Project	4
CHEM 121 General Chemistry (B.1.a.)	4
CHEM 122 General Chemistry (B.1.a.)	4
ENGL 215 Writing: Argumentation or	
ENGL 218 Professional Writing: Argumentation	
and Reports (A.4.)	4
—	69

### SUPPORT COURSES

1

Concentrations courses (see below)

28-38

(

Units

#### **GENERAL EDUCATION AND BREADTH** REQUIREMENTS

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300-400 level. Additional GEB courses are listed under Major Courses.

A.1. ENGL 114 Writing: Exposition	4
A.2. ENGL 125/PHIL 125/SPC 125 Critical	
Thinking	3
A.3. SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	3
B.1.b. Life sciences elective	3
B.2. MATH 118 Pre-Calculus Algebra or	
MATH 120 Pre-Calculus Algebra and	
Trigonometry (B.2.)	4
B.2. STAT 211 Elem. Probability and Stat. (B.2.)	3
C.1. PHIL 230/PHIL 231 Philosophical Classics	3
C.1. Critical reading electives	6
C.2. Fine and performing arts elective	3
C.3. Literature, philosophy, arts elective	
(300–400 level)	3
Area C Arts and humanities elective	3
D.1. HIST 204 History of American Ideals and	
Institutions	3
D.1. POLS 210 American and California Govt	3
D.2. HIST 315 Modern World History	3
	5

D.3. ECON 201/ECON 211/ECON 222	3
D.4.a. ANT 201/GEOG 150/SOC 105	3
DAb = ANT/RUS/ECON/CEOC/ROUS/SOC	2
D.4.D. ANT/BUS/ECON/GEOG/POLS/SOC	
(300–400 level) elective	3
E.1. PSY 201/PSY 202 General Psychology	3
E.2. BIO 220/FSN 210/HE 210/PE 250/PSY	-
304/REC 100 elective	2
F.1. Computer literacy elective	3
F.2. Technology elective (300-400 level)	3
	67
	07
Electives	24–34
:	100
	130

\* MATH 116 and MATH 117 will substitute for MATH 118 and are taught at a slower pace for those who need more review. MATH 117 satisfies GEB Area B.2.

#### **CONCENTRATIONS** (select one)

### **Computers and Printing Technology Concentration**

CSC 204 C and UNIX	3
CSC electives (in addition to GEB F.1.)	6
PHYS 121 College Physics	4
PHYS 122 College Physics	4
GRC 302 New Technologies in Graphic Comm	3
GRC 331 Color Quality Control	4
GRC 432 Imaging Systems Management	4

28

#### **Design Reproduction Technology Concentration**

ART 131 2-D Design Fundamentals	3
ART 132 Beginning Color Theory	3
ART 133 Color and Design	3
ART 331 Typographic Design	3
ART 332 Symbology	3
ART 333 Corporate Identity	3
GRC 438 Electronic Art Preparation	4
GRC 439 Line and Halftone Media for Books and	
Publications	4
GRC 440 Advanced Copy Technology for	
Newspapers and Magazines	4
-	30

### **Printing Management Concentration**

BUS 207 Business Law	4
ACTG 211 Financial Accounting for Nonbusiness	
Majors	4
MKTG 204 Elements of Marketing	4
GRC 302 New Technologies in Graphic Comm	3
GRC 331 Color Quality Control	4
GRC 423 Printing Labor Relations	4
GRC 432 Imaging Systems Management	4
Select a minimum of 8 units from the following:	8
ENGL 310, SPC 301, or any 300-400 level	
BUS/MKTG/ACTG course selected with adviser	
approval	
CSC elective (100–200 level in addition to GEB	
F.1.)	3
	38

## HOME ECONOMICS DEPARTMENT

Mathematics and Home Economics Bldg. (38), Room 136 (805) 756-2225

### Faculty

#### Department Head, Barbara P. Weber

Connie BreazealeSarah S. LordLezlie A. LabhardNancy A. MorrisKaren F. LangeCynthia L. Regan

### Programs

B.S. Home Economics with Concentrations in:

Interior Design Textiles and Clothing Merchandising

#### M.S. Home Economics

Long noted for its successful preparation of professionals in home economics, the Cal Poly Home Economics Department continues to provide outstanding professional training for its majors. Students from throughout the state are attracted to this program because of excellent faculty, a firm home economics core, outstanding emphasis area courses, and the department's strong commitment to the university's "learn by doing" educational philosophy.

Students have the opportunity to explore the integrative, holistic nature of home economics which includes the study of: individuals and families in their near environment; human growth and development; the interrelationships of individuals of all ages and socio-economic levels; the interdependence of food and nutrition as they influence human behavior and health; the relationship of design, technology, and environment to human behavior; and management theory, application, and family decision-making behavior; and the concept of international education and related studies.

Students selecting the emphasis area in general home economics obtain a professional education of maximum breadth and depth for employment in business, industries, and institutions whose various products and services require broad home economics expertise. A wide range of additional professional courses in foods and consumer economics to meet individual career goals may also be selected.

Students selecting the emphasis area in home economics education are offered the opportunity to obtain a professional education focusing on specific breadth and depth in major home economics subject areas and on the education competencies required for obtaining a secondary credential in home economics.

Facilities include well-equipped laboratories for foods and residential equipment, interior design, clothing, and textiles.

The interior design program has been granted full accreditation by the Foundation for Interior Design Education Research (FIDER).

### CURRICULAR CONCENTRATIONS

#### **Interior Design**

A concentration in Interior Design offers students a professional education focusing on the specific knowledge and technical skills required in the practice of residential and contract interior design for employment in design studios, design firms, architectural firms, and in related wholesale and retail businesses. Students select coursework in consultation with an adviser. Subjects studied include fundamentals of drawing, materials of construction, design fundamentals, introduction to drawing and perspective, basic graphics, human factors for environmental designers, history of interior design, individual residential design, interior design materials and techniques, barrier free environments, and advanced interior design.

### **Textiles and Clothing Merchandising**

A concentration in Textiles and Clothing Merchandising offers students a professional education focusing on specific knowledge in textiles and clothing subjects, for employment in textile and clothing industries and in fashion and textiles merchandising at both wholesale and retail levels. Students select coursework in consultation with an adviser. Subjects studied include apparel construction, principles of management, fashion analysis, flat pattern, elements of marketing, financial accounting for nonbusiness majors, and tailoring. Students select from a list of restricted electives in the major which include: textiles and clothing industries, fashion merchandising, fashion promotion, clothing for disabled people, and advanced textiles.

### **CURRICULUM FOR B.S. HOME ECONOMICS**

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

nits

### **MAJOR COURSES**

HE 101 Home Economics as a Profession	1
HE 121 Fundamentals of Foods	4
HE 122 Design Analysis and Presentation	3
HE 204 Consumer Policy	3
HE 210 Nutrition (E.2.)	3
HE 220 Textile End-Products	3
HE 242 Interior Design	3
HE 305 Housing and Society	3
HE 322 Textiles	3
HE 324 Management of Family Resources	3
HE 326 Presentation Methods	3
HE 331 Residential Equipment	3
HE 341 Clothing and Human Behavior	3
HE 459 Undergraduate Seminar	2
HE 461 Senior Project	3
HE 462 Senior Project	3
Restricted electives to be chosen from HE 300 and	
HE 400 series must be selected from	
coursework related to concentration or	
emphasis area. 12 units must be chosen from	
the HE 400 series	24
-	70

### SUPPORT COURSES

HE 108 Child, Family, and Community	3
HE 203 Family Development	3
Concentration courses (see below)	36/29
CHEM 121 General Chemistry (B.1.a.)	4
SPC 201 Public Speaking or SPC 202 Principles of	
Speech Communication (A.3.)	3
ENGL 215 Writing: Argumentation or	
ENGL 218 Professional Writing: Argumentation	
and Reports (A.4.)	4
	53/46

### **GENERAL EDUCATION AND BREADTH** REQUIREMENTS

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300-400 level. Additional GEB courses are listed under Major and Support Courses.

A.1.	ENGL 114 Writing: Exposition	4
A.2.	ENGL 125/PHIL 125/SPC 125 Critical	
Th	inking	3
<b>B</b> .1.	Physical and life sciences electives	4,4
B.2.	Mathematics elective	3
B.2.	Mathematics or statistics elective	3
C.1.	PHIL 230/PHIL 231 Philosophical Classics	3
C.1.	Critical reading electives	6
C.2.	Fine and performing arts elective	3
C.3.	Literature, philosophy, art elective (300-400	
lev	el)	3
Area	C Arts and humanities elective	3

D.1. HIST 204 History of American Ideals and Institutions	3
D.I. POLS 210 American and California	
Government	- 3
D.2. HIST 315 Modern World History	3
D.3. ECON 201/ECON 211/ECON 222	3
D.4.a. ANT 201/GEOG 150/SOC 105	3
D.4.b. ANT/BUS/ECON/GEOG/POLS/SOC	
elective (300-400 level)	3
E.1. PSY 201/PSY 202 General Psychology	3
F.1. Computer literacy elective	3
-	63
Electives	12/19
=	
	198

### **CONCENTRATIONS** (select one)

#### **Interior Design Concentration**

ARCH 106 Materials of Construction	3
ARCH 111 Introduction to Drawing and	
Perspective	3
ARCH 303 Human Factors for Environmental	
Design	3
ARCH 401 Toward a Barrier-Free Environment	3
ART 101 Fundamentals of Drawing	4
ART 131 2-Dimensional Design Fundamentals	3
ART 132 Beginning Color Theory	3
ART 134 3-Dimensional Design 1 or	
IT 125 Industrial Wood Processes	3
ART 232 Beginning Graphic Design or	
ARCH 112 Basic Graphics	3
• HE 346 Interior Design Materials and Techniques	4
HE 347 Interior Design Materials and Techniques	4
	36

### **Textiles and Clothing Merchandising Concentration**

ACTG 211 Financial Accounting for Non-Business Majors ..... 4 HE 131 Apparel Construction..... 3 HE 224 Textiles and Clothing Design Applications... 3 HE 237 Fashion Analysis 3 HE 241 Flat Pattern 3 MGT 201 Principles of Management..... 3 MKTG 204 Elements of Marketing 4 HE 333 Advanced Clothing Design or HE 440 Internship ..... 3 HE 442 Comparative Tailoring or HE 445 Merchandise Planning and Control ..... 3

2	۵
4	9

### MASTER OF SCIENCE IN HOME ECONOMICS

The Master of Science degree in Home Economics is designed to provide appropriate graduate level courses for: (1) job-entry level of competence for instructors of home economics in community colleges, (2) upgrading teachers now in the field, (3) qualifying students for continued graduate work at other institutions, (4) developing ability for selfdirected study and growth, (5) international students, (6) professional competence for employment in business, extension, community, and civil service.

The degree study plan must include 45 units of adviserapproved graduate work, at least 24 of which must be at the 500 level. Student teaching will not be accepted as credit toward the degree program. A minimum overall grade point average of 3.0 is required in all units attempted subsequent to admission to the program. Any course grade less than a C will not be accepted as meeting unit requirements for the degree. All candidates must meet the current Graduation Writing Requirement (see page 000).

Although only 9 units of credit may be applied to the degree requirements, students must enroll in HE 599 Thesis for every quarter in which they are receiving advisement.

For further information or advisement students should communicate with the head of the Home Economics Department or the Graduate Program Coordinator.

1 Inits

### CURRICULUM FOR M.S. HOME ECONOMICS

	0
Required courses	15–17
EDUC 589 Research Methods and Analysis in	
Education (5)	
HE 580 Seminar (3)	
<sup>1</sup> HE 599 Thesis (3) (3) (3)	
or additional approved coursework and	
comprehensive examination (9)	
Courses in the general field of Home Economics and	
in major area(s) of interest selected from 400 and	
500 series level	24
Electives selected from 400 and 500 series level	6-4
	45

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

<sup>1</sup> Must register for thesis credit each quarter of advisement.

## INDUSTRIAL TECHNOLOGY DEPARTMENT

Engineering West Bldg. (21), Room 100 (805) 756-2676

### Faculty

#### Department Head, Gerald E. Cunico

Fred Abitia William C. Chambers Larry W. Gay Roger L. Keep Lynn S. Mosher James L. Murphy Anthony J. Randazzo Nelson L. Smith III

### Programs

B.S. Industrial Technology with Concentrations in:

Industrial and Technology Education Industrial Management

M.A. Industrial and Technical Studies

Integrative Technology Minor

#### Packaging Minor

The Industrial Technology Department offers the Bachelor of Science in Industrial Technology and the Master of Arts in Industrial and Technical Studies. This department also administers the Bachelor of Vocational Education program and the Packaging Minor.

The Bachelor of Science program in Industrial Technology has two concentrations which prepare graduates for employment in a broad range of professional positions in industry, Industrial Management and Industrial and Technology Education. (Also see Teaching Credential programs.)

#### **Integrative Technology Minor**

The Integrative Technology minor is an interdisciplinary program jointly sponsored by Industrial Engineering, Industrial Technology and Psychology and Human Development departments. The minor is for non-engineering students who wish to pursue their professional career in a corporate setting and want to learn more about the impact of technology. The minor will acquaint students with how factories operate and how technology is integrated into corporate operations. For more information, see School of Professional Studies Section.

#### **Packaging Minor**

The Packaging Minor is administered by the Industrial Technology Department. For more information, please see School of Professional Studies Section.

### CURRICULAR CONCENTRATIONS

#### Industrial and Technology Education

No new students were admitted to the Industrial and Technology Education concentration beginning Fall Quarter 1991. The concentration will be eliminated from the program when the students now enrolled complete their course requirements.

#### **Industrial Management**

This concentration emphasizes preparation for technical leadership responsibilities with a broad variety of industries including manufacturing, communication, transportation and utility services. Graduates in the field of industrial management function in the mid-ground between the applied aspects of engineering and administration. Students who enjoy working primarily with people in solving technical problems are particularly well suited for careers in industrial technology. Preparation for professional emphasis in industrial sales, production, quality management, plant facilities management, industrial training, or facilities/construction is provided through the selection of appropriate electives.

## CURRICULUM FOR B.S. INDUSTRIAL TECHNOLOGY

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

Units

### MAJOR COURSES

IT 101 Technical Problem Solving	3
IT 105 Industrial Processes	2
IT 212 Introduction to Technical Management and	
Industry	3
IT 225 Graphic Interpretation and Communications	4
IT 237, IT 238 Industrial Electricity	3,3
IT 311 Industrial Safety and Health Management	3
IT 322 Energy and Power	4
IT 323 Energy Management	3
IT 329 Industrial Materials	3
IT 333 Electronic Computer Applications	4
IT 402 Technical and Management Presentations	3
IT 433 Production and Process Management	3
IT 461 Senior Project	3
Adviser approved electives	18
Concentration courses (see below)	37/32
	99/94

### SUPPORT COURSES

l	MATH 120 Pre-Calculus Algebra and Trigonometry	
	(B.2.)	5
	PHYS 121 College Physics (B.1.a.)	4
	PHYS 122 College Physics (B.1.a.)	4
	CHEM 121 General Chemistry (B.1.a.)	4
	CHEM 122 General Chemistry (B.1.a.)	4
	ECON 201 Survey of Economics (D.3.)	3
	STAT 211 Elementary Probability and Statistics	
	(B.2.)	3
	-	
		27

## GENERAL EDUCATION AND BREADTH REQUIREMENTS

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

A.1. ENGL 114 Writing: Exposition	4
A.2. ENGL 125/PHIL 125/SPC 125 Critical	
Thinking	3
A.3. SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	3
A.4. ENGL 215 Writing: Argumentation or	
ENGL 218 Professional Writing: Argumentation	
and Reports	4
B.1.b. Life sciences elective	3
C.1. PHIL 230/PHIL 231 Philosophical Classics	3
C.1. Critical reading electives	6
C.2. Fine and performing arts elective	3
C.3. Literature, philosophy, art elective (300-400	
level)	3
Area C Arts and humanities elective	3
D.1. HIST 204 History of American Ideals and	
Institutions	3

D.1. POLS 210 American and California	
Government	3
D.2. HIST 315 Modern World History	3
D.4.a. ANT 201/GEOG 150/SOC 105	3
D.4.b. ANT/BUS/ECON/GEOG/POLS/SOC	
(300-400 level) elective	3
E.1. PSY 201/PSY 202 General Psychology	3
E.2. BIO 220/FSN 210/HE 210/PE 250/PSY	
304/REC 100 elective	2
F.1. Computer literacy elective	3
	58
Electives	14/19
	198

MATH 118 and MATH 119 or MATH 116 and MATH 117 may be used in lieu of Math 120.

### **CONCENTRATIONS** (select one)

#### **Industrial Management Concentration**

IT 141 Plastic Processes and Applications	2
IT 325 Mechanical Systems	4
IT 326 Product Evaluation	3
IT 331 Advanced Industrial Electrical Systems	4
IT 332 Electronic Control Systems	4
IT 350 Quality Systems Applications	3
IT 406 Industrial Management and Supervision	3
IT 418 Technical Management Problems	4
IT 463 Industrial Technology Seminar	2
ACTG 211 Financial Accounting for Nonbusiness	
Majors	4
MATH 131 Technical Calculus	4
	37

### Industrial and Technology Education Concentration

IT 125 Industrial Wood Processes	3
IT 250 Transportation Power	3
IT 327 Plastics Technology	3
IT 354 Industrial Machine Tool Service Systems	3
IT 424 Curriculum and Methods of Industrial and	
Technology Education	3
IT 443 General Metals	3
IT 444 Technical Drawing	3
Adviser approved electives	11
	32

## MASTER OF ARTS DEGREE IN INDUSTRIAL AND TECHNICAL STUDIES

The Master of Arts program in Industrial and Technical Studies is designed to provide preparation for professional responsibilities and leadership for a broad range of professional positions in industry and education.

The curriculum translates a contemporary body of context derived from the business-industrial-technological segment of society into awareness, understandings, experiences and competencies.

The primary characteristic of this degree program is its emphasis upon professional and technical preparation of individuals for leadership roles in industry and education.

### **Prerequisites**

Admission as a graduate student in this program requires a 2.8 minimum grade point average or 2.8 in the last 90 quarter units of coursework taken to satisfy the requirements for the baccalaureate degree. Advancement to candidacy requires completion of 12 units of courses specified in a formal program of study with a minimum grade point average of 3.0.

### **Conditionally Classified Standing**

The student may enroll in a graduate degree curriculum if in the opinion of the appropriate campus authority the student can remedy any deficiencies by additional preparation.

For information pertaining to specific requirements for admission to graduate standing-classified or graduate standing--conditionally classified, the student should communicate with the head of the Industrial Technology Department or the department's Graduate Coordinator.

#### **Program of Study**

The Master of Arts degree in Industrial and Technical Studies is an integrated program of 45 units of graduate work commencing in any quarter of each year, and is designed for students who have a baccalaureate degree in Industrial Technology, Industrial Education, or who have comparable technical and professional preparation. Master's level courses at the 400-500 level are offered, when possible, in the summer and in the late afternoon and evening to accommodate those individuals who are employed full-time. A thesis, project, or comprehensive examination is required.

A minimum grade point average of 3.0 must be maintained in all courses taken to satisfy the requirements for the degree. All candidates must meet the current Graduation Writing Requirement.

400-level courses used as part of a graduate program will include an extra written or oral assignment.

## CURRICULUM FOR M.A. INDUSTRIAL AND TECHNICAL STUDIES

Units

- IT 520 Organization and Administration of Industrial and Technical Studies (3)
- IT 521 Curriculum in Industrial and Technical Studies (3)
- IT 522 Facility Planning (3)
- IT 527 Technical Trends and Issues (3)
- IT 580 Graduate Research in Industrial and Technical Studies (3)
- <sup>1</sup> IT 599 Industrial and Technical Studies Thesis or Project (5)

Professional electives ...... 19

Elective courses at the 500 level chosen with approval of the adviser

45

See COURSES OF INSTRUCTION section of the catalog for description of courses in Industrial Technology and other subjects.

<sup>1</sup> The student may be permitted a nonthesis/project option by accomplishing all of the following steps: 1) Obtaining approval of the adviser and the Graduate Studies Committee. 2) Substituting 5 units of 500-level coursework which support this professional degree and are approved in advance by the above committee. IT 500 Individual Study (1-6) is recommended. 3) Passing a comprehensive written examination covering the graduate program.

## **MILITARY SCIENCE DEPARTMENT**

Dexter Bldg. (34), Room 116 (805) 756-7682

### Faculty

### Department Head, Lt. Colonel Stephen E. Hack

Major Margaret M. Christensen Major Mark M. Earley Captain John E. Bachmann Captain David R. Singleton

#### PURPOSE

The Military Science Department conducts a dynamic fouryear 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 soughtafter commission as a Second Lieutenant in the U.S. army must meet eligibility requirements and complete the entire Military Science/ROTC (Reserve Officer Training Corps) Advanced Course (22 units). To be eligible for participation in the Cal Poly ROTC Program, a student must be enrolled full time (12 units) at Cal Poly, have at least two years remaining as a university student to permit completion of the advanced course prior to reaching the 30th birthday, and be physically qualified.

### FINANCIAL ASSISTANCE

Many opportunities for financial assistance are available to students. Three areas of opportunities are: ROTC cadets who sign a contract for Advanced Phase, students who earn an ROTC scholarship, and cadets who train with Reserve or National Guard units. All ROTC cadets sign a contract to participate in the Advanced Phase of ROTC and receive a \$100 a month allowance. Criteria to participate in the Advanced Phase are stated later. Highly competitive two-, three-, and four-year ROTC scholarships are available. The scholarship provides payment of full tuition, books, supplies, and the \$100 a month allowance for the duration of the scholarship. Students interested in scholarship competition should contact the Military Science Department at the time of application to the university. Reserve or National Guard training provides an additional two sources of financial assistance: approximately \$120 a month for one weekend drill and approximately \$145 a month tuition assistance from the National Guard/Army Reserve "New GI Bill" benefits.

### EQUIPMENT AND UNIFORMS

All necessary equipment, uniforms and textbooks for participation in the Military Science/ROTC program are furnished to the student by the United States Government free of charge. Title to this property, other than expendable items, remains with the government. Students entering into active commissioned service after graduation are granted a special \$300 uniform allowance.

### FOUR-YEAR PROGRAM

The four-year program elective military science curriculum is divided into two diverse phases. The basic phase is primarily for freshmen and sophomores, and the advanced phase is for junior and senior level students.

#### **BASIC PHASE**

The Basic Phase is a two-year invigorating period where students may, without obligation, investigate the ROTC Program and the military as a full- or part-time career. Students may enter and leave this phase during any quarter. The curriculum for the basic phase is listed below and offers many challenging, exciting opportunities for all students. To become an ROTC cadet during this phase requires the student be registered for a Military Science class, completion of an ROTC enrollment form (obtained at the Military Science Department, Dexter Building, Room 115), and an interview with the ROTC Enrollment Officer. Because this phase is for students to examine the ROTC Program without penalty or obligation, participation in ROTC activities is encouraged but not mandatory. Advancement into the challenging Advanced Phase is accomplished either by successfully completing the Basic Phase classes, completing ROTC Summer Basic Camp or completing any military basic training program.

#### ROTC SUMMER BASIC CAMP

One method to qualify for the Advanced Phase is to successfully complete the six-week challenging ROTC Summer Basic Camp. Students normally attend Basic Camp between their second and third academic years. Transfer students may complete the camp during the summer immediately prior to their matriculation at Cal Poly. It is important that potential transfer students who plan to participate in the two-year ROTC program make their intentions known directly to the Military Science Department no later than March 1 of the year they plan to register at the university even though this date may precede the date of their final acceptance by the university.

The government will provide a transportation allowance to and from Basic Camp and pay at the rate of one-half of a Second Lieutenant's basic pay. All equipment, uniforms, room, board and medical care are furnished free while at camp. A maximum of 7 units elective credit may be earned for attending Basic Camp. No military obligation is incurred as a result of attendance.

### **BASIC TRAINING**

Outstanding students who have successfully served on active duty, regardless of the branch of service, are qualified to enter the Advanced Phase because they have completed basic training for their particular branch of service. Also, students who have been or are members of Reserve or National Guard units and have completed basic training are qualified for the Advanced Phase.

### **ADVANCED PHASE**

The Advanced Phase is a two-year period where ROTC cadets receive advanced leadership and management training. The cadets receive many hours of hands-on, practical leadership experiences to prepare them for a military career or a management position in the civilian sector. To become a cadet in the Advanced Phase a student must complete the Basic Phase or ROTC Summer Basic Camp or Basic Training. The student must also make a commitment to attend all required training activities and sign a contract to accept a commission in the United States Army. In return for the student's commitment, the Military Science Department will provide \$100 a month, classroom instruction, real leadership opportunities, and continuous feedback on each cadet's leadership progress. A six-week summer training camp, between the two years of the Advanced Phase, will be provided for testing and developing each cadet's leadership abilities. All equipment, uniforms, room, board, and medical care are furnished free while at this camp. The cadets will also receive approximately \$600 during the six weeks. Upon successful completion of the Advanced Phase and graduation from the university, the cadet will be commissioned as a Second Lieutenant in the United States Army.

### SIMULTANEOUS MEMBERSHIP PROGRAM

Students can serve simultaneously in the National Guard or Army Reserve while they are cadets in ROTC and receive pay from both sources. Those who complete the ROTC Advanced Phase prior to graduation may continue serving in the Reserve or National Guard in the Simultaneous Membership Program. Since students can earn about \$3,000 each year, this program provides both financial and experience benefits.

### **Basic Phase**

#### Freshman

MSC 111 Orienteering (2)

- MSC 112 Survival Training: Wilderness (2)
- MSC 116 Basic Military Skills (2)

### Sophomore

MSC 211 Current Military Affairs (2) MSC 212 Basic Camp (1–7) MSC 213 Survival Training: Mountain (2) MSC 215 Leadership Management Seminar (2) MSC 225 Advanced Survival Techniques (2) MSC 229 Ranger Challenge (2)

### **Advanced Phase**

#### Junior

- MSC 311 Leadership and Management (3)
- MSC 312 Leader Communication Skills (3)
- MSC 313 Tactical Military Operations (3)
- <sup>2</sup> MSC 314 ROTC Advanced Camp (6)

### Senior

- MSC 411 Military Professionalism and Ethics (3)
- MSC 412 Military Justice (2)
- MSC 413 Military Organization and Management (2)
- <sup>3</sup> HIST 308 American Warfare (3)
- <sup>1</sup> Basic Camp is an *optional* 6-week summer training course (1-7 units) at Fort Knox, Kentucky.
- <sup>2</sup> Advanced Camp is a *mandatory* 6-week summer training experience at Fort Lewis, Washington (6 credits).

<sup>3</sup> Prerequisite to commissioning

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

## PHYSICAL EDUCATION AND RECREATION ADMINISTRATION DEPARTMENT

Physical Education Bldg. (42), Room 215 (805) 756-2545

### Faculty

### Department Head, Dwayne G. Head

Doris Acord Katharine Barthels C. Andrea Brown Victor A. Buccola Steven C. Davis Gerald DeMers Sonja M. Glassmeyer Kellie G. Hall Vaughan D. Hitchcock Lynn M. Jamieson Robert E. Meyers, Jr. Raymond Nakamura Andrew J. Proctor Jimmy H. Railey Carolyn B. Shank Mary L. Stallard Michael Swiderski James L. Webb Marylinda Wheeler

### Programs

B.S. Physical Education with Concentrations in:

Commercial and Corporate Fitness Health Education Teaching

B.S. Recreation Administration with Concentrations in:

Leisure Services Management Therapeutic Recreation

M.S. Physical Education

The Physical Education and Recreation Administration Department offers undergraduate degree programs in physical education and recreation administration with a graduate degree program in physical education. The department also contributes to the general education and elective needs of all students by providing health education, basic instruction in physical education and first aid/CPR courses.

Because of an ideal geographical location, the university has become a center for workshops held by some of the State's health and physical education organizations.

The department has a full range of both indoor and outdoor facilities and laboratories which accommodate an extensive physical education instructional program as well as full-scale athletic, intramural, and recreational sports programs.

### PHYSICAL EDUCATION MAJOR

The Bachelor of Science degree in Physical Education is a broad based program offering students curricular choices for a wide range of career opportunities. These choices include the traditional concentrations in teaching and health education and the contemporary choices of a commercial and corporate fitness concentration, an individualized course of study and certificate programs in athletic coaching and aquatics specialist. In order to qualify for graduation all Physical Education majors must demonstrate knowledge and skill competency in at least ten different activities (team and individual sports, dance, gymnastics, or combatives). All students are required to show competency in swimming. Competency can be demonstrated by passing a professional activity class with a grade of "C" or better or by passing a department administered skill and knowledge test.

### **CURRICULAR CONCENTRATIONS**

### **Commercial and Corporate Fitness**

This concentration incorporates basic knowledge of business and managerial skills with the scientific and clinical knowledge of exercise physiology, human chemistry, psychology and nutrition. These graduates work in a wide range of enterprises which include: fitness programs, YMCA/YWCA, private health clubs and various wellness evaluation and rehabilitation programs.

#### **Health Education**

This concentration is designed to prepare students for careers in education, public and private health-related agencies and for graduate school in the health sciences. The concentration focuses on working with others to enhance the quality of life through the mediums of physical and mental health.

### Teaching

This concentration provides coursework which enables graduates to enter the teaching profession with the knowledge and skills necessary to achieve maximum success within each person's capabilities. The single subject credential in physical education and an emphasis in adapted physical education are available as part of the program. Also see Teaching Credential Programs.

### Individualized Course of Study

In addition to the concentrations, students may pursue department approved individual course of study and certificate programs. For majors other than physical education, the department offers certificate programs in athletic coaching and aquatics. Physical education majors who select the athletic coaching certificate would also have to complete another certificate program, concentration, or individualized course of study.

### **RECREATION ADMINISTRATION MAJOR**

Organizations offering leisure services and products exist as a result of the demand for increased leisure opportunity. The Bachelor of Science degree program in Recreation Administration offers professional preparation for employment in public, private, and commercial leisure service organizations. Students may pursue a concentration in either leisure services management or therapeutic recreation *or* elect to develop a course of study in leisure/recreation program delivery to include: outdoor and recreation education, aquatics, cultural arts, recreational sports and dance. In addition, leisure education courses provide university students with lifestyle management skills. The program is accredited by the National Recreation and Park Association/American Association of Leisure and Recreation Council on Accreditation.

### **CURRICULAR CONCENTRATIONS**

### **Leisure Services Management**

This concentration emphasizes preparation for employment in organizations that provide leisure products or services for profit or financial self-sufficiency. An emphasis on recreation business is targeted to the following settings: employee services and recreation, travel and tourism, product sales and manufacturing, public/private entrepreneurship, joint commercial-public ventures, and small business opportunities.

### **Therapeutic Recreation**

This concentration prepares students for employment in recreation therapy, leisure education for the disabled, and special recreation in such settings as hospitals, correctional institutions, health organizations, residential care facilities, and community-based agencies and organizations. Coursework includes the areas of physical disabilities, developmental disabilities, mental health, and geriatrics.

### **CURRICULUM FOR B.S. PHYSICAL EDUCATION**

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

#### Units

### **MAJOR COURSES**

PE 206–PE 229 Professional Activity/DANC 211	
Dance Fundamentals	10
PE 250 Health Education	2
PE 252 Introduction to Athletic Training	2
PE 270 Introduction to Physical Education	2
PE 280 First Aid and CPR	3
PE 302 Mechanical Kinesiology	4
PE 303 Physiology of Exercise	4
PE 307 Adaptive Physical Education	4
PE 318 Measurement and Evaluation in Physical	
Education I	3
PE 319 Measurement and Evaluation in Physical	
Education II	4
PE 401 Administration of Physical Education and	
Health Fitness Programs	3
PE 402 Motor Learning and Control	4
PE 404 Motor Development	3
PE 411 The Human Element in Sport	3
PE 461 Senior Project	3
PE 462 Senior Project	2
PE 474 History and Philosophy of Physical	
Education	3
	59

### SUPPORT COURSES

ENGL 302/ENGL 310/ENGL 318 (Students in	
Teaching Concentration must take ENGL 302)	4
FSN 210/HE 210 Nutrition (E.2.)	3
MATH 118 or MATH 116 and MATH 117 (B.2.)	3
PSY 201/PSY 202 General Psychology (E.1.)	3
STAT 130 Introduction to Statistical Reasoning or	
STAT 211 Elementary Probability and Statistics	
(B.2.)	3
ZOO 237 Human Anatomy	3
ZOO 331, ZOO 332 Human Physiology (B.1.b.)	3,3
ZOO 340 Human Muscle Anatomy	2
Concentration courses (see below) 40/	35/39
67/0	62/66

## GENERAL EDUCATION AND BREADTH REQUIREMENTS

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

A.1. ENGL 114 Writing: Exposition	4
A.2. ENGL 125/PHIL 125/SPC 125 Critical	
Thinking	3
A.3. SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	3
A.4. ENGL 215 Writing: Argumentation or	
ENGL 218 Professional Writing: Argumentation	
and Reports	4
B.1.a. CHEM 121 Chemistry	4

B.1.b. ZOO 131 General Zoology	4
C.1. PHIL 230/PHIL 231 Philosophical Classics	3
C.1. Critical reading electives	6
C.2. Fine and performing arts elective	3
C.3. Literature, philosophy, art elective (300-400	
level)	3
Area C Arts and humanities elective	3
D.1. HIST 204 History of American Ideals and	
Institutions	· 3
D.1. POLS 210 American and California Govt	3
D.2. HIST 315 Modern World History	3
D.3. ECON 201/ECON 211/ECON 222	3
D.4.a. ANT 201/GEOG 150/SOC 105	3
D.4.b. ANT/BUS/ECON/GEOG/POLS/SOC	
(300-400 level) elective	- 3
F.1. Computer literacy elective	3
F.2. Technology elective (300-400 level)	3
	64
Electives 8	8/13/9
	198

#### **CONCENTRATIONS** (select one)

### **Commercial and Corporate Fitness Concentration**

PE 434 Design and Implementation of Health and	
Fitness Programs	3
PE 439 Commercial/Corporate Fitness Internship	3
PE 445 Electrocardiography	3
PE 450 Lifestyle Management in the Workplace	3
PE 451 Nutrition for Fitness and Sport	3
PE 452 Testing and Exercise Prescription for Fitness	
Specialists	3
REC 210 Programming for Leisure	4
CHEM 326 Survey of Organic Chemistry	4
CHEM 328 Survey of Biochemistry	4
MGT 118 Intro. to Human Relations in Business	3
MGT 201 Principles of Management	3
SPC 301 Business and Professional Communication	4
=	40

### **Health Education Concentration**

BACT 221 General Bacteriology	4
BIO 253 Orientation to the Health Professions	1
BIO 301 Human Ecology	3
BIO 302 Human Genetics	3
HD 203 Family Development or	
SOC 306 Sociology of the Family	3
HD 308 Adulthood or	
PSY 459 Lifespan Theories	3
PE 354 School Health Programs	2
PE 405 Administration of Health Education	2
PE 408 Exercise & Health Promotion Senior Adults.	3
PSY 205 Human Sexuality	3
PSY 317 Psychology of Stress	3
PSY 330 Behavioral Effects of Psychoactive Drugs	
or PE 305 Drug Education	2
SOC 344 Sociology of Poverty or GEOG 320	
Geography of Hunger	3
	35

<sup>1</sup> Commercial and corporate fitness students take CHEM 121 as their GEB B.1.a. course and CHEM 122 as an elective for prerequisite for CHEM 326.

### **Teaching Concentration**

DANC 381 Methods of Teaching Dance	4
PE 209 Creative and Non-Traditional Games	1
PE 215 Field Sports	2
REC 260 Intramural and Recreational Sports	3
PE 275 Sports Officiating	2
PE 296 Planning Techniques in Physical Education.	3
PE 354 School Health Programs	2
PE 356 Teaching Gymnastics	2
PE 384 Water Safety Instructor	3
PE 422 Teaching Elementary Physical Education	4
PE 423 Teaching Secondary Physical Education	4
PE 424 Organizing and Teaching Physical	
Education	4
PE 440 Physical Education Practicum	1
Adaptive Physical Education and Coaching	
Methods (PE 245, 321, 322, 323/325, 327, 344,	
379, 407, 438)	4
-	39
	55

### **CURRICULUM FOR B.S. RECREATION ADMINISTRATION**

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

Units

#### **MAJOR COURSES**

REC 101 Intro. to Recreation and Leisure Services	3
REC 102 Backcountry Ethics and Safety	3
REC 105 Recreation Leadership	3
REC 210 Programming for Leisure	4
REC 252 Introduction to Therapeutic Recreation	4
REC 323 Supervisory Roles in Recreation Admin	3
REC 324 Legal and Managerial Patterns in	
Recreation Administration	3
REC 327 Leisure Counseling	3
REC 328 Aging and Leisure	3
REC 364 Commercial Recreation and Leisure	
Services	3
REC 416 Physical Education and Recreation	
Facilities	3
REC 424 Financing Recreation and Leisure Services	4
REC 430, 431 Therapeutic Recreation Internship or	
REC 432 Internship	9/6
REC 460 Research in Recreation Administration	4
REC 461 Senior Project	3
REC 462 Senior Project	2
JOUR 312 Introduction to Public Relations	4
SOC 333 Social Research Methods	3
	64/61
	, • .

### SUPPORT COURSES

ACTG 211 Financial Accounting for Nonbusiness	
Majors	4
BUS 101 The Business Enterprise	4
CSC 120 Prin. of Business Data Processing (F.1.)	4
ECON 201/ECON 211/ECON 222 (D.3.)	3
ENGL 215 Writing: Argumentation or	
ENGL 218 Professional Writing: Argumentation	
and Reports (A.4.)	4
PE 280 First Aid and CPR	3
PSY 201/PSY 202 General Psychology (E.1.)	3
SPC 201 Public Speaking or	
SPC 202 Principles of Speech (A.3.)	3
STAT 211 Elementary Probability and Statistics	
(B.2.)	3
ANT/BUS/ECON/GEOG/POLS/SOC elective	
(300–400 level) (D.4.b.)	3
ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
Mathematics elective (B.2.)	3
Physical sciences elective (B.1.) (Therapeutic	
Recreation students take ZOO`131)	3
Concentration courses (see below)	33/36
	76/79

			_
76	1	7	9

### **GENERAL EDUCATION AND BREADTH** REQUIREMENTS

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300-400 level. Additional GEB courses are listed under Support Courses.

A.1. ENGL 114 Writing: Exposition	4
Thinking	3
B.1. Life sciences elective (with lab)	3
B.1. Physical or life sciences elective	3
Area B Science, mathematics or statistics elective.	3
C.1. PHIL 230/PHIL 231 Philosophical Classics	3
C.1. Critical reading electives	6
C.2. Fine and performing arts elective	3
C.3. Literature, philosophy, art elective (300-400	
level)	3
Area C Arts and humanities elective	3
D.1. HIST 204 History of American Ideals and	-
Institutions	3
D.1. POLS 210 American and California Govt	3 2
E 2 PIO 220/ESN 210/HE 210/DE 250/DSV	3
204/REC 100 elective	2
F 2 Technology elective (300-400 level)	3
	48
Electives	10
=	198

### **Leisure Services Management Concentration**

ACTG 301 Managerial Accounting	4
MKTG 204 Elements of Marketing	4
REC 301 Outdoor Recreation Education or	
REC 302 Outdoor Experiential Education	3
REC 310 Program Admin. Leisure Services	3
REC 312 Employee Services and Recreation	3
REC 314 Travel and Tourism—Implications for	
Leisure	3
REC 316 Commercial Recreation Entrepreneurship	1
REC 464 Delivery of Commercial Rec. Services	3
CSC elective	3
Adviser approved electives	9

### **Therapeutic Recreation Concentration**

PSY 307 Abnormal Psychology	3
PSY 323 The Helping Relationship	4
REC 320 Processes and Techniques in Therapeutic	
Recreation	4
REC 325 Recreation Therapy in a Physical	
Rehabilitation Setting	4
REC 329 Team Procedures and Processes for	
Recreation Therapists	4
REC 407 Programming and Adaptive Techniques in	
Therapeutic Recreation	4
ZOO 237 Human Anatomy	3
Therapeutic Recreation Concentration electives	7
=	

## MASTER OF SCIENCE DEGREE IN PHYSICAL EDUCATION

### **General Characteristics**

The degree program is designed to offer advanced study in physical education which will qualify men and women to enter the field at occupational levels requiring a master's degree. The program offers the increased depth and quality needed for (a) teaching physical education at the secondary and community college levels, (b) positions in private, governmental, and international agencies and programs, (c) selfdirected study and growth in the field of physical education, and (d) continued graduate work at other institutions.

### Areas of Emphasis

Students may select one of the following areas of emphasis which is most compatible with career and personal objectives.

### Wellness Management

Wellness Management is an extension of the Commercial /Corporate Fitness Concentration under the B.S. degree program in Physical Education. This emphasis will prepare people to: a)seek employment as a fitness/wellness program director in a variety of public and private agencies and companies, b) enter into their own business in this rapidly expanding field, and c) continue in an advanced degree program in health education, exercise science, and exercise physiology.

### Human Movement and Sport

This emphasis is offered for students who wish advanced preparation for elementary, secondary, or college positions in physical education, or in related areas such as athletic administration and coaching. It is oriented toward a practical application and offers an opportunity for the in-depth study needed for: a) teaching physical education at all levels; b) coaching at the secondary and post-secondary levels, as well as with private and municipal agencies; c) program administration at all levels; and d) continued graduate work at other institutions.

### **Prerequisites**

### **Conditionally Classified Standing**

The student may enroll in the physical education graduate degree program if in the opinion of the physical education graduate coordinator the student can remedy any deficiencies by additional preparation.

Those applicants with undergraduate deficiencies must remove these deficiencies before advancement to classified standing or advancement to candidacy. Undergraduate preparation should include a major in physical education or equivalent academic preparation as determined by the student's adviser. In addition, the student should have an adequate background in both activity and coaching theory classes as well as the following academic coursework: human muscle anatomy, human physiology, physiology of exercise, kinesiology, measurement and evaluation, organization and administration of physical education, adapted physical education, motor learning, history and philosophy of physical education, and human element in sport. These deficiencies may be removed by either coursework or examination. Classes completed to remove deficiencies may not apply toward the master's degree.

### **Classified Standing**

For admission to classified standing, an applicant must have an undergraduate major in physical education or equivalent academic preparation as determined by the departmental coordinator of graduate studies and a minimum grade point average of 2.75 in the last 90 units of undergraduate work. Students below a 2.75 GPA may appeal to the Graduate Coordinator to be "conditionally" accepted. This latter procedure will involve a review process and a specified contract to be successfully completed before admission to classified standing.

### Advancement to Candidacy

For advancement to candidacy a student shall complete 18 quarter units of approved graduate-level classes with a minimum grade point average of 3.0 at Cal Poly. At least 18 units must be completed after advancement to candidacy.

### **Requirements for the Degree**

The formal program of study must include 45 units of approved graduate work; at least 33 of these units must be completed at the 500 level, with 24 of these units taken in Physical Education.

All candidates must meet the current Graduation Writing Requirement.

Each candidate must successfully complete a comprehensive examination before the degree is granted. This examination may take one of two forms: (1) those students presenting a thesis or project must successfully defend the thesis or project in an oral examination, or (2) those students not presenting a thesis or project must pass an oral examination dealing with general current knowledge of the profession and coursework taken toward the degree requirements. *If the degree is not completed within 4 years, the graduate faculty will require that a thesis candidate also be tested on coursework.* 

Up to 12 units may be taken in 400-level courses with adviser approval provided those courses were not taken as part of the student's undergraduate program. Graduate students taking 400-level courses will be required to complete assignments beyond those normally required of undergraduate students and will be graded against more rigorous standards than those applied to undergraduate students in the same course. The following 400-level PE courses offered by the department are *not* acceptable for graduate credit: PE 400, PE 401, PE 402, PE 405, PE 424, PE 437, PE 440, PE 461, PE 462, and PE 474. A maximum of 21 units with adviser approval may be taken outside of the Department.

### CURRICULUM FOR M.S. PHYSICAL EDUCATION

	Units
Required courses PE 517 Research Methods in Physical Education (3)	6
PE 519 Evaluation of Current Studies (3)	
Area of Emphasis	21
9 units must be selected from one of the following areas emphasis. An additional 9 units must be taken in the area of emph with adviser approval.	of asis
<ul> <li>Wellness Management</li> <li>PE 503 Seminar in Adult Wellness (3)</li> <li>PE 504 Cardiopulmonary Physiology, Pathology and Exercise (3)</li> <li>PE 512 Critical Health Issues (3–9)</li> <li>PE 530 Advanced Physiology of Exercise (4)</li> <li>PE 536 Advanced Electrocardiography (4)</li> </ul>	
<ul> <li>Human Movement and Sport</li> <li>PE 501 Administration of Adapted Physical Education Programs (3)</li> <li>PE 502 Current Trends and Issues in Physical Education (3)</li> <li>PE 511 Administration of Physical Education and Athletics (3)</li> <li>PE 525 Human Performance and Learning (3)</li> <li>PE 526 Sport in American Society (3)</li> </ul>	
Electives to be selected with adviser's approval	18
	45
For more detailed information or advisement, students should communic with the Coordinator of Graduate Studies for Physical Education.	:ate



# **School of Science and Mathematics**

## **DEGREE PROGRAMS**

B.S.	Biochemistry
B.S.	Biological Sciences
	Anatomy-Physiology Concentration
	Biology Concentration
	Plant Pathology-Entomology Concentration
	Plant Tissue Culture Concentration
B.S.	Chemistry
	Polymers and Coatings Concentration
B.S.	Ecology and Systematic Biology
	Ecology Concentration
	Marine Biology and Fisheries Concentration
	Systematics Concentration
	Wildlife Biology Concentration
B.S.	Mathematics
B.S.	Microbiology
	General Microbiology Concentration
	Medical Laboratory Technology Concentration
B.S.	Physical Science
B.S.	Physics
	Electronics Concentration
	Electro-optics Concentration
B.S.	Statistics
M.S.	Biological Sciences
M.S.	Chemistry
M.S.	Mathematics
	Applied Mathematics Specialization
	Mathematics Teaching Specialization

### MINORS

Biotechnology

Mathematics

Statistics

## SCHOOL OF SCIENCE AND MATHEMATICS

Faculty Offices East (25), Room 229 (805) 756-2226

### Philip S. Bailey, Dean Harry Fierstine, Associate Dean

The School of Science and Mathematics is composed of five departments: Biological Sciences, Chemistry, Mathematics, Physics, and Statistics. It offers nine undergraduate programs leading to Bachelor of Science degrees in Biochemistry, Biological Sciences, Chemistry, Ecology and Systematic Biology, Mathematics, Microbiology, Physical Sciences, Physics, and Statistics and three graduate programs leading to Master of Science degrees in Biological Sciences, Chemistry and Mathematics. Minors in Biotechnology, Mathematics and Statistics are also available. In cooperation with the University Center for Teacher Eduction the school offers programs leading to teaching credentials in Biological Sciences, Mathematics, and Physical Sciences.

The School of Science and Mathematics has two equally important roles: (1) to provide support and breadth courses in science and mathematics for all students within the university and (2) to provide specialized coursework for students enrolled in one of the school's nine undergraduate, three minor, and three graduate programs.

The school is, as is all of Cal Poly, dedicated to undergraduate instruction. Resources are channeled for this purpose in support of the "learn by doing" approach of this university. In laboratory, students have daily access to modern instrumentation. Classroom instruction is done in relatively small classes so that a personal approach by instructors is possible. Because of its large role in offering support courses to the rest of the university, the number of faculty in each department is relatively large and favors student-faculty interaction, both academically and socially.

### STUDENT SERVICES

The School Office not only assists the faculty and staff with the administration of the five instructional departments, but it acts on various student-initiated petitions (change of major, curriculum substitutions, withdrawal from the university). In addition, the Dean's Office has the dual function of counseling those on academic probation and notifying those undergraduate students who are eligible each quarter for the Dean's Honor List (undergraduate students who have completed 12 or more letter-graded units during the quarter with a 3.50 GPA or better).

### FACULTY ADVISING

Faculty members take an active role in academic and career advising. Students are encouraged by all and required by some departments to obtain academic advising prior to registration each quarter. The adviser-student relationship becomes important especially when the student needs a letter of reference for a potential employer or needs career advice.

### **ADVISING CENTER**

Science North (53), Room 218 (805) 756-2615

A school advising office supplements the role of the faculty adviser. The Advising Center staff provide information on school programs, coordinates public relations efforts, distributes registration materials, and furnishes information on academic and career advising.

### APPLYING TO GRADUATE SCHOOL

Many universities around the country offer fine masters and/or Ph.D. programs in the physical, biological and mathematical sciences. Faculty in the School of Science and Mathematics have earned master's and doctoral degrees from a wide variety of these universities and are excellent sources for information and advice about the graduate programs, prerequisites and application procedures. Applications to graduate programs should be made in the fall for admission to the following fall term. The Graduate Record Exam (GRE) should be taken early in the application cycle. Generally, two or more letters of reference from faculty are required. Most Ph.D. granting institutions offer financial support in the form of teaching assistantships and research fellowships.

#### HEALTH SCIENCES PREPROFESSIONAL PREPARATION

Students applying to professional schools in the health sciences have need of current information in order to be competitive for admission. A Health Professions Guidance and Evaluation Committee has been established to assist students, regardless of their major, in all phases of their preparation. Please see Health Professions for more information.

### **BIOTECHNOLOGY MINOR**

The Biotechnology Minor is a 24-unit program consisting of a core of required courses totaling 14-15 units and 9-10 units to be selected from a list of restricted elective courses. The courses in the core must be taken by all students wishing to obtain a minor in Biotechnology. Each degree program wishing to have students participate in the minor program must provide their students with a list of restricted electives. The courses in the core and the restricted electives of the minor will appear in an agreement form to be completed by the student and approved by the Department Head or Chair. Advising for students in the Biotechnology minor will take place in the student's major department.

*Biological Sciences* students preparing for the minor should take CHEM 316, CHEM 317, and CHEM 371 to fulfill the organic chemistry and biochemistry requirements in their major.

*Biochemistry* students preparing for the minor should take BACT 221 and BIO 303 as part of the General Education and Breadth science electives in their major.

*Note:* Courses listed in the major column of the Curriculum Evaluation Sheet or in the requirements for a concentration are not eligible to satisfy the requirements for the minor.

	Units
Core courses	14-15
BIO 375/CHEM 375 Molecular Biology Laboratory (2)	
BIO 475/CHEM 475 Tissue Culture Techniques (4)	
BIO 304 Molecular Genetics (3) or	
CHEM 373 Molecular Biology (3)	
CHEM 473 Immunochemistry (3) or	
ZOO 426 Serology and Immunology (4)	
CHEM 474 Protein Laboratory Techniques (2)	
Restricted electives	10–9

#### **Biochemistry Majors**

9-10 units to be selected from the following list of courses. Some of the prerequisites to the courses below may be waived or substituted with approval of the instructor and adviser for students formally enrolled in the minor. With approval of the program adviser, up to 3 units may be chosen from other courses.

BACT 333, BACT 402, BACT 403, BACT 423, BACT 424, BIO 311, BIO 322, BIO 323, BIO 324, BIO 426, BOT 450, CHEM 378, CHEM 439

#### Biological Science Majors

9-10 units to be selected from the following courses. Select at least one course from Group A and one from Group B. Group A: BIO 321, BIO 322, BIO 323, BIO 324, BIO 426, BOT 450, CHEM 374 Group B: BACT 333, BACT 402, BACT 403, BACT 423, BACT 424, BIO 311, CHEM 331, CHEM 372, CHEM 378, ZOO 433

#### Microbiology Majors

9-10 units to be selected from the following list. Note: BACT 333, CHEM 372, CHEM 374 not open to students in the General Microbiology Concentration. BACT 403, BIO 321, CHEM 378 not open to students in the Medical Laboratory Technology Concentration.

BACT 333, BACT 403, BACT 342, BIO 311, BIO 321, BIO 322, BIO 323, BIO 324, BIO 426, BOT 450, CHEM 331, CHEM 371, CHEM 372, CHEM 374, CHEM 378, CHEM 439

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## **BIOLOGICAL SCIENCES DEPARTMENT**

Fisher Science Hall (33), Room 273 (805) 756-2788

### Faculty

### Department Chair, V. L. Holland

Frederick P. Andoli Leslie S. Bowker Robert J. Brown Raul J. Cano Fred L. Clogston Jaime S. Colomé Alan F. Cooper Alvin A. Delong Douglas D. Donaldson Harry L. Fierstine Dennis F. Frey Roger D. Gambs David V. Grady Michael T. Hanson Dennis N. Homan Peter lankav Eric V. Johnson David J. Keil

Anthony E. Knable George N. Knecht Richard J. Krejsa A. Mark Kubinski Kingston L. Leong Royden Nakamura Maria E. Ortiz Lee R. Parker Pratapsinha C. Pendse Elizabeth K. Perryman Thomas L. Richards Rhonda L. Riggins-Pimentel William D. Stansfield John W. Thomas Dirk R. Walters Archie M. Waterbury Michael A. Yoshimura

### Programs

B.S. Biological Sciences with Concentrations in:

Anatomy-Physiology Biology Plant Pathology-Entomology Plant Tissue Culture

B.S. Ecology and Systematic Biology with Concentrations in:

Ecology Marine Biology and Fisheries Systematics Wildlife Biology

B.S. Microbiology with Concentrations in:

General Microbiology Medical Laboratory Technology

#### M.S. Biological Sciences

The department offers complete undergraduate programs leading to Bachelor of Science degrees in Biological Sciences, Ecology and Systematic Biology, and Microbiology. For qualified students, a graduate program is available leading to the Master of Science degree. In addition, courses are offered to satisfy biology requirements in other academic majors.

The department is housed in modern facilities equipped with up-to-date instrumentation. Cal Poly's geographical setting offers unusual opportunities for studying representative plants and animals of both Northern and Southern California. Graduates of the various programs enter fields in teaching; medical and biological laboratory technology; public health; wildlife management; agriculture; industry; and private, state and national park and forest services. A significant number enter graduate or professional schools for advanced study of botany, entomology, microbiology, plant pathology, zoology, marine sciences, veterinary science, medicine and dentistry. The department offers courses required for preprofessional training in medicine and paramedical fields. In the teaching area, all state requirements may be met for an academic major in biological sciences leading to credentials in secondary teaching.

The department supports the concept of international education and encourages students to investigate opportunities for overseas study. For further information, see Study Abroad Programs.

### **BIOLOGICAL SCIENCES MAJOR**

With the several curricular concentrations described below, this degree offers students a broad education in biology. It is suitable for preprofessional preparation in the bio-medical fields, as a base for work toward postbaccalaureate studies, and for technical competency in the concentrations offered.

### CURRICULAR CONCENTRATIONS

### Anatomy-Physiology

This concentration is designed for students who are interested in zoology with an emphasis in the structure and function of animals and for preprofessional students of the health sciences.

### Biology

This concentration gives the student a broad training in biology. Several of the courses in the concentration are required for the single subject teaching credential in biology.

### Plant Pathology-Entomology

Students are trained to recognize, evaluate and solve plant disease and insect problems. They may be employed as technicians in research or extension service, or may continue their studies at the graduate level.

### **Plant Tissue Culture**

A program of study designed for the student who desires a career-oriented education leading to professional work in the field of botany and related subjects. Basic subject matter, skills, and laboratory experience in plant tissue culture and its applications are emphasized.

### ECOLOGY AND SYSTEMATIC BIOLOGY MAJOR

The four-year program in Ecology and Systematic Biology leads to a Bachelor of Science degree. Emphasis is placed on the study of the variety of living organisms, their relationships to each other, and to their environment. The concentrations described below enable the student to tailor his or her curriculum towards specific career objectives.

### **CURRICULAR CONCENTRATIONS**

### Ecology

This concentration stresses a broad understanding of the interactions of organisms with each other and with their environment. With this foundation, graduates may pursue careers in education, ecology, environmental impact analysis, environmental monitoring or management in either government agencies or private industries. Graduates will be academically prepared for professional certification as Associate Ecologist by the Ecological Society of America.

#### **Marine Biology and Fisheries**

This concentration prepares students for advanced training or professional employment in public or private agencies concerned with marine sciences, freshwater ecology, fisheries biology, fisheries management, or related fields. By judicial selection of electives, the student will be academically prepared to apply for professional certification as a Fisheries Biologist by the American Fisheries Society.

#### **Systematics**

This concentration stresses the identification and classification of living organisms. Graduates may pursue employment in teaching, in environmental impact analysis, or in museums, herbaria, zoos and botanical gardens, or go on to advanced education in taxonomy and systematics.

#### Wildlife Biology

This concentration prepares students for advanced training or professional employment in public or private agencies concerned with the biology and management of both game and nongame terrestrial wildlife species. By judicial selection of electives, the student will be academically prepared to apply for professional certification as an Associate Wildlife Biologist with the Wildlife Society.

### MICROBIOLOGY MAJOR

The undergraduate program leading to the Bachelor of Science degree in Microbiology involves the study of microorganisms such as bacteria, viruses, algae, protozoa, and fungi. Special emphases are placed on their structure and function as well as their interactions with each other and with human beings.

### CURRICULAR CONCENTRATIONS

### **General Microbiology**

This concentration provides students with basic concepts in microbiology along with practical skills. Graduates are prepared to enter positions in industry, various areas of research, public health, teaching, and advanced degree programs.

#### **Medical Laboratory Technology**

This concentration prepares students specifically for careers in medically oriented fields: immunology, medical bacteriology, medical mycology, virology, parasitology, hematology, and genetics.

### **BIOTECHNOLOGY MINOR**

For information regarding the Biotechnology Minor, please see School of Science and Mathematics Section.

### **CURRICULUM FOR B.S. BIOLOGICAL SCIENCES**

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

Freshman

	BIO 151 Introduction to Biology (B.1.b.)	5
	BIO 152 Biology of Plants and Fungi	5
	BIO 153 Biology of Animals	5
	CHEM 127 General Chemistry (B.1.a.)	4
	CHEM 128 General Chemistry	4
	CHEM 129 General Chemistry	4
	CHEM 326 Survey of Organic Chemistry	4
	ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
	ENGL 114 Writing: Exposition (A.1.)	4
	ENGL 125/PHIL 125/SPC 125 Critical Thinking	
	(A.2.)	3
1	MATH 120 Pre-Calculus Algebra and Trigonometry	
	(B.2.)	5
2	Computer literacy elective (F.1.) (CSC 111	
	recommended)	3
	-	
		- 49

### Sophomore

	BACT 221 General Bacteriology	4
	BIO 303 Genetics	3
	BOT 223 Introductory Plant Taxonomy	4
	PHYS 121 College Physics	4
	PHYS 122 College Physics	4
	PHYS 123 College Physics	4
	STAT 211 Elementary Probability and Statistics	
	(B.2.)	3
	ECON 201/ECON 211/ECON 222 (D.3.)	3
	ENGL 215 Writing: Argumentation or	
	ENGL 218 Professional Writing: Argumentation	
	and Reports (A.4.)	4
	PSY 201/PSY 202 General Psychology (E.1.)	3
	SPC 201 Public Speaking or	
	SPC 202 Principles of Speech Communication	
	(A.3.)	3
	FSN 210/PE 250/PSY 304 elective (E.2.)	2
3	Electives and courses to complete major	8

### Junior

	BIO 304 Molecular Genetics (B.1.b.)
	BIO 325 General Ecology or
	BOT 326 Plant Ecology
	BIO 414 Evolution
4	BIO 431 Physiology I: General or
	BOT 322 Introduction to Plant Physiology
	BIO 461 Senior Project
4	CHEM 328 Survey of Biochemistry
	ENGL 311 Advanced Professional Writing or
	ENGL 318 Writing for Scientific Journals
	LIB 301 Library Resources in Biology and
	Agriculture
	PHIL 230/PHIL 231 Philosophical Classics (C.1.)

POLS 210 American and California Government	
(D.1.)	3
Critical reading electives (C.1.)	6
Fine and performing arts elective (C.2)	3
Literature, philosophy, arts (300-400 level)	
elective (C.3.)	3
Electives and courses to complete major	6
-	50

### Senior

Units

2 2 2 3	BIO 423 General Cytology	4 2 4 3 3 3 3 3 25
3	Electives and courses to complete major	25
	-	50

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<sup>1</sup> MATH 118 and MATH 119 or MATH 141 will substitute.

- <sup>2</sup> To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 86 of this catalog.
- <sup>3</sup> Of the total elective units 18–25 shall be chosen in a field of concentration in the Biological Sciences with adviser approval and 2-3 units at 300-400 level of an approved Biological Sciences elective. Additional information is available from the department.
- 4 BOT 326, BOT 322, CHEM 371 and CHEM 373 are recommended for students in Plant Tissue Culture Concentration.

### **CONCENTRATIONS** (select one)

#### Anatomy and Physiology Concentration

ZOO 303, ZOO 304 Vertebrate Embryology and	
Laboratory (3) (2) or ZOO 326 Comparative	
Anatomy of the Chordates (5)	5
ZOO 422 Functional Histology	4
ZOO 432 Physiology II: Comparative Systems (4) or	
ZOO 433 Physiology III:Endocrine and	
Reproductive (4)	4
Adviser approved electives	5
-	18

### **Biology Concentration**

BIO 328 Marine Biology	4
ZOO 237 Human Anatomy	3
ZOO 331 Human Physiology L	3
ZOO 332 Human Physiology II	3
Select one of the following	4
BACT 322 Dairy Microbiology (4)	
BACT 342 Sanitary Microbiology (4)	
BACT 421 Food Microbiology (4)	
Select one of the following	4
BOT 333 Field Botany (4)	
BOT 334 Morphology of Vascular Plants (4)	
BOT 335 Plant Anatomy (4)	
BOT 426 Mycology (4)	

BOT 437 Algology (4)	
Select one of the following	4
ZOO 321 Mammalogy (4)	
ZOO 322 Ichthyology (4)	
ZOO 323 Ornithology (4)	
ZOO 329 Vertebrate Field Zoology (4)	
ZOO 341 Herpetology (4)	
	23

#### **Plant Pathology and Entomology Concentration**

BOT 323 Plant Pathology	4
BOT 325 Plant Nematology	4
BOT 425 Plant Virology	4
ENT 332 Economic Entomology	4
Adviser approved electives	4
BOT 426 or ENT 421 recommended	
-	
	20

### **Plant Tissue Culture Concentration**

BIO 322 Introduction to Electron Microscopy	2
BIO 324 Transmission Electron Microscopy	
Laboratory	2
BIO 375 Molecular Biology Laboratory	2
BOT 323 Plant Pathology	4
BOT 334 Morphology of Vascular Plants	4
BOT 335 Plant Anatomy	4
BOT 450 Plant Cell and Tissue Culture	5
	23

### **B.S. BIOLOGICAL SCIENCES**

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

Units

MAJOR COURSES ...... 60/67 BIO 151 (B.1.b.), 152, 153, 303, 414, 423, 461, 462 BIO 325/BOT 326 BIO 431/BOT 322 ENT 326/ZOO 336 Concentrations (select one:) (18/25) Anatomy and Physiology Concentration (18) ZOO 303 and 304 or ZOO 326; 422; 432 or 433 Adviser approved electives (5) **Biology Concentration** (25) **BIO 328** ZOO 237, 331, 332 Select one of the following (4) BACT 332, 342, 421 Select one of the following (4) BOT 333, 334, 335, 426, 437 Select one of the following (4) ZOO 321, 322, 323, 329, 341 Plant Pathology and Entomology Conc. (20) BOT 323, 325, 425 ENT 332 Adviser approved electives (4) BOT 426 or ENT 421 recommended Plant Tissue Culture Concentration (23) BIO 322, 324, 375 BOT 323, 334, 335, 450

SUPPORT COURSES 59 **BACT 221** BIO 304 (B.1.b.) **BOT 223** <sup>2</sup> CHEM 127 (B.1.a.), 128, 129, 326, 328 ENGL 311/318 LIB 301 MATH 120 (B.2.) PHYS 121, 122, 123 STAT 211 (B.2.) Computer literacy elective (F.1.) (CSC 111 recommended) GENERAL EDUCATION AND BREADTH REQUIREMENTS..... 58 Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300-400 level. Additional GEB courses are listed under Maior and Support Courses. Area A: (14) ENGL 114 (A.1.) ENGL 125/PHIL 125/SPC 125 (A.2.) SPC 201/SPC 202 (A.3.) ENGL 215/ENGL 218 (A.4.) Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300-400 level) (C.3.) Arts and humanities elective (Area C) Area D: (18) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/211/222 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.) Area E: (5) PSY 201/PSY 202 (E.1.) FSN 210/PE 250/PSY 304 elective (E.2.) Area F: (3) Technology elective (F.2.) 198 <sup>1</sup> BOT 322 is recommended for students in Plant Tissue Culture Concentration. <sup>2</sup> CHEM 371 and 373 are recommended for students in Plant Tissue Culture Concentration

<sup>3</sup> MATH 118 and 119 or 141 will substitute.

## CURRICULUM FOR B.S. ECOLOGY AND SYSTEMATIC BIOLOGY

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

### Freshman

	BIO 151 Introduction to Biology (B.1.b.)
	BIO 152 Biology of Plants and Fungi
1	CHEM 127 General Chemistry (B.1.a.)
	CHEM 128 General Chemistry
	CHEM 326 Survey of Organic Chemistry
	(B.1.a.)
2	MATH 120 Pre-Calculus Algebra and Trig. (B.2.)
	STAT 211 Elem. Probability and Stat. (B.2.)
	STAT 212 Statistical Methods
4	Computer literacy elective (F.1.) (CSC 111
	recommended)
	ENGL 114 Writing: Exposition (A.1.)
	ENGL 125/PHIL 125/SPC 125 Critical Thinking
	(A.2.)
	SS 121 Introductory Soil Science (F.2.)
	ANT 201/GEOG 150/SOC 105 (D.4.a.)

#### Sophomore

	BIO 153 Biology of Animals	5
	BIO 325 General Ecology	4
	BACT 221 General Bacteriology	4
	BOT 223 Introductory Plant Taxonomy	4
	ECON 201/ECON 211/ECON 222 (D.3.)	3
	ENGL 215 Writing: Argumentation or	
	ENGL 218 Professional Writing: Argumentation	
	and Reports (A.4.)	4
	HIST 204 History of American Ideals and	
	Institutions (D.1.)	3
	PHYS 121 College Physics	4
3	PHYS 122 College Physics	4
	PSY 201/PSY 202 General Psychology (E.1.)	3
	SPC 201 Public Speaking or	
	SPC 202 Prin. of Speech Communication (A.3.).	3
	Electives and courses to complete major	7
	. ,	

#### Junior

	BIO 303 Genetics
	BIO 414 Evolution
	BIO 442 Biometry
	BIO 461 Senior Project
	BOT 333 Field Botany
5	ENT 326 General Entomology
	ENGL 318 Writing for Scientific Journals
	HIST 315 Modern World History (D.2.)
	PHIL 230/PHIL 231 Philosophical Classics (C.1.)
	POLS 210 American and California Govt. (D.1.)

Critical reading electives (C.1.)6Electives and courses to complete major9

#### Senior

Units

6	BIO 431 Physiology I: General	4
	ZOO 437 Animal Behavior	4
	FNR 403 Environmental Impact Analysis	3
4	ANT/BUS/ECON/GEOG/POLS/SOC elective	
	(300–400 level) (D.4.b.)	3
4	Arts and humanities elective (Area C)	3
7	BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC	
	100 elective (E.2.)	2
4	Fine and performing arts elective (C.2.)	3
4	Literature, philosophy, arts (300-400 level)	
	elective (C.3.)	3
	Electives and courses to complete major	25
	-	50
	-	107
		197

- <sup>1</sup> CHEM 129 and CHEM 328 are recommended for students planning postgraduate training.
- <sup>2</sup> MATH 118 and MATH 119 or MATH 141 will substitute.
- <sup>3</sup> PHYS 123 is recommended for students planning postgraduate training.
   <sup>4</sup> To be selected in accordance with General Education—Breadth requirements. See page 86.
- <sup>5</sup> ZOO 336 may be substituted for ENT 326 by students in the Fisheries and Wildlife concentration.
- <sup>6</sup> Systematics concentration (Group I, Botany) may substitute BOT 322.
   <sup>7</sup> PSY 304 recommended.

### **CONCENTRATIONS** (select one)

### **Ecology Concentration**

BIO 415 Biogeography	3
BOT 326 Plant Ecology	4
CONS 207 Resource Survey	3
ZOO 329 Vertebrate Field Zoology	4
Select two courses from the following BIO 328, 334, 342; CONS 320, 426, 431	6

### **Marine Biology and Fisheries Concentration**

BIO 328 Marine Biology or	
BIO 334 Limnology	4/3
BOT 437 Algology	4
CONS 320 Fishery Resource Management or	
CONS 422 Freshwater Fisheries	4
ZOO 322 Ichthyology	4
ZOO 436 Functional Invertebrate Zoology	4
Select with adviser approval from:	7-9
BIO 328, 334, 437; CONS 120, 210, 320, 422, 426,	
433; ENT 421; FNR 203, 406; ZOO 321, 341	

**Systematics Concentration** 

BIO 415 Biogeography	3
BOT 335 Plant Anatomy or	
ZOO 326 Comparative Anatomy of the Chordates	4/5
BOT 443 Biology and Conservation of Systematic	
Botany	3
CONS 210 Endangered Species	3

Select one group with adviser approval:	. 12
GROUP I- Botany	
ZOO 329 Vertebrate Field Zoology (4)	
And two from: BOT 334, 426, 437	
GROUP II- <i>Zoology</i>	
Select three from: ZOO 321, 322, 323, 336, 341	
	25/20
	23/20

### Wildlife Biology Concentration

CONS 120 Fisheries and Wildlife Management	3
CONS 427 Habitat Management	4
CONS 431 Game Management	4
ZOO 321 Mammalogy	4
ZOO 323 Ornithology	4
Select with adviser approval from:	12
BIO 334; CONS 207, 210, 221, 426; ENT 421; FNR	
203, 302, 406; ZOO 341	
	- 31

### **B.S. ECOLOGY AND SYSTEMATIC BIOLOGY**

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

Units

BIO 151 (B.1.b.), 152, 153, 303, 325, 414, 1 431, 442 **BOT 333** ZOO 437 Concentrations (select one:) (20-31) Ecology Concentration (20) **BIO 415 BOT 326 CONS 207** ZOO 329 Select two courses from the following (6) BIO 328, 334, 342; CONS 320, 426, 431 Marine Biology and Fisheries Concentration (27) BIO 328/334 **BOT 437** CONS 320/422 ZOO 322, 436 Select with adviser approval from (7/8): BIO 328, 334, 437; CONS 120, 210, 320, 422, 426, 433; ENT 421; FNR 204, 406; ZOO 321, 341 Systematics Concentration (25/26) **BIO 415** BOT 335/ZOO 326 **BOT 443 CONS 210** Select one group with adviser approval: (12) GROUP I- Botany ZOO 329 Select two from: BOT 334, 426, 437 GROUP II- Zoology Select three from: ZOO 321, 322, 323, 336, 341 Wildlife Biology Concentration (31) CONS 120, 427, 431 ZOO 321, 323 Select with adviser approval from (12):

BIO 334, CONS 207, 210, 221, 426; ENT 421; FNR 203, 302, 406; ZOO 341 SUPPORT COURSES 60 BACT 221 BIO 461 **BOT 223** <sup>2</sup> CHEM 127 (B.1.a), 128, 326 (B.1.a) **ENGL 318** <sup>3</sup> ENT 326 <sup>4</sup> MATH 120 (B.2.) FNR 403 PHYS 121, 5 122 SS 121 (F.2.) STAT 211 (B.2.), STAT 212 Computer literacy elective (F.1.). (CSC 111 recom) **GENERAL EDUCATION AND BREADTH** REQUIREMENTS..... 55 Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300-400 level. Additional GEB courses are listed under Major and Support Courses. Area A: (14) ENGL 114 (A.1.) ENGL 125/PHIL 125/SPC 125 (A.2.) SPC 201/SPC 202 (A.3.) ENGL 215/ENGL 218 (A.4.) Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.)

Fine and performing arts elective (C.2.)
Literature, philosophy, arts elective (300–400 level) (C.3.)
Arts and humanities elective (Area C)
Area D: (18)
HIST 204 (D.1.), POLS 210 (D.1.)
HIST 315 (D.2.)
ECON 201/211/222 (D.3.)
ANT 201/GEOG 150/SOC 105 (D.4.a.)
ANT/BUS/ECON/GEOG/POLS/SOC elective (300–400 level) (D.4.b.)
Area E: (5)
PSY 201/PSY 202 (E.1.)

197

<sup>1</sup> Systematics Concentration (Botany emphasis) may substitute BOT 322.
 <sup>2</sup> CHEM 129 and 328 are recommended for students planning postgraduate training.

MATH 118 and 119 or 141 will substitute.

<sup>5</sup> PHYS 123 is recommended for students planning postgraduate training.

<sup>&</sup>lt;sup>3</sup> ZOO 336 may be substituted for ENT 326 by students in the Fisheries and Wildlife concentration.

### **CURRICULUM FOR B.S. MICROBIOLOGY**

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

### Freshman

	BIO 151 Introduction to Biology	5
	BIO 152 Biology of Plants and Fungi	5
	CHEM 127 General Chemistry (B.1.a.)	4
	CHEM 128 General Chemistry	4
	CHEM 129 General Chemistry	4
1	MATH 118 Pre-Calculus Algebra (B.2.)	4
	ENGL 114 Writing: Exposition (A.1.)	4
	ENGL 125/PHIL 125/SPC 125 Critical Thinking	
	(A.2.)	3
	HIST 204 History of American Ideals and	
	Institutions (D.1.)	3
	POLS 210 American and California Government	
	(D.1.)	3
	SPC 201 Public Speaking or	
	SPC 202 Principles of Speech Communication	
	(A <sub>x</sub> 3.)	3
2	STAT 211 Elementary Probability and Statistics	
	(B.2.)	3
3	Computer literacy elective (F.1.) (CSC 111	
	recommended)	3
		48

#### Sophomore

	BACT 224 General Microbiology I
	BACT 225 General Microbiology II
	BACT 226 General Microbiology III
	BIO 153 Biology of Animals
4	CHEM 326 Survey of Organic Chemistry (B.1.a.)
	PHYS 121 College Physics
	PHYS 122 College Physics
	PHYS 123 College Physics
	ENGL 215 Writing: Argumentation or
	ENGL 218 Professional Writing: Argumentation
	and Reports (A.4.)
	ECON 201 Survey of Economics or
	ECON 211 Principles of Economics (D.3.)
	ANT 201/GEOG 150/SOC 105 (D.4.a.)
3	Critical reading elective (C.1.)
	Electives and courses to complete major

#### Junior

	BACT 402 General Virology
	BACT 403 General Virology Laboratory
	BIO 303 Genetics
	BIO 431 Physiology I: General
	CHEM 331 Quantitative Analysis
5	CHEM 371 Biochemical Principles
	HIST 315 Modern World History (D.2.)
	PHIL 230/PHIL 231 Philosophical Classics (C.1.)
	PSY 201/PSY 202 General Psychology (E.1.)

#### <sup>3</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (300–400 level) (D.4.b.) ..... 3 <sup>3</sup> Critical reading elective (C.1.)..... 3 Fine and performing arts elective (C.2.) ..... 3 Electives and courses to complete major ..... 11

50

24

#### Senior

Units

4

3

3

	BACT 423 Medical Microbiology	5
	BACI 424 Bacterial Cytology and Physiology	5
	BIO 461 Senior Project	3
	BIO 304 Molecular Genetics	3
	ZOO 426 Serology and Immunology	4
3	Arts and humanities elective (Area C)	3
	FSN 210/PE 250/PSY 304 elective (E.2.)	2
3	Literature, philosophy, arts elective (300–400	
	level) (C.3.)	3
3	Technology elective (F.2.)	3
	Electives and courses to complete major	21
		52
	•	198

MATH 119 or MATH 120 will substitute.

- <sup>3</sup> To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 86 of this catalog
- 4 CHEM 316 and CHEM 317 will substitute for CHEM 326. (Substitution strongly recommended for students in the General Microbiology Concentration.)
- <sup>5</sup> CHEM 328 may be substituted for Medical Laboratory Technology Concentration.

#### **CONCENTRATIONS** (select one)

#### **General Microbiology Concentration**

BACT 333 Industrial Microbiology	4
BACT 342 Sanitary Microbiology	4
BACT 421 Food Microbiology or	
BACT 322 Dairy Microbiology	4
BIO 423 General Cytology	4
CHEM 372 Metabolism	3
CHEM 373 Molecular Biology	3
CHEM 374 Biochemistry Laboratory	2

### **Medical Laboratory Technology Concentration**

BACT 430 Medical Mycology	4
<sup>1</sup> BIO 375 Molecular Biology Laboratory	2
CHEM 335, CHEM 336 Clinical Chemistry	3,4
CHEM 377 Chemistry of Drugs and Poisons	3
ZOO 425 Parasitology	4
ZOO 428 Hematology	4
	24

<sup>1</sup> BIO 321 Biological Instrumentation (3) will substitute.

<sup>&</sup>lt;sup>2</sup> MATH 141 will substitute.

### **B.S. MICROBIOLOGY**

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

Units

M	IAJOR COURSES	58
	BACT 224, 225, 226, 402, 403, 423, 424	
	BIO 303	
	ZOO 426	
	Concentrations (select one:)	
	General Microbiology Concentration (24)	
	BACT 322/421; 333, 342	
	BIO 423	
	CHEM 372, 373, 374	
	Medical Laboratory Technology Conc. (24)	
	BACT 430	
	<sup>1</sup> BIO 375	
	CHEM 335, 336, 377	
	ZOO 425, 428	
SI	UPPORT COURSES	69
	BIO 151 (B.1.b.), 152, 153, 304, 431, 461	
2	CHEM 127 (B.1.a.), 128, 129, 326 (B.1.a.), 331, <sup>3</sup>	
	371	
4	MATH 118 (B.2.)	
	PHYS 121, 122, 123	1997 - A.
5	STAT 211 (B.2.)	
G	ENERAL EDUCATION AND BREADTH	
	REOUIREMENTS	61

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300-400 level. Additional GEB courses are listed under Support Courses.

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

Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300-400 level) (C.3.) Arts and humanities elective (Area C)

Area D: (18) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/211 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.) Area E: (5) PSY 201/PSY 202 (E.1.)

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FSN 210/PE 250/PSY 304 elective (E.2.)
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Area F: (6) Computer literacy elective (CSC 111 recommended) (F.1.) Technology elective (F.2.)

ELECTIVES	10
	198

<sup>1</sup> BIO 321 Biological Instrumentation (3) will substitute.

<sup>2</sup> CHEM 316 and CHEM 317 will substitute for CHEM 326. (Substitution strongly recommended for students in the General Microbiology Concentration)

<sup>3</sup> CHEM 328 may be substituted for Medical Laboratory Technology Concentration.

4 MATH 119 or 120 will substitute.

<sup>5</sup> MATH 141 will substitute.

## MASTER OF SCIENCE DEGREE IN BIOLOGICAL SCIENCES

### **General Characteristics**

This degree offers a broad background in the biological sciences. The program is designed to offer sufficient breadth and depth to strengthen the student's academic understanding and improve competence for (a) many types of biological work which require advanced training beyond the bachelor's degree, (b) employment in industry and/or civil service, (c) teaching biological sciences at the elementary, secondary and community college levels, (d) independent research in the field of specialization, or (e) continued graduate work at other institutions.

### **Prerequisites**

Admission as a conditionally classified or classified student in this program requires a minimum grade point average of 3.0 in the last 90 quarter units attempted, satisfactory scores on the Graduate Record Examination, and letters of recommendation from persons knowing your academic potential. Advancement to candidacy requires a satisfactory background in biology, and completion of 12 units of courses specified in an informal study plan with a minimum grade point average of 3.0.

Information pertaining to specific departmental requirements for admission to graduate standing-classified or graduate standing-conditionally classified may be obtained from the Chair of the Graduate Committee (Graduate Coordinator) of the Biological Sciences Department.

### **Program of Study**

The formal program of study for the degree must include 45 units of committee-approved graduate work, at least 30 units of which must be at the 500 level. At least 18 units of the formal program of study must be completed after the student has been advanced to candidacy. A grade point average of 3.0 or better is required in all courses taken as a graduate student. Two approaches to the M.S. degree in Biological Sciences are possible. The requirements for these two approaches are listed below.

### **CURRICULUM FOR M.S. BIOLOGICAL SCIENCES**

	Thesis Plan	Coursework Plan
BIO 501 Cellular Biology	3	3
BIO 502 Biology of Organisms	3	3
BIO 503 Population Biology	3	3
BIO 590 Seminar in Biology	3	3
BIO 599 Thesis, 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	9	14
Electives from 400- and 500-level		
courses	15	15
	45	45

All 45 units must be acceptable for graduate credit and in accordance with Graduate Guidelines of the Biological Sciences Department. For further information students should communicate with the head of the Biological Sciences Department or with the Chairperson of the Graduate Committee.

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Bacteriology, Biology, Botany, Conservation, Entomology, Zoology and other subjects.

## **CHEMISTRY DEPARTMENT**

Faculty Offices East Bldg. (25), Room 125B (805) 756-2693

### Faculty

### Department Chair, John C. Maxwell

Linda Atwood Christina A. Bailey Philip S. Bailey Albert C. Censullo Robert S. Cichowski Lee C. Coombs Norman L. Eatough Leland S. Endres Thomas G. Frey John W. F. Goers Jerome F. Houlis Ralph A. Jacobson Dane R. Jones James Y. Katekaru David L. Keeling Martin A. Kellerman John F. Marlier Neil J. Moir William C. Rife Michael G. Silvestri Jan W. Simek Russell L. Tice James D. Westover David G. Williamson Max T. Wills

### Programs

- **B.S. Biochemistry**
- B.S. Chemistry Polymers and Coatings Concentration

#### M.S. Chemistry

The Chemistry Department has two roles in the university: to provide professional education for students who are majors in chemistry and biochemistry and who plan careers in the natural sciences and related fields, and to provide instruction in the fundamentals of chemistry to students with majors in fields related to chemistry, especially in the life sciences, agriculture, and engineering.

The Chemistry Department provides curricula leading to the Bachelor of Science in Chemistry, the Bachelor of Science in Chemistry with a concentration in Polymers and Coatings, and the Bachelor of Science in Biochemistry; the B.S. in Chemistry is certified by the American Chemical Society.

The baccalaureate curricula in biochemistry and chemistry include required courses in general chemistry, analytical chemistry, inorganic chemistry, organic chemistry, and physical chemistry. Advanced undergraduates choose electives from courses which cover a broad range of specialized topics, such as agricultural chemistry, environmental chemistry, food chemistry, geochemistry, glass chemistry, immunochemistry, industrial catalysis, nuclear chemistry, nutritional biochemistry, pharmacology, and polymer chemistry.

The Polymers and Coatings concentration includes the required courses in the chemistry curriculum and electives in the area of polymers, coatings, surface chemistry and materials engineering.

The curriculum emphasizes laboratory work, especially work with many kinds of current instrumentation, across the fields

of chemistry. It also emphasizes project work: every undergraduate completes a senior project, an intensive research project designed and carried out by the student and supervised by a faculty adviser. A senior project may be pure or applied research in chemistry or biochemistry or it may be interdisciplinary work which combines chemistry with another field such as art, biology, civil or environmental engineering, psychology, or soil science. Under the department's cooperative education program, many bachelor's degree candidates work full-time in industry or government for one or two quarters, for pay and academic credit.

Career opportunities for chemists are increasing. There are openings in traditional areas such as clinical chemistry, environmental analysis, the health professions, industrial research and production, pharmacology, product quality control, and teaching at the secondary or university level; newer opportunities lie in such related areas as library science, market research, patent law, and safety engineering.

The concentration in polymers and coatings gives students the background and practical experience to move into a rewarding career in a wide range of fields including textiles, paints and varnishes, rubber, plastics, adhesives and resins.

There is a rapidly increasing number of career opportunities in the expanding fields of biotechnology and polymers and coatings. A major in biochemistry or chemistry or a minor in biotechnology prepares students for direct entry into these careers, as well as for postgraduate education in a professional specialty.

#### **Biotechnology Minor**

For information regarding the Biotechnology minor, see School of Science and Mathematics section.

### **CURRICULUM FOR B.S. CHEMISTRY**

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

Units

#### Freshman

CHEM 127 General Chemistry (B.1.a.)	4
CHEM 128 General Chemistry	4
CHEM 129 General Chemistry	4
CHEM 156 General Chemistry Laboratory	1
CSC 110 Computers and Computer Applications or	
CSC 111 Introduction to Computer Applications	
for the Sciences (F.1.)	3
MATH 131, MATH 132, MATH 133 Technical	
Calculus <i>or</i>	
MATH 141, MATH 142, MATH 143 Calculus I,	
II, III (B.2.)	4,4,4
ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
BIO 101/BOT 121/ZOO 131 (B.1.b.)	3
ENGL 114 Writing: Exposition (A.1.)	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking	
(A.2.)	3
HIST 204 History of American Ideals and	
Institutions (D.1.)	3

#### Sophomore

CHEM 253 Chemical Literature	2
CHEM 316 Organic Chemistry	4
CHEM 317 Organic Chemistry	5
CHEM 318 Organic Chemistry	5
CHEM 331 Quantitative Analysis I	5
CHEM 332 Quantitative Analysis II	4
MATH 241, MATH 242 or STAT or CSC courses	4,4
PHYS 131 General Physics (B.1.a.)	4
PHYS 132 General Physics	4
PHYS 133 General Physics	4
ENGL 215 Writing: Argumentation or	
ENGL 218 Professional Writing: Argumentation	
and Reports (A.4.)	4
SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	
(A.3.)	3

### Junior

CHEM 305 Physical Chemistry (B.1.a.)
CHEM 306 Physical Chemistry
CHEM 307 Physical Chemistry
CHEM 355 Physical Chemistry Laboratory
CHEM 356 Physical Chemistry Laboratory
CHEM 459 Undergraduate Seminar
ECON 201 Survey of Economics or
ECON 211 Principles of Economics (D.3)
PHIL 230/PHIL 231 Philosophical Classics (C.1.)
POLS 210 American and California Government
(D.1.)
PSY 201/PSY 202 General Psychology (E.1.)

BIO 220/FSN 210/PE 250/PSY 304/REC 100	
elective (E.2.)	2
Critical reading electives (C.1.)	6
Fine and performing arts elective (C.2.) Physics elective (200-level and above except	3
PHYS 215)	3
or concentration	4
-	11

### Senior

	CHFM 439 Instrumental Analysis	5
	CHEM 461 Senior Project	2
	CHEM 481 Inorganic Chemistry	3
	CHEM 483 Inorganic Synthesis	1
	HIST 315 Modern World History (D.2.)	3
1	ANT/BUS/ECON/GEOG/POLS/SOC elective	
	(D.4.b.)	3
1	Arts and humanities elective (Area C)	3
1	Literature, philosophy, arts elective (300-400	
	level) (C.3.)	3
1	Technology elective (F.2.)	3
A	dvanced chemistry electives to complete major or	
	concentration	14
El	ectives	9
	-	49
	=	189

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300–400 level). Please see page 86 of this catalog.

## ADVANCED CHEMISTRY ELECTIVES OR CONCENTRATION

Select either the advanced chemistry electives or the concentration.

Select 18 units of approved chemistry electives. At least three courses must be chosen from List B.

List A
CHEM 252 Laboratory Glassblowing (1)
CHEM 335 Clinical Chemistry (3)
CHEM 336 Clinical Chemistry (4)
CHEM 341 Environmental Chemistry I (3)
CHEM 342 Environmental Chemistry II (3)
CHEM 344 Chemical Process Principles (3)
CHEM 350 Chemical Safety (1)
CHEM 371 Biochemical Principles (4)
CHEM 372 Metabolism (3)
CHEM 373 Molecular Biology (3)
CHEM 374 Biochemistry Laboratory (2)
CHEM 377 Chemistry of Drugs and Poisons (3)
CHEM 385 Geochemistry (3)
CHEM 400 Special Problems (1-3)
CHEM 446 Surface Chemistry of Materials (3)
CHEM 447 Polymers and Coatings Laboratory   (2)
CHEM 448 Polymers and Coatings Laboratory II (2)
CHEM 449 Internship in Polymers and Coatings (2)
CHEM 450 Chemical Warfare (2)
CHEM 470 Selected Advanced Topics (1-3)
CHEM 471 Selected Advanced Laboratory (1–3)

CHEM 473 Immunochemistry (3) CHEM 474 Protein Techniques Laboratory (2) CHEM 477 Biochemical Pharmacology (3) CHEM 485, 495 Cooperative Ed. Experience (6, 12) *List B* (Select at least 3 courses) CHEM 419 Intermediate Organic Chemistry (3) CHEM 444 Polymers and Coatings I (3) CHEM 445 Polymers and Coatings II (3) CHEM 446 Surface Chemistry of Materials (3) CHEM 457 Qualitative Organic Analysis (3) CHEM 458 Instrumental Org. Qualitative Analysis (3) CHEM 462 Senior Project (2)

### **Polymers and Coatings Concentration**

CHEM 444 Polymers and Coatings I	3
CHEM 445 Polymers and Coatings II	3
CHEM 446 Surface Chemistry of Materials	3
CHEM 447 Polymers and Coatings Lab I	2
CHEM 448 Polymers and Coatings Lab II	2
CHEM 449 Internship in Polymers and Coatings	2
MATE 306 Materials Engineering	3
-	18

### **B.S. CHEMISTRY**

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

Units

MAJOR COURSES	69
CHEM 128, 129, 253, 305 (B.1.a), 306, 307, 316,	
317, 318, 331, 332, 355, 356, 439, 459, 461, 481,	
483	
Advanced Chemistry electives or concentration	
(11) (see below)	
SUPPORT COURSES	50
CHEM 127 (B.1.a.), 156	
CSC 110/111 (F.1.)	
MATH 131, 132, 133 or 141, 142, 143 (B.2.)	
MATH 241, 242 or STAT/CSC	
PHYS 131 (B.1.a.), 132, 133	
Physics elective (200-400 level except PHYS 215)	
(3)	
Advanced Chemistry electives or concentration	
(7) (see below)	
Advanced Chemistry Electives. Select 18 units of	
approved chemistry electives. At least three	
courses must be chosen from List B.	
List A: CHEM 252, 335, 336, 341, 342, 344, 350,	
371, 372, 373, 374, 377, 378, 385, 400, 446, 447,	
448, 449, 450, 470, 471, 473, 474, 485, 495	
List B: (Select at least 3 courses) CHEM 419, 444,	
445, 446, 457, 458, 462, 482	
Polymers and Coatings Concentration (18)	
CHEM 444, 445, 446, 447, 448, 449	
MATE 306	

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Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Major and Support Courses.

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

Area B: (3) BIO 101/BOT 121/ZOO 131 (B.1.)

Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300–400 level) (C.3.) Arts and humanities elective (Area C)

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

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

#### Area F: (3) Technology elective (F.2.) ELECTIVES

9

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### **CURRICULUM FOR B.S. BIOCHEMISTRY**

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

### Freshman

CHEM 127 General Chemistry (B.1.a.)	4
CHEM 128 General Chemistry	4
CHEM 129 General Chemistry	4
BOT 121/ZOO 131/BACT 221 (B.1.b.)	4
CSC 110 Computers and Computer Applications or	
CSC 111 Introduction to Computer Applications	
for the Sciences (F.1.)	3
MATH 131, MATH 132 Technical Calculus or	
MATH 141, MATH 142 Calculus I, II (B.2.)	4,4
PHYS 121, PHYS 122 College Physics or	
PHYS 131, 132 General Physics (B.1.a.)	4,4
ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
ENGL 114 Writing: Exposition (A.1.)	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking	
(A.2.)	3
HIST 204 History of American Ideals and	
Institutions (D.1.)	3

### Sophomore

CHEM 253 Chemical Literature	2
CHEM 316 Organic Chemistry	4
CHEM 317 Organic Chemistry	5
CHEM 318 Organic Chemistry	5
CHEM 331 Quantitative Analysis I	5
PHYS 123 College Physics or	
PHYS 133 General Physics	4
ECON 201 Survey of Economics or	
ECON 211 Principles of Economics (D.3.)	3
ENGL 215 Writing: Argumentation or	
ENGL 218 Professional Writing: Argumentation	
and Reports (A.4.)	4
PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
POLS 210 American and California Government	
(D.1.)	3
PSY 201/PSY 202 General Psychology (E.1.)	3
SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	
(A.3.)	3
BIO 220/FSN 210/PE 250/PSY 304/REC 100	
elective (E.2.)	2
Elective	2
	18
	-++O

### Junior

1	CHEM 301 Biophysical Chemistry	3
1	CHEM 302 Biophysical Chemistry	4
	CHEM 371 Biochemical Principles	4
	CHEM 372 Metabolism	3
	CHEM 373 Molecular Biology	3
	CHEM 374 Biochemistry Laboratory	2
	CHEM 459 Undergraduate Seminar	2
	HIST 315 Modern World History (D.2.)	3
	•	

2	ANT/BUS/ECON/GEOG/POLS/SOC elective	
	(300–400 level) (D.4.b.)	3
2	Critical reading electives (C.1.)	6
2	Fine and performing arts elective (C.2.)	3
2	Life sciences electives (300-level recommended)	
	(B.1.b.)	6
2	Literature, philosophy, arts elective (300-400	
	level) (C.3.)	3
	Electives	3
	-	48

### Senior

Units

3 2 2	CHEM 461 Senior Project Approved Chemistry electives Arts and humanities elective (Area C) Technology elective (F.2.)	2 9 3 3
	Electives	26
	-	43

<sup>1</sup> CHEM 305, CHEM 306, CHEM 355 will substitute.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300–400 level). Please see page 86 of this catalog.

this catalog. <sup>3</sup> CHEM 156, CHEM 252, CHEM 300-, 400-, and 500-level courses (except CHEM 326 and CHEM 328).
# **B.S. BIOCHEMISTRY**

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

MAJOR COURSES 61 CHEM 128, 129, 253, 301, 302, 316, 317, 318, 331, 371, 372, 373, 374, 459, 461 Approved Chemistry electives (9): CHEM 156, 252, 300-, 400-, and 500-level courses (except 326 and 328). SUPPORT COURSES 34 BOT 121/ZOO 131/BACT 221 (B.1.b.) CHEM 127 (B.1.a.) CSC 110/111 (F.1.) MATH 131, 132 or 141, 142 (B.2.) PHYS 121, 122 or 131, 132 (B.1.a.) PHYS 123/133 Life sciences elective (300-level recommended) (B.1.b.)

#### GENERAL EDUCATION AND BREADTH REQUIREMENTS.....

61

Units

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

Area A: (14) ENGL 114 (A.1.) ENGL 125/PHIL 125/SPC 125 (A.2.) SPC 201/SPC 202 (A.3.) ENGL 215/218 (A.4.) Area B: (3) Life sciences elective (300 level recommended) (B.1.)

Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300–400 level) (C.3.) Arts and humanities elective (Area C)

Area D: (18)

HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/ECON 211/ECON 222 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.) Area E: (5)

PSY 201/PSY 202 (E.1.) BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC 100 elective (E.2.) Area F: (3)

Technology elective (F.2.)
ELECTIVES 31

187

<sup>1</sup> CHEM 305, 306, 355 will substitute for CHEM 301, 302.

# MASTER OF SCIENCE DEGREE IN CHEMISTRY

# **General Characteristics**

This program is designed to provide training at the graduate level for those who will be seeking employment in industry, government, and education, and for those who will be continuing their graduate or professional education at other institutions.

The hallmark of the program is flexibility. Students can choose to do a traditional research thesis, or choose either the extra coursework and comprehensive examination, or industrial internship non-thesis option. The internship program, which is one of the largest in the U.S., provides the student with a six-month, full-time, full-pay industrial position. The internship takes the place of the traditional research thesis and the internship allows students to demonstrate in practice their mastery of chemistry by completing a project. A limited number of graduate student assistant instructor positions are available. Applicants to all programs follow the same admissions procedures.

#### **Prerequisites**

Admission to the program as a classified graduate student normally requires a baccalaureate degree in chemistry or biochemistry and a minimum grade point average of 3.0 in the last 90 quarter units of coursework attempted. Applicants with majors in other areas may be admitted conditionally. More detailed information pertaining to specific departmental requirements may be obtained from the Departmental Graduate Coordinator or the Chair of the Chemistry Department.

Advancement to candidacy requires completion of any prerequisites or conditions, completion of 12 units of coursework specified in the formal study plan with a minimum grade point average of 3.0, and, for thesis students, approval of the thesis proposal.

*Note:* The M.S. in Chemistry program is in the process of being phased-out and no students are being admitted at this time.

1 Inits

# **CURRICULUM FOR M.S. CHEMISTRY**

Required courses:	27
500-level CHEM courses (18)	
CHEM 590 Graduate Seminar (3)	
CHEM 598 Internship (3-6) or	
CHEM 599 Thesis (3) (3) or additional courses	
and comprehensive examination if the	
coursework option is chosen (6)	
Additional courses at 400 or 500 level:	18
Twelve units from the Chemistry Department and	
six units outside of the Chemistry Department	
-	45
<ul> <li>CHEM 599 Thesis (3) (3) or additional courses and comprehensive examination if the coursework option is chosen (6)</li> <li>Additional courses at 400 or 500 level:</li> <li>Twelve units from the Chemistry Department and six units outside of the Chemistry Department</li> </ul>	18

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

# **MATHEMATICS DEPARTMENT**

Faculty Offices East Bldg. (25), Room 208 (805) 756-2206

# Faculty

#### Department Chair, Thomas E. Hale

Steven J. Agronsky Sabah Al-hadad Alfred M. Bachman Estelle L. Basor Michael R. Colvin H. Arthur DeKleine James E. Delany Gary M. Epstein Gerald P. Farrell lack E. Girolo D. Edward Glassco Stuart Goldenberg Harvev C. Greenwald Adelaide T. Harmon-Elliott Donald G. Hartig Alan W. Holz J. Myron Hood Kempton L. Huehn Rex L. Hutton

Goro C. Kato Euel W. Kennedy Martin T. Lang George M. Lewis George W. Luna lean M. McDill Kent E. Morrison James R. Mueller Paul F. Murphy Thomas D. O'Neil Linda J. Patton Don P. Rawlings H. Bernard Strickmeier Raymond D. Terry John Van Eps Stephen T. Weinstein Robert S. Wolf Ahmed I. Zayed

# Programs

**B.S.** Mathematics

M.S. Mathematics with Specializations in:

Applied Mathematics Mathematics Teaching

#### Minor: Mathematics

The Mathematics Department offers a complete undergraduate program of courses leading to a Bachelor of Science degree in mathematics. It also offers a program of courses for students who wish to minor in mathematics as well as graduate courses for programs of study leading to a Master of Science degree. In addition, the Mathematics Department offers courses that serve many other departments in the university. The applied flavor generated by these courses, and close interdepartmental relations, increase both the usefulness of and the demand for the graduates who complete a degree in mathematics.

The undergraduate program in mathematics at Cal Poly consists of a central core of courses taken by all students majoring in mathematics. These courses give a solid basis for more advanced work in a program of study that can be tailored to fit the needs and objectives of each individual student. Advanced coursework beyond the central core is chosen in close consultation with faculty advisors.

The rich variety of courses available in the department permits the student not only to obtain a broad exposure to those fields of mathematics which are most useful in the physical sciences and engineering, but also to obtain experience with the mathematics that is used in business, management sciences, and operations research.

Students wishing to prepare for a teaching career in junior or senior high school may make a selection of courses especially designed to satisfy California single subject credential requirements.

All of these programs provide adequate mathematical foundation for the student contemplating the pursuit of an advanced degree in mathematics.

# **CURRICULUM FOR B.S. MATHEMATICS**

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

Units

52

#### Freshman

(A.2.)	3
ENGL 125/PHIL 125/SPC 125 Critical Thinking	•
ENGL 114 Writing: Exposition (A.1.)	4
PHYS 132 General Physics (B.1.a.)	4
PHYS 131 General Physics (B.1.a.)	4
CSC 201/CSC 207/CSC 240	3
(F.1.)	4
CSC 118 Fundamentals of Computer Science 1	2
MATH 170 Theory of Equations	2
MATH 143 Calculus III	4
MATH 142 Calculus II	4
MATH 141 Calculus I (B.2.)	4
	MATH 141 Calculus I (B.2.) MATH 142 Calculus II MATH 142 Calculus II MATH 143 Calculus III MATH 170 Theory of Equations CSC 118 Fundamentals of Computer Science I (F.1.) CSC 201/CSC 207/CSC 240 PHYS 131 General Physics (B.1.a.) PHYS 132 General Physics (B.1.a.) PHYS 132 General Physics (B.1.a.) ENGL 114 Writing: Exposition (A.1.) ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) Electives and courses to complete major

#### Sophomore

	MATH 202 Orientation to the Mathematics Major	1
2	MATH 206 Linear Algebra I	4
	MATH 241 Calculus IV	4
	MATH 242 Differential Equations	4
	MATH 248 Methods of Proof in Mathematics	4
1	CSC 218 Fundamentals of Computer Science II or	
	CSC 410 Computer Fundamentals for Educators	3
	PHYS 133 General Physics	4
	STAT 321 Statistical Analysis (B.2.)	3
	ENGL 215 Writing: Argumentation or	
	ENGL 218 Professional Writing: Argumentation	
	and Reports (A.4.)	4
	HIST 204 History of American Ideals and	
	Institutions (D.1.)	3
	POLS 210 American and California Government	
	(D.1.)	3
	SPC 201 Public Speaking or	
	SPC 202 Principles of Speech Communication	
	(A.3.)	3
	Electives and courses to complete major	12
	. ,	

#### Junior

1	MATH 300/MATH 316/MATH 317/MATH 318	3-4
	MATH 335 Graph Theory <i>or</i>	
	MATH 336 Combinatorial Mathematics	3
	MATH 412 Advanced Calculus I	4
	STAT 322 Statistical Analysis	4
	ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
	PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
	PSY 201/PSY 202 General Psychology (E.1.)	3
3	ANT/BUS/ECON/GEOG/POLS/SOC elective	
	(300–400 level) (D.4.b.)	3
	BIO 220/FSN 210/PE 250/PSY 304 elective (E.2.)	2
3	Critical reading electives (C.1.)	6
3	Life sciences elective (B.1.b.)	3

Electives	and	courses	to	complete	major	•••••	12-	-1	1
						-			_

49

#### Senior

	MATH 459 Undergraduate Seminar	2
4	MATH 461 Senior Project	3
	MATH 462 Senior Project	2
	MATH 481 Modern Algebra	4
	HIST 315 Modern World History (D.2.)	3
3	Arts and humanities elective (Area C)	3
3	Economics elective (D.3.)	3
3	Fine and performing arts elective (C.2.)	3
3	Literature, philosophy, arts elective (300–400	-
	level) (C.3.)	3
3	Technology elective (F.2.)	3
	Electives and courses to complete major	19
	-	48
	=	198

<sup>1</sup> CSC 207, CSC 410 and MATH 300 to be taken by Math majors in the teaching credential program.

<sup>2</sup> Recommended to be taken concurrently with MATH 143 or MATH 241.

<sup>3</sup> To be selected in accordance with General Education-Breadth requirements (at least 12 units must be at 300–400 level). Please see page 86 of this catalog.

Candidates for a teaching credential in mathematics may take Educ 410 and Educ 420 in place of MATH 461.

# ADD COURSES BELOW TO MATHEMATICS CURRICULUM

Select 28 units from the advanced study tracks or from the list of additional electives below. Three advanced study tracks must be completed, *at least two* of which are to be chosen from the first four tracks listed.

#### **Advanced Study Tracks**

- MATH 306 and MATH 406 Linear Algebra II, III (4) (4)
- MATH 341 Theory of Numbers (4) and MATH 482 Modern Algebra II (4)
- MATH 413 and MATH 414 Advanced Calculus II, III (3) (3)
- MATH 431 and MATH 432 Mathematical Optimization I, II (3) (3)
- MATH 304 Vector Analysis (4) and MATH 404 Differential Geometry (4)
- MATH 304 Vector Analysis (4) and MATH 418 Partial Differential Equations (4)
- MATH 335 Graph Theory (3), MATH 336 Combinatorial Mathematics (3), and MATH 437 Game Theory (3)
- MATH 408 Functions of a Complex Variable (4) and MATH 409 Complex Analysis (4)

MATH 442 Euclidean Geometry (4) and MATH 443 Modern Geometries (4).

#### Additional electives. Select from:

MATH 350, 417, 419, 424, 470 CSC 219, 221, 332, 333, 345, 346, 350, 360, 433 IE 304, 305 STAT 425, 426, 427

# **B.S. MATHEMATICS**

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

Units

MATH 143, 206, 241, 242, 248, 300 (Teaching)/316/317/318, 335/336, 412, 459, 461 (EDUC 410 & 420 for Teaching), 462, 481 Add Courses Below to Mathematics Curriculum (20/28)Select 20-28 units from the advanced study tracks or from the list of additional electives below. Three advanced study tracks must be completed, at least two of which are to be chosen from the first four tracks listed. Advanced coursework in Major plus advanced coursework in Support must total 28 units. Advanced Study Tracks MATH 306 and 406 MATH 341 and 482 MATH 413 and 414 MATH 431 and 432 MATH 304 and 404 MATH 304 and 418 MATH 335, 336 and 437 MATH 408 and 409 MATH 442 and 443 Additional Electives MATH 350, 417, 419, 424, 470 CSC 118 (F.1.), 201/207/240, 218/410 (CSC 207 & 410 for Teaching) MATH 141 (B.2.), 142, 170, 202 PHYS 131 (B.1.a.), 132 (B.1.a.), 133 STAT 321 (B.2.), 322 Add Courses Below to Mathematics Curriculum Select 0-8 units from the list of additional electives below. Advanced coursework in Major plus advanced coursework in Support must total 28. Additional Electives CSC 219, 221, 332, 333, 345, 346, 350, 360, 433 IE 304, 305 STAT 425, 426, 427 **GENERAL EDUCATION AND BREADTH** REQUIREMENTS..... 61 Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300-400 level. Additional GEB courses are listed under Sup-

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

Area B: (3) Life sciences elective (B.1.)

port Courses.

Area C: (18) PHIL 230/PHIL 231 (C.1.)

Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300-400 level) (C.3.) Arts and humanities elective (Area C) Area D: (18) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/ECON 211/ECON 222 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.) Area E: (5) PSY 201/PSY 202 (E.1.) BIO 220/FSN 210/PE 250/PSY 304/REC 100 elective (E.2.) Area F: (3) Technology elective (F.2.) 198

# **CURRICULUM FOR MATHEMATICS MINOR**

		Units
I.	Required courses. MATH 206 Linear Algebra I (4) MATH 248 Methods of Proof in Mathematics (4)	8
11.	<ul> <li>Complete at least two of the following tracks 1         A track consists of at least two courses from the following groups of courses.         Completion of all four courses in the last group is considered two tracks.         Some tracks have additional mathematics prerequisites such as MATH 242.     </li> </ul>	2–16
	MATH 304 Vector Analysis (4) MATH 316/317/318 Engineering Math (4) MATH 418 Partial Differential Equations (4)	
	MATH 306 Linear Algebra II (4) MATH 406 Linear Algebra III (4)	
	MATH 335 Graph Theory (3) MATH 336 Combinatorial Mathematics (3) MATH 437 Game Theory (3)	
	MATH 408 Functions of a Complex Variable (4) MATH 409 Complex Analysis (4)	
	MATH 412 Advanced Calculus I (4) MATH 413 Advanced Calculus II (3)	
	MATH 431 Mathematical Optimization I (3) MATH 432 Mathematical Optimization II (3)	
	MATH 442 Euclidean Geometry (4) MATH 443 Modern Geometries (4)	
	MATH 341 Theory of Numbers (4) MATH 419 Intro. to History of Mathematics (3) MATH 481 Modern Algebra I (4) MATH 482 Modern Algebra II (4)	
11	I. Completion of 30 units of Mathematics courses with at least 15 units in 300 or 400 level courses	10-6
		30

#### **MASTER OF SCIENCE DEGREE IN MATHEMATICS**

# **General Characteristics**

A graduate of this program with a specialization in Applied Mathematics will be prepared for employment as a mathematician in government or industry. A graduate of this program with a specialization in Mathematics Teaching will have satisfied the fifth year requirement for a secondary credential. Students who complete either specialization will be qualified for teaching in a community college and will be prepared to pursue further graduate study.

#### **Prerequisites**

. . ..

Prerequisite to entering the program with a classified or conditionally classified status, the student must have a bachelor's degree from an accredited institution with a minimum grade point average of 2.5 in the last 90 quarter units attempted. Advancement to candidacy requires approval of a formal program of study by the departmental graduate study committee and completion of 12 units of the courses specified in the informal study plan with a minimum grade point average of 3.0.

For information pertaining to specific departmental requirements for admission to graduate standing-classified or graduate standing-conditionally classified, the student should communicate with the Chair of the Mathematics Department.

# CURRICULUM FOR M.S. MATHEMATICS, SPECIALIZATION IN APPLIED MATHEMATICS OR IN MATHEMATICS TEACHING

1 Inite

	Onna
Required courses MATH 506 Topics in Modern Algebra (4) MATH 508 Introduction to Topology (4) MATH 515 Real Analysis (4)	12
<ul> <li>Specialization courses</li></ul>	12
MATH, CSC, STAT electives Select from any MATH, CSC, or STAT 400- or 500-level courses as approved by the advising committee.	12
Electives Select additional units according to specialization with approval of adviser. Satisfactorily complete the comprehensive examinations.	9
	45
See COLIPSES OF INSTRUCTION section of this catalog for description	ns of

ee COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Mathematics and other subjects.

# **PHYSICS DEPARTMENT**

Science Bldg. (52), Room D-37 (805) 756-2448

# Faculty

# Chair, Robert H. Dickerson

Lawrence H. Balthaser Joseph C. Boone Ronald F. Brown Anthony J. Buffa Arthur S. Cary David H. Chipping Gayle Cook Neil L. Fleishon Thore C. Foster Richard B. Frankel Teymoor Gedayloo David W. Hafemeister Kenneth A. Hoffman James S. Kalathil Randall D. Knight John Mottmann Kenneth S. Ozawa Ralph A. Peters John E. Poling David M. Roach Arthur Z. Rosen Richard A. Saenz Thomas G. Schumann Keith S. Stowe Willem L. van Wyngaarden Leonard W. Wall Walter D. Wilson Ronald E. Zammit

# Programs

**B.S. Physical Science** 

B.S. Physics with Concentrations in:

Electronics Electro-optics

The Physics Department offers curricula in physics and in physical sciences leading to the Bachelor of Science degree. It also serves all schools of the university by offering courses which provide the scientific foundations for work taken by students in their major fields. The department contributes to the general education of all students by increasing their understanding of the process of scientific discovery, of the nature of the physical universe, and of the potential impact of science on society.

The department's goal in educating physics majors is to train them for positions as physicists in industry or government laboratories, to prepare them for further training as physics teachers, or to give them a strong foundation in science that will enable them to enter other related professions. The program also provides students with excellent preparation for graduate school. Graduates are engaged in many fields, including electronics and computers, lasers, aerospace, energy production and utilization, the development of new materials, and state-of-the-art research on topics ranging from quarks to astrophysics.

To prepare physics majors effectively for employment, the department provides a comprehensive laboratory program. Facilities include specialized laboratories in electrical measurements, optics, solid state physics, nuclear physics, and atomic physics. Student activities include a chapter of the national Society of Physics Students and a chapter of the national physics honor society, Sigma Pi Sigma. Students have the choice of selecting one of the specialized concentrations or following the general physics curriculum, which offers a variety of elective coursework. Students who are planning to pursue graduate studies in physics are advised to follow the general curriculum. The electronics concentration is designed for students wishing to acquire a working knowledge of electronics for use in experimental physics. The electro-optics concentration provides a background in optical devices and techniques used in this rapidly expanding field.

High school students planning to major in physics should include in their high school program as much as possible of the following: eight semesters of college preparatory mathematics, two of physics and two of chemistry.

The B.S. in Physical Science is designed primarily to prepare students who intend to be secondary school teachers of one or more of the physical sciences. It may also serve students who plan to enter another field in which a physical science background would be useful. Students intending to do graduate study in either chemistry or physics should elect a chemistry or physics major. Students planning to qualify for a teaching credential in physical science should plan their electives to include the education courses indicated. The Physical Science degree program is administered jointly by the Chemistry and Physics Departments.

# **CURRICULUM FOR B.S. PHYSICS**

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

Units

#### Freshman

PHYS 131 General Physics	4
PHYS 132 General Physics	4
CHEM 127 General Chemistry (B.1.a.)	4
CHEM 128 General Chemistry (B.1.a.)	4
CHEM 129 General Chemistry	4
MATH 141 Calculus I (B.2.)	4
MATH 142 Calculus II	4
MATH 143 Calculus III	4
CSC 118/204 (F.1.) (CSC 118 recommended)	3
ENGL 114 Writing: Exposition (A.1.)	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking	
(A.2.)	3
SPC 201 Public Speaking or	
SPC 202 Principles of Speech Communication	
(A.3,)	3
Life sciences elective (B.1.b.)	3

#### Sophomore

	PHYS 133 General Physics	4
	PHYS 206 Instrumentation in Experimental Physics.	3
	PHYS 211 Modern Physics I	- 4
	PHYS 212 Modern Physics II	3
	PHYS 243 Introductory Modern Physics Laboratory	
		1
	PHYS 256 Electrical Measurements Laboratory	1
	MATH 241 Calculus IV	4
	MATH 242 Differential Equations	4
	MATH 318 Advanced Engineering	
	Mathematics	4
	ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
	ECON 201/ECON 211/ECON 222 (D.3.)	3
	ENGL 215 Writing: Argumentation or	
	ENGL 218 Professional Writing: Argumentation	
	and Reports (A.4.)	4
	PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
	BIO 220/FSN 210/HE 210/PE 250/PSY 304/REC	
	100 (E.2.)	2
1	Critical reading electives (C.1.)	6
	· -	49

# Junior

PHYS 301 Thermal Physics I
PHYS 302 Analytic Mechanics
PHYS 303 Analytic Mechanics
PHYS 323 Optics
PHYS 341 Quantum Physics Laboratory
PHYS 342 Quantum Physics Laboratory
PHYS 363 Undergraduate Seminar
PHYS 405 Quantum Mechanics
MATH 304 Vector Analysis (B.2.)
MATH 418 Partial Differential Equations

	PSY 201/PSY 202 General Psychology (E.1.)	3
	Arts and humanities elective (Area C)	3
	Fine and performing arts elective (C.2.)	3
ļ	Literature, philosophy, arts elective (300-400	
	level) (C.3.)	3
	Electives to complete major or concentration	9

#### Senior

1	Technology elective (F.2.) Electives to complete major or concentration	3 12 9
1	(D.1.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300–400 level) (D.4.b.)	3
	HIST 204 History of American Ideals and Institutions (D.1.) HIST 315 Modern World History (D.2.) POLS 210 American and California Government	3
	PHYS 408 Electromagnetic Fields and Waves PHYS 409 Electromagnetic Fields and Waves PHYS 461 Senior Project PHYS 462 Senior Project	4 3 2 2

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 86 of this catalog.

# ADVANCED PHYSICS ELECTIVES OR CONCENTRATION

Select either the advanced physics electives or one of the concentrations.

# **Advanced Physics Electives (21)**

Select one of the following: PHYS 403, 406, 412. Select 18 units of approved physics electives (listed below). For students anticipating an industrial career PHYS 412, PHYS 452, PHYS 413, PHYS 423 are suggested electives. For students anticipating graduate work in physics, PHYS 401, PHYS 406, PHYS 423, and PHYS 424 are suggested electives.

PHYS 202 Physics and the Computer	3
PHYS 317 Special Theory of Relativity	3
PHYS 357 Advanced Instrumentation in Experimental	
Physics	3
PHYS 401 Thermal Physics II	3
PHYS 403 Nuclear Physics	3
PHYS 406 Quantum Mechanics	3
PHYS 410 Physics of the Solid Earth	3
PHYS 412 Solid State Physics	3
PHYS 413 Advanced Topics in Solid State Physics	3
PHYS 416 Theoretical Acoustics	3
PHYS 423 Advanced Optics	4
PHYS 424 Theoretical Physics	3
PHYS 452 Solid State Physics Laboratory	1
PHYS 470 Selected Advanced Topics	1-3
PHYS 471 Selected Advanced Laboratory	1
MATH 408 Functions of a Complex Variable	4

#### **Electronics Concentration**

Students will not be allowed to enroll in EE 301 until they have a) completed PHYS 357 and MATH 318, and b) received the approval of advisers in both Physics and Electrical/Electronics Engineering. Students will then be allowed to enroll in EE courses with physics courses substituting for EE prerequisites.

PHYS 357 Advanced Instrumentation in Experimental

Physics	3
EE 301 Linear Systems Analysis	3
EE 302 Linear Control Systems	3
EE 307 Digital Integrated Electronics	3
EE 341 Linear Analysis Laboratory	1
EE 342 Control Systems Laboratory	1
EE 347 Digital Integrated Electronics Laboratory	1
EE electives to be selected from the following list:	6
LL 300, 303, 313, 320, 340, 349, 353	
	21

#### **Electro-optics Concentration**

Students will not be allowed to enroll in EE 301 until they have a) completed PHYS 357 and MATH 318, and b) received approval of advisers in both Physics and Electrical/Electronics Engineering. Students will then be allowed to enroll in EE courses with physics courses substituting for EE prerequisites.

PHYS 357 Advanced Instrumentation in Experimental	
Physics	3
PHYS 423 Advanced Optics	4
EE 301 Linear Systems Analysis	3
EE 341 Linear Analysis Laboratory	1
EE 403 Fiber Optics Communication	3
EE 418 Electro-Optical Engineering	3
EE 443 Fiber Optics Laboratory	1
Electives to be selected from the following list:	3
EE 302, 307, 308, 309, 328, 342, 347, 348, 349,	
414	

# 21

Units

**B.S. PHYSICS** 

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

MAJOR COURSES	69
PHYS 133, 206, 211, 212, 243, 256, 301, 302, 303,	
323, 341, 342, 363, 405, 408, 409, 461, 462	
Advanced Physics Electives or Concentration (21)	
Advanced Physics Electives	
Select one of the following: PHYS 403, 406, 412.	
Select 18 units of approved physics electives	
from:	
PHYS 202, 317, 357, 401, 403, 406, 410, 412,	
413, 416, 423, 424, 452, 470, 471	
MATH 408	
Electronics Concentration	
PHYS 357	
EE 301, 302, 307, 341, 342, 347	
Electives to be selected from: EE 308, 309,	
313, 328, 348, 349, 353	

Electro-optics Concentration	-	
PHYS 357, 423		
EE 301, 341, 403, 418, 443		
Electives (3 to be selected from: EE 302, 307,		
308, 309, 328, 342, 347, 348, 349, 414)		
SUPPORT COURSES	5	5
CHEM 127 (B.1.a.), 128 (B.1.a.), 129		
MATH 141 (B.2.), 142, 143, 241, 242, 304 (B.2.),		
318, 418		
PHYS 131, 132		
CSC 118/204. (F.1.) CSC 118 recommended.		
GENERAL EDUCATION AND BREADTH		
REQUIREMENTS	6	1

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Support Courses.

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

Area B: (3) Life sciences elective (B.1.)

Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300–400 level) (C.3.) Arts and humanities elective (Area C)

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

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

#### Area F: (3) Technology elective (F.2.)

ELECTIVES	9

#### 194

# **CURRICULUM FOR B.S. PHYSICAL SCIENCE**

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

Units

46

#### Freshman

1

PHYS 131, PHYS 132 General Physics or	
PHYS 121, PHYS 122 College Physics (B.1.a.)	4,4
CHEM 127 General Chemistry (B.1.a.)	4
CHEM 128 General Chemistry	4
CHEM 129 General Chemistry	4
MATH 141, MATH 142, MATH 143 Calculus I, II,	
III <i>or</i> MATH 131, MATH 132, MATH 133	
Technical Calculus (B.2.)	4,4,4
ENGL 114 Writing: Exposition (A.1.)	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking	
(A.2.)	3
ENGL 215 Writing: Argumentation or ENGL	
218 Professional Writing: Argumentation	
and Reports (A.4.)	4
PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3

# Sophomore

	GEOL 201 Physical Geology	3
l	Chemistry electives (CHEM 326/316 and CHEM	
	328/371)	4,4
	200-level MATH, CSC, or STAT electives	8
	Adviser approved Physics elective	3
1	Physics electives (PHYS 133/PHYS 123 and PHYS	
	211)	4,4
	BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)	2
	CSC 110 Computers and Computer Applications or	
	CSC 410 Computer Fundamentals for Educators	
	(F.1.)	3
	HIST 204 History of American Ideals and	_
	Institutions (D1)	3
	HIST 315 Modern World History (D 2)	3
	POLS 210 American and California Government	-
	(D1)	3
	DSV 201/DSV 202 Ceneral Psychology (E1)	3
	SPC 201 Public Speaking or	5
	SPC 201 Fublic Speaking 0/	
	SPC 202 Finciples of Speech Communication	2
	(A.J.)	
		50

#### Junior

ASTR 301 The Solar System or	
ASTR 302 Stars and Galaxies	3
CHEM 301 Biophysical Chemistry or	
CHEM 305 Physical Chemistry (B.1.a.)	3
Adviser approved Astronomy and/or earth science	
elective	4
Adviser approved Chemistry elective	4
Adviser approved physical science electives	
(300–400 level)	3,3
ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
ECON 201/ECON 211/ECON 222 (D.3.)	3

2	Critical reading electives (C.1.)	6
2	Life science elective (B.1.b.)	3
3	Electives	12
	, <del> </del>	47

#### Senior

	CHEM 461, PHYS 461, or PSC 461 Senior Project Adviser approved physical sciences elective (300–400 level) (Prospective teachers take	2
	PSC 424)	3
2	Adviser approved Physics elective (300–400 level) ANT/BUS/ECON/GEOG/POLS/SOC elective	3
	(300-400 level) (D.4.b.)	3
2	Arts and humanities elective (Area C)	3
2	Fine and performing arts elective (C.2.)	3
2	Literature, philosophy, arts elective (300–400	3
2	Technology elective (F 2 )	3
3	Electives	23
	-	46
	=	189

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Physics and Physical Science and other subjects.

<sup>1</sup> A choice of the PHYS 121, PHYS 122, PHYS 123 sequence or CHEM 326 or CHEM 328 restricts the Physics and Chemistry electives available to the student later in this program.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 86 of this catalog.

<sup>3</sup> Students planning on qualifying for a teaching credential must take EDUC 302, 305, 403, 404, 405, 409, 410, 420.

# **B.S. PHYSICAL SCIENCE**

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

Units

ASTR 301/302 CHEM 128 (B.1.a.), 129 (B.1.a.), 301 or 305 (B.1.a.) GEOL 201 PHYS 132/122 (B.1.a.) <sup>1</sup> Chemistry electives (CHEM 326/316 and CHEM 328/371) (8) <sup>1</sup> Physics electives (PHYS 133/123 and PHYS 211) (8) Adviser approved Astronomy and/or earth science elective (4) Adviser approved Astronomy and/or earth science elective (4) Adviser approved Physics electives (at least 3 units at 300–400 level) (6) Adviser approved physical sciences electives (300–400 level) (Prospective teachers take PSC 424) (9) CHEM 461, PHYS 461, or PSC 461 <b>SUPPORT COURSES</b>	MAJOR COURSES		
<ul> <li>CHEM 128 (B.1.a.), 129 (B.1.a.), 301 or 305 (B.1.a.)</li> <li>GEOL 201 PHYS 132/122 (B.1.a.)</li> <li><sup>1</sup> Chemistry electives (CHEM 326/316 and CHEM 328/371) (8)</li> <li><sup>1</sup> Physics electives (PHYS 133/123 and PHYS 211) (8)</li> <li>Adviser approved Astronomy and/or earth science elective (4)</li> <li>Adviser approved Astronomy and/or earth science elective (4)</li> <li>Adviser approved Physics electives (at least 3 units at 300–400 level) (6)</li> <li>Adviser approved physical sciences electives (300–400 level) (Frospective teachers take PSC 424) (9)</li> <li>CHEM 461, PHYS 461, or PSC 461</li> <li>SUPPORT COURSES</li></ul>	ASTR 301/302		
<ul> <li>GEOL 201</li> <li>PHYS 132/122 (B.1.a.)</li> <li><sup>1</sup> Chemistry electives (CHEM 326/316 and CHEM 328/371) (8)</li> <li><sup>1</sup> Physics electives (PHYS 133/123 and PHYS 211) (8)</li> <li>Adviser approved Astronomy and/or earth science elective (4)</li> <li>Adviser approved Chemistry elective (4)</li> <li>Adviser approved Physics electives (at least 3 units at 300–400 level) (6)</li> <li>Adviser approved physical sciences electives (300–400 level) (6)</li> <li>Adviser approved physical sciences electives (300–400 level) (Prospective teachers take PSC 424) (9)</li> <li>CHEM 461, PHYS 461, or PSC 461</li> <li>SUPPORT COURSES 31</li> <li>CHEM 127 (B.1.a.)</li> <li>CSC 110/410 (F.1.)</li> <li>MATH 141, 142, 143 or MATH 131, 132, 133 (B.2.)</li> <li>PHYS 131/121 (B.1.a.)</li> <li>200-level MATH, CSC, or STAT electives (8)</li> <li>GENERAL EDUCATION AND BREADTH REQUIREMENTS. 61</li> </ul>	CHEM 128 (B.1.a.), 129 (B.1.a.), 301 or 305 (B.1.a.)		
<ul> <li>PHYS 132/122 (B.1.a.)</li> <li><sup>1</sup> Chemistry electives (CHEM 326/316 and CHEM 328/371) (8)</li> <li><sup>1</sup> Physics electives (PHYS 133/123 and PHYS 211) (8)</li> <li>Adviser approved Astronomy and/or earth science elective (4)</li> <li>Adviser approved Chemistry elective (4)</li> <li>Adviser approved Physics electives (at least 3 units at 300–400 level) (6)</li> <li>Adviser approved physical sciences electives (300–400 level) (6)</li> <li>Adviser approved physical sciences electives (300–400 level) (Prospective teachers take PSC 424) (9)</li> <li>CHEM 461, PHYS 461, or PSC 461</li> <li>SUPPORT COURSES 31</li> <li>CHEM 127 (B.1.a.)</li> <li>CSC 110/410 (F.1.)</li> <li>MATH 141, 142, 143 or MATH 131, 132, 133 (B.2.)</li> <li>PHYS 131/121 (B.1.a.)</li> <li>200-level MATH, CSC, or STAT electives (8)</li> <li>GENERAL EDUCATION AND BREADTH REQUIREMENTS. 61</li> </ul>	GEOL 201		
<ul> <li><sup>1</sup> Chemistry electives (CHEM 326/316 and CHEM 328/371) (8)</li> <li><sup>1</sup> Physics electives (PHYS 133/123 and PHYS 211) (8)</li> <li>Adviser approved Astronomy and/or earth science elective (4)</li> <li>Adviser approved Chemistry elective (4)</li> <li>Adviser approved Physics electives (at least 3 units at 300–400 level) (6)</li> <li>Adviser approved physical sciences electives (300–400 level) (Prospective teachers take PSC 424) (9)</li> <li>CHEM 461, PHYS 461, or PSC 461</li> <li>SUPPORT COURSES</li></ul>	PHYS 132/122 (B1a)		
<ul> <li><sup>1</sup> Physics electives (PHYS 133/123 and PHYS 211) (8)</li> <li>Adviser approved Astronomy and/or earth science elective (4)</li> <li>Adviser approved Chemistry elective (4)</li> <li>Adviser approved Physics electives (at least 3 units at 300–400 level) (6)</li> <li>Adviser approved physical sciences electives (300–400 level) (Prospective teachers take PSC 424) (9)</li> <li>CHEM 461, PHYS 461, or PSC 461</li> <li>SUPPORT COURSES</li></ul>	<ol> <li>Chemistry electives (CHEM 326/316 and CHEM 328/371) (8)</li> </ol>		
Adviser approved Astronomy and/or earth science elective (4) Adviser approved Chemistry elective (4) Adviser approved Physics electives (at least 3 units at 300–400 level) (6) Adviser approved physical sciences electives (300–400 level) (Prospective teachers take PSC 424) (9) CHEM 461, PHYS 461, or PSC 461 <b>SUPPORT COURSES</b>	<sup>1</sup> Physics electives (PHYS 133/123 and PHYS 211 (8)	)	
Adviser approved Chemistry elective (4) Adviser approved Physics electives (at least 3 units at 300–400 level) (6) Adviser approved physical sciences electives (300–400 level) (Prospective teachers take PSC 424) (9) CHEM 461, PHYS 461, or PSC 461 <b>SUPPORT COURSES</b>	Adviser approved Astronomy and/or earth scien elective (4)	ce	
Adviser approved Physics electives (at least 3 units at 300–400 level) (6) Adviser approved physical sciences electives (300–400 level) (Prospective teachers take PSC 424) (9) CHEM 461, PHYS 461, or PSC 461 <b>SUPPORT COURSES</b>	Adviser approved Chemistry elective (4)		
Adviser approved physical sciences electives (300–400 level) (Prospective teachers take PSC 424) (9) CHEM 461, PHYS 461, or PSC 461 <b>SUPPORT COURSES</b>	Adviser approved Physics electives (at least 3 units at 300–400 level) (6)		
424) (9)       General EDUCATION AND BREADTH         81       61         82       SUPPORT COURSES         81       General EDUCATION AND BREADTH         82       General EDUCATION and BreadTH         83       General EDUCATION and BreadTH         84       General EDUCATION EDUC	Adviser approved physical sciences electives (300–400 level) (Prospective teachers take PS	SC	
SUPPORT COURSES       31         CHEM 127 (B.1.a.)       31         CSC 110/410 (F.1.)       MATH 141, 142, 143 or MATH 131, 132, 133         (B.2.)       PHYS 131/121 (B.1.a.)         200-level MATH, CSC, or STAT electives (8)         GENERAL EDUCATION AND BREADTH         REQUIREMENTS	(424) (3) CHENA 461 DHVS 461 or DSC 461		
SUPPORT COURSES       31         CHEM 127 (B.1.a.)       CSC 110/410 (F.1.)         MATH 141, 142, 143 or MATH 131, 132, 133       (B.2.)         PHYS 131/121 (B.1.a.)       200-level MATH, CSC, or STAT electives (8)         GENERAL EDUCATION AND BREADTH       61		21	
CHEM 127 (B.1.a.) CSC 110/410 (F.1.) MATH 141, 142, 143 or MATH 131, 132, 133 (B.2.) PHYS 131/121 (B.1.a.) 200-level MATH, CSC, or STAT electives (8) GENERAL EDUCATION AND BREADTH REQUIREMENTS		31	
CSC 110/410 (F.1.)         MATH 141, 142, 143 or MATH 131, 132, 133         (B.2.)         PHYS 131/121 (B.1.a.)         200-level MATH, CSC, or STAT electives (8)         GENERAL EDUCATION AND BREADTH         REQUIREMENTS	CFEWI 127 (D.1.d.)		
MATH 141, 142, 143 or MATH 131, 132, 133         (B.2.)         PHYS 131/121 (B.1.a.)         200-level MATH, CSC, or STAT electives (8)         GENERAL EDUCATION AND BREADTH         REQUIREMENTS			
(B.2.) PHYS 131/121 (B.1.a.) 200-level MATH, CSC, or STAT electives (8) GENERAL EDUCATION AND BREADTH REQUIREMENTS	MATH 141, 142, 143 or MATH 131, 132, 133		
PHYS 131/121 (B.1.a.) 200-level MATH, CSC, or STAT electives (8) GENERAL EDUCATION AND BREADTH REQUIREMENTS	(B.2.)		
200-level MATH, CSC, or STAT electives (8) GENERAL EDUCATION AND BREADTH REQUIREMENTS	PHYS 131/121 (B.1.a.)	• •	
GENERAL EDUCATION AND BREADTH REQUIREMENTS	200-level MATH, CSC, or STAT electives (8)		
REQUIREMENTS	GENERAL EDUCATION AND BREADTH		
	REQUIREMENTS	61	

Please see page 86 for selection of General Education and Breadth (G.E.B.) electives. At least 12 units must be at the 300–400 level. Additional GEB courses are listed under Major and Support Courses.

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Area A: (14)
ENGL 114 (A.1.)
ENGL 125/PHIL 125/SPC 125 (A.2.)
SPC 201/SPC 202, (A.3.)
ENGL 215/ENGL 218 (A.4.)
Area B: (3)
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Life sciences elective (B.1.)

Area C: (18)

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

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

Area E: (5) PSY 201/PSY 202 (E.1.) BIO 220/FSN 210/PE 250/PSY 304/REC 100 elective (E.2.)	
Area F: (3) Technology elective (F.2.) ELECTIVES	35
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Students planning on qualifying for a teaching credential must take EDUC 302, 305, 403, 404, 405, 409, 410, 420.

<sup>&</sup>lt;sup>1</sup> A choice of the PHYS 121, 122, 123 sequence or CHEM 326 or CHEM 328 restricts the Physics and Chemistry electives available to the student later in this program.

# STATISTICS DEPARTMENT

Faculty Office Building (47), Room 28A (805) 756-2709

# Faculty

#### Department Chair, Roxy L. Peck

James C. Daly Jay L. Devore John E. Groves Y. Leon Maksoudian John M. Rogers Richard J. Rossi Robert K. Smidt Kent D. Smith Sing-Chou Wu

# Programs

**B.S. Statistics** 

**Minor: Statistics** 

The Statistics Department has two primary purposes-to offer introductory statistics courses to students from many different majors at Cal Poly, and to offer a curriculum of diverse statistics courses for those students pursuing a Bachelor of Science degree in Statistics.

In this age of high technology it has become increasingly easy to record and store information resulting from experiments, surveys, and historical studies. It is the responsibility of the professional statistician to determine the best ways to collect, summarize and analyze these data. Because of the increasing number of quantitative studies that are conducted in fields ranging from medicine to agriculture to business, the professional statistician is in great demand.

The National Science Foundation estimates that statistics is one of the few areas that will have more openings in the 1990's than there are individuals with degrees in that area. Recent graduates of the program at Cal Poly are working for companies in fields as diverse as insurance, weapons testing, aircraft manufacturing, banking, and computer manufacturing.

The statistics degree program requires students to have a substantial amount of coursework in mathematics and computer science. With this basis the students take courses in the following statistics areas–analysis of variance, regression analysis, statistical use of computers, sampling methods, non-parametric analysis, multivariate analysis, and mathematical statistics. In the various courses the students make use of computer systems available at Cal Poly.

Throughout the program faculty encourage students to work on practical, realistic problems that require the understanding of all aspects of the data acquisition and analysis problem.

# **CURRICULUM FOR B.S. STATISTICS**

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

Unit	5
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# Freshman

	CSC 118 Fundamentals of Computer Science I	
	(F.1.)	4
	MATH 141 Calculus I (B.2.)	4
	MATH 142 Calculus II (B.2.)	4
	MATH 143 Calculus III	4
	ENGL 114 Writing: Exposition (A.1.)	4
	ENGL 125/PHIL 125/SPC 125 Critical Thinking	
	(A.2.)	3
	ENGL 215 Writing: Argumentation or ENGL	
	218 Professional Writing: Argumentation	
	and Reports (A.4.)	4
	HIST 204 History of American Ideals and	
	Institutions (D.1.)	3
	POLS 210 American and California Govt. (D.1.)	3
	PSY 201/PSY 202 General Psychology (E.1.)	3
1	Physical or life science electives (one each, one	
	with lab) (B.1.)	4,3
2	Elective	3

#### Sophomore

	STAT 321 Statistical Analysis	3
	STAT 322 Statistical Analysis	4
	MATH 241 Calculus IV	4
	MATH 242 Differential Equations	4
	MATH 206 Linear Albegra I	4
	MATH 248 Methods of Proof in Mathematics	4
	ANT 201/GEOG 150/SOC 105 (D.4.a.)	3
	PHIL 230/PHIL 231 Philosophical Classics (C.1.)	3
	SPC 201 Public Speaking or	
	SPC 202 Prin. of Speech Communication (A.3.).	3
	BIO 220/FSN 210/PE 250/PSY 304/REC 100 (E.2.)	2
1	Critical reading electives (C.1.)	6
1	Economics elective (D.3.)	3
1	Fine and performing arts elective (C.2.)	3
3	Approved technical elective	3

#### Junior

	STAT 323 Analysis of Variance	3
	STAT 324 Applied Regression Analysis	3
	STAT 330 Statistical Uses of Computers	3
	CSC 201 FORTRAN Programming	3
	CSC 332 Numerical Analysis I	3
4	Approved MATH electives (300-400 level)	6
1	Literature, philosophy, arts elective (300-400	
	level) (C.3.)	3
1	Physical or life science elective (300-400 level)	
	(B.1.)	3
	Statistics elective (400 level)	3
2	Electives	15
	·	45

~	•
Sei	nor

	STAT 423 Linear Models	3
	STAT 425 Probability Theory and Applications L	3
	STAT 426 Probability Theory and Applications II	3
	STAT 427 Mathematical Statistics	3
	STAT 461 Senior Project	2
	STAT 462 Senior Project	2
	STAT 463 Undergraduate Seminar	2
	HIST 315 Modern World History (D.2.)	3
1	ANT/BUS/ECON/GEOG/POLS/SOC elective	
	(300–400 level) (D.4.b.)	3
1	Arts and humanities elective (Area C)	3
	Statistics electives (400 level)	6
1	Technology elective (F.2.)	3
3	Approved technical elective	3
2	Electives	10
		49
	•	189

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

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements (at least 12 units must be at 300-400 level). Please see page 86 of this catalog.

<sup>2</sup> Of the total elective units, at least 15 units must be selected with the ap-

<sup>3</sup> Of the total elective units, at least 15 units must be selected with the approval of adviser in one field in which statistics is applied.
<sup>3</sup> Selected from the following list of courses: CSC 219 or IE 304, IE 305, CSC 350 or IE 420, IE 430, IE 435.
<sup>4</sup> Selected from the following list of courses: MATH 306, MATH 335, MATH 200, MATH 430, MATH 43

336, MATH 406, MATH 412, MATH 431, MATH 437.

# **B.S. STATISTICS**

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

	Units
MAIOR COURSES	65
CSC 201. 332	
MATH 142 (B.2.), 143, 241, 242	
STAT 321, 322, 323, 324, 330, 423, 425, 426, 427,	
461, 462, 463	
Statistics electives (400 level) (9)	
SUPPORT COURSES	43
CSC 118 (F.1.)	
MATH 141 (B.2.), 206, 248	
Approved technical electives (6) to be selected	
from: CSC 219 or IE 304, IE 305, CSC 350 or IE	
420, IE 430, IE 435.	
from MATH 20( 225 23( 40( 412 421 427	
TOM: MATH 306, 335, 336, 406, 412, 431, 437.	
Adviser approved electives in one field in which	
GENERAL EDUCATION AND BREADTH	(0)
KEQUIKEMEN IS	60
Please see page 86 for selection of General Education a Breadth (G.E.B.) electives. At least 12 units must be at 300–400 level. Additional GEB courses are listed under and Support Courses.	nnd the Major
Area A: (14) ENGL 114 (A.1.) ENGL 125/PHIL 125/SPC 125 (A.2.) SPC 201/SPC 202 (A.3.)	

ENGL 215/ENGL 218 (A.4.)

Area B: (10)
Physical and life sciences electives (one each, one with lab) (B.1.)
Physical or life science elective (300-400 level) (B.1.)

Area C: (18) PHIL 230/PHIL 231 (C.1.) Critical reading electives (C.1.) Fine and performing arts elective (C.2.) Literature, philosophy, arts elective (300–400 level) (C.3.) Arts and humanities elective (Area C)

Area D: (18) HIST 204 (D.1.), POLS 210 (D.1.) HIST 315 (D.2.) ECON 201/211/222 (D.3.) ANT 201/GEOG 150/SOC 105 (D.4.a.) ANT/BUS/ECON/GEOG/POLS/SOC elective (300-400 level) (D.4.b.) Area E: (5) PSY 201/PSY 202 (E.1.) BIO 220/FSN 210/PE 250/PSY 304/REC 100 elective (E.2.) Area F: (3)

Technology elective (F.2.) ELECTIVES 13

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# **CURRICULUM FOR STATISTICS MINOR**

	Units
<ul> <li>Select one of the following introductory sequences</li> <li>STAT 211 Elementary Probability and Statistics (3), and STAT 212 Statistical Methods (3)</li> <li>STAT 251 Statistical Inference for Mgmt. I (4), and STAT 252 Statistical Inference for Mgmt. II (4)</li> <li>STAT 321 Statistical Analysis (3) and STAT 322 Statistical Analysis (4)</li> </ul>	68
<ul> <li>Select from the following</li> <li>STAT 313 Applied Experimental Design and Regression Models (3) or STAT 323 Analysis of Variance (3)</li> <li>STAT 324 Applied Regression Analysis (3)</li> <li>STAT 330 Statistical Uses of Computers (3)</li> </ul>	9
Select from any 400-level STAT course	6
Coordinator Sample Survey Design of Experiment Multivariate Techniques Quality Control Regression Special Topics	6

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# **University Center for Teacher Education**

# **DEGREE PROGRAMS**

# M.A. Education

Computer Based Education Specialization Counseling and Guidance Specialization Curriculum and Instruction Specialization Educational Administration Specialization Reading Specialization Special Education Specialization

# **TEACHING CREDENTIAL PROGRAMS**

#### 340

# UNIVERSITY CENTER FOR TEACHER EDUCATION

Dexter Bldg. (34), Room 213 (805) 756- 2583

# Faculty

#### **Director, Susan Roper**

MaryLud Baldwin Donald Cheek Leonard Davidman Erland G. Dettloff Howard Drucker Margaret J. Glaser Robert L. Levison Donald K. Maas Susan L. McBride Don M. Morris Patricia A. Mulligan Dennis M. Nulman Kenneth F. Palmer Louis D. Pippin David J. Sanchez Bernard A. Troy

The following faculty participate with the University Center for Teacher Education and hold academic rank in a department outside the Center:

Frederick P. AndoliJerome F. HoulisC. Andrea BrownSarah S. LordCarl R.V. BrownLynn S. MosherGlen R. CaseyH. Bernard StrickmeierPhilip L. FetzerMarylinda WheelerAlan W. HolzRaymond F. Zeuschner

Programs

M.A. Education with Specializations in:

Computer Based Education Counseling and Guidance Curriculum and Instruction Education Administration Reading Special Education

The University Center for Teacher Education is a recently organized unit of Cal Poly. It is designed to promote an all-University approach toward teacher education and to develop a strong, collaborative, and enduring partnership with area school districts.

The Center offers a wide variety of courses and programs leading to careers in education. Common to all programs is a commitment to excellence, to cooperation and collaboration, to preparation for future educational challenges. A pronounced teaching shortage is upon us. As the state's population grows, enrollments in grades K–12 increase and with them the demand for teachers. New roles and responsibilities for highly competent teachers are developing, and teaching can lead to specialist positions in administration, curriculum planning, counseling, special education, reading, or computer-based education. To meet the need for excellent teachers the Center seeks talented, creative students who are committed to a long-term career in education and to the improvement of educational processes and institutions.

The University Center for Teacher Education offers a Master of Arts degree in Education with a broad range of specializations and teaching credential programs for qualified candidates. The M.A. in Education has areas of specialization in: Computer Based Education, Counseling and Guidance, Curriculum and Instruction, Educational Administration, Reading, and Special Education.

Credential programs include preliminary and professional clear teaching credentials in single and multiple subjects. Service and specialist credentials in Administrative Services, Pupil Personnel Services, Reading Specialist and Special Education Specialist (Learning Handicapped and Severely Handicapped) are also offered. To accommodate the working professional, courses are offered during the late afternoon and evening.

Stressing the "learn by doing" philosophy of Cal Poly, the University Center for Teacher Education provides opportunities for extensive student on-site observation and fieldwork. Cal Poly maintains cooperative relations with the surrounding school districts, and within our service area students can enjoy cross-cultural, urban and rural fieldwork. Additionally, the Center operates the Reading Clinic, providing diagnostic and remedial services for clients of school age.

# MASTER OF ARTS DEGREE-EDUCATION

# **General Characteristics**

The Master of Arts degree in Education is designed to provide both a broad-based perspective of education and increased competence in positions of special responsibility. The specializations are closely related to the occupational and professional requirements of a variety of vocational pursuits in the fields of education, counseling, college student affairs, and agencies involved with community affairs.

# **Program of Study**

All programs require a minimum of 45 quarter units of acceptable graduate work, with at least 24 units of 500-level Education courses. Courses taken in these programs may also be applied toward related credentials.

The candidate must maintain a grade point average of 3.0 (B) or better in all coursework attempted subsequent to admission to postbaccalaureate standing. Calculation of the grade point average will include all grades, although only the courses with A, B, or C grades will be counted to satisfy requirements for the degree. Required courses with a D or F grade must be repeated in all M.A. programs. All candidates must meet the current Graduation Writing Requirement.

Credits earned in student teaching will not be accepted toward completion of any specialization within the Master of Arts in Education. At least 36 program-required quarter units shall be completed in residence. Transfer and/or extension credits will only be accepted when the credits are acceptable for master's degree credit by the offering institution in its own programs.

Depending on the specialization, final assessment of a candidate's progress shall include a comprehensive written examination and EDUC 590 Research Applications in Education, *or* the completion of a thesis/project. Although only six units of credit may be applied to the degree requirements, students must enroll in EDUC 599 Thesis/Project for every quarter in which they are receiving advisement.

# **Conditionally Classified Standing**

The student may enroll in a graduate degree curriculum, if in the opinion of the appropriate campus authority, the student can remedy any deficiencies by additional preparation.

# **Classified Standing**

For admission as a classified graduate student, a student shall have a minimum grade point average of 3.0 in the last 90 quarter units attempted. A student shall have earned an acceptable baccalaureate degree from a regionally accredited institution. Or, the student shall have completed equivalent academic preparation and have satisfactorily met the professional, personal, scholastic, and other standards for graduate study, including qualifying examinations, as the appropriate university authorities may prescribe. Only those applicants who show promise of success and fitness will be admitted to the graduate degree program, and only those who continue to demonstrate a satisfactory level of scholastic competence and who possess appropriate personal qualities will be eligible to continue in such a program.

# Advancement to Candidacy

Advancement to master's degree candidacy requires completion of a minimum of 24 quarter units of program-required courses in residence, specified in a formal program of study, with a minimum grade point average of 3.0 and the formal recommendation of the specialization faculty. Students must maintain a minimum grade point average of 3.0 in all coursework included on the formal program of study, and in all coursework completed subsequent to admission to postbaccalaureate standing.

# M.A. EDUCATION, SPECIALIZATION IN COMPUTER BASED EDUCATION

The Computer Based Education specialization is designed to prepare teachers and other school personnel to develop and use computer programs for classroom instruction. Graduates of this program are expected to be capable of producing their own courseware and software; of integrating available software and technology into the curriculum; and of providing leadership in the modification of curriculum to take advantage of technological benefits. Either EDUC 590 and a written comprehensive examination or EDUC 599 is required for completion of the degree program.

# Prerequisites

Students entering the Computer Based Education Program are expected to display proficiency in programming or to take additional coursework after admission to develop this proficiency.

1 Inite

	Onnes
Education Core EDUC 587 Educational Foundations and Current Issues (4)	13
EDUC 588 Education, Culture and Learning (4) EDUC 589 Research Methods and Analysis in Education (5) Required Courses in Area of Specialization	10
CSC 413 Authoring Languages (4) CSC 414 Authoring Languages and Systems (4) CSC 416 Computer Applications in School Administration (3)	19
<ul> <li>CSC 427 Computer Based Educational Systems I <ul> <li>(4)</li> </ul> </li> <li>1 EDUC 590 Research Applications in Education (4)</li> <li>Electives to be selected with adviser's approval</li></ul>	13
-	45

<sup>1</sup> If EDUC 599 Thesis/Project is selected in lieu of EDUC 590, student must register for credit each quarter of advisement.

# M.A. EDUCATION, SPECIALIZATION IN COUNSELING AND GUIDANCE

The Master of Arts degree in Education with a Counseling and Guidance Specialization is designed to prepare students for careers in public or private school counseling or student affairs work in higher education. Admission to the program requires gualifying examinations, references, an autobiographical statement, and an interview. Coursework in developmental psychology is a prerequisite for this M.A. program. Candidates who have not completed such a class will not be denied admission to the university, but will be required to remove the deficiency as soon as possible. Pupil Personnel Services (PPS) Credential candidates must meet credential requirements of the State of California. Only six guarter units of fieldwork experience will apply toward the M.A., although additional fieldwork will be required to meet PPS credential and student affairs requirements. Student affairs candidates must include EDUC 562 in their formal program of study. EDUC 590 and a comprehensive examination or EDUC 599 are required. Courses taken in this program may be applied toward a fifth-year study for a clear teaching credential. Candidates whose goals are for clinical counseling careers in agency settings or in private practice should refer to the Master of Science degree program in Psychology in the Psychology and Human Development Department.

Education Core	13
EDUC 587 Educational Foundations and Current	
EDLIC ESS Education Culture and Learning (4)	
EDUC 500 Education, Culture and Learning (4)	
EDUC 589 Research Methods and Analysis in	
Education (5)	
Required in the Area of Specialization	29
EDUC 555 Counseling and Communication (4)	
EDUC 556 Ethnic Counseling (4)	
EDUC 557 Career Development (4)	
EDUC 560 Counseling Theories and Assessment	
(4)	
EDUC 561 Group Counseling (3)	
EDUC 573 Field Experience-Counseling (6)	
<sup>1</sup> EDUC 590 Research Applications in Education (4)	
Electives (to be selected with adviser's approval)	6
. –	48

Units

# M.A. EDUCATION, SPECIALIZATION IN CURRICULUM AND INSTRUCTION

The Curriculum and Instruction Specialization aims at expanding the candidate's instructional skills and knowledge of curriculum at the elementary and/or secondary level. Candidates may want to improve their skills as classroom teachers; they may choose to enter positions as resource teachers, curriculum specialists, or instructional team leaders; or they may seek employment in the private sector in curriculum and training related positions. Courses taken in this program may be applied toward a fifth year of study for a clear teaching credential. In addition to the general prerequisites, applicants must have successfully completed student teaching or the equivalent prior to entering the program. Either EDUC 590 *and* a written comprehensive examination *or* EDUC 599 is required for the completion of a master's degree with a specialization in curriculum and instruction.

	Units
Education Core	13
EDUC 587 Educational Foundations and Current	
Issues (4)	
EDUC 588 Education, Culture and Learning (4)	
EDUC 589 Research Methods and Analysis in	
Education (5)	
Required in Area of Specialization	27
EDUC 501 Problems and Practices in Curriculum	
Development (3)	
EDUC 503 Seminar in Language Arts Curriculum	
and Methods (3)	
EDUC 504 Seminar in Science and Mathematics	
Curriculum and Methods (4)	
EDUC 505 Seminar in Social Studies Curriculum	
and Methods (3)	
EDUC 506 Models of Instruction (4)	
EDUC 507 Instructional Materials Tech. (3)	
EDUC 532 Adv. Field Experiences in Educ. (3)	
<sup>1</sup> EDUC 590 Research Applications in Education (4)	
Electives (selected with adviser's approval)	5
(Suggested Electives: EDUC 440, 450, 470, 480,	

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Units

# M.A. EDUCATION, SPECIALIZATION IN EDUCATIONAL ADMINISTRATION

511, 512, 513, 515, 526, 529, 555, PE 422)

This program is designed for career candidates in educational administration. It emphasizes a comprehensive knowledge of educational administration including applied theory of administration and leadership, schools in contemporary society, and effective management related to educational outcomes. While designed for career school administrators, the program can be helpful for administrators in other fields. EDUC 590 *and* a comprehensive written examination *or* EDUC 599 are required for completion of a masters degree with a specialization in Educational Administration.

Work in this program may be applicable to an Administrative Services Credential (See credential programs).

Education Core EDUC 587 Educational Foundations and Current Issues (4).	13
EDUC 588 Education, Culture and Learning (4)	
EDUC 589 Research Methods and Analysis in	
Education (5)	
Required in the Area of Specialization	12
EDUC 512 Educ. Organization and Mgmt. (4)	
EDUC 513 Educ. Planning Decision Making (4)	
<sup>1</sup> EDUC 590 Research Applications in Education (4)	
Electives (to be selected with adviser's approval)	20
Suggested electives: EDUC 501, 510, 511, 514, 515,	
516, 518, 542.	
-	45

<sup>1</sup> If EDUC 599 Thesis/Project is selected in lieu of EDUC 590, student must register for credit each quarter of advisement.

#### M.A. EDUCATION, SPECIALIZATION IN READING

The Master of Arts degree in Education with a specialization in Reading is designed to present the candidate an opportunity for advanced preparation in reading. Graduate students not meeting minimum standards may appeal for special consideration to the Reading Assessment Committee.

Either EDUC 590 *and* a written comprehensive examination *or* EDUC 599 is required for the completion of a master's degree with a specialization in reading.

Units 13

19

- Education Core ..... EDUC 587 Educational Foundations and Current Issues (4)
- EDUC 588 Education, Culture and Learning (4) EDUC 589 Research Methods and Analysis in Education (5)
- Required in Area of Specialization ..... EDUC 525 Reading Processes, Programs, and Technology (4)
  - EDUC 526 Diagnosing and Remediating Reading Problems (4)
  - EDUC 530 Secondary, College, and Adult Reading Practices (4)
  - EDUC 532 Advanced Field Experiences in Education (3)

<sup>1</sup> EDUC 590 Research Applications in Education (4)

Electives (to be selected with adviser's approval) ...... 13 Suggested electives: EDUC 529, 531.

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# M.A. EDUCATION, SPECIALIZATION IN SPECIAL EDUCATION

The Master of Arts degree with a specialization in Special Education is an academic program that offers the student an opportunity for advanced learning in Special Education. Applicants must meet personal and professional standards, including necessary qualifying examinations, presentation of personal recommendations, and a personal interview.

Units for the master's degree program can be applied towards the requirements for a clear single or multiple subjects teaching credential. It is also possible for the qualified student to complete the requirements for the Specialist Credential while pursuing the requirements for the Master of Arts degree in Education.

Either EDUC 590 *and* a written comprehensive examination *or* EDUC 599 is required for the completion of the Master's degree with a specialization in Special Education.

Units

Education (5)

Required in Area of Specialization	11
EDUC 547 Atypical Learning Patterns (4)	
EDUC 553 Current Issues in Special Education (3)	
<sup>1</sup> EDUC 590 Research Applications in Education (4)	
Electives (to be selected with adviser's approval)	21
-	45

<sup>1</sup> If EDUC 599 Thesis/Project is selected in lieu of EDUC 590, the student must register for credit each quarter of advisement.

# **Teaching Credential Programs**

# University Center for Teacher Education Services Center Dexter Bldg. (34), Room 216 (805) 756- 2126

The Teaching Credential Programs consist of coursework and field experiences, including student teaching, required to obtain the Preliminary and Professional Clear Multiple and Single Subject teaching credentials in California. Guidelines for credentials are established by the State of California's Commission on Teacher Credentialing (CTC).

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

# **Basic Credentials**

# (Preliminary and Professional Clear)

Multiple Subject Instruction (as commonly practiced in California elementary and middle schools) Multiple Subject - Bilingual Emphasis (Spanish) Single Subject Instruction (as commonly practiced in Cali-

fornia high schools and most junior high schools) Agriculture

English (and Speech Communication) History Home Economics Industrial and Technology Education Life Science (Biology) Mathematics Physical Education Physical Science (Chemistry and Physics) Government (Political Science) Social Science

# **Advanced Credentials**

#### Specialist Credentials (Clear)

Adapted Physical Education Specialist Agriculture Specialist Reading Specialist Special Education Learning Handicapped Specialist, and Severely Handicapped Specialist

# Services Credentials

Administrative Services (Preliminary and Professional) Pupil Personnel Services (Basic School Counseling)

The teaching credential programs typically take four quarters to complete. Applications are accepted during specific periods at the beginning of each Fall, Winter and Spring quarters (for these dates contact the UCTE 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. Further information, requirements and procedures for entering a particular credential program may be obtained from the appropriate credential program adviser (listing of program advisers is also available in the Services Center. The Master of Arts in Education section of this catalog contains additional information regarding graduate degree programs which may coincide with credential programs.

Candidates for the single subject teaching credential in Agriculture or the Agricultural Specialist credential may complete their preparation program through the Agricultural Education Department at Cal Poly. For further information or advisement students should communicate with the head of the Agricultural Education Department.

# Multiple and Single Subject Teaching Credential Program

#### **Admission Requirements**

- admission to Cal Poly as a postbaccalaureate student,
- required cumulative GPA (see below),
- evidence of passage of the California Basic Educational Skills Test (CBEST),
- evidence of passage of the National Teacher's Examination (NTE) or an approved Waiver (coursework) statement, and
- evidence of application for Certificate of Clearance (Multiple Subject only).

The requirements for admission to Cal Poly to pursue a Multiple Subject credential differ slightly from those for the Single Subject credential. Details concerning specific credential program admission requirements are available from the appropriate adviser, and in the advisement handbook.

Admission to the university does not guarantee admission to the teacher education program.

# Admission to the Teaching Credential Program-Step 1

To enter the credential program and to identify additional requirements that must be completed prior to beginning student teaching, a 'Step 1' application is to be submitted at least two quarters before student teaching (not including summer quarter). For most credential candidates this is done upon completion of the baccalaureate degree or during the first quarter of postbaccalaureate studies. Check with your credential program adviser and the credential handbook to be sure that all requirements are completed.

# Minimum Scholarship Standards for Admission to Teaching Credential Programs

Discipline	Minimum GPA
Division	1990-92

Note: GPA's are subject to change.

Single Subjects:

Agriculture	2.50
Biological Sciences	2.65
Education (includes Physical Education and	
Industrial Arts)	2.57
Home Economics (includes Child Development)	2.74
English (includes Speech)	2.75
Mathematics	2.65
Physical Sciences (includes Chemistry and Physics)	2.60
Social Sciences (includes History and Political	
Science)	2.65
Multiple Subjects	2.83

The candidate shall have a grade point average in the upper half of undergraduate students in the candidate's discipline division. The candidate's GPA shall be based on the cumulative work attempted at Cal Poly. In the absence of at least 45 quarter units of work attempted at Cal Poly, the GPA shall be based on cumulative work attempted at all colleges and universities. It is the prerogative of the major department to require a GPA which exceeds the mandated minimum standard. *These GPA's are subject to change.* 

#### **STEP 1 Requirements:**

Refer to most recent student handbook for specifics.

- Completion of an approved early field experience;
- a Certificate of Clearance;
- letters of recommendation;
- a professional aptitude interview with adviser;
- evidence of competency in oral reading, writing and speaking English;
- evidence of freedom from rubella and tuberculosis; and
- evidence of mathematics competency (Multiple Subject candidates only).

# Admission to Student Teaching -STEP II

#### 6 and 12 Unit Assignments

Applications must be made by Monday of the fourth week of the quarter before one plans to student teach. Six and twelve-unit student teaching assignments are to be completed in consecutive quarters.

Six-unit student teaching consists of a part-time (half-day) experience in the classroom, observing and teaching under the supervision of a coordinating teacher and a university supervisor.

Twevle-unit student teaching consists of a full-time all day experience with the student teacher gradually assuming responsibility for the class under the supervision of a cooperating teacher and university supervisor.

# Application for the Preliminary or Professional Clear Credential

Upon completion of Cal Poly's Teaching Credential Program (Multiple or Single Subject) each student must apply for their Preliminary or Professional Clear Credential. These applications are available through the UCTE Services Cneter and may be submitted as early as two weeks prior to completing the final credential requirements. See the credential handbooks for more information.

# Professional Clear Credential- Fifth Year of Study

To qualify for the Professional Clear Multiple or Single Subject credential candidates must complete the following requirements *beyond* the Preliminary credential requirements. This is also referred to as the Fifth Year of Study.

- 45 quarter units of adviser approved postbaccalaureate coursework;
- coursework in *Health Education* (PE 250, PE 305, and verification of completion of a training program in cardiopulmonary resuscitation (CPR);
- coursework in Special Education (EDUC 440, 4 units);
- coursework in Computer Education (EDUC 480, PE 350, MATH 300, or AGED 410), and
- recommendation from a California college or university with a CTC approved Teacher Preparation Program.

Passing the California Basic Education Skills Test (CBEST) is required for all credentials.

# **Minimum GPA Requirements**

Students may enter the credential program as an undergraduate or as a postbaccalaureate candidate. The minimum GPA which must be maintained each quarter after admission to the program for undergraduate candidates is the same as their required admission GPA (see above table).

Postbaccalaureate candidates must maintain a 3.00 quarterly GPA. The required grade point averages must be maintained in both the professional education coursework (see Credential Program Handbook for specific courses) and all other coursework attempted after admission to the credential program.

# **ADVANCED CREDENTIALS**

### **Administrative Services**

The Educational Administration program offers two credential programs, one leading to recommendation for the Preliminary Administrative Services Credential, the second leading to recommendation for the Professional Administrative Services Credential.

The preliminary program is designed to prepare candidates for the Preliminary Administrative Services Credential which authorizes service in any administrative position, any grade level. It requires 44 quarter units, most of which are applicable to the Master of Arts degree with a Specialization in Educational Administration.

In consonance with the Master of Arts program, the credential program emphasizes a comprehensive knowledge of public school administration including applied theory of administration and leadership, schools in contemporary society, and effective management related to educational outcomes.

The credential emphasizes applied theory with actual experience in fieldwork assignments and an evaluation of administrative competence as a basis for credential recommendation.

The professional credential program prepares candidates for the Professional Administrative Services Credential. This program requires 36 quarter units of work, a minimum of 12 units of which must be advanced fieldwork, and 18 units must be appropriate coursework. Candidates must hold a Preliminary Administrative Services Credential or M.A. degree to be admitted.

The program emphasizes advanced skill development in building-level or central office administration with emphasis on the job application of management skills.

For credential recommendation the candidate must, in addition to completing the program of study, have had two years of successful administrative experience and meet program competency review criteria.

For more information regarding this program, contact the Coordinator, Administrative Services, University Center for Teacher Education.

# **Bilingual Emphasis**

The Multiple Subject Credential, Bilingual Emphasis (Spanish) is designed to prepare teachers for bilingual classrooms. Basic mastery of oral and written Spanish and knowledge of Hispanic culture are required for admission to the program. Courses in bilingual classroom teaching methods supplement the regular credential program requirements.

For more information regarding this program, contact the Coordinator, Reading and Bilingual Education, University Center for Teacher Education.

# **Pupil Personnel Services**

The Pupil Personnel Services Credential (PPS) is designed to prepare students for counseling and guidance positions in public and private schools in grades K-12. This program stresses applied theory and practical, direct experiences to prepare pupil personnel candidates. A low student-adviser ratio allows for personalized attention. The PPS Credential program has excellent fieldwork placements in K-12 public schools including career centers, continuation schools, and special classes. Required courses are generally offered in late afternoons and evenings.

For more information regarding this program, contact the Coordinator, Counseling and Guidance, University Center for Teacher Education.

# **Reading Specialist**

The Reading Specialist Credential program is designed to supplement the basic multiple subject or single subject credential. The Reading Specialist Credential permits the holder to function as a Reading Supervisor, Reading Specialist or Reading Teacher in grades K-12. In order to qualify for admission to the Reading Specialist Credential program the candidate must hold a valid Multiple Subject or Single Subject Preliminary or Life Credential; and have completed a reading methods course or the equivalent. The Reading Specialist Credential program requires two years of full-time teaching experience and successful completion of a final assessment examination before the credential can be awarded.

For more information, contact the Coordinator, Reading, University Center for Teacher Education.

# **Special Education Specialist**

The Special Education Specialist program is designed to prepare teachers for two advanced credentials: the Learning Handicapped Credential, and the Severely Handicapped Credential. These credentials enable the teacher to work with students ages 3–21, with mild, moderate and/or severe problems in a variety of settings.

The Special Education Specialist program attempts to accommodate the working professional. Courses are offered during the late afternoon and evening. The unit requirement for the credential allows the full-time student to complete the requirements in one year. The Special Education program emphasizes a practical orientation to teaching.

In order to be admitted to the program, a candidate must have a baccalaureate degree from an accredited institution, and should have at least a preliminary teaching credential that is valid in California. Applicants must also meet certain personal and professional standards evaluated by required qualifying examinations and personal interviews. Generic courses are open to undergraduate students as per university guidelines.

Units for the Specialist Credential may be applied towards the requirements for a Clear Single or Multiple Subjects teaching credential. It is also possible for qualified students to complete the requirements for the Master of Arts degree in Education while pursuing the Specialist Credential.

#### Learning Handicapped Credential

This program is designed to give students the competencies needed to teach mildly handicapped students ages 3–21. This program stresses practical skills across a wide variety of areas. The Learning Handicapped Credential may be combined with the Reading Specialist Credential.

#### Severely Handicapped Credential

This program is designed for those who wish to teach students ages 3–21 with severe handicaps including the trainable mentally retarded, severely emotionally disturbed, autistic, and multiply handicapped. The training emphasis is upon functional curriculum planning, integration into least restrictive environments, vocational preparation, and community living skills.

For more information regarding this program, contact the Coordinator, Special Education, University Center for Teacher Education.

Advanced credential candidates must maintain a grade point average of 3.0 (B) or better in all credential required coursework. Calculation of the grade point average will include grades received in all classes required for the credential, although only courses with A, B, or C grades will be counted to satisfy credential requirements.



# SCHOOLS, DEPARTMENTS AND COURSE PREFIXES

# SCHOOL OF AGRICULTURE

-	
Agribusiness	AGB
Agricultural Education	AGED
Agricultural Engineering	AE
Animal Sciences and Industry	ASCL PL VS
Cron Science	CRSC ERSC VCSC
Dairy Science	
Early Science and Nutrition	
Food science and induition	FSIN
Natural Resources Management	FNR
Ornamental Horticulture	ОН
Soil Science	SS
SCHOOL OF ADCHITECTURE AND ENVIRONMENTAL DESIGN	
SCHOOL OF ARCHITECTORE AND ENVIRONMENTAL DESIGN	
Environmental Design	EDES
Architectural Engineering	ARCE
Architecture	ARCH
City and Regional Planning	CRP
Construction Management	CM
Landscape Architecture	
	L/X
SCHOOL OF DUSINESS	
Graduate Studies-Business	GSB
Accounting	ACTG
Business Administration	BUS, FIN, MKTG
Economics	FCON
Management	MGT MIS
······································	
SCHOOL OF ENGINEERING	
Engineering	FNGR
Aeronautical Engineering	AFRO
Civil and Environmental Engineering	
Computer Engineering	CE, EINVE
Computer Engineering	CPE
Computer Science	CSC
Electronic and Electrical Engineering	EE
Engineering Technology	EET, ET, ETME
Industrial Engineering	EET, ET, ETME IE, ETMP, ETWT
Industrial Engineering	EET, ET, ETME IE, ETMP, ETWT MATE
Engineering Technology Industrial Engineering Materials Engineering Mechanical Engineering	EET, ET, ETME IE, ETMP, ETWT MATE ME
Engineering Technology Industrial Engineering Materials Engineering Mechanical Engineering	EET, ET, ETME IE, ETMP, ETWT MATE ME
Industrial Engineering	EET, ET, ETME IE, ETMP, ETWT MATE ME
Engineering Technology Industrial Engineering Materials Engineering Mechanical Engineering SCHOOL OF LIBERAL ARTS Humanities	EET, ET, ETME IE, ETMP, ETWT MATE ME HUM
Engineering Technology Industrial Engineering Materials Engineering Mechanical Engineering SCHOOL OF LIBERAL ARTS Humanities Women's Studies	EET, ET, ETME IE, ETMP, ETWT MATE ME HUM WS
Engineering Technology Industrial Engineering Materials Engineering Mechanical Engineering SCHOOL OF LIBERAL ARTS Humanities Women's Studies	EET, ET, ETME IE, ETMP, ETWT MATE ME HUM WS ART
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Engineering Technology Industrial Engineering Materials Engineering Mechanical Engineering SCHOOL OF LIBERAL ARTS Humanities Women's Studies Art and Design English	EET, ET, ETME IE, ETMP, ETWT MATE ME HUM WS ART ENGL EORL ER CER ITAL SDAN
Engineering Technology Industrial Engineering Materials Engineering Mechanical Engineering SCHOOL OF LIBERAL ARTS Humanities Women's Studies Art and Design English Foreign Languages and Literature	EET, ET, ETME IE, ETMP, ETWT MATE ME HUM WS ART ENGL FORL, FR, GER, ITAL, SPAN
Engineering Technology Industrial Engineering Materials Engineering Mechanical Engineering SCHOOL OF LIBERAL ARTS Humanities Women's Studies Art and Design English Foreign Languages and Literature History	EET, ET, ETME IE, ETMP, ETWT MATE ME HUM WS ART ENGL FORL, FR, GER, ITAL, SPAN HIST
Engineering Technology Industrial Engineering Materials Engineering Mechanical Engineering SCHOOL OF LIBERAL ARTS Humanities Women's Studies Art and Design English Foreign Languages and Literature History Journalism	EET, ET, ETME IE, ETMP, ETWT MATE ME HUM WS ART ENGL FORL, FR, GER, ITAL, SPAN HIST JOUR
Engineering Technology Industrial Engineering Materials Engineering Mechanical Engineering SCHOOL OF LIBERAL ARTS Humanities Women's Studies Art and Design English Foreign Languages and Literature History Journalism	EET, ET, ETME IE, ETMP, ETWT MATE ME HUM WS ART ENGL FORL, FR, GER, ITAL, SPAN HIST JOUR LS
Engineering Technology Industrial Engineering Materials Engineering Mechanical Engineering SCHOOL OF LIBERAL ARTS Humanities Women's Studies Art and Design English Foreign Languages and Literature History Journalism Liberal Studies	EET, ET, ETME IE, ETMP, ETWT MATE ME HUM WS ART ENGL FORL, FR, GER, ITAL, SPAN HIST JOUR LS MU
Engineering Technology Industrial Engineering Materials Engineering Mechanical Engineering SCHOOL OF LIBERAL ARTS Humanities Women's Studies Art and Design English Foreign Languages and Literature History Journalism Liberal Studies Music	EET, ET, ETME IE, ETMP, ETWT MATE ME HUM WS ART ENGL FORL, FR, GER, ITAL, SPAN HIST JOUR LS MU PHIL
Engineering Technology Industrial Engineering Materials Engineering Mechanical Engineering SCHOOL OF LIBERAL ARTS Humanities Women's Studies Art and Design English Foreign Languages and Literature History Journalism Liberal Studies Music Philosophy Political Science	EET, ET, ETME IE, ETMP, ETWT MATE ME HUM WS ART ENGL FORL, FR, GER, ITAL, SPAN HIST JOUR LS MU PHIL POLS
Engineering Technology Industrial Engineering Materials Engineering Mechanical Engineering SCHOOL OF LIBERAL ARTS Humanities Women's Studies Art and Design English Foreign Languages and Literature History Journalism Liberal Studies Music Philosophy Political Science Psychology and Human Development	EET, ET, ETME IE, ETMP, ETWT MATE ME HUM WS ART ENGL FORL, FR, GER, ITAL, SPAN HIST JOUR LS MU PHIL POLS HD, PSY
Engineering Technology Industrial Engineering Materials Engineering Mechanical Engineering SCHOOL OF LIBERAL ARTS Humanities Women's Studies Art and Design English Foreign Languages and Literature History Journalism Liberal Studies Music Philosophy Political Science Psychology and Human Development Social Sciences	EET, ET, ETME IE, ETMP, ETWT MATE ME HUM WS ART ENGL FORL, FR, GER, ITAL, SPAN HIST JOUR LS MU PHIL POLS HD, PSY ANT, GEOG, SOC SOCS
Engineering Technology Industrial Engineering Materials Engineering Mechanical Engineering SCHOOL OF LIBERAL ARTS Humanities Women's Studies Art and Design English Foreign Languages and Literature History Journalism Liberal Studies Music Philosophy Political Science Psychology and Human Development Social Sciences Speech Communication	EET, ET, ETME IE, ETMP, ETWT MATE ME HUM WS ART ENGL FORL, FR, GER, ITAL, SPAN HIST JOUR LS MU PHIL POLS HD, PSY ANT, GEOG, SOC, SOCS SPC
Engineering Technology Industrial Engineering Materials Engineering Mechanical Engineering SCHOOL OF LIBERAL ARTS Humanities Women's Studies Art and Design English Foreign Languages and Literature History Journalism Liberal Studies Music Philosophy Political Science Psychology and Human Development Social Sciences Speech Communication	EET, ET, ETME IE, ETMP, ETWT MATE ME HUM WS ART ENGL FORL, FR, GER, ITAL, SPAN HIST JOUR LS MU PHIL POLS HD, PSY ANT, GEOG, SOC, SOCS SPC DANG TH
Engineering Technology Industrial Engineering Materials Engineering Mechanical Engineering SCHOOL OF LIBERAL ARTS Humanities Women's Studies Art and Design English Foreign Languages and Literature History Journalism Liberal Studies Music Philosophy Political Science Psychology and Human Development Social Sciences Speech Communication Theatre and Dance	EET, ET, ETME IE, ETMP, ETWT MATE ME HUM WS ART ENGL FORL, FR, GER, ITAL, SPAN HIST JOUR LS MU PHIL POLS HD, PSY ANT, GEOG, SOC, SOCS SPC DANC, TH
Engineering Technology Industrial Engineering Materials Engineering Mechanical Engineering SCHOOL OF LIBERAL ARTS Humanities Women's Studies Art and Design English Foreign Languages and Literature History Journalism Liberal Studies Music Philosophy Political Science Psychology and Human Development Social Sciences Speech Communication Theatre and Dance SCHOOL OF PROFESSIONAL STUDIES	EET, ET, ETME IE, ETMP, ETWT MATE ME HUM WS ART ENGL FORL, FR, GER, ITAL, SPAN HIST JOUR LS MU PHIL POLS HD, PSY ANT, GEOG, SOC, SOCS SPC DANC, TH
Engineering Technology Industrial Engineering Materials Engineering Mechanical Engineering SCHOOL OF LIBERAL ARTS Humanities Women's Studies Art and Design English Foreign Languages and Literature History Journalism Liberal Studies Music Philosophy Political Science Psychology and Human Development Social Sciences Speech Communication Theatre and Dance SCHOOL OF PROFESSIONAL STUDIES Granbic Communication	EET, ET, ETME IE, ETMP, ETWT MATE ME HUM WS ART ENGL FORL, FR, GER, ITAL, SPAN HIST JOUR LS MU PHIL POLS HD, PSY ANT, GEOG, SOC, SOCS SPC DANC, TH
Engineering Technology Industrial Engineering Materials Engineering Mechanical Engineering SCHOOL OF LIBERAL ARTS Humanities Women's Studies Art and Design English Foreign Languages and Literature History Journalism Liberal Studies Music Philosophy Political Science Psychology and Human Development Social Sciences Speech Communication Theatre and Dance SCHOOL OF PROFESSIONAL STUDIES Graphic Communication	EET, ET, ETME IE, ETMP, ETWT MATE ME HUM WS ART ENGL FORL, FR, GER, ITAL, SPAN HIST JOUR LS MU PHIL POLS HD, PSY ANT, GEOG, SOC, SOCS SPC DANC, TH GRC HE

Industrial Technology Military Science Physical Education and Recreation Administration	IT MSC PE, REC
SCHOOL OF SCIENCE AND MATHEMATICS	
Science and Mathematics Biological Sciences	SCM BACT, BIO, BOT, CONS, ENT, ZOO
Chemistry	СНЕМ
Mathematics	MATH
Physics	ASTR, GEOL, PHYS, PSC
Statistics	STAT
UNIVERSITY CENTER FOR TEACHER EDUCATION	
Ethnic Studies	ES
Education	EDUC
ATHLETICS	PEM, PEW
UNIVERSITY LIBRARY	LIB

# **COURSE DESCRIPTIONS**

Courses are listed alphabetically by prefix abbreviation. Prefixes and page numbers on which they begin are listed below.

Some courses will be shown as cross-listed in the title line. These courses cannot be repeated for credit under the separate prefixes.

All credits are in quarter units. Cal Poly operates on a four quarter system.

#### **Course Numbering System**

The numbering system used is a three-digit system. Courses are generally numbered according to the plan shown below.

- 010-099 Nondegree credit or short courses.
- 100-299 Courses taught primarily in the freshman and sophomore years.
- 300–399 Courses primarily for advanced undergraduate students.
- 400–499 Courses for advanced undergraduates. Certain 400level courses can be used in graduate programs. See Graduate Studies, page 138.
- 500-599 Graduate courses.
- 600–699 Courses for professional advancement within a special field and do not carry credit for degree requirements in any of the curricula.

# **Prerequisites**

Prerequisites indicate recommended preparation. Course prerequisites cited in this catalog are intended to inform the student of any previous work needed for the course. Eligibility of students who do not meet the stated prerequisites is determined by their academic advisers and the approprice instructor. The instructor may drop a student from the class if the prerequisites have not been met.

#### **Modes of Instruction**

The mode of instruction is included in each course description; for supervision courses, no mode is indicated. Some courses have more than one mode of instruction.

### Activity:

Class meets for 2 hours per unit of credit.

#### Laboratory:

Class meets for 3 hours per unit of credit.

#### Lecture:

Class meets for 1 hour per unit of credit.

#### **Experimental courses:**

New courses which are not included in the catalog. Course descriptions appear in the quarterly *Class Schedule*. Experimental courses may be distinguished by an "X" in the course number.

PREFIX	TITLE
ACTG	Accounting
AE	Agricultural Engineering
AERO	Aeronautical Engineering
AG	Agriculture
AGB	Agribusiness
AGED	Agricultural Education
ANT	Anthropology
ARCE	Architectural Engineering
ARCH	Architecture
ART	Art
ASCI	Animal Science
ASTR	Astronomy and Astrophysics
BACT	Bacteriology
BIO	Biology
BOT	Botany
BUS	Business
CF	Civil Engineering
CHEM	Chemistry
CM	Construction Management
CONS	Conservation
COOP	Cooperative Education
CPF	Computer Engineering
CRP	City and Regional Planning
CRSC	Crop Science
CSC	Computer Science
DANC	Dance
DH	Dairy Husbandry
DPT	Dairy Products Technology
FCON	Fconomics
FDUC	Education
FDFS	Environmental Design
FF	Electronic and Electrical Engineering
FFT	Electronic Engineering Technology
ENGI	English
ENGR	Engineering
ENT	Entomology
ENVE	Environmental Engineering
FT	Engineering Technology
FS	Ethnic Studies
ETME	Engineering Technology–Mechanical
FTMP	Engineering Technology Meenuneur
	Processes
FT\//T	Engineering Technology-Welding
FIN	Financial Management
ENIR	Forestry and Natural Resources
FORI	Foreign Language
FR	French
FRSC	Fruit Science
FSN	Food Science and Nutrition
GEOG	Geography
GEOU	Geology
CFR	German
GRC	Graphic Communication
CSR	Graduate Studies_Rusiness
<u>Ч</u> П	Human Develonment
HE	Home Economics
HIST	History
111,21	

HUM	Humanities
IE	Industrial Engineering
IT	Industrial Technology
ITAL	Italian
JOUR	Journalism
LA	Landscape Architecture
LIB	Library
LS	Liberal Studies
MATE	Materials Engineering
MATH	Mathematics
ME	Mechanical Engineering
MGT	Management
MIS	Management Information Systems
MKTG	Marketing
MSC	Military Science
MU	Music
OH	Ornamental Horticulture
PE	Physical Education
PEM	Physical Education Men
PEW	Physical Education Women
PHIL	Philosophy
PHYS	Physics
PI	Poultry Industry
POLS	Political Science
PSC	Physical Science
PSY	Psychology
REC	Recreation Administration
SCM	School of Science and Mathematics
SOC	Sociology
SOCS	Social Sciences
SPAN	Spanish
SPC	Speech Communication
SS	Soil Science
STAT	Statistics
ТН	Theatre
VGSC	Vegetable Science
VS	Veterinary Science
WS	Women's Studies
ZOO	Zoology

# **ACTG-ACCOUNTING**

# ACTG 204 Income Tax for the Nonaccountant (2)

Federal and state income taxation of individuals. 2 lectures. Prerequisite: Sophomore standing.

#### ACTG 211 Financial Accounting for Nonbusiness Majors (4)

Introduction to financial accounting theory and practice with an emphasis on financial statement preparation and analysis. Not open to Business Administration majors. 4 lectures.

# ACTG 221, 222 Financial Accounting I and II (4) (4)

Introduction to financial accounting theory and practice. 4 lectures. Sequence courses.

# ACTG 301 Managerial Accounting (4)

Applications of accounting to management decision-making, planning and control including cost behavior, budget preparation, performance reporting, motivational and behavioral considerations, and ethics. Microcomputers used for problem solving and analyses. 4 lectures. Prerequisite: MATH 221, STAT 252, ECON 222, CSC 120, and ACTG 211 or ACTG 221 or consent of instructor.

#### ACTG 302 Microcomputer Applications in Accounting (2)

Microcomputer applications in accounting. Advanced electronic spreadsheets, including integration with word processing and database software. Selection and use of accounting software on microcomputers. 1 lecture, 1 activity. Prerequisite: ACTG 211 or ACTG 221 and CSC 120.

# ACTG 304 Tax Accounting (4)

Federal income taxation of individuals. 4 lectures. Prerequisite: ACTG 211 or ACTG 222 or consent of instructor.

# ACTG 321, 322,323 Intermediate Accounting I, II, III (4) (4) (4)

Comprehensive coverage of financial reporting. 321 covers financial statements, revenue, assets, leases, and long-term debt. 322 includes income taxes, pensions, liabilities, equities, accounting changes, and cash flows. 323 includes inflation, international accounting, interim-segment reporting, special measurement problems, financial disclosures and analysis. 4 lectures. Prerequisite: 321: ACTG 222 and junior standing; 322: ACTG 321 with minimum grade of C-; 323: ACTG 322 with minimum grade of C-.

# ACTG 400 Special Problems for Advanced Undergraduates (1-4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units. Prerequisite: Junior standing or consent of instructor.

# ACTG 402 Advanced Cost Accounting (4)

Product costing systems including hybrid costing systems, management control systems, cost allocation, activity based costing, cost information for decision making, new manufacturing environment, backflush costing and strategic control systems. International dimension integrated in the course content. 4 lectures. Prerequisite: ACTG 301.

# ACTG 404 Taxation of Partnerships, Estates and Trusts and Complex Capital Transactions (4)

Federal income taxation of sales and exchanges and Subchapter S corporations, partnerships, estates and trusts. Federal gift and estate taxes. 4 lectures. Prerequisite: ACTG 304.

#### ACTG 405 Corporate Tax Accounting and Tax Administration (4)

Federal income taxation of regular corporations, tax research, tax administration, and IRS practice. 4 lectures. Prerequisite: ACTG 304.

# ACTG 421 Accounting for Business Combinations (2)

Concepts and techniques of accounting for various forms of business combinations including acquisitions, mergers, and consolidations. Emphasis is placed on the preparation of consolidated financial statements for acquisitions classified as purchases and poolings-of-interests. 2 lectures. Prerequisite: ACTG 323 with minimum grade of C-, or permission of instructor.

#### ACTG 422 Accounting for Governments and Not-For Profit Entities (2)

Accounting concepts and techniques used by state and local units of governments and private not-for-profit entities. Emphasis is placed on the accounting and reporting practices of state and local units of governments. 2 lectures. Prerequisite: ACTG 321 with minimum grade of C-, or permission of instructor.

# ACTG 423 Financial Reporting by Public Companies (2)

A study of the Securities and Exchange Commission and its reporting requirements. Emphasis is placed on the Commission's regulation of accounting, reporting, internal controls, and auditing. Impact on accountants' legal liability is also examined. 2 lectures. Prerequisite: ACTG 323 with minimum grade of C-, or permission of instructor.

#### ACTG 431 Professional Accounting (4)

Development of the accounting profession. Past, present and future. Emphasis on contemporary issues confronting the professional accountant and his/her social and ethical responsibilities and opportunities. 4 lectures. Prerequisite: ACTG 323 or consent of instructor.

#### ACTG 446 Auditing (4)

Survey of the auditing environment including institutional, ethical, and legal liability dimensions. Introduction to audit planning, assessing materiality and audit risk, collecting and evaluating audit evidence, considering the internal control structure, substantive testing, and reporting. 4 lectures. Prerequisite: ACTG 323 or consent of instructor. Recommended: MGT 321.

#### ACTG 447 Advanced Auditing (4)

Advanced coverage of selected topics including assessing materiality and audit risk, applying nonstatistical and statistical sampling, auditing computerized accounting systems, performing other attestation and accounting services, and researching auditing problems. 3 lectures, 1 activity. Prerequisite: ACTG 446. MGT 321 recommended.

# ACTG 461 Senior Project (1)

Primary research sources and materials in accounting, auditing and taxation. Original authoritative sources; tax legislation; professional and academic journals. Computerized data bases. 1 seminar. Prerequisite: ACTG 323, senior standing, and completion of graduation writing requirement.

#### ACTG 462 Senior Project (3)

Selection and analysis of a problem under faculty supervision. Problems typical of those which graduates must solve in their fields of employment. Formal report is required. Minimum 90 hours total time. Prerequisite: ACTG 461.

#### ACTG 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

#### ACTG 500 Individual Study (1-4)

Advanced study planned and completed under direction of departmental faculty member. Open only to graduate students demonstrating ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head.

# **AE-AGRICULTURAL ENGINEERING**

# AE 121 Agricultural Mechanics (2) C

GEB F.2.

Identification and use of tools and materials; shop safety; tool sharpening and care; concrete mixes and materials; simple

electric wiring; metal work; pipe fitting; basic woodworking; estimating quantities and costs. Students are required to meet safety regulations in laboratory work. Miscellaneous course fee required–see *Class Schedule*. 1 lecture, 1 laboratory.

#### AE 124 Small Engines (2)

Operating principles of the small internal combustion engine. Maintenance and trouble-shooting applications of small power units to mowers and other landscape equipment. Repair procedures related to economic justifications. 1 lecture, 1 two-hour activity.

#### AE 128 Introduction to Fundamentals of Agricultural Technology (3)

Introduction to agricultural engineering and agricultural engineering technology. Career opportunities. Problem solving techniques. Selection of materials for fabrication. Laboratory skills development in wood, metal, concrete, plumbing and projects in creative design. Strength tests of wood joints and concrete. Performance test of student design projects. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: MATH 116 or equivalent, high school drafting or concurrent enrollment in AE 133 or ETME 131.

#### AE 131 Agricultural Surveying (2)

Introduction to basic surveying techniques as applied to agriculture. Keeping field notes; land measurement by tape; differential and profile leveling; contour and plane table mapping; land surveying and identification; fundamentals of land grading. 1 lecture, 1 laboratory. Prerequisite: MATH 116.

#### AE 133 Agricultural Drafting (3)

Technical drawing oriented toward working drawings of agricultural engineering components and systems. Freehand sketching and instrument techniques. Multiview projection and pictorial drawings. Not open for credit to students with previous college level drafting course work. 1 lecture, 2 laboratories.

#### AE 134 Agricultural Electrification (3)

Fundamentals of electric wiring and code regulations, electrical distribution and the wiring of agricultural structures. Selection, installation, and maintenance of electric motors. Emphasis on practical applications. 2 lectures, 1 laboratory. Prerequisite: MATH 116 or MATH 118.

# AE 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.

#### AE 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.

#### AE 143 Power and Machinery (4)

Performance of tractors and machinery. Evaluation of tillage, planting, and harvesting operations. Analysis and development

of optimum mechanical systems. Use of microcomputers for evaluation, analysis, and report presentation. Miscellaneous course fee required-see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: AE 128, MATH 116 or equivalent.

# AE 151 CAD for Agricultural Engineering (1)

Computer aided drafting on the Macintosh or similar computer using Versacad software. Drawing setup. 2-D projections including automatic dimensioning and hatching. Isometric construction, drawing layers, library symbols. Use of 3-D drawing software. 1 laboratory. Prerequisite: ETME 142 or equivalent.

# AE 200 Special Problems for Undergraduates (2-4)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

# AE 203 Agricultural Systems Analysis (3)

Agricultural Systems Analysis investigates the interrelationships between sub-components in an overall system. Problem solving algorithms, network analysis, project planning techniques, and optimization. 2 lectures, 1 laboratory. Prerequisite: MATH 116 or equivalent.

# AE 231 Agricultural Building Construction (3)

Development of practical skills in carpentry and light construction. Selection of materials. Agricultural buildings repaired, constructed, or modified during laboratory periods. 1 lecture, 2 laboratories. Prerequisite: AE 128 or consent of instructor.

# AE 232 Agricultural Structures Planning (3)

Environmental factors affecting crop storage structures and animal housing. Insulation, heating, ventilation, water supply, and waste disposal. Functional planning of production systems. Application of solar energy to agriculture. 2 lectures, 1 laboratory. Prerequisite: AE 128, PHYS 132 and college drafting.

# AE 234 Agricultural Power Transmission and Mechanics (3)

Elements in the utilization and transmission of power in agricultural equipment. Emphasis on V-belt, roller chain, gear, and shaft drive. 2 lectures, 1 laboratory. Prerequisite: AE 142, PHYS 121.

# AE 236 Principles of Irrigation (4)

Land grading design, operation, management, and evaluation of irrigation methods. Miscellaneous course fee required-see *Class Schedule.* 3 lectures, 1 laboratory. Prerequisite: MATH 141, AE 237, SS 121, a computer programming course.

# AE 237 Engineering Surveying I (2)

Use and care of tapes, levels, transits, and electronic distance measuring instruments (EDMI). Keeping field notes, measurements by tape. Differential and profile leveling. Turning angles and determining directions of lines. Map reading. 1 lecture, 1 laboratory. Prerequisite: MATH 119 or an understanding of trigonometric functions.

# AE 238 Engineering Surveying II (2)

Traverses by tholite. 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: AE 237.

# AE 240 Agricultural Engineering Laboratory (1–2)

Individual projects. Total credit limited to 4 units, with a maximum of 2 units per quarter. 1 or 2 laboratories. Prerequisite: Consent of instructor.

# AE 301 Closed Circuit Hydraulics (3)

Selection, application and use of hydraulic components from manufacturer's specifications and literature. Use of standardized circuit design procedures with related calculation and selection criteria. 2 lectures, 1 laboratory. Prerequisite: AE 234.

# AE 312 Hydraulics (4)

Static and dynamic characteristics of liquids, flow in open and closed channels, uniform and nonuniform flow, flow measurement, pumps. 3 lectures, 1 laboratory. Prerequisite: PHYS 132, ME 211.

# AE 321 Agricultural Safety (3)

Principles of agricultural safety. Accident causation and prevention, hazard identification and abatement, laws and regulations. Machinery, electrical, chemical, livestock, shop and fire safety. Rural crime prevention and safety program development. 3 lectures. Prerequisite: Junior standing.

# AE 323 Agricultural Products Handling (3)

Application of product handling techniques and equipment to the processing of agricultural commodities. 2 lectures, 1 laboratory. Prerequisite: PHYS 123 or consent of instructor.

# AE 324 Principles of Agricultural Electrification (4)

R-L-C circuit fundamentals. Applications of electricity in agriculture including circuit fundamentals. Materials, code regulations, electrical measurements, system planning, motors, basic electronics, and an introduction to computer usage. 3 lectures, 1 laboratory. Prerequisite: AE 134, MATH 119 or MATH 120, PHYS 123.

# AE 326 Energy Systems for Agriculture (3)

Theory and application of energy sources and systems. Covering such sources as heat systems, biomass, direct energy conversion, and power application to the soil. 2 lectures, 1 laboratory. Prerequisite: AE 143, ME 211, ME 302. ME 302 may be taken concurrently.

# AE 328 Measurements and Computer Interfacing (3)

Transducers and engineering measurements in agricultural engineering. Transducer characteristics, signal processors and controllers, instrumentation techniques and the use of the computer in the measurement interface. 2 lectures, 1 laboratory. Prerequisite: CSC 251, EE 311.

# AE 331 Irrigation Theory (3)

Plant-water-soil relations using evapo-transpiration, plant stress, soil moisture deficiency, frequency and depth of irrigation, salinity, infiltration, drainage and climate control. Miscellaneous course fee required-see *Class Schedule*. 3 lectures. Prerequisite: AE 236, SS 121, MATH 141 or consent of instructor.

# AE 335 Agricultural Power (3)

Principles of spark ignition and compression ignition engines and related accessories. Service, trouble-shooting, and repair procedures. 1 lecture, 2 laboratories.

# AE 337 Landscape Irrigation (3)

Design of landscape irrigation systems including soil factors, hydraulics, site information, selection of system components,

back flow prevention, plumbing codes and cost estimating. 2 lectures, 1 laboratory. Prerequisite: SS 121 or consent of instructor.

# AE 339 Agricultural Mechanics Skills (2)

Advanced shop skills. Carpentry, electricity, plumbing, surveying, power mechanics, tractor equipment operation and maintenance. 2 lectures, 2 laboratories weekly for five weeks per session-two sessions per quarter. Prerequisite: Agricultural teacher candidates starting/returning from student teaching, senior or graduate standing or consent of instructor.

#### AE 340 Irrigation Water Management (4) GEB F.2.

Soil-plant-water relationships, evapotranspiration rates and irrigation schedules. Water quality, salinity and drainage. Water rights and irrigation institutions. Water measurement. For non-AE majors only. Miscellaneous course fee required-see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: MATH 118, SS 121.

# AE 341 Gasoline Engine Diagnosis (3)

Use of modern engine testing equipment in the evaluation of engine components and accessories such as: cylinder condition, ignition systems, electrical and electronic systems and fuel systems. 2 lectures, 1 laboratory. Prerequisite: AE 335.

# AE 342 Diesel Fuel Systems (3)

Use of modern test and service equipment in evaluating and servicing diesel fuel systems. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: AE 335 or equivalent or consent of instructor.

# AE 343 Project Analysis (5)

Analysis of projects for structural design, applied elements of statics, dynamics, strength of materials, fabrication, and fasteners. 3 lectures, 2 laboratories. Prerequisite: AE 133 or equivalent, PHYS 121, AE 234.

# AE 344 Agricultural Equipment Projects (3)

Construction of special agricultural equipment related to any agricultural enterprise. 1 lecture, 2 laboratories. Prerequisite: AE 343.

# AE 345 Aerial Photogrammetry and Remote Sensing (3)

Object recognition, three-dimensional equipment, and interpretation. Print alignment, stereoscopic viewing, scales, elevation determination, and application. Application of aerial photos to regional studies. 2 lectures, 1 laboratory. Prerequisite: MATH 116.

# AE 347 Principles of Agricultural Machinery (4)

Principles of the design of machine elements and mechanisms, machinery testing, motion, linkages, strength of materials. Basic metallurgy, friction studies, steering geometry and systems. 3 lectures, 1 laboratory. Prerequisite: AE 142, AE 343 or concurrently.

# AE 348 Energy for a Sustainable Society (3)

Transition from fossil-fuel to renewable energy sources including hydro, biomass, solar, wind, and energy conservation. Environmental, economic, and political consequences of a renewable energy-based sustainable society. 3 lectures. Prerequisite: Junior standing, GEB B.1. course.

# AE 399 Graphical Interface Computing in Agriculture (1)

Macintosh or similar computer and available software as an effective educational tool. Applications of word processing, spreadsheets, graphics, drawing/drafting, data base and some basic programming to the problems and designs encountered in the Agricultural Engineering and Agricultural Engineering Technology programs. 1 laboratory. Prerequisite: AG 250 or ARCH 250 or CSC 251.

# AE 400 Special Problems for Advanced Undergraduates (2-4)

Individual investigation, research, studies, or surveys of selected problems in agriculture. Total credit limited to 8 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

# AE 403 Agricultural Systems Engineering (3)

Engineering principles combined with mathematical optimization techniques to evaluate parameters in agricultural production and processing systems. Project planning techniques, linear and nonlinear modeling, response surface methodology. 2 lectures, 1 laboratory. Prerequisite: CSC 251, IE 314, MATH 242, STAT 321.

# AE 405 Chemigation (1)

Fertilizer and chemical injection through irrigation systems. Hardware, fertilizer compounds, and distribution uniformity. Matching chemicals and equipment to specific irrigation methods. Miscellaneous course fee required-see *Class Schedule*. 1 laboratory. Prerequisite: AE 236 or AE 340, SS 121.

# AE 414 Irrigation Engineering (4)

Design of on-farm irrigation systems; micro, surface, and sprinkler irrigation systems; canals and pumps; economic and strategies of pipe design; pipeline protection. Miscellaneous course fee required-see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: AE 331 or AE 340; hydraulics.

# AE 415 Hydrology (3)

Collection, organization and use of precipitation and runoff data, flood frequency and economics of structures, stream gauging and use of hydrograph, principles of groundwater management and flood routing. 3 lectures. Prerequisite: MATH 141 or consent of instructor.

# AE 421 Equipment Engineering (4)

Design and construction of specialized agricultural components and equipment. 2 lectures, 2 laboratories. Prerequisite: CE 205, ME 212, ETWT 144.

# AE 422 Equipment Engineering (3)

Design and construction of specialized agricultural components and equipment. 2 lectures, 1 laboratory. Prerequisite: AE 421.

# AE 425 Computer Controls for Agriculture (3)

Computer activated controls as applied to agricultural machinery, agricultural structures, processing and irrigation industries. Encompassing control logic to evaluate stability behavior of systems of computer interfacing, data input and control output. 2 lectures, 1 laboratory. Prerequisite: AE 324, CSC 110 or AG 250.

# AE 427 Agricultural Process Engineering (3)

Agricultural engineering principles applied to air, water, airwater mixtures, drying, heating, refrigeration, fluid flow, size reduction, fan laws and materials handling. 2 lectures,1 laboratory. Prerequisite: AE 312, AE 333, ME 302.

# AE 430 Finite Element Analysis (3)

Introduction to the theory of finite element analysis and its application to drainage, pipe flow, fruit and vegetable damage predictions, structural strength, heat transfer, and other agricultural engineering applications. 2 lectures, 1 laboratory. Prerequisite: CE 204, MATH 242, ME 302.

# AE 432 Agricultural Buildings (4)

Selection of buildings, storage units, and related equipment for production agriculture. Design of beams and column members in wood and steel. Environmental factors affecting crop storage and animal housing. Farmstead layouts. Working drawings and cost estimates. 3 lectures, 1 laboratory. Prerequisite: AE 133, AE 231, AE 343.

# AE 433 Agricultural Structures Design (4)

Structural analysis and design of agricultural service and processing buildings. Emphasis on use of wood, metals, and reinforced concrete in light construction. 3 lectures, 1 laboratory. Prerequisite: AE 232, CE 205.

# AE 435 Drainage (3)

Flow of water in porous media. Intrinsic permeability and hydraulic conductivity. Flow nets, wells and ground water, design of sub-surface drains. 2 lectures, 1 laboratory. Prerequisite: AE 312, AE 331, or AE 340 or SS 432 and consent of instructor.

# AE 437 Conservation Engineering (3)

Engineering solutions of soil and water conservation problems. Applications of engineering fundamentals of hydraulics, hydrology, and soils used in the design and construction of soil and water conservation structures. 2 lectures, 1 laboratory. Prerequisite: AE 312, AE 415, SS 121, or consent of instructor.

# AE 440 Agricultural Irrigation Systems (4)

On-farm irrigation system evaluation and management. Drip, micro-spray, furrow, border strip, sprinkler systems. Irrigation efficiency and uniformity. Pumping costs. For non-AE majors only. Miscellaneous course fee required-see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: SS 121.

# AE 446 Geographic Information Data Sources (2)

Techniques for preparing data for geographic information systems. Digital data from surveying, aerial photographs, satellite imagery, and government data sources will be entered, displayed, and edited using computer software and translated for use in other software packages. 1 lecture, 1 laboratory. Prerequisite: AE 237 or AE 131, and GEB F.1. computer literacy course.

# AE 448 Bioconversion (3)

Thermal mechanics and physical techniques for converting biomass into useful energy forms for agriculture and industry. Laboratory exercises include experiments with methane and alcohol production and combustion of agricultural residue. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: MATH 117 or equivalent, or consent of instructor.

# AE 450 Advanced Graphical Interface Computing (1)

Macintosh or similar computer as an effective intellectual tool. Applications in problem solving, project planning, numerical analysis, advanced word processing, spreadsheets and modeling. Communications and data transfer. 1 laboratory. Prerequisite: AE 399 or equivalent.

# AE 461, 462 Senior Project (2) (3)

Solution of an engineering problem in agriculture. Involves research methodology: problem statement, analysis, synthesis project design, construction (when feasible), and evaluation. Project requires 150 hours with a minimum of faculty supervision.

# AE 463 Undergraduate Seminar (2)

Group discussion of current agricultural engineering topics presented by individual members of the class and visitors. Placement opportunities and requirements. 2 seminars.

# AE 464 Professional Practice (3)

Contracts, specifications, and legal aspects of agricultural engineering. Safety and human factors. Engineering ethics and professional registration. 3 lectures. Prerequisite: Senior standing.

# AE 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

# AE 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

# AE 492 Pumps and Pump Drivers (3)

Pump characteristics and system head. Net positive suction head. Series and parallel operation. Pump contracts and protection. Selection of pumping systems for different water sources. Design of pump intakes for surface water supplies. Driver selection. Servicing motors and engines. Hand pumps and wind mills. 2 lectures, 1 laboratory. Prerequisite: Senior standing.

# AE 500 Individual Study (1-3)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of instructor.

# AE 521 Engineering of Agricultural Systems (4)

Problem solving by analyzing the need, establishing boundaries and developing creativity. Examples worked through in practicability analysis, transportation problems, linear programming and system analysis with an emphasis on optimum system operation. 3 lectures, 1 laboratory. Prerequisite: Consent of instructor.

# AE 522 Instrumentation Control/Microprocessors (4)

Engineering input/output instrumentation for sensing and controlling functions through data acquisition, analysis and response to agricultural processing. Miscellaneous course fee required-see *Class Schedule.* 3 lectures, 1 laboratory. Prerequisite: BASIC language programming or consent of instructor.

# AE 529 Small Farm Mechanization (3)

Principles of farm machinery used for tillage, seeding, weeding, harvesting and transport of agricultural crops. Small-scale equipment, suitable for subsistance farming in developing countries. Small tractors, hand tools, animal power, and fuel from renewable sources. Miscellaneous course fee required--see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: AE 143 or equivalent, graduate standing, or consent of instructor.

#### AE 531 Water Wells (3)

Groundwater resources drilling methods and development of wells. Water well design for pollution prevention. Well rehabilitation. Destruction of abandoned wells. Design of domestic water systems. Water quality standards and water conditioning for different applications. 2 lectures, 1 laboratory. Prerequisite: Graduate standing.

# AE 533 Irrigation Project Design (4)

Formation of water user associations and social/financial aspects of development of irrigation projects. Engineering solutions for improved water delivery and canal automation. Interaction between engineering and social factors. Miscellaneous course fee required-see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: AE 340, consent of instructor.

#### AE 581 Graduate Seminar in Agricultural Engineering (3)

Current engineering problems and recent developments as they relate to agriculture. Problem identification, statement and research methodology emphasized in problem solution. 3 seminars.

# **AERO-AERONAUTICAL ENGINEERING**

# AERO 102 General Aviation (3)

Fundamentals of aerodynamics and principles of flight. Introduction to power systems and instrumentation. Air navigation, interpretation of weather data, uses of flight computer, subjects covered in the private pilot's examination. Past, present and future of general aviation and its implications on society. Not acceptable as a technical elective for engineering students. Not open for technical credit to Aeronautical Engineering students. 3 lectures.

#### AERO 121 Aerospace Fundamentals (1)

Introduction to the engineering profession including the aeronautical and aerospace fields. Engineering approach to problem-solving and analysis of data obtained from experiments. Basic nomenclature and design criteria used in the aerospace industry. Applications to basic problems in the field. 1 laboratory.

#### AERO 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

# AERO 210 History of Aviation (3) GEB F.2.

History of technological innovations which led to modern aviation. People and circumstances that contributed to the major breakthroughs in aeronautics and astronautics. Discussion of current events in aviation. 3 lectures.

# AERO 215 Aerospace Engineering Analysis I (2)

Introduction to problem solving techniques in aerospace engineering using digital computers. Primary emphasis on the solution of problems in aerodynamics, aerospace structures, performance, stability and control, and astronautics. 2 laboratories. Prerequisite: CSC 251, MATH 143.

#### AERO 240 Additional Engineering Laboratory (1-2) (CR/NC)

Total credit limited to four units, with not more than two units in any one quarter. Credit/No Credit grading. 1 or 2 laboratories.

#### AERO 301, 302, 303 Aerothermodynamics (5) (5) (3)

Properties and characteristics of fluids, fluid statics and dynamics, the thermodynamic relations, laminar and turbulent subsonic flows as applied to flight vehicles. Introduction to heat transfer. 5 lectures, fall and winter; 3 lectures, spring. Prerequisite: ME 211, MATH 242.

# AERO 304 Experimental Aerothermodynamics (2)

Laboratory experiments verify the momentum and energy equations. Fan performance, boundary layer measurements, diffuser performance, heat transfer and solar collector performance experiments are evaluated. 1 lecture, 1 laboratory. Prerequisite: AERO 301, AERO 302, ENGL 218. Concurrent: AERO 303.

#### AERO 306 Aerodynamics I (3)

Introduction to theoretical aerodynamics. Primary emphasis in the subsonic region. Basic aerodynamic theory: Airfoil theory, wing theory, lift and drag. Structure of atmosphere, air speed indicators, static and dynamic flight performance. 3 lectures. Concurrent: AERO 302.

# AERO 307 Wind Tunnel and Flight Test Laboratory (3)

Wind tunnel testing of basic aerodynamic properties of airfoils, finite wings, aircraft models, and aircraft flight performance. Emphasis on both static and dynamic responses of aircraft. Various measurement techniques, data reduction schemes, and analysis methods. 1 lecture, 2 laboratories. Prerequisite: AERO 301, AERO 306, ENGL 218.

# AERO 315 Aerospace Engineering Analysis II (3)

Analysis methods for aerospace engineering problems. Applications of analysis methods to solving problems in aerodynamics, aerospace structures, stability and control, and astronautics. 3 lectures. Prerequisite: AERO 215, MATH 242.

#### AERO 320 Fundamentals of Guidance and Control (3)

Introduction to state-space and transfer function models for aircraft, missiles, and helicopters. Elementary classical and modern analysis techniques using interactive computer graphics. 3 lectures. Prerequisite: AERO 215. Concurrent: AERO 315.

#### AERO 330 Stress Analysis (4)

Basic strain, stress and equilibrium equations. St. Venant torsion theory. Rotating discs. Theory of plates and shells. Beams on elastic foundation. Theories of failure. Introduction to modern fatigue analysis and fracture mechanics. 4 lectures. Prerequisite: MATH 242, CE 204, CE 205.

# AERO 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

# AERO 401 Propulsion Systems (4)

Power plant types, components, characteristics, and requirements. Principles of thrust and energy utilization. Thermodynamic processes and performance of turboprop, turboshaft, turbofan, turbojet, ramjet, and rocket engines. 3 lectures, 1 laboratory. Prerequisite: AERO 303, AERO 404, CHEM 124.

# AERO 404 Gas Dynamics (3)

Fundamental theory of one dimensional gas dynamics: Isentropic flow, flow in converging-diverging nozzles, shock propagation, normal and oblique shock theory, Prandtl-Meyer expansions, Fanno line flow, and measurement methods. 3 lectures. Prerequisite: AERO 302.

# AERO 405 Aerodynamics II (3)

Review of gas dynamics, shock-wave and boundary-layer interaction, compressible subsonic and transonic flows over airfoils, 2-dimensional supersonic flows around thin airfoil, finite wing in supersonic flow. 3 lectures. Prerequisite: AERO 404.

# AERO 406 Hypersonic Flow Theory (3)

Theoretical and analytical methods for the high-speed flight of aerospace vehicles. Review of gas dynamics, local surface inclination methods, inviscid methods, boundary layer and aerodynamic heating, and viscous interactions. 3 lectures. Prerequisite: AERO 303, AERO 404.

# AERO 407 Reentry Aerodynamics (3)

Near planet environments. Transition from orbital to aerodynamic motion. 3 lectures. Prerequisite: AERO 406. Concurrent: AERO 451.

# AERO 409 Flight Test (3)

Principles of flight testing with applications to performance, stability and control, and avionics system test. Data analysis and presentation. Test planning and principles of in-flight simulation. 1 lecture, 2 laboratories. Prerequisite: AERO 320.

# AERO 416 Principles of Rotary Wing Flight (3)

Introduction to analysis of rotary wing aircraft. Overview of avionics systems. Performance figures of merit. Stability and control of helicopters. Equations of motion for forward flight. 3 lectures. Prerequisite: AERO 306 and AERO 315.

# AERO 418 Fundamentals of Flight Simulation (3)

Overview of flight simulators and supporting facilities. Aircraft equations of motion and navigation equations with respect to the earth's surface. Ground, environmental, avionics systems models. Lab simulation and flight evaluation. 2 lectures, 1 laboratory. Prerequisite: MATH 242, AERO 320 or EE 301 or CSC 360 or ME 422.

# AERO 420 Stability and Control of Aerospace Vehicles (4)

Steady-state and perturbed equations of motion for a rigid body in flight. Static and dynamic stability derivatives. Modes of motion in response to control inputs. State-space and transfer function analysis. Introduction to feedback control. 4 lectures. Prerequisite: AERO 306 and AERO 320.

# AERO 430 Aerospace Structural Analysis (4)

Deflection analysis. Principles of fictitious displacement, virtual work, unit load method. Energy methods: Dummy load method, Castigliano's theorem, Maxwell-Betti reciprocal theorem, minimal principles, Rayleigh-Ritz's method, Galerkin's method. The shear lag problem and the stability of structures. Numerical methods: Finite difference, finite elements method. 4 lectures. Prerequisite: AERO 315, AERO 330.

# AERO 432 Experimental Stress Analysis (1)

Employing the knowledge of stress analysis and aerospace structural analysis in an individual and group design project dealing with aerospace structures. 1 laboratory. Prerequisite: AERO 430.

# AERO 435 Composite Structures 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. Bending, buckling, and vibration of laminated plates. Fracture mechanics of composite structures. 3 lectures, 1 laboratory. Prerequisite: AERO 330 or ME 328.

# AERO 443, 444, 445 Flight Vehicle Design (4) (4) (2)

Preliminary layout of a typical transport aircraft and a space vehicle using design and calculation techniques developed in previous aeronautical engineering courses. Design of selected component structures and preparation of necessary drawings. AERO 443 and 444: 2 lectures, 2 laboratories; AERO 445: 2 laboratories. Prerequisite: AERO 306, AERO 330, senior standing.

# AERO 447, 448, 449 Spacecraft Design (4) (4) (2)

Preliminary layout of typical space vehicle using design and calculation techniques developed in previous aeronautical engineering courses. Design of selected components and preparation of necessary drawings. AERO 447 and 448: 2 lectures and 2 laboratories; AERO 449: 2 laboratories. Prerequisite: AERO 430, AERO 451, AERO 315, senior standing.

# AERO 451 Orbital Mechanics I (3)

Motion of a body in the central force field. Space vehicle trajectories, guidance systems, power generators for interplanetary travel, structural loading, and principles of space vehicle design. 3 lectures. Prerequisite: ME 212.

# AERO 452 Orbital Mechanics II (3)

Orbital motion, perturbing forces. Aspherocity of the earth, aerodynamic drag, third-body tidal forces, etc. Enke and Cowell solution techniques. Restricted 3-body problem. Satellite attitude dynamics, rigid body-symmetric and asymmetric semirigid bodies. Attitude control, spinning/fixed gravity gradient. Gyroscopic instruments. 3 lectures. Prerequisite: AERO 451.

# AERO 456 Aircraft Vibration and Flutter (3)

Analysis of vibration and flutter for fixed and rotary wing aircraft and other structures. History of aeroelasticity; analysis of structures using matrix methods. Formulation of dynamic equations by Lagrangian approach. Solution to obtain eigenvalues and eigenvectors. Unsteady aerodynamics and Thorsen's lift deficiency function. 3 lectures. Prerequisite: AERO 315.

### AERO 461, 462 Senior Project (2) (3)

Selection and completion of a project which is typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: Senior standing.

#### AERO 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

#### AERO 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

#### AERO 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.

#### AERO 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.

# AERO 500 Individual Study (1-3)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.

#### AERO 515 Continuum Mechanics (3)

Rules of index notation and transformation laws of Cartesian tensors as applied to a continuous medium. Application of these methods to fluids and solids provides the student with a unified understanding of the fundamental laws of physics for a continuum. 3 seminars. Prerequisite: AERO 303, AERO 315, graduate standing or consent of instructor.

#### AERO 520 Theoretical Aerodynamics (3)

Fundamentals of analytic aerodynamics; potential flow, Kutta-Joukowski theorem, Schwarz-Christoffel transformation, lifting line theory, thin wing theory, three-dimensional lift and drag of wings, slender body theory. 3 lectures. Prerequisite: AERO 306, graduate standing or consent of instructor.

#### AERO 522 Boundary-Layer Theory (3)

Concept of boundary-layer. Boundary-layer equations, similarity transformation, integral methods for steady, twodimensional laminar and turbulent boundary layers. 3 lectures. Prerequisite: AERO 303, graduate standing or consent of instructor.

# AERO 523 Turbulent Flow (3)

Basic physical properties of turbulent flow. Turbulence structure, scale of motion, energy production and dissipation. Kinematics and dynamics of vorticity emphasizing shear flows and mixing processes. Similarity rules for wakes, jets, and boundary layers. Rational modeling of turbulence. 3 lectures. Prerequisite: AERO 302, graduate standing or consent of instructor.

#### AERO 526 Computational Fluid Dynamics I (3)

Basic principles underlying the Navier-Stokes equation. Relations between time-accurate and relaxation methods. Implicit and explicit methods. Considerations of accuracy, stability of numerical methods, and programming complexity. 3 lectures. Prerequisite: AERO 3O3, graduate standing or consent of instructor.

#### AERO 527 Computational Fluid Dynamics II (3)

Numerical methods for solving elliptic, parabolic, and hyperbolic sets of partial differential equations. Application to potential flow, Euler equations, boundary-layer equations, and Navier-Stokes equations. Computational problems are assigned. 3 lectures. Prerequisite: AERO 526.

#### AERO 530 Inelastic Structural Analysis (3)

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. 3 seminars. Prerequisite: AERO 430, graduate standing or consent of instructor.

#### AERO 535 Advanced Aerospace Structural Analysis (3)

Advanced flight vehicle and fracture mechanics analysis and design. Fundamentals and applications of modern fatigue analysis in the aerospace industry. 3 seminars. Prerequisite: AERO 430, graduate standing or consent of instructor.

# AERO 540 Elements of Rocket Propulsion (3)

Analysis and design of liquid and solid rockets using basic design parameters such as droplet atomization, droplet and particle combustion, heat transfer, combustion stability and control, and thermochemical computations. 3 lectures. Prerequisite: AERO 401, graduate standing or consent of instructor.

# AERO 545 Non-Impulsive Orbit Design (3)

Review of ion chemical design, 2-body orbital mechanics, and expected perturbing forces. Emphasis on Encke methods of perturbed orbit determination. 1 lecture, 2 activities. Prerequisite: AERO 451.

#### AERO 550 Analysis and Design of Flight Control Systems (3)

Fundamental principles of flight control design for modern aircraft. Automatic control of aircraft and missiles. Selected advanced topics in computer analysis of control systems. 2 lectures, 1 laboratory. Prerequisite: AERO 420, graduate standing or consent of instructor.

# AERO 551 Advanced Topics in Estimation and Control (3)

Principles of multi-loop analysis and design using state representations of actual systems. Optimal design for regulators and trackers. Observers and Kalman filter applications. Current research in robust control. 3 lectures. Prerequisite: AERO 420 or AERO 550, graduate standing or consent of instructor.
GEB F.1.

# AERO 555 Flying Qualities of Piloted Vehicles (3)

Flying qualities prediction from reduced-order-models. Transfer function models for the pilot. Cooper-Harper scale, pilotinduced-oscillation, fly-by-wire systems, in-flight simulation. Aerospace-craft handling qualities. 2 lectures, 1 laboratory. Prerequisite: AERO 550, graduate standing or consent of instructor.

#### AERO 570 Selected Advanced Topics (3)

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

# AERO 587 Cooperative Education Experience (6)

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Prerequisite: Graduate standing and consent of instructor.

# AERO 590 Graduate Seminar (1)

Current developments in the field of Aeronautical Engineering. Participation by students, faculty and guest lectureres. 1 twohour seminar. Prerequisite: Graduate standing or consent of instructor.

# AERO 597 Cooperative Education Experience (12)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Prerequisite: Graduate standing and consent of instructor.

# AERO 599 Design Project (Thesis) (2) (2) (5)

Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis. Prerequisite: Graduate standing.

# AG-AGRICULTURE

# AG 100 Agriculture Enterprise Project (1-4) (CR/NC)

Selection and completion of a management/production project under faculty supervision. Project participation is subject to approval by the department head and the Cal Poly Foundation. Degree credit limited to 12 units. Registration is through department offices and subtopics will list the department supervising the project. Credit/No Credit grading only.

# AG 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)

problems, 3 lectures,

Microcomputers and commercial software used in agricultural industries. Word processing, spreadsheets, data base management programs, and programs applied to agriculturally oriented

# AG 301 Agriculture and American Life (3) GEB F.2.

Relationship of agriculture and natural resources to man and his society. Impact of soil, water, and land uses on animal and crop production within the United States. Relative importance of resources used and commodities produced. Not open to students with majors in agriculture. 3 lectures. Prerequisite: Junior standing.

# AG 339 Internship in Agriculture (1-12) (CR/NC)

Selected students will spend up to 12 weeks with an approved agricultural firm engaged in production or related business. Time will be spent applying and developing production and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Credit/No Credit grading. Prerequisite: Consent of internship instructor.

#### AG 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

#### AG 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

# AG 500 Individual Study (1--6)

Advanced independent study planned and completed under the direction of a member of the school faculty. Total credit limited to 6 units. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.

#### AG 539 Graduate Internship in Agriculture (1-9)

Application of theory to the solution of problems of agricultural production or related businesses in the field. Analyze specific management problems and perform general management assignments detailed in a contract between the student, the firm or organization, and the faculty adviser before the internship commences. Degree credit limited to 6 units. Prerequisite: Consent of internship instructor.

#### AG 585 Cooperative Education Experience (6) (CR/NC)

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

### AG 595 Cooperative Education Experience (12) (CR/NC)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

# AG 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 100 Orientation to Agribusiness (1) (CR/NC)

Understanding the depth and breadth of agribusiness, the agricultural industry, the university, and the Agribusiness Department. Emphasis on career and curriculum orientation. Credit/No Credit grading only. 1 activity.

# AGB 102 Introduction to Agricultural Economics (3)

Introduction to the economic aspects of agribusiness. Role of agricultural resources, major agricultural resource issues, and their policy remedies. 3 lectures.

# AGB 109 Farm Bookkeeping (4)

Farm record keeping for tax, management and credit purposes using the cash method of accounting. An overview of the accrual system and measures of farm profits. Not for credit towards B.S. degree for majors in the School of Agriculture. For technical students only. 3 lectures, 1 activity.

#### AGB 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

#### AGB 201 Agribusiness Sales and Service (3)

Emphasis on relationship selling focusing on building trust and providing valuable service. Critical skills of self-management, communication, and interpersonal values through role playing and presentations. Sales opportunities in the entire food industry surveyed, ranging from input industries such as seeds and fertilizers, to output industries such as produce and wine. 3 lectures.

# AGB 203 Agribusiness Organization (3)

Organizational management of agribusiness. Primary functions and skills necessary for successful management of agribusiness related firms. Planning, organizing, leading and control. 3 lectures.

# AGB 212 Agricultural Economics (3)

Changes in agriculture and agricultural production in response to changing economic conditions. Optimum methods of agricultural production. Impact of technological change. Evaluating market structure and price formulating factors for agricultural products and inputs. 3 lectures. Prerequisite: AGB 102, ECON 201, or ECON 211.

# AGB 300 Successful California Farms (2)

Visits to successful California farms involving many types of farming. Farm resources and organization, techniques of operation, yields, problems. Different regions visited on different trips. Miscellaneous course fee required-see *Class Schedule*. Can only be taken once for credit in the major.

# AGB 301 Agricultural Marketing (3)

Agricultural commodity marketing systems from farm to consumer. Middlemen types and marketing alternatives. Role of futures markets in pricing and risk minimization. Storage, transportation and grading systems. Selected topics such as foreign trade and marketing orders. 3 lectures. Prerequisite: AGB 212 or ECON 201 or ECON 212.

# AGB 302 Agricultural Associations and Cooperatives (3)

Purpose, kinds, organization and management of agricultural cooperatives. Emphasis on California cooperatives, their characteristics, operation and future. One-day field trip visiting agricultural cooperatives included. 3 lectures. Prerequisite: AGB 203.

# AGB 304 Agribusiness Marketing Management (3)

Marketing management applied to agricultural and food industries. Marketing concept, role of today's middlemen and growing importance of consumerism, ecology and conservation in today's changing market place. Exploration of marketing mix decisions including planning, product management, pricing, promotion and distribution. 3 lectures. Prerequisite: AGB 212, ECON 201, or ECON 211.

#### AGB 305 Agricultural Resources (3)

Survey of agricultural production areas of United States from standpoint of physical resource, markets, economic advantages, and problems. Appraisal of area problem from standpoint of land economic principles. 3 lectures. Prerequisite: AGB 212, ECON 201 or ECON 211 or ECON 222.

# AGB 307 World Agricultural Resources (3)

World agricultural production areas with emphasis on natural and human resources, existing production, economic implications, population growth and potential food supply. 3 lectures. Prerequisite: AGB 212, ECON 201 or ECON 211 or ECON 222.

#### AGB 310 Agribusiness Credit and Finance (3)

Fundamentals of financing California's agribusiness industry. Principles of making investment decisions and costs of credit. Developing credit strategies within the framework of sources of credit and types of loans available to farms, ranches, and other agribusiness firms. 3 lectures. Prerequisite: One quarter of accounting or farm records.

#### AGB 312 Agricultural Policy (3)

Agricultural policy objectives and formulation, resource allocation and production adjustments. Survey of State and Federal agricultural policy and the trade policies of other countries as they influence the planning and practices of agribusiness. 3 lectures. Prerequisite: AGB 212, ECON 201 or ECON 211 or ECON 222.

### AGB 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 required for major.

# AGB 314 Fair Management (3)

Principles and procedures in organizing, managing and promoting fairs. Emphasis on California and Western fairs. Career opportunities, programs and problems in fair management and growth of fairs in America. A one-day field trip is required. 3 lectures. Prerequisite: Junior standing.

# AGB 315 Land Economics (3)

Supply of land, population pressure on land, input-output relations affecting land use, economic returns, land values, development and investment costs, locational factors, conservation, institutional factors, leasing, land use planning, taxation, public regulations. 3 lectures. Prerequisite: AGB 212, ECON 201 or ECON 211 or ECON 222.

#### AGB 317 Agriculture-Consumer Relationships (3)

Basic facts, public opinion and ways of developing greater understanding of agriculture, its nature, characteristics, problems and relationship to nonfarm persons. Consumer education programs and procedures. Field trip is required. 3 lectures. Prerequisite: Upper division standing.

#### AGB 318 Agricultural Trade Policies (3)

Analysis of American trade policies and their relationship to agriculture. International trade pacts and their influence on agricultural production and marketing. 3 lectures. Prerequisite: AGB 212, ECON 201 or ECON 221 or ECON 222.

#### AGB 321 Farm Records (4)

Fundamentals of record keeping, kinds of records, inventory, depreciation, payrolls, cash and accrual basis of income tax reporting, financial statements and analysis. 3 lectures, 1 activity. Prerequisite: AG 250 or equivalent, upper division standing.

#### AGB 322 Principles of Farm Management (4)

Organization and operation of farm and ranch businesses. Identification of factors affecting profitability. Evaluation of the business for increased efficiency and profit. Application of budgeting to laboratory farms and independent analysis of a farm. 3 lectures, 1 activity. Prerequisite: AGB 321 or ACTG 211.

#### AGB 323 Agribusiness Managerial Accounting (4)

Agribusiness management with an emphasis on using accounting procedures that will provide useful information in making management decisions, setting objectives, and controlling operations. 3 lectures, 1 activity. Prerequisite ACTG 211.

# AGB 324 Agricultural Property Management and Sales (4)

Economic, legal and real estate principles in the investment, development, mortgaging and transferring of agricultural real estate. 3 lectures, 1 activity. Prerequisite: AGB 310 or consent of instructor.

# AGB 326 Farm Appraisal (4)

Methods of farm appraisal, use of county records, appraisal practice on different types of farms, discussions with professional appraisers. 3 lectures, 1 activity. Prerequisite: AGB 212, ECON 201 or ECON 211 or ECON 222 and junior standing.

# AGB 331 Farm Accounting (4)

Application of commercial accounting process to farm and ranch accounting problems. Emphasis on accounting systems that facilitate financial statement presentation, tax preparation and ADP enterprise analysis. Income tax laws pertaining to agriculture. 3 lectures, 1 activity. Prerequisite: ACTG 211.

# AGB 336 Commodity Markets in Agribusiness (4)

Commodity market history, performance, and use in management of agribusiness. Techniques of analysis, hedging, speculation with applications to the agricultural business firm. 4 lectures. Prerequisite: AGB 212 or consent of instructor.

#### AGB 360 Agribusiness Research Methods (3)

Concepts of research methodology and data presentation in agribusiness. Emphasis on advanced computer applications to problems in the field. Selection of methodology compatible with the problem. 3 lectures. Prerequisite: STAT 212 or STAT 252.

#### AGB 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head or instructor.

#### AGB 401 Agribusiness Labor Relations and Personnel Management (4)

Agricultural labor trends and problems as determined by changes occurring in farming and farm related industries. Labor-management relations in agriculture; principles and procedures in organizing and managing the agricultural business personnel program. 4 lectures. Prerequisite: Senior standing.

### AGB 405 Agribusiness Marketing Research Methods (3)

Collecting, tabulating and analyzing data for use in market research and sales. Techniques for determining market potential. Surveys, trends, correlation, market factor derivation, test marketing. Routing techniques, sampling procedures. 3 lectures. Prerequisite: AG 250, AGB 304, AGB 313, STAT 212 or STAT 252.

# AGB 406 Agribusiness Marketing Communication (3)

Principles, methods and materials for communicating ideas, information and skills to management, staff members, stockholders, customers and general public. Agricultural business public relations programs. Organization and presentation of surveys, studies, reports and publications. 2 lectures, 1 activity. Prerequisite: AGB 405, or consent of instructor.

#### AGB 409 California Agricultural Law (3)

Historical and current sources of law, examination of judicial systems, application of contracts, agency, labor law, torts, property and water law, partnerships, corporations and corporate finance applicable to agricultural enterprises. 3 lectures. Prerequisite: BUS 207, senior standing or consent of instructor.

# AGB 410 Management Practices in Agricultural Lending (3)

Advanced loan analysis for major types of farms. Legal and tax ramifications in lending. Capitalization of agricultural lending institutions. Risk assessment and management for agricultural producers and their creditors. Interest rate expectations and effect on lender behavior. 3 lectures. Prerequisite: ACTG 211, AGB 310 and senior standing.

### AGB 412 Applied Agricultural Resource Use: Analysis and 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 313, AGB 323, and AGB 421 or AGB 433.

# AGB 413 Crop Management Problems (3)

Management problems of crop farms and orchards. Crop enterprise costing procedures, equipment costing and replacement, scheduling of operations to obtain efficiencies. Determination of most profitable rotations and levels of input use. Planning for changes in operation, orchard development, investment analysis. 2 lectures, 1 activity. Prerequisite: AGB 322.

# AGB 415 Livestock Management Problems (3)

Analysis of actual livestock enterprise. Budgeting a ranch by enterprises. Analysis of internal problems such as bull purchase economics, feed buying chart, feedyard economics, cattle price relationships, livestock systems. 2 lectures, 1 activity. Prerequisite: AGB 322.

# AGB 416 Dairy Management Problems (3)

Analysis of actual dairy enterprise. Budgeting a dairy farm by enterprises. Analysis of problems such as load by load milkfeed analysis, value of milk quotas, most profitable concentrate to hay feeding. 2 lectures, 1 activity. Prerequisite: AGB 322.

# AGB 418 U.S. and Asia Pacific Agricultural Trade (3)

Agricultural infrastructures and trade policies of major U.S. trading partners in the Asia Pacific region. Particular emphasis on Japan's influence on California agricultural trade. Cultural and geo-political influences on the development of agricultural policy in the Asia Pacific region. 3 lectures. Prerequisite: AGB 318 or consent of instructor.

# AGB 421 Agribusiness Operations Analysis (4)

Principles and procedures in agricultural business operations analysis and research. Evaluation of programs and problems to achieve optimal decisions. Production and financial data, statistics, pricing, costs, inventories, production level, and plant expansion or contraction. 3 lectures, 1 activity. Prerequisite: AG 250, AGB 313, STAT 212 or STAT 252.

# AGB 427 Agricultural Estate Planning (3)

Principles and procedures in agricultural estate planning and conservation. Determining beneficiary needs, assets, valuation, and taxes. Utilizing wills, property transfers, gifts, insurance, business continuation agreements, trusts and other tools in estate planning. 3 lectures. Prerequisite: Senior standing.

# AGB 433 Agricultural Price Analysis (3)

Application of statistical tools for price analysis. Emphasis on price making process for specific agricultural commodities. Utilization of market reports and production estimate data in price forecasting and analysis. 2 lectures, 1 activity. Prerequisite: AG 250, AGB 313, STAT 212 or STAT 252.

# AGB 435 Linear Programming in Agriculture (3)

Application of linear programming to modern commercial agriculture; assumptions and data requirements; graphic and simplex solutions; preparation, coding and solutions of models simulating current problems. 2 lectures, 1 activity. Prerequisite: AG 250, AGB 313.

# AGB 440 Field Studies in Agribusiness (2)

Visitation to selected agribusinesses. Organization, operation, services and problems considered. Miscellaneous course fee required-see *Class Schedule*. Prerequisite: Senior standing or consent of instructor. Can only be taken once for credit in the major.

# AGB 445 Produce Marketing (2)

Directed group study of fresh fruit and vegetable marketing. Includes analysis of terminal markets, retail marketing (supermarkets, farmer's markets, roadside stands), limited preserving and ripening, grading and inspection, economics of transportation, international marketing. 2 seminars. Prerequisite: Senior standing and AGB 304.

# AGB 450 Agribusiness Strategy Formulation (4)

Development of strategy for farms and farm related businesses where uncontrollable environment makes output and results highly unpredictable; emphasis on the total enterprise. Case analysis. 4 lectures. Prerequisite: Senior standing and AGB 323.

# AGB 455 Advanced Fair Management Seminar (2)

Advanced studies in fair management with emphasis on budgets, contracts, entertainment, carnivals, exhibit programs, crowd control, master planning maintenance. 2 seminars. Prerequisite: AGB 314.

# AGB 460 Research Methodology in Agribusiness (1)

Empirical application of the scientific method as it relates to the design and development of Senior Project. 1 seminar. Prerequisite: Senior standing and AGB 313.

# AGB 461, 462 Senior Project (2) (3)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: Senior standing and AGB 460.

# AGB 463 Undergraduate Seminar (2)

Individual or group presentation for discussion of subjects and problems within the agribusiness field. 2 seminars. Prerequisite: Completion of AGB 461.

# AGB 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

#### AGB 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

#### AGB 510 World Agricultural Development (3)

Special problems of agriculture in less-developed countries considering the role of economic, social and institutional policies in directing development. 3 seminars. For students in M.S. in Agriculture Program/Specialization in International Agriculture Development.

#### AGB 514 Agribusiness Managerial Leadership and Communication (4)

Current issues in agriculture addressed through the case analysis method. Emphasis on communication skills and leadership qualities, identifying key success requirements. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

#### AGB 515 International Agricultural Marketing (3)

Organization and function of international agricultural markets with emphasis on developing countries. Factors inhibiting development of an improved agricultural market structure. 3 seminars. Prerequisite: AGB 510.

#### AGB 516 Agricultural Program Management in Developing Countries (3)

Overall context of decision making by program managers in developing countries. Case studies and proposal writing for effective program management. 3 seminars. Prerequisite: AGB 510, AGB 515.

#### AGB 543 Agribusiness Policy and Program Analysis (4)

Economic, political, and social objectives of domestic agricultural policies and programs. Consequences of government's policies and programs to control production, allocate resources, support market prices, and provide benefits to food and fiber producers, marketers, and consumers. Topical analysis of current effort of government to direct agriculture. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

#### AGB 554 Managing Price Risk in Agribusiness (4)

Examination of alternatives available to the agribusiness manager to manage price risk. Use of forward contracts, cooperative seasonal pools, and hedging with futures contracts and options. Futures markets, their function and operation. Analysis of cash-futures price relationships, hedging guidelines, and other topics necessary for successful hedge program execution. Student involvement in a speculation and hedging simulation. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

# AGB 555 Technological and Economic Change in Agribusiness (4)

Ramifications and impacts in agribusiness firms from technological and economic changes. Emphasis on specific agribusiness firms and their managerial process of dealing with problems and opportunities in the operational enrvironments of economic, technology, political, global, domestic and marketing. 4 seminars. Prerequisite: Graduate standing, second year.

#### AGB 563 International Agricultural Trade and Market Development (4)

Changing agricultural trade prospects in a dynamic world economy. Interface between strategies of government and private firms to create and expand foreign markets for U.S. agricultural products. Impacts of agricultural trade policies, agricultural market development, and the activities of agricultural export marketing firms. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

#### AGB 581 Graduate Seminar in Agribusiness (3)

Group study of selected developments, trends and problems in the field. 3 seminars. Prerequisite: Graduate standing.

# AGED-AGRICULTURAL EDUCATION

#### AGED 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 202 Introduction to Agricultural Education (2)

Overview of agricultural education programs including goals and purposes. Kinds of classes and types of programs. Qualifications essential to success in teaching agriculture. Planned program of studies to meet requirement for teaching. 2 lectures.

# AGED 220 Agriculture Youth Conferences (2) (CR/NC)

Problems encountered and practices applied during the conduct of the annual FFA State Convention. Methods, procedures and materials adapted for use by the student in developing the committee system to produce conferences, conventions and workshops of all kinds and sizes. Total credit for AGED 220 and AGED 221 limited to 6 units. Credit/No Credit grading only. 2 activities. Prerequisite: Consent of instructor.

#### AGED 221 Agriculture Youth Conferences (3) (CR/NC)

Problems encountered and practices applied during the conduct of the annual FFA State Convention. Methods, procedures and materials adapted for use by the student in developing the committee system to produce conferences, conventions and workshops of all kinds and sizes. Total credit for AGED 220 and AGED 221 limited to 6 units. Credit/No Credit grading only. 3 activities. Prerequisite: Consent of instructor.

#### AGED 303 F.F.A. Programs and Activities (2)

Implementation processes and operational procedures for conducting an F.F.A. Chapter activities program appropriate to community, school and student needs. F.F.A. leadership training, proficiency awards, foundation programs and educational field days. 2 activities. Prerequisite: AGED 202 and consent of instructor.

#### AGED 339 Supervised Agricultural Experiences (2)

Application of the principles and practices for initiating, conducting and integrating Supervised Occupational Experience Programs (S.O.E.P.) for vocational agricultural students. Student and instructor record keeping, S.O.E.P. management, and relationships between F.F.A. and S.O.E.P. will be demonstrated and practiced. 2 activities. Prerequisite: AGED 202 or consent of instructor.

#### AGED 350 Undergraduate Field Experience (1) (CR/NC)

Presentations and group discussions of activities and programs unique to teaching vocational agriculture in California secondary schools. Credit/No Credit grading only. 1 lecture. Prerequisite: AGED 202 or consent of instructor. Concurrent: AGED 351.

### AGED 351 Undergraduate Field Experience (1) (CR/NC)

Observation of the practices and techniques utilized by vocational agriculture teachers in conducting organized instruction in vocational agriculture classrooms, shops, school farms, laboratories. SOEP visits and FFA activities. Credit/No Credit grading only. Prerequisite: AGED 202 or consent of instructor. Concurrent: AGED 350.

# AGED 404 Agricultural Leadership (2)

Emphasis is upon equipping current and prospective leaders in agriculture with the background and skills to achieve their potential. Class members will be encouraged to assess their status as leaders and to identify means whereby their effectiveness can be improved. 2 activities. Prerequisite: PSY 201 or PSY 202.

#### AGED 410 Computer Applications in Agricultural Education (2)

Development of computer literacy for teaching agriculture. Analysis and specialization of hardware. Instruction in video and telecommunication technology, CATI network systems and software applicable to vocational agriculture. Recommended for Agricultural Science majors and required for teaching credential candidates. Prerequisite: AG 250 or CSC 110 and consent ofinstructor.

# AGED 424 Organizing and Teaching Agriculture (3)

Determining course objectives, content, and calendar for use by the teacher in classroom, shop and field instruction while assigned to community schools. Concurrent with student teaching. 3 activities. Prerequisite: AGED 438 and consent of instructor.

#### AGED 438 Instructional Processes in Agricultural Education (3)

Preparation for student teaching in agriculture. Orientation to classroom situation. Development of plans for teaching including daily lessons and unit plans; utilization of source information and resources. Class demonstration in teaching procedures; analysis and evaluation. 1 lecture, 2 activities.

#### AGED 440 Student Teaching in Agricultural Education (6-12) (CR/NC)

Off-campus assignment to a selected cooperating public school. Participation in all phases of agriculture teacher duties and activities including departmental organization and administration. Prior approval and appointment necessary. Total credit limited to 18 units. Credit/No Credit grading only.

### AGED 441 Student Teaching Practicum (2)

Problems encountered and practices applied during student teaching. Methods, procedures and materials adapted for use by the teacher concurrent with student teaching. 2 activities. Prerequisite: Consent of instructor.

# AGED 461 Senior Project (3)

Emperical 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 70 hours total time. 1 seminar and 2 supervision.

# AGED 462 Senior Project (3)

Completion of a project begun in AGED 461 under faculty supervision. Projects typical of problems that graduates must solve in their field of employment. Project results are presented in a formal report. Minimum 90 hours total time. Prerequisite: AGED 461 or consent of instructor.

#### AGED 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

# AGED 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

#### AGED 513 Field Experience–Vocational Agriculture (1–3)

Practice and techniques in management and supervision of vocational agriculture programs. Relationships among students, staff, community and school groups. Budgeting, staffing, records, reporting. Student activities and Future Farmers of America programs. Total credit limited to 6 units. Prerequisite: Prior approval and appointment.

#### AGED 520 Program Development in Agricultural Education (3)

Development of up-to-date approaches to a total integrated program based on occupational opportunities and community needs. Philosophy, organization and administration of agricultural education programs. Development in such areas as curriculum, supervised occupational experience, Future Farmers of America, and summer programs. 3 seminars.

#### AGED 522 Instructional Programs in Agricultural Mechanics (3)

Organizing the vocational agriculture mechanics curriculum and determining course content. Student demonstrations and presentations; evaluation and analysis. 1 seminar, 2 laboratories.

#### AGED 580 Special Problems in Agricultural Education (1-3)

Individual study of modern issues and problems conducted through research, planning and development. Field problems and in-service study in agricultural industry encouraged. Final written report required. Total credit limited to 9 units with not more than 3 units in any one quarter. Prior approval of instructor required.

# ANT-ANTHROPOLOGY

#### ANT 201 Cultural Anthropology (3)

# GEB D.4.a.

Meaning and significance of culture to human beings. Examination of how cultures differ in their impact on behavior. How cultures develop and change. 3 lectures.

# ANT 202 World Prehistory (3)

Development of human cultures in both the Old and New Worlds from the earliest times until the dawn of history; cultural growth. 3 lectures.

#### ANT 203 Physical Anthropology (3)

Facts and problems of human evolution. Fossil man. Primate evolution and social behavior. Human variation. 3 lectures.

# ANT 310 California Archaeology (3)

California Indians. Field studies in locating, surveying, and analyzing aboriginal sites. Site excavation. Laboratory techniques for recording, preserving, and reporting of artifacts. Relating observations and finds to the natural environment in which a site is located. Integrating knowledge of natural and social sciences to use of archaeology. 2 lectures, 1 laboratory. Prerequisite: ANT 201 or consent of instructor.

# ANT 325 Material Culture (3)

Description of processes of invention and diffusion. Role of environment and primitive technology on culture. Major preindustrial inventions and their social correlations. 3 lectures. Prerequisite: ANT 201 or consent of instructor.

# ANT 333 Language and Culture (3)

Interrelation between language and other facets of culture. Speech in its social setting. Emphasis on social and cultural factors which influence language variation and language diversity. 3 lectures. Prerequisite: ANT 201 or consent of instructor.

#### ANT 341 Comparative Societies (3)

Comparative study of contemporary peoples and cultures representing the major cultural types. 3 lectures. Prerequisite: ANT 201.

# ANT 360 Human Cultural Adaptation (3) GEB D.4.b.

Examination of social and cultural systems as means by which humans adapt to their physical, biotic and social environments. 3 lectures. Prerequisite: Any course in GEB area D.4.a.

# ANT 401 Culture and Health (3)

Relationship between culture and health. Ecological factors influencing health and illness. Impact of Western culture on world health. Health systems throughout the world. Theories of causation, diagnosis methods, treatment modes. Care providers. Health-care needs of U.S. ethnic groups. 3 lectures. Prerequisite: ANT 201 or consent of instructor.

# ANT 420 Development Anthropology (3)

Application of the basic concepts of anthroplogy to problems of development. Major theories of change and development. Sociocultural dimensions of economic development. Context of development in the Third World. Roles that anthropologists and other social scientists play in the development process. 3 lectures. Prerequisite: ANT 201 or consent of instructor.

# ANT 444 Sex, Death and Human Nature (3)

How Darwinian processes of differential reproduction and mortality influence human interests, passions, and behaviors.

Theories of inclusive fitness, parental investment and senescence. Sex differences, sexual attraction, life histories, violence and aggression, including rape, homicide and infanticide. 3 lectures. Prerequisite: One upper division ANT course or consent of instructor.

#### ANT 450 Area Studies (3)

Comparative analysis of cultures within a selected region (e.g., Southeast Asia, Subsaharan Africa). *Class Schedule* will list topic selected. Total credit limited to 12 units. 3 lectures. Prerequisite: ANT 201 or consent of instructor.

### ANT 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topics selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

# **ARCE-ARCHITECTURAL ENGINEERING**

# ARCE 221 Elementary Structures (3)

Forces on building structures. Static equilibrium and stability of structural systems. Shear and bending moment diagrams. 3 lectures. Prerequisite: PHYS 131, MATH 142.

# ARCE 222 Mechanics of Structural Members I (3)

Stress-strain relationships. Stresses and deformations in structural members due to axial force, shear, torsion, and moment. 3 lectures. Prerequisite: ARCE 221.

#### ARCE 223 Mechanics of Structural Members II (3)

Advanced topics of stresses in beams. Plastic bending, unsymmetrical bending, Combined stresses. Stress transformation. Buckling. Deflection of beams. 3 lectures. Prerequisite: ARCE 222.

# ARCE 226 Structural Systems for Architects (3)

Concepts of structural integrity and stability, structural subsystems, methods of analysis. 3 lectures. Prerequisite: ARCE 222.

#### ARCE 227 Structural Analysis I (2)

Analysis of statically determinate trusses, beams, frames, cables, and arches. 2 lectures. Prerequisite: ARCE 221.

#### ARCE 240 Additional Engineering Laboratory (1-2)

Total credit limited to 4 units, with a maximum of 2 units per quarter. 1 or 2 laboratories.

#### ARCE 302 Structural Analysis II (3)

Analysis of statically indeterminate structures. Energy methods. Slope-deflection. Moment distribution including sidesway. 3 lectures. Prerequisite: ARCE 227.

#### ARCE 303 Steel Design I (3)

Analysis and design of steel structural members subjected to bending, shear and axial forces. 3 lectures. Prerequisite: ARCE 223.

#### ARCE 304 Timber Design (3)

Analysis and design of timber structural members subjected to bending, shear, and axial forces. Wood diaphrams, shear walls and their connections. 3 lectures. Prerequisite: ARCE 223.

#### ARCE 305 Masonry Design (2)

Design of load-bearing walls, shear walls, columns and beams in masonry. 2 lectures. Prerequisite: ARCE 223.

#### ARCE 306 Matrix Analysis of Structures (3)

Analysis of statically indeterminate structures by direct stiffness method including continuous beams, plane trusses, and introduction to three-dimensional structures. 3 lectures. Prerequisite: ARCE 302.

#### ARCE 309 Survey of Soil Mechanics and Foundation Engineering (3)

Fundamentals of foundation engineering, evaluation of soil reports, principles of determination of bearing capacity, soil classification, selection of types of foundations, evaluation of expansive properties of foundation soils, discussion of basic laboratory tests. 3 lectures. Prerequisite: ARCE 226.

#### **ARCE 311** Structures for Landscape Architects (3)

Structural concepts related to landscape architecture. Design of retaining walls, decks, trellises, bridges and large-scale covered spaces. 3 lectures.

#### ARCE 321 Timber Design (3)

Design of timber structures. Limitations and potential of the material in relation to the design and construction process. For architecture and construction students. 3 lectures. Prerequisite: ARCE 226.

#### ARCE 322 Steel Design (3)

Design of steel structures. Limitations and potential of the material to the design and construction process. For architecture and construction students. 3 lectures. Prerequisite: ARCE 226.

#### ARCE 323 Concrete and Masonry Design (3)

Design of reinforced concrete and masonry structures. Limitations and potential of the material to the design and construction process. For architecture and construction students. 3 lectures. Prerequisite: ARCE 226.

# ARCE 325 Dynamics (4)

Static and dynamic loads, rigid body dynamics. Vibrations of spring-mass systems. Degrees of freedom and vibration modes. 4 lectures. Prerequisite: ARCE 221 and MATH 242.

#### ARCE 351 Structural Computing Applications I (1)

Introduction to word processing, graphics, spread sheets, and Basic programming. 1 laboratory. Prerequisite: CSC 251.

#### ARCE 352 Structural Computing Applications II (1)

Introduction to structural analysis software for personal computers. 1 laboratory. Prerequisite: ARCE 302, CSC 251.

#### ARCE 353 Structural Computing Applications III (1)

Introduction to structural analysis software for the main-frame computer. 1 laboratory. Prerequisite: ARCE 302, CSC 251.

#### ARCE 371 Structural Systems Laboratory (3)

Studies in the relationship of structural framing to overall building geometry with emphasis on the statical stability of structural configurations. 3 laboratories. Prerequisite: ARCE 223. Prerequisite or corequisite: ARCE 302.

#### ARCE 372 Steel Structures Design Laboratory (3)

Design project utilizing structural steel. 3 laboratories. Prerequisite: ARCH 231 or ARCH 457 or ARCH 458 or ARCH 459. ARCE 302, ARCE 303, ARCE 352 or ARCE 353 and ARCE 371.

#### ARCE 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

#### ARCE 403 Advanced Steel Structures Laboratory (3)

Advanced topics in design of steel structures with emphasis on plate girders, plastic design of continuous beams and frames and composite steel-concrete design. 3 laboratories. Prerequisite: ARCE 303, ARCE 372, or equivalent.

#### ARCE 412 Dynamics of Framed Structures (3)

Analysis of structures subjected to dynamic loads with singleand 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 483.

#### ARCE 414 Precast Concrete (3)

Precast and prestressed concrete principles, materials and techniques of construction. Concrete mixes, forming, casting, finishing, curing and erection methods of precast concrete. Design potentials, aesthetics, cost and construction time as related to buildings and other structures. 3 lectures. Prerequisite: ARCE 323 or ARCE 444 or equivalent.

#### ARCE 421 Soil Mechanics (3)

Principles of soil mechanics, including rudiments of geology, soil classification, gravimetric and volumetric relations, compaction, methods and testing, shear strength of soil and strength theories. 2 lectures, 1 laboratory. Prerequisite: ARCE 222, GEOL 201 or consent of instructor.

#### ARCE 422 Foundation Design (3)

Soil-bearing capacity and settlement characteristics of soils. Sizing and design of spread footings. Design and analysis of earth-retaining structures. 3 lectures. Prerequisite: ARCE 421. Prerequisite or corequisite: ARCE 444.

#### ARCE 423 Advanced Foundation Design (3)

Design and analysis of beams on elastic foundations and mat foundations. Pile foundations and sheet pile retaining structures. 3 lectures. Prerequisite: ARCE 422.

#### ARCE 444 Reinforced Concrete Laboratory (3)

Theory and design of basic reinforced concrete elements: columns, beams, tee beams and one way slabs. 3 laboratories. Prerequisite: ARCE 371 and ARCE 372.

#### ARCE 445 Prestressed Concrete Design Laboratory (3)

Design and analysis of prestressed concrete structures. 3 laboratories. Prerequisite: ARCE 444.

# ARCE 446 Advanced Structural Systems Laboratory (3)

Concepts and issues involved in the design of complex structures including tall buildings, shells, arches and tension structures. 3 laboratories. Prerequisite: ARCE 371 or consent of instructor.

# ARCE 447 Advanced Reinforced Concrete Laboratory (3)

Advanced topics in the design of concrete structures. 3 laboratories. Prerequisite: ARCE 444 or equivalent.

#### ARCE 451 Timber and Masonry Structures Design Laboratory (3)

Design projects utilizing timber and masonry. Relationship of structural detailing to overal structural behavior. Production of structural calculations and drawings. 3 laboratories. Prerequisite: ARCE 304, ARCE 305, ARCE 371 or consent of instructor.

# ARCE 452 Concrete Structures Design Laboratory (3)

Design projects utilizing reinforced concrete. Layout of the structure and preliminary design. Production of design calculations and structural drawings. Two-way slab design. 3 laboratories. Prerequisite: ARCE 444 or consent of instructor.

# ARCE 453 Senior Project Laboratory (3)

Projects by individuals or teams which involve, but are not limited to, physical modeling and testing of integrated design projects which may include students from other disciplines. 3 laboratories. Prerequisite: ARCE 372, ARCE 451 and ARCE 452.

# ARCE 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

# ARCE 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

#### ARCE 480 Senior Seminar (1)

Discussion of selected topics that are of current interest to the structural engineering profession. 1 seminar. Prerequisite: Senior standing.

# ARCE 481 Structural Experimental Laboratory (1)

Application of techniques of physical modeling to obtain solutions to structural design problems. 1 laboratory. Prerequisite: ARCE 226 or ARCE 302.

# ARCE 483 Seismic Analysis and Design (4)

Introduction to dynamic response analysis of building structures with emphasis on earthquake ground motion. Earthquake resistant design of buildings in accordance with building codes. Application of computer programs and physical models for seismic design. Laboratory studies utilizing physical models for studying the behavior of building structures subjected to simulated ground motions. 3 lectures, 1 activity. Prerequisite: ARCE 325, ARCE 371, CSC 331.

#### ARCE 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

#### ARCE 490 History of Structures (3)

Tracing developments in structural materials, structural understanding and complete structures from ancient times through the industrial revolution and the present day. 3 lectures. Prerequisite: Junior standing.

### ARCE 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

#### ARCE 504 Finite Element Method for Building Structures (3)

Basic concepts of equilibrium and compatibility. Stiffness and flexibility properties of various types of finite elements. Development and application of displacement and force methods. Elastic stability and dynamic response of buildings to earthquake, wind, and moving loads. Use of finite-element computer programs. 3 lectures. Prerequisite: MATH 242, ARCE 306, or consent of instructor.

# ARCE 521 Architectural Structures (3)

Static and dynamic loads, structural equilibrium and stability, structural configurations and systems, response to dynamic loads, behavior of structures. 2 seminars, 1 activity. Prerequisite: Graduate standing in Architecture.

#### 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)

Exploration of the major paradigms which have guided the development of architectural education and the profession. Survey of the roles of the architects and an introduction to curricula and programs designed to prepare students for careers in architecture. 2 lectures.

# ARCH 106 Materials of Construction (3)

Use and application of construction processes and materials. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 laboratory.

# ARCH 111 Introduction to Drawing and Perspective (3)

Basic techniques used in graphic communication. Orthographic and isometric projection. Mechanical perspective, shades and shadows. 3 laboratories.

#### ARCH 112 Basic Graphics (3)

Drawing as a communication tool in the environmental design fields. Exercises to develop basic skills and speed in the representation of ideas. Use of various drawing media. 3 laboratories. Prerequisite: ARCH 111, or consent of instructor.

# ARCH 113 Graphic Analysis and Communication Skills (3)

Further development of freehand graphic communication skills for representation of conceptual ideas analysis, and design concepts. Demonstrates the link between graphics, design process and communications. 3 laboratories. Prerequisite: ARCH 111, ARCH 112.

# ARCH 202 Creative Problem-Solving (3)

Techniques for stimulating creative behavior applied to general and environmental problems. Development of problem-solving and decision-making skills and knowledge. 3 lectures.

# ARCH 204 Architectural Theory (3)

Theories of architectural design. 3 lectures. Prerequisite: EDES 101.

#### ARCH 207 Environmental Control Systems I (4)

Theory and application of climate, energy use and comfort as determinants of architectural form. Emphasis on architectural methods of ventilating, cooling, heating, and lighting for envelope-load dominated buildings. 2 lectures, 2 laboratories. Miscellaneous course fee required–see *Class Schedule*. Prerequisite: PHYS 131, PHYS 132.

#### ARCH 208, 209 Architectural Design Basics (2) (2)

Introduction to the elements and theories of the environmental and architectural design processes. 2 laboratories. Prerequisite: ARCH 112.

# ARCH 231 Architectural Practice (3)

Wood construction methods and processes. Construction documents used as communication medium for such methods and processes. Miscellaneous course fee required-see *Class Schedule.* 3 laboratories. Prerequisite: ARCH 106 and ARCH 111.

#### ARCH 240 Additional Architectural Laboratory (1-2)

Total credit limited to 4 units, with a maximum of 2 units per guarter. 1 or 2 laboratories.

#### ARCH 250 Computer Applications (3) GEB F.1.

Introduction to the application of computers in architecture. Operating systems, applications, graphics systems. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 laboratory.

#### ARCH 251 Environmental Design Fundamentals (5)

Development of abilities in environmental perception, techniques for analysis of the built environment, creative problem solving techniques and appropriate communication skills. 5 laboratories. Prerequisite: ARCH 111, ARCH 112, ARCH 113. EDES 101 or consent of department head.

#### ARCH 252, 253 Architectural Design Fundamentals (5) (5)

Continuation of ARCH 251. Development of concepts pertaining to architectural form, space, structure, and organization. Consideration of function, site, climatic forces, and contextual issues which shape the built environment. One designated field trip required. 5 laboratories. Prerequisite: ARCH 251.

### ARCH 270 Selected Topics (1-3)

Directed group study of selected topics. *Class Schedule* will list topic selected. Open to first-, second-, third-year students. Total credit limited to 6 units. 1 to 3 lectures.

# ARCH 302 Principles of Architectural Design (3)

Basic theory of the art of architecture and its application in architectural design. 3 lectures. Prerequisite: ARCH 204.

#### ARCH 303 Human Factors for Environmental Designers (3)

Integrated approach to development of systematic design programs. Developing and interpreting human factors design criteria, performance and satisfaction as a function of environmental factors, determining and assessing user preferences, methods of field observation and analysis. 3 lectures. Prerequisite: Second-year standing in School of Architecture and Environmental Design or consent of instructor.

# ARCH 307 Environmental Control Systems II (4)

Theory and application in the integration of environmental control systems and architectural form. Comprehensive techniques for achieving an architecture of the well-tempered environment. Miscellaneous course fee required-see *Class Schedule.* 2 lectures, 2 laboratories. Prerequisite: ARCH 207, ARCH 250.

#### ARCH 310 Architectural Design Methods and Theories (4)

Analysis of design process, methods of analysis, synthesis, and evaluation in design. Relation between methods used and theories of design. 4 lectures. Prerequisite: ARCH 253.

# ARCH 312 Home and Community Design (3) GEB F.2.

Historical development of the home and city and the effect of location, climate, social and technological factors on homes and cities. Considerations and design methodology; furniture, landscape, and relation of home to community environment. For non-Architecture majors. 3 lectures. Prerequisite: Junior standing.

#### ARCH 313 Advanced Delineation (2)

Development of proficiency in architectural presentation. Projects and critiques. 2 laboratories. Prerequisite: ARCH 253.

### ARCH 316 California Architecture and the California Dream (3) GEB C.3.

Development of California Architecture as the symbolic expression of the myth of the California Dream. Focus on tracing California's unique contribution to architecture and urban patterns in the United States. 3 lectures. Prerequisite: ENGL 114.

# ARCH 317 History of Architecture (3) GEB C.3.

Architecture and urbanism in the Mediterranean Basin, Europe and Asia from prehistory to about AD 900. Cultural and

physical conditions which influenced the built environment. 3 lectures. Prerequisite: ENGL 114.

### ARCH 318 History of Architecture (3) GEB C.3.

Architecture and urbanism in the Pre-Columbian Americas, and the developments in the West from the Middle Ages until the end of the Baroque. Cultural and physical conditions which influenced the built environment. 3 lectures. Prerequisite: ENGL 114.

# ARCH 319 History of Architecture (3) GEB C.3.

Architecture and urbanism from Neo-Classicism to the present. Cultural and physical conditions which influenced the built environment. 3 lectures. Prerequisite: ENGL 114.

# ARCH 337 Photographic Presentation (2)

Media presentations in architecture with emphasis on black and white and color print photographic presentations, formats, and techniques applicable to architecture subjects and to design communication. 1 lecture, 1 laboratory. Prerequisite: ARCH 111, ARCH 112, ARCH 113.

#### ARCH 338 Media Presentations in Architecture (2) (CR/NC)

Media presentations in architecture with emphasis on photographic color slide presentations, formats and techniques applicable to architectural subjects and to design communication. For students in SAED. Credit/No Credit grading only. 1 lecture, 1 laboratory. Prerequisite: ARCH 111, ARCH 112, ARCH 113.

#### ARCH 339 Video Presentations in Architecture (2) (CR/NC)

Media presentations in architecture with emphasis on video format and creative camera and editing techniques as applicable to subjects in architecture and design communication. Open to students in SAED. Credit/No Credit grading only. 1 lecture, 1 laboratory. Prerequisite: ARCH 111, ARCH 112, ARCH 113.

# ARCH 341, 342 Architectural Practice (4) (4)

Construction systems in masonry, steel, and concrete and combinations of these materials. Preparation of outline specifications. Production of design development drawings. 2 lectures, 2 laboratories. Prerequisite: ARCH 231, ARCH 253. Concurrent enrollment recommended in: ARCH 351, or ARCH 352, or ARCH 353.

# ARCH 350 Computer Applications in Architecture (3)

Applications of computer systems to large-scale data processing, analysis, optimization and evaluation of design program elements. 2 lectures, 1 activity. Prerequisite: ARCH 250.

# ARCH 351, 352, 353 Architectural Design (5) (5) (5)

Continuation of ARCH 253. Development and exploration of architectural theories, building systems, and design processes involved in creating appropriate architecture. Miscellaneous course fee required–see *Class Schedule*. 5 laboratories. Prerequisite: ARCE 226, ARCH 231, ARCH 253. Concurrent enrollment required in ARCH 341 or ARCH 342.

# ARCH 357 Computer Graphics in Architecture (4)

Computer-aided design methods in architecture, focusing upon two-dimensional and three-dimensional graphics on microcomputers. Miscellaneous course fee required-see *Class Schedule.* 2 lectures, 2 laboratories. Prerequisite: ARCH 250.

#### ARCH 400 Special Problems for Advanced Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

### ARCH 401 Toward a Barrier-Free Environment (3)

Exploring the interface between the built environment and human behavior. Physical and psychological design determinants. Attitudes towards deviancy, accessible environments and persons with disabilities. Legal, ethical, human factors. 3 lectures. Prerequisite: Junior standing or consent of instructor.

# ARCH 407 Environmental Control Systems III (4)

Theory and application of mechanical and electrical systems for comfort. Emphasis on internal-load dominated buildings. Consideration of artificial lighting, H.V.A.C. systems, acoustics, water and waste systems. Miscellaneous course fee required--see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: ARCH 307.

#### ARCH 411 Climatic Determinants of Building Design (2)

Influence of solar radiation and climatic conditions on siting and design of buildings. Architectural principles and energy conservation. 2 lectures. Prerequisite: PHYS 132, ARCH 307.

# ARCH 413 The Built Environment: Issues and Education (3)

Identification of major issues in the design and creation of the built environment. Strategies for developing instructional units related to critical thinking and problem solving in the K-12 school setting. 1 lecture, 2 activities. Prerequisite: Junior standing.

#### ARCH 441, 442 Professional Practice (3) (3)

Basic elements of architectural practice. Office organization, procedures, contracts, specifications, construction cost analysis and comprehensive client services. Professional ethics. 1 lecture, 2 activities. Prerequisite: ARCH 353 and concurrent enrollment in ARCH 452 or ARCH 453.

#### ARCH 445 Urban Design in Architecture (3)

Design role of the urban architect. Economic, environmental and technological forces impacting on architectural practice in urban areas. 3 lectures. Prerequisite: ENGL 114.

#### ARCH 446 The Small Scale Master Builder (4)

Principles of practice as owner-designer-builder, selling or leasing products. Comparison with traditional practice. Potential income, constraints on design decisions, and ethics. Analysis of factors and methods relevant to such practice, including financing, taxes, accounting, market analysis, and development potential. Starting with little or no capital. 4 lectures. Prerequisite: Fourth-year standing.

#### ARCH 447 Design Regulations (3) (Also listed as CRP 447)

Practical application of fundamental building code requirements and zoning regulations in the design process. Codes and regulations used including city zoning regulations, city parking and driveway standards, the Uniform Building Code, and architectural barrier laws. 3 lectures. Prerequisite: ARCH 342.

#### ARCH 451 Architectural Design (5)

Continuation of ARCH 351, 352, 353. Problems of increasing architectural complexity involving the comprehensive integration of architectural theory, design processes, and building systems with emphasis placed on multifunction singular buildings. Miscellaneous course fee required-see *Class Schedule*. 5 laboratories. Prerequisite: ARCH 307, ARCH 342, ARCH 351, ARCH 352, ARCH 353, ARCE 321, ARCE 322, ARCE 323.

### ARCH 452 Architectural Design (5)

Continuation of ARCH 351, 352, 353. Problems of increasing architectural complexity involving the comprehensive integration of architectural theory, design processes, and building systems with emphasis placed on multibuilding, multifunctional projects. Miscellaneous course fee required-see *Class Schedule*. 5 laboratories. Prerequisite: ARCH 307, ARCH 342, ARCH 451, ARCE 321, ARCE 322, ARCE 323.

#### ARCH 453 Architectural Design (5)

Continuation of ARCH 351, 352, 353. Problems of increasing architectural complexity involving the comprehensive integration of architectural theory, design processes, and building systems with emphasis placed on multibuilding, multifunctional projects in an urban context. Miscellaneous course fee required–see *Class Schedule*. 5 laboratories. Prerequisite: ARCH 307, ARCH 342, ARCH 452, ARCE 321, ARCE 322, ARCE 323.

# ARCH 455 Human Factors Applications in Architecture (3)

Human factors applications: human factors taxonomy, standardized information system, ergonomic research methods, evaluation procedures, and application strategies. 3 lectures. Prerequisite: Consent of instructor.

# ARCH 460 Advanced Computer Graphics in Architecture (3)

Advanced methods in the application of computer graphics and multi-media techniques in architectural design. Miscellaneous course fee required-see *Class Schedule.* 2 lectures, 1 activity. Prerequisite: ARCH 357 or equivalent and consent of instructor.

#### ARCH 461 Advanced Computer-Aided Design in Architecture (3)

Advanced applications of computers in architectural design with emphasis on utilizing intelligent tools in the design process. Miscellaneous course fee required-see *Class Schedule.* 2 lectures, 1 activity. Prerequisite: ARCH 357 or equivalent and 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. 2 seminars. Prerequisite: Fourth-year standing in architecture. Credit/No Credit grading only.

#### ARCH 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

#### ARCH 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

### ARCH 480 Special Studies in Architecture (1-12)

Special issues and problems through research, field trips, design projects, and other forms of investigation and involvement. Course requirements are determined prior to each individual project through a contractual agreement between students and department. The departmental Off Campus Study Guidelines apply except when superceded by guidelines and practices of the London Study Program of the School of Liberal Arts. Total credit limited to 36 units. Prerequisite: Junior standing.

#### ARCH 481 Senior Architectural Design Thesis Project (6)

Comprehensive building design and research project in an architectural concentration area. Demonstration of professional competency in integration of architectural theory, principles and practice with creative, organizational and technical abilities in architectural programming, design and design research. Total credit limited to 18 units, with a maximum of 6 units per quarter. Miscellaneous course fee required—see *Class Schedule.* 6 laboratories. Prerequisite: ARCH 442, ARCH 453 and fifth year standing.

#### ARCH 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

#### ARCH 491 Design Project (2)

Comprehensive architectural design project chosen by the student to challenge technical, creative, and organizational abilities. Project to involve community or field contact on a team basis. Construction or projects involving other disciplines encouraged. 2 laboratories. Prerequisite: Fifth-year standing.

#### ARCH 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

# ARCH 501 Environmental Control Systems (3)

Comparative analysis and evaluation of mechanical and electrical building systems in high-rise and special purpose low-rise buildings. 3 seminars. Prerequisite: ARCH 407.

#### ARCH 510, 511 Environmental Design Methods (3) (3)

Application of systematic, step-by-step procedures to rational and intuitive judgmental tasks. Methods for formulation, idea production, evaluation, and testing applied to planning, testing, design information systems, communication between designer and client, user participation in design, and other current topics. 511 focuses on specific problem area among topics and may be repeated up to 9 units. 3 lectures. Prerequisite: Graduate standing.

# ARCH 513 Natural Architectural Lighting (3)

Perception and awareness of light; natural light as generator of urban spaces and building forms. Principles of design in lighting fundamentals and techniques. 3 lectures. Prerequisite: ARCH 407 or consent of instructor.

# ARCH 519 Theory of Architecture (3)

Comparative analysis of the major historic influences which have contributed to the development of architectural design theories. *Class Schedule* will list topic selected. Total credit limited to 9 units. 2 lectures, 1 seminar. Prerequisite: ARCH 319 or graduate standing.

# ARCH 531 Habitability (3)

Habitability standards and concepts significant for architectural design and practice. Behavioral analysis of habitats, facilities and urban systems. Design and development of structures and systems responsive to human needs. Habitability and environmental specifications, human factors, human engineering, behavioral sciences. 3 seminars. Prerequisite: ARCH 453.

# ARCH 532 Quantitative Methods in Architecture (3)

Roles of research in environmental design analysis. Approaches to research, hypothesis testing, data banks, and information systems for design. Use of research findings in various decision-making systems. 3 seminars. Prerequisite: Graduate standing.

# ARCH 533 Architectural Programming (3)

Information management in the design process. Techniques for gathering, analyzing, and transforming data for use as design information. Variety of approaches to pre-design planning. 3 seminars. Prerequisite: ARCH 453.

#### ARCH 537 Principles of Development (3)

Theory and application of the architect's role in real estate development. Topics include financing, corporate structuring, feasibilities, market studies, and proposal presentation. Emphasis on the influence of design on the success of the development process. 3 seminars. Prerequisite: Graduate standing in Architecture, or consent of instructor.

#### ARCH 551 Architectural Design (5)

Professional initiative and responsibility in integrating architectural design theory and practice with fields influencing the total environment. Building types considered as the coordinating factor. Total credit limited to 15 units with no more than 5 units in any one quarter. 5 laboratories. Prerequisite: Graduate standing.

#### ARCH 561 Advanced Design (3)

Continuation of ARCH 551. Advanced studies integrating architectural design theory and practice with fields influencing the shaping of the total environment. Total credit limited to 9 units. 3 laboratories. Prerequisite: Graduate standing.

#### ARCH 563 Professional Seminar (2)

Problems and topics in the field of the architectural profession. Seminar drawn upon expertise of visiting professionals in addition to topics presented by regular faculty and students. 2 seminars. Prerequisite: Graduate standing.

# ARCH 580 Seminar in Theory of Architecture (3)

Directed group study of selected topics in the theory of architecture for graduate students. *Class Schedule* will list specific topics selected. Total credit limited to 9 units. 3 seminars. Prerequisite: ARCH 453.

# ARCH 598 Master's Design Project (3-6)

Completion of an architectural design project demonstrating individual creative ability at an advanced level. Total credit limited to 9 units. 3 or 6 laboratories. Prerequisite: Consent of graduate adviser, consent of graduate committee, and ARCH 561.

# ARCH 599 Master's Thesis (3-6)

Completion of a thesis embodying original research in an area of environmental design. Total credit limited to 9 units. Prerequisite: Consent of graduate adviser, consent of graduate committee and ARCH 561.

# ART

# ART 101 Fundamentals of Drawing (4) GEB C.2.

Analysis, history and practice of the art of drawing. Drawing problems progress from simple geometric shapes to more sophisticated subject matter, expanding visual awareness. Lectures on historical methods and the importance of drawing. Development of individual techniques. 1 lecture, 3 activities.

# ART 104 Introduction to Art Materials (3)

Manipulation and experimentation with a wide variety of art media and techniques. Evaluation of expressive and design qualities in group and individual projects. 3 activities.

# ART 108 Fundamentals of Sculpture (4) GEB C.2.

Studio course in the creative investigation of three-dimensional form through problems in modeling, casting, carving and assembly. Emphasis on expression, aesthetics and history. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 3 activities.

#### ART 111 Introduction to Art (4) GEB C.2.

Designed to acquaint the non-art major with painting, sculpture, drawing, crafts, architecture, and printmaking. Development of vocabulary, analytic skills, and research techniques for the understanding of art objects. 4 lectures.

# ART 112 Survey of Western Art (3)

GEB C.2.

History of major art movements in western civilization from Greek art to the present. Representative periods of western culture, such as the Classic tradition, the Middle Ages, the Italian Renaissance, the Renaissance in Northern Europe, Baroque and Rococo, Romanticism, Neo-Classicism and Modernism. 3 lectures.

#### ART 131 2-Dimensional Design Fundamentals (3)

Basic design theory in black, white and greys covering the visual elements and principles in two dimensions. 1 lecture, 2 activities.

#### ART 132 Beginning Color Theory (3)

Basic design color theory developed through exercises in hue, value and intensity. 1 lecture, 2 activities. Prerequisite: ART 131.

#### ART 133 Color and Design (3)

Advanced color problems in two-dimensional design theory covering compositional, optical and psychological aspects of visual communication. 1 lecture, 2 activities. Prerequisite: ART 131, ART 132.

# ART 134 3-Dimensional Design I (3)

Studio course in research and application of principles, elements and criticism of three-dimensional design concepts. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 2 laboratories.

# ART 135 3-Dimensional Design II (3)

Studio course using 3-dimensional forms and materials. Introduction of product design including concept, illustration and assembly methods. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 2 laboratories. Prerequisite: ART 134, or consent of instructor.

#### ART 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of instructor.

# ART 201 Intermediate Drawing (3)

Development of additional drawing techniques with emphasis on form and composition. 3 activities. Prerequisite: ART 101.

#### ART 204 Beginning Watercolor (3)

Transparent watercolor painting. Course emphases: proper use of watercolor paper, brush techniques, pigment mixing, use of color, use of washes, wet-into-wet, indirect methods, composition and presentation. 3 activities. Prerequisite: ART 101.

#### ART 211 Art History-Prehistoric through the European Middle Ages (4)

Nature and development of outstanding works of art from ancient cultures in Europe, Egypt and the Eastern Mediterranean. Emphasis upon the study of painting, sculpture and related visual arts that coincide with historical background factors. 4 lectures.

# ART 212 Art History-European Renaissance through Baroque Eras (4)

Studies concentrate upon significant visual expressions of the Renaissance and Baroque eras in painting, sculpture and architecture. Relevancy of historical background factors to art expression emphasized. 4 lectures. Prerequisite: ART 211.

#### ART 213 Art History-European 18th and 19th Century Art (4)

Painting, sculpture and the related visual arts culminating with Romanticism, Neoclassicism, and Realism. Historical factors and artistic leaders pertinent to art expression of these eras emphasized. 4 lectures. Prerequisite: ART 211 or ART 212.

#### ART 221 Basic B/W Photography (3)

Fundamental techniques in black and white photography. Mechanics of cameras and equipment, optics, composition, filters, subject content, developing, printing, and mounting. Understanding photographic principles, producing a quality continuous tone print, and print presentation. 35mm camera with manual adjustment capability required. 2 lectures, 1 laboratory.

# ART 222 35mm Intermediate B/W Photography (3)

Control of tonal range using 35mm cameras and available daylight illumination. Composition and visual communication. Assignments range from close-ups to architecture. Emphasis on "photographic seeing" and professional quality enlargements. 2 lectures, 1 laboratory. Prerequisite: ART 221.

### ART 224 35mm Advanced B/W Photography (3)

Advanced B/W photography using 35mm cameras. Artificial light including studio electronic flash, tungsten studio light, and hand strobe. Professional quality developing and printing. Includes portraiture, close-ups, product, and action. 2 lectures, 1 laboratory. Prerequisite: ART 221, ART 222.

# ART 228 35mm Color Slide Photography (2)

Introductory nonlaboratory course in color slide photography featuring 35mm camera handling, slide film, indoor and outdoor photography, composition, slide presentation. 2 lectures.

# ART 231 Computer Assisted Graphic Design (3)

Introduction to the Macintosh system to acquaint students with operating procedures. Students will learn Aldus PageMaker 4, Aldus FreeHand 3.0, Adobe PhotoShop and Pixel Paint Professional for use in their own creative design or photo work. 2 lectures, 1 laboratory. Prerequisite: ART 230 or computer literacy (F.1.) course.

# ART 232 Beginning Graphic Design (3)

Basic terminology, studio skills, assembly methods, photographic reproduction processes, and specification for graphic designers. Familiarization with the various services available. 2 lectures, 1 laboratory. Prerequisite: ART 131, ART 132, ART 133.

#### ART 242 Glassblowing (4)

Studio course in the offhand process of working with glass from a furnace. Overview of glass history. Development of tools and forming processes studied while students develop 3-dimensional projects. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 2 activities.

#### ART 243 Glassforming (3)

Studio course in the creative processes of fusing, forming, and assembling glass. Introduction to the use of line, color, and texture related to glass as a transparent or opaque material. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 2 laboratories.

#### ART 245 Ceramics I (3)

Studio course in basic clay working with emphasis on design quality, hand building, and use of the potter's wheel. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 2 laboratories.

#### ART 255 Jewelry Design (3)

Studio course in nonferrous metal techniques including cutting, forming, soldering, and forging with emphasis on creative design solutions. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 2 laboratories.

#### ART 301 Advanced Drawing (3)

Development of advanced methods and techniques in the study of form and structure. Emphasis on problem solving. 3 activities. Prerequisite: ART 131 and ART 201.

# ART 302 Life Drawing I (3)

Development of methods and techniques in the study of form and structure as it relates to human proportion and anatomy analysis. 3 activities. Prerequisite: ART 201.

# ART 303 Life Drawing II (3)

Advanced problems in life drawing. Advanced methods and techniques in the study of the human form as it relates to proportion, anatomy analysis and composition. 3 activities. Prerequisite: ART 302.

# ART 304 Advanced Watercolor (3)

Transparent watercolor painting. Design and composition of painting, use of drawing and advanced watercolor techniques. 3 activities. Prerequisite: ART 204.

#### ART 305 Painting Techniques (3)

Physical characteristics of painting media, creative understanding of pictorial space and color. 3 activities. Prerequisite: ART 101.

# ART 306 Figure Painting (3)

Comparative development of proportion and structure of the human head and figure as it relates to color and value. Mixing of pigment color and its implementation to figure painting. Continued emphasis with figure, its artistic placement in space and pictorial composition. Total credit limited to 6 units. 3 activities. Prerequisite: ART 204, ART 302.

# ART 307 Graphic Rendering (3)

Problems in felt-marker rendering techniques relative to various graphic design applications. 2 lectures, 1 laboratory. Prerequisite or concurrent: ART 301 and ART 302.

#### ART 308 Sculpture (3)

Studio course in advanced investigation of three-dimensional form through problems in modeling, casting, carving, and techniques of assembly. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 2 laboratories. Prerequisite: ART 108.

#### ART 311 Art History-Modern Art (4)

History of painting and sculpture from the French Revolution to World War I. Covers such major movements as Neo-Classicism, Romanticism, Impressionism, Post-Impressionism, Fauvism, Cubism, Expressionism, and Dada. 4 lectures. Prerequisite: ART 111, ART 112 or ART 213

# ART 312 Art History–Contemporary Art (4) GEB C.3.

History of major art movements and ideologies from Surrealism to the present. Major emphasis will be placed on developments in painting and sculpture after World War II. 4 lectures. Prerequisite: ART 311, a 200-level art history course.

### ART 313 Design History (3)

Survey of design history from Russian avant-garde to the present. Emphasis placed on Constructivism, Streamlining, and development of the Modern Movement in design. 3 lectures. Prerequisite: Any lower division art history course for Art majors; Junior standing for all other students.

#### ART 314 History of Photography (4) GEB C.3.

Photography and significant photographers from the invention of the camera obscura to the present day. Evolution of visual ideas in the medium with regard to changes in technology and society. Relationship to other visual arts and cultural impact. 4 lectures. Prerequisite: Any lower division art history course for Art majors; Junior standing for all other students.

### ART 320 Fashion Photography (3)

Posing and directing models in fashion photography using 35mm and medium format cameras in black and white. Various studio lighting setups and locations techniques as they apply to advertising and editorial fashion photography. 2 lectures, 1 laboratory. Prerequisite or concurrent: ART 224.

# ART 321 Photographic Expression: B/W (4)

Advanced techniques including multiple exposure, multiple printing, high contrast and series. Emphasis on personal expression and developing style, introduction to symbology, visual source development and the work of contemporary creative photographers. 2 lectures, 2 laboratories. Prerequisite: ART 224 and ART 314.

#### ART 322 Color Photography I, Negative (3)

Fundamental techniques in color photography. Theory of color, visual concepts, exposing, and processing color negatives, printing from color negatives, finishing and presentation. Studio electronic flash and available light. 2 lectures, 1 laboratory. Prerequisite: ART 224.

# ART 323 Color Photography II, Positive (3)

Development of consistent control of 35mm transparency exposure and printing. Theory of color in expression and communication; exploration of both a descriptive approach and interpretive approach using multiple image techniques, a survey of contemporary color photography. 2 lectures, 1 laboratory. Prerequisite: ART 228, ART 322.

#### ART 325 4x5 Camera Techniques, B/W (3)

Basic techniques using 4x5 view cameras. Architecture, landscapes, portraiture, and other outdoor subjects used to help the student master the use of large format cameras. Other topics include exposure techniques, perspective, and sharpness correction, lighting and composition. Sensitometric approach to B/W film development and print quality emphasized. 2 lectures, 1 laboratory. Prerequisite: ART 323.

### ART 326 4x5 Camera/Commercial (3)

Professional techniques with large format cameras. Outdoor and studio photography presented using B/W film and color transparencies. Topics include studio lighting for glass and metal, copying, interiors, and product photography. 2 lectures, 1 laboratory. Prerequisite: ART 325.

#### ART 327 Portraiture (3)

Studio and environmental portraiture. Emphasis on light ratios/patterns; posing; personality portrayal. Retouching of film and print. 2 lectures, 1 laboratory. Prerequisite: ART 224, ART 325.

#### ART 329 Editorial and Corporate Photography (3)

Creating, lighting and executing editorial photography. Producing photography for corporate needs i.e. annual reports, brochures and in-house publications. Emphasis on selecting subject matter, handling lights and color film. 2 lectures, 1 laboratory. Prerequisite: ART 326.

#### ART 331 Typographic Design (3)

Principles of letterforms and how these principles affect the communication of ideas through graphic design. Analysis of type style, structure, and form. 3 activities. Prerequisite: Junior

standing. ART majors: ART 135, ART 230 (or concurrent). GRC majors: ART 133.

# ART 332 Symbology (3)

Use of symbolism, metaphor and connotative imagery in graphic design. Exploration of various problem solving methods for image-making. 3 activities. Prerequisite: ART 331, junior standing.

#### ART 333 Corporate Identity (3)

Design and implementation of corporate logos. Development of graphic standards manuals for use of identity for diverse applications. 3 activities. Prerequisite: ART 332, junior standing.

#### ART 343 Glass Casting (3)

Various aspects of glass as a transparent substance. Glass castings will be produced in lab exercises that will involve the student's interpretation of glass as a spacial material as well as a sculptural form. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 2 laboratories. Prerequisite: ART 108 or ART 242 or ART 243, or consent of instructor.

#### ART 345 Ceramics II (3)

Studio course in hand, wheel, mold, extruder jigger, and press forming skills. Design of single and multiple forms and kiln firing procedures. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 2 activities. Prerequisite: ART 108, or ART 134, or ART 245 or consent of instructor.

# ART 346 Ceramics III (3)

Studio use of clay, slip, engobe, glaze, stoneware and raku. Contemporary craftmaker's skills are developed through use of historic and industrial techniques. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 2 activities. Prerequisite: ART 108, or ART 134, or ART 245 or consent of instructor.

#### ART 355 Metalsmithing (3)

Studio course investigating intermediate fabrication including raising, box construction and masonite dye. Exploration of surface design techniques for nonferrous metals. Emphasis on creative design solutions to problems. Miscellaneous course fee required-see *Class Schedule*. 3 activities. Prerequisite: ART 108 or ART 255, or consent of instructor.

#### ART 356 Jewelry Casting (3)

Introduction to casting for the jeweler with emphasis on creative design solutions to assigned problems. Use of lost wax techniques including design, wax working, casting and finishing. Miscellaneous course fee required-see *Class Schedule.* 3 activities. Prerequisite: ART 108 or ART 255, or consent of instructor.

#### ART 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Senior standing and consent of instructor.

### ART 408 Illustration (3)

Development of techniques and conceptual skills in illustration for use in the fields of graphic design and advertising. Total credit limited to 6 units. For Applied Art and Design majors only. 3 activities. Prerequisite: ART 204, ART 302, ART 331.

#### ART 424 Multi-Media Photography (4)

Multi-media presentation, synchronizing color slides, music, narration, and video. Contemporary, creative photography techniques applied. Creative seeing and interpretation that communicates to the viewer. 2 lectures, 2 laboratories. Prerequisite: ART 323.

#### ART 426 Illustration Photography I-B/W (3)

Principles of lighting and design as applied to subjects and small product studio photography. 35mm and 4x5 cameras used. Emphasis on creative problem solving, tabletop composition and lighting to produce quality image. 2 lectures, 1 laboratory. Prerequisite: ART 326 and senior standing.

#### ART 427 Illustration Photography II-Color (3)

Applied principles of design and color to produce a photograph that sells an idea, product, or service. 35mm and 4x5 cameras used. Emphasis on thinking, planning, interpreting, and presenting an idea photographically. 2 lectures, 1 laboratory. Prerequisite: ART 426 and senior standing.

#### ART 428 Commercial Photography (4)

Professional photographic techniques using large and small format cameras, color and B/W materials. Incorporates personal style. Emphasis on commercial and illustrative applications in studio and on location. Portfolio quality prints. 2 lectures, 2 laboratories. Prerequisite: ART 427 and senior standing.

#### ART 430 Advanced Typographic Design (3)

Advanced principles of letterform design and modification related to the communication of ideas through graphic design. Advanced analysis of type characteristic. Computer application to the typographic design processes. 3 activities. Prerequisite: ART 333 and senior standing.

#### ART 431 Package Design (3)

Graphics for food, beverage and related packaging. Positioning of products through research into typography, imagery and color. For Applied Art and Design majors only. 3 activities. Prerequisite: ART 333 and senior standing.

#### ART 432 Advertising Design (3)

Development of print advertising from concept to marker rendering. Emphasis on art direction, photo direction and copywriting. For Applied Art and Design majors only. 3 activities. Prerequisite: ART 431 and senior standing.

### ART 433 Editorial Design (3)

Design of editorial material, printed collateral, magazine layouts and annual reports. For Applied Art and Design majors only. 3 activities. Prerequisite: ART 432 and senior standing.

#### **ART 460** Professional Practices (2)

Professional practices in the art and design field, legal and ethical questions, taxes, contracts, fees and copyrights. Current job opportunities, resumé and portfolio preparation with visiting professionals. For Applied Art and Design majors only. 2 lectures. Prerequisite: Senior standing.

# ART 461 Senior Project (3)

Selection and completion of a project under faculty supervision. Minimum of 90 hours time. Results presented in a formal report. Prerequisite: Senior standing and ART 460.

# ART 462 Senior Portfolio Project (1)

Preparation of portfolio system for entrance into the professional job market. 1 activity. Prerequisite: Senior standing and ART 461.

#### ART 463 Undergraduate Seminar (2)

Analysis of selected problems and topics for undergraduates. 2 seminars. Prerequisite: Senior standing.

#### ART 464 Graphics and Animation Techniques for Microcomputers (3)

Original and available software to investigate graphics generation and realtime animation techniques. Topics include BASIC vs. assembly language, brush painting, page flipping. Color graphics, sound, and music. Educational and commercial applications and marketing. 3 lectures. Prerequisite: CSC 110 or CSC 410 and CSC 207.

# ART 465 Contemporary Photography Seminar (2)

Survey of significant photographers and developments in the field since 1950. The interaction between photography and the other visual arts as well as its social impact during this period. Student presentations on selected research topics. Total credit limited to 4 units. 2 seminars. Prerequisite: ART 314.

# ART 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

#### ART 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

# ART 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

#### ART 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

# ASCI-ANIMAL SCIENCE

# ASCI 100 Enterprise Project (1-4) (CR/NC)

Selection and completion of a management/production project under faculty supervision. Project participation is subject to approval by the project supervisor and the Cal Poly Foundation. Degree credit limited to 12 units. Credit/No Credit grading only.

#### ASCI 101 Introduction to the Animal Sciences (2) (CR/NC)

Economic, environmental and societal impact of the livestock, poultry and horse industries. Basic terminology, anatomy, and physical requirements of animals. Career and academic planning. Co-curricular, extra-curricular, and post-graduate opportunities. Required of all first-time students in the Animal Sciences and Industry Department. Credit/No Credit grading only. 2 lectures.

# ASCI 111 Market Beef Production (3)

Introduction to modern beef production. Problems and responsibilities of the beef industry as it relates to diet/health issues and new advances. Study of industry characteristics, types, breeds, market classes and grades, carcass characteristics and merchandising cattle. 3 lectures.

### ASCI 112 Elements of Swine Production (3)

History, development and importance of swine industry. Types, breeds, market classes and grades of swine. Basic principles and practices of swine feeding and management. 3 lectures.

# ASCI 113 Elements of Sheep Production (3)

Role of sheep in world agriculture. Types, breeds, market grades of products and merchandising. Survey of types of sheep operations and geographic influence on management. Social concerns including humane care, residues and diet/health issues. 3 lectures.

#### ASCI 114 Elements of Horse Production (3)

Status of the horse industry. Breeds of horses and their uses. Anatomy and parts of the horse. Unsoundnesses, ailments and their treatments. Early history of the horse. 3 lectures.

# ASCI 131 Beginning Western Riding (3)

Designed to teach basic riding to students with no previous experience. Proper and safe catching, grooming, saddling, bridling, mounting and riding techniques. Fundamental care of the horse. Proper attire and advanced sign-up required. Miscellaneous course fee required-see *Class Schedule*. 3 laboratories.

#### ASCI 200 Special Problems for Undergraduates (2-3)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 3 units per quarter. Prerequisite: Consent of department head.

#### ASCI 202 Feeds and Feeding (3)

Simple use of food nutrients. Identification and classification of feeds for each class of livestock. Digestion and utilization of feeds. Feeding standards and computation of simple rations for livestock. Economy in feeding and purchasing feeds by nutritive values. 3 lectures.

#### ASCI 226 Livestock Evaluation (3)

Utilization of objective and subjective estimation measures in establishing economic worth of domestic animals of the three meat animal species and horses. 1 lecture, 2 laboratories.

# ASCI 230 General Animal Science (4)

Role of animal agriculture in food production and human nutrition. Discussion of breeds, types of enterprises, nutrition, reproduction and management of beef cattle, sheep and swine. Commentary on the horse as a recreational animal. Credit not allowed for Animal Science majors. 3 lectures, 1 laboratory.

### ASCI 240 Applied Feeds and Feeding (2)

Introduction to feedstuffs, identification and quality evaluations. Proximate analysis, digestibility and energy values of feeds. Mechanics of ration formulation and feeds selection based on nutrient content and market values for the various species of domestic livestock. 1 lecture, 1 activity. Prerequisite or concurrent: ASCI 202.

#### ASCI 241 Applied Beef Cattle Practices (2)

Application of operational practices in the purchasing, management, and marketing of beef cattle. Equipment, preventive veterinary practices, live animal evaluation, performance records, carcass evaluation, and ranch evaluation. 1 lecture, 1 activity.

#### ASCI 242 Applied Swine Management Practices (2)

Application of operational practices in the management and merchandising of swine. Housing and equipment, routine veterinary practices, live animal evaluation, performance evaluations, farrowing and post-farrowing practices, and carcass appraisal. 1 lecture, 1 activity.

#### ASCI 243 Applied Sheep Management Practices (2)

Flock management. Sheep handling techniques, breed evaluation. Internal and external parasite control. Tagging, shearing, foot trimming. Selection, culling and identification. Marking techniques. Pregnancy diagnosis. Wool grading and judging. Market lamb and carcass evaluation. 1 lecture, 1 activity.

#### ASCI 244 Applied Horse Practices (2)

History and location of horse unit facilities and breeds maintained. Common knots, proper techniques in safely catching, leading, grooming, and restraining horses. Evaluation of desirable and faulty conformation. Preventive health program. Determining the age of a horse by dentition. Pedigree analysis. 1 lecture, 1 activity. Prerequisite or corequisite: ASCI 114 recommended.

# ASCI 260 Preparation of Livestock for Shows and Sales (2)

Techniques, equipment and knowledge necessary in order to properly condition, groom, and present livestock for evaluation and merchandizing. Total credit limited to 8 units. 2 laboratories.

#### ASCI 302 Applied Animal Nutrition (3)

Feedstuff evaluation and analysis. Advancements in feedstuff evaluation and application to ration formulation. Principles and practices in livestock ration formulation. Linear programming principles as applied to computer formulated rations. 2 lectures, 1 laboratory. Prerequisite: ASCI 202, ASCI 240, CHEM 326.

#### ASCI 304 Animal Breeding (3)

Application of genetic principles for livestock improvement. Improving production through a study of selection techniques, mating systems, and performance evaluation using current technology. 3 lectures. Prerequisite: BIO 303.

### ASCI 311 Commercial Beef Management (3)

Management practices involved in the commercial beef cattle breeding enterprise. Trends and economic considerations relative to California and the U.S. Principles of selection, basic reproductive physiology, breeding systems, range management, nutrition, health programs and marketing phases of the enterprise. 3 lectures. Prerequisite: ASCI 111.

#### ASCI 312 Swine Management (3)

Management practices involved in commercial and purebred swine enteprises. Methods of production and marketing, performance testing programs and carcass evaluation techniques. Nutritional requirements, rations, feed additives, diseases and parasites, facilities and equipment. 3 lectures. Prerequisite: ASCI 112, ASCI 242.

#### ASCI 313 Sheep Management (3)

Management practices of purebred and commercial sheep operations. Techniques, equipment, feeds, health care products and decision making throughout a production cycle from selection to culling. Exposure to emerging technologies and scientific advancements that will affect the sheep industry. 3 lectures. Prerequisite: ASCI 113. Recommended: ASCI 243.

#### ASCI 314 Advanced Horse Management (3)

Management practices relative to the training and conditioning of the horse. Investigation of the nutritional, behavioral and physiological parameters required of the horse in work, sport and recreational events. Miscellaneous course fee required-see *Class Schedule.* 3 lectures. Prerequisite: ASCI 114 and ASCI 244, or consent of instructor.

#### ASCI 323 Beef Husbandry (4)

Management practices of purebred beef operations. Breeding programs and selection practices using the latest technologies, including the use of computers for the selection of bulls and replacement females. 3 lectures, 1 laboratory. Prerequisite: ASCI 111 and ASCI 311.

#### ASCI 326 Advanced Livestock Evaluation (2)

Application of deductive and inductive logical processes in appraising the relative merit of individual animals within a group sample. Oral expression of the selection rationale. 2 laboratories. Prerequisite: ASCI 226.

#### ASCI 329 Principles of Range Management (3)

Characteristics, history and multiple uses of rangeland. Principles of range plant physiology and ecology in relation to range condition, trend, utilization and improvement practices. Principles of proper grazing practices and nutrition of livestock. 3 lectures. Prerequisite: One course each in soil science, animal science and botany or crop science.

#### ASCI 331 Applied Range Management Practices (2)

Basic taxonomy and values of common range plants. Evaluation of range sites, soils, condition, trend and grazing utilization. Application of range technology, improvement and management practices to field situations. 1 lecture, 1 activity. Prerequisite: One course each in soil science, animal science and botany or crop science. ASCI 329 recommended.

#### ASCI 333 Equine Reproduction (5)

Management of the breeding farm, breeding problems, diseases, study of estrus cycles, servicing the mare, handling stallions. Breeding systems, teasing, embryo transfer, ultrasound pregnancy diagnosis, new developments in breeding technology. Miscellaneous course fee required-see *Class Schedule*. 4 lectures, 1 laboratory. Prerequisite: ASCI 114, ASCI 244.

# ASCI 400 Special Problems for Advanced Undergraduates (2-4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 4 units per quarter. Prerequisite: Prior consent of department head.

### ASCI 401 Reproductive Physiology (4)

Reproductive efficiency of farm animals. Anatomy and physiological factors involved in reproduction. Male and female systems, pregnancy, estrual behavior, semen collection and evaluation, artificial insemination, pregnancy testing, and hormone therapy. 3 lectures, 1 laboratory. Prerequisite: VS 123.

# ASCI 402 Animal Nutrition (4)

Metabolism of proteins, carbohydrates, fats, minerals, and vitamins. Relationship of proper nutrition to livestock production. 3 lectures, 1 laboratory. Prerequisite: ASCI 302, CHEM 328.

#### ASCI 434, 435 Advanced Western Riding/Training (4) (4)

Training the young horse for work on a snaffle bit. Requires learning gaits, leads, backing, stopping, turning, trailer loading, rope work, and trail riding. Students must provide equipment. Advanced sign-up with instructor required. 4 laboratories. Prerequisite: ASCI 434: ASCI 114, ASCI 244, ASCI 260. ASCI 435: ASCI 434 and consent of instructor.

#### ASCI 461, 462 Senior Project (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.

#### ASCI 463 Undergraduate Seminar (2)

Major developments in the chosen field of the student. Discussion of new developments, policies, practices, and procedures. Each individual is responsible for the development and presentation of a topic in the chosen field. 2 seminars.

#### ASCI 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

#### ASCI 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

#### ASCI 475 The Practice of Animal Science (2)

Scientific and husbandry principles in the optimization of the art of animal production. Case studies diagnosed, intrepreted and resolved. Current scientific literature reviewed and applied to production cases. Professional expertise from animal industry leaders is utilized. 2 seminars. Prerequisite: Senior standing and consent of instructor.

#### ASCI 581 Graduate Seminar in Animal Production (3)

Current findings and research problems in the field and their application to the industry. 3 seminars.

# ASTR-ASTRONOMY AND ASTROPHYSICS

#### ASTR 101 Introduction to the Solar System (3)

GEB B.1.a.

GEB B.1.a.

GEB B.1.a.

**GFB B.1.b.** 

Descriptive astronomical properties of the Earth, Moon, other planets and their satellites. Comets, asteroids and other members of the Solar System. Theories of the formation of the Solar System. Opportunities for telescope observations of the Moon and planets. Not open to students who have completed or are taking ASTR 301, or PHYS 132. 3 lectures.

# ASTR 102 Introduction to Stars and Galaxies (3)

Descriptive astronomical properties of the Sun, stars, galaxies, and interstellar material. Expanding universe and cosmological models. Opportunities for telescope observations and star identification. Not open to students who have completed or are taking ASTR 301, ASTR 302, or PHYS 132. ASTR 101 is not a prerequisite. 3 lectures.

# ASTR 301 The Solar System (3) GEB B.1.a.

Quantitative and descriptive properties of the Solar System including the physics of the planets, their satellites, comets and interplanetary media. Possible origins of the Solar System. Not open to students who have completed ASTR 101. 3 lectures. Prerequisite: PHYS 132 or PHYS 123.

#### ASTR 302 Stars and Galaxies (3)

Quantitative and descriptive properties of the stars, galaxies and interstellar media; including stellar structure and evolution, structure and make-up of galaxies and cosmological models. Not open to students who have completed ASTR 102. 3 lectures. Prerequisite: PHYS 132 or PHYS 123. ASTR 301 is not a prerequisite.

#### ASTR 303 Relativity and Cosmology (3) GEB B.1.a.

Introduction to the basic ideas of Einstein's theories of relativity and cosmology. The structure and evolution of the universe. The principle of relativity, the speed of light, gravity and the equivalence principle. Curved spacetime, black holes, the expanding universe, the Big Bang, and nucleosynthesis. 3 lectures. ASTR 302 is not a prerequisite. Prerequisite: PHYS 122 or PHYS 132.

# **BACT-BACTERIOLOGY**

# BACT 221 General Bacteriology (4) GEB B.1.b.

Morphology, metabolism, classification and identification; bacteriology of air, soil, water, and foods with applications to industry, agriculture, medicine, and public health. 2 lectures, 2 laboratories. Prerequisite: One quarter of chemistry.

# BACT 224 General Microbiology I (4)

Anatomy, physiology, and systematics of prokaryotic and eukaryotic microorganisms and the viruses. 2 lectures, 2 laboratories. Prerequisite: BIO 153 and CHEM 129. Recommended: one quarter of organic chemistry.

# BACT 225 General Microbiology II (4) GEB B.1.b.

Genetics and molecular biology of prokaryotic and eukaryotic microorganisms and the viruses. Fundamentals of medical microbiology, immunology, host-parasite relations, antimicrobial agents and systematics. 2 lectures, 2 laboratories. Prerequisite: BACT 224.

#### BACT 226 General Microbiology III (4) GEB B.1.b.

Anatomy and physiology of prokaryotic and eukaryotic microorganisms found in nature and involved in nutrient recycling. Microbial associations with plants and animals. Systematics. 2 lectures, 2 laboratories. Prerequisite: BACT 224.

#### BACT 322 Dairy Microbiology (4) GEB B.1.b.

Methods used in the isolation, identification and enumeration of microorganisms important to the dairy industry, with emphasis on those instrumental in dairy fermentations and ripening processes, those used as sanitary indicators, and on major spoilage organisms. 2 lectures, 2 laboratories. Prerequisite: BACT 221 or BACT 224.

#### BACT 333 Industrial Microbiology (4) GEB B.1.b.

Microbial biotechnology in producing pharmaceuticals, food additives, and industrial chemicals. Consideration of selected large-scale processes for producing primary and secondary metabolites. 2 lectures, 2 laboratories. Prerequisite: BACT 221 or BACT 224, CHEM 326 or equivalent.

#### BACT 342 Sanitary Microbiology (4) GEB B.1.b.

Principles of disease prevention and control. Water-, food-, and air-borne microbial contaminations and epidemiology of ensuing diseases. Laboratory techniques in detection and control of wastes and disease-causing microorganisms. 2 lectures, 2 laboratories. Prerequisite: BACT 221 or BACT 224.

#### **BACT 402** General Virology (3)

Virus-host interactions. Structure and function of viruses as obligate intracellular parasites of microbes, plants, and animals. Epidemiology, pathogenesis, prophylaxis, chemotherapy, and manipulation of viruses which parasitize humans. 3 lectures. Prerequisite: BACT 225 and CHEM 328 or equivalent. Recommended: ZOO 426.

#### BACT 403 General Virology Laboratory (2)

Methods of culture, characterization and identification of viruses, with emphasis on viruses parasitic in microorganisms, humans, and animals. 2 laboratories. Prerequisite or concurrent: BACT 402 and consent of instructor.

#### BACT 421 Food Microbiology (4)

Physiological activities of microorganisms involved in the preparation, preservation, deterioration and toxicity of foods and related products. 2 lectures, 2 laboratories. Prerequisite: BACT 221 or BACT 224. Recommended: CHEM 326.

#### BACT 423 Medical Microbiology (5)

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: BACT 225 and BACT 226. Recommended: Organic Chemistry.

#### BACT 424 Bacterial Cytology and Physiology (5)

Cellular structure and life processes of bacteria; chemical composition, growth and metabolism. General biological and evolutionary considerations. 3 lectures, 2 laboratories. Prerequisite: BACT 225 and CHEM 328.

#### BACT 430 Medical Mycology (4)

Morphology, physiology, infectivity, and immunogenicity of fungi pathogenic for man and other mammals. Host-parasite interactions. Demonstration and isolation of pathogenic fungi from clinical material. 2 lectures, 2 laboratories. Prerequisite: BIO 152, BIO 153, and BACT 423.

# **BIO-BIOLOGY**

#### BIO 100 Orientation to Biological Sciences (1) (CR/NC)

Career opportunities in the biological sciences, designing a career goal and a survey of departmental facilities and procedures related to research, study and graduation. Credit/No Credit grading only. 1 lecture.

# BIO 101 General Biology (3) GEB B.1.b.

Principles of cellular biology, heredity, ecology, and evolution, with emphasis on their relationship to human affairs. Not open for credit to students who have completed BIO 151 or BOT 121 or ZOO 131. 3 lectures.

#### BIO 102 Plant Biology (4)

Structural and functional aspects of plants. Survey of algae, fungi and plants including field trips to observe them in their natural environment. Emphasis on plants of importance to humans. One Saturday field trip. Not open for credit to students who have completed BIO 152 or BOT 121. 3 lectures, 1 laboratory. Prerequisite: BIO 101, BIO 105.

#### **BIO 103** Animal Biology (4)

GEB B.1.b.

**GEB B.1.b.** 

Structural and functional aspects of animals with specific emphasis on humans. Survey of major animal phyla including local field trips to observe them in their natural environment. One Saturday field trip. Not open for credit to students who have completed BIO 153 or ZOO 131. 3 lectures, 1 laboratory. Prerequisite: BIO 101, BIO 105.

#### BIO 105 General Biology Laboratory (1) GEB B.1.b.

Observations and experiences involving basic principles in the biological sciences. Emphasis on the diversity of living systems. Cell structure and function. Genetics and ecological relationships. 1 laboratory. Concurrent or previous enrollment in BIO 101.

#### BIO 127 Natural History: Animal Adaptations (3)

GEB B.1.b.

GEB B.1.b.

Interpretation of structural and functional adaptations of animals; emphasis on phenomena readily observed in the field. Laboratory exercises emphasize insects as examples. 2 lectures, 1 laboratory.

#### BIO 128 Natural History: Animal Communities (3)

Examination of local biotic communities, emphasizing identification and natural history of the animals which inhabit them. Field experience in local communities. 2 lectures, 1 laboratory, 2 Saturday field trips. Recommended: BIO 127.

# **BIO 129 Natural History: Plant Communities (3)**

#### GEB B.1.b.

Principles of field biology and ecology; laboratory and field study of land and freshwater plant communities, emphasizing identification of plants inhabiting them. 1 lecture, 2 laboratories, Saturday field trips. Recommended: BIO 128.

#### **BIO 151** Introduction to Biology (5) GEB B.1.b.

Fundamental principles of biology with emphasis on the physical and chemical basis of life; cytology; bioenergetics; storage; processing and expression of genetic information; ecology; evolution. 3 lectures, 2 laboratories. Recommended prerequisite: Concurrent or previous enrollment in college chemistry course.

#### **BIO 152** Biology of Plants and Fungi (5) GEB B.1.b.

Structure, ecology, reproduction, and evolution of fungi, cvanobacteria, algae, and plants. 3 lectures, 2 laboratories. Prerequisite: BIO 151.

#### **BIO 153** Biology of Animals (5) GEB B.1.b.

Survey of the protist and animal kingdoms; fundamentals of animal form and function. 3 lectures, 2 laboratories. Prerequisite: BIO 151.

#### BIO 205 Traces Through Time (3) (Also listed as PSC 205) GEB B.1.a. or B.1.b.

Survey of evidence supporting evolution including origin of the universe, radiometric dating, structure of Earth and plate tectonics. Evolutionary evidence from chemistry biology, fossils, and the geographical distribution of life. Fundamental differences between science and creationism will be explored. A student using this course for GEB credit also must take at least one other course in Area B.1.b. and at least one other course in Area B.1.a. 3 lectures.

#### **BIO 220** Physiology and Biological Adaptation (4) GEB B.1.b. and E.2.

Physiological principles with integration of principles of adaptation of life processes among living organisms. Not open for credit to students who have completed ZOO 131. 4 lectures. Prerequisite: Completion or simultaneous enrollment in college level chemistry.

#### **BIO 253** Orientation to the Health Professions (1) (CR/NC)

Participation in hospital activities and mental health services. Intended for medically oriented students. Total credit limited to 6 units with a maximum of 1 unit per guarter. Credit/No Credit grading only. 1 activity. Prerequisite: Instructor's consent and one quarter of college chemistry and BIO 153 or ZOO 131.

#### **BIO 300** Biology of Cancer (2)

Molecular, cellular and immunological aspects of cancer. Types of cancer and modes of treatment. Environmental, psychological and sociological implications. Cancer research. Not for Biology credit for Biological Sciences majors. 2 lectures.

#### **BIO 301** Human Ecology (3)

#### **GEB B.1.b.**

Examination of the ways in which humans are dependent on their environment, their ability to modify it, and the results of such modification. 3 lectures. Prerequisite: One guarter of biological science.

#### **BIO 302 Human Genetics (3)** GEB B.1.b.

Basic principles of human inheritance. Transmission of genetic traits, chromosomal anomalies of humans, gene action, mutations and mutagenic agents, eugenics, and principles of genetic counseling, 3 lectures, Prerequisite: One course in college biology (preferably BIO 101, BIO 151, or ZOO 131).

#### BIO 303 Genetics (3)

GEB B.1.b. Principles of heredity and variation. 3 lectures. Prerequisite: One guarter of college biology and one guarter of college

#### **BIO 304** Molecular Genetics (3) GEB B.1.b.

Introduction to the structures, functions, and regulatory mechanisms of nucleic acids in biological systems. 3 lectures, Prerequisite: One guarter of college biology. Recommended: BIO 303 and one course in biochemistry.

# **BIO 306** Applications of Biological Concepts (4)

mathematics. Recommended: STAT 211.

Applications of basic biological concepts with special reference to how these concepts can be presented and developed in elementary schools. Emphasis is on hands-on activities, problem solving and computer assisted instruction modules in biology. 2 lectures, 2 laboratories. Prerequisite: BIO 101, BIO 102, BIO 103, and BIO 105, or equivalent.

#### **BIO 311 Radiation Biology (3)** GEB B.1.b.

Review of production and characteristics of non-ionizing and ionizing radiation; interaction and effect of radiation on living cells, tissues, organs, and organisms; introduction to use of radioisotopes: radiation protection and dosimetry: impact of nuclear energy on the biological world. 3 lectures. Prerequisite: CHEM 122 or CHEM 128 and one of the following: BIO 101, BIO 151, BOT 121, ZOO 131.

#### **BIO 321** Biological Instrumentation (3)

Theory and operation of instruments commonly used in biological investigation. 1 lecture, 2 laboratories. Prerequisite: BIO 151, BOT 121 or ZOO 131.

#### **BIO 322** Introduction to Electron Microscopy (2)

Introduction to principles and theory of scanning and transmission electron microscopy including instruments utilized in study of biological and nonbiological specimens. 1 lecture, 1 activity. Prerequisite: BIO 151, BOT 121 or ZOO 131 or consent of instructor.

#### **BIO 323** Scanning Electron Microscopy Laboratory (1)

Techniques of using the scanning electron microscope including preparing, examining and interpreting biological and nonbiological materials. 1 laboratory. Prerequisite or concurrent enrollment in: BIO 322.

#### **BIO 324** Transmission Electron Microscopy Laboratory (2)

Applications of transmission electron microscopy including in-depth training in specimen preparation and use of the microscope. Design of experiments and interpretation of results will be included in laboratory. 2 laboratories. Prerequisite or concurrent enrollment in: BIO 322.

#### **BIO 325** General Ecology (4)

#### **GEB B.1.b.**

Interactions between living organisms and their environment in terrestrial and aquatic habitats. 3 lectures, 1 laboratory. Prerequisite: BIO 152 and BIO 153.

#### BIO 328 Marine Biology (4)

GEB B.1.b.

GEB B.1.b.

Biological and environmental studies of marine organisms, with emphasis on their economic importance. 2 lectures, 2 laboratories. Prerequisite: BIO 152 or BIO 153, or consent of instructor.

# BIO 330 Biology of Aging (3)

Theories of aging, the biological principles involved, and the current status of research in the field. 3 lectures. Prerequisite: College-level course in biology. Recommended: An introductory course in chemistry.

# BIO 334 Limnology (3) GEB B.1.b.

Biological, physical, and chemical dynamics of freshwater ecosystems. 2 lectures, 1 laboratory. Prerequisite: BIO 325. Recommended: One college level course in chemistry.

# BIO 342 Computer Applications in Biology (3)

Applications of computers and data processing technology to the understanding and solving of specific problems in biology. 2 lectures, 1 laboratory. Prerequisite: One college level course in biological science and one course in computer science.

### BIO 375 Molecular Biology Laboratory (2) (Also listed as CHEM 375) GEB B.1.b.

Techniques used in molecular biology and biotechnology, plasmid DNA extraction, agarose gel electrophoresis, restriction endonuclease mapping, transduction, transformation, and gene cloning. 2 laboratories. Prerequisite: BACT 221 or BACT 224 and BIO 304 or CHEM 373.

# BIO 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

# **BIO 414** Evolution (3)

Scientific evaluation of the theories, mechanisms, and evidences concerning biological evolution. 3 lectures. Prerequisite: BIO 303.

# BIO 415 Biogeography (3)

Plant and animal distribution patterns in relation to past and present physical and biotic factors; continent by continent survey of biogeography with major emphasis on North America. 3 lectures. Prerequisite: BIO 325.

# BIO 423 General Cytology (4)

Detailed study of the structure and function of animal and plant cells. 3 lectures, 1 laboratory. Prerequisite: BIO 152 and BIO 153 or ZOO 131 and BOT 121 and organic chemistry or biochemistry.

# BIO 424 Organizing and Teaching Biological Sciences (3)

Objectives, content, techniques, material, and recent trends of successful instruction in secondary school biology. 3 lectures. Prerequisite: Consent of instructor.

# **BIO 426** Cytogenetics (4)

Cytological basis of genetics. Correlation between genetic principles and chromosome behavior by studying mitotic and meiotic cells. Cytological study of hybrids, polypoids and

chromosomal aberrations in plants and animals. 3 lectures, 1 laboratory. Prerequisite: BIO 303.

# BIO 431 Physiology I: General (4)

Functioning, control, and integration of physiological phenomena at various levels from cell to organism. 2 lectures, 2 laboratories. Prerequisite: CHEM 326; BIO 152 or BIO 153.

# BIO 437 Marine Resources (3)

Resource status of present and potential biological marine resources of the sea. Identification, life history, ecology, culture and economics of pertinent organisms. 3 lectures. Prerequisite: BIO 152 and ZOO 336.

# BIO 442 Biometry (4)

Design of biological experiments with emphasis on sampling methods, data collection, mensuration, and analysis of field and laboratory data. 3 lectures, 1 laboratory. Prerequisite: One year of biology and STAT 212 or STAT 321.

# BIO 461, 462 Senior Project (3) (2)

Projects are selected from typical problems which graduates may meet in areas of their future employment. Results are presented in written reports. Minimum 150 hours total time.

# BIO 463 Undergraduate Seminar (2)

Study and discussion of recent developments in the field of biology. 2 seminars. Prerequisite: Senior standing.

# BIO 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

# BIO 471 Selected Advanced Laboratory (1-2)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topics selected. Total credit limited to 4 units. 1 to 2 laboratories. Prerequisite: Consent of instructor.

# BIO 475 Tissue Culture Techniques (4) (Also listed as CHEM 475)

Introduction to the principles and methods of tissue culture with emphasis on the manipulation and study of animal cells. 2 lectures, 2 laboratories. Prerequisite: BACT 221 or BACT 224, BIO 303 and CHEM 328 or CHEM 371.

# BIO 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

#### BIO 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

#### BIO 500 Individual Study (1-3)

Advanced study planned and completed with the approval of and under the direction of a member of the department faculty. A written scholarly presentation of the results of each BIO 500 project must be included in the graduate student's departmental file. Not open for credit to students in the thesis program. Total credit limited to 4 units. Prerequisite: Graduate standing and consent of instructor.

#### BIO 501 Cellular Biology (3)

Consideration of recent studies on the energetics, synthesis, regulation, genetics, transport, movements, reproduction, and differentiation of cells. 2 seminars, 1 activity. Prerequisite: Graduate standing and/or consent of instructor.

# BIO 502 Biology of Organisms (3)

Consideration of recent advances in the knowledge of organisms; their morphology, systems of maintenance, organization and integration, reponsiveness and behavior, development and reproductive processes. 2 seminars, 1 activity. Prerequisite: Graduate standing and/or consent of instructor.

#### **BIO 503** Population Biology (3)

Consideration of current theory and practice in evolution, genetics, ecology and systematics of organisms. 2 seminars, 1 activity. Prerequisite: Graduate standing and/or consent of instructor.

#### **BIO 515** History of Biology (3)

Analysis of historical attempts to solve biological problems. 3 seminars. Prerequisite: Graduate standing and/or consent of instructor.

#### **BIO 524** Developmental Biology (3)

Developmental phenomena of higher and lower plants, vertebrate and invertebrate animals at the molecular, cellular, histological and organ levels. Each quarter will emphasize a different biological description. Total credit limited to 9 units, with a maximum of 3 units per quarter. 2 seminars, 1 laboratory. Prerequisite: Graduate standing and/or consent of instructor.

#### **BIO 531** Theory and Prediction in Ecology (2)

Directed group study and lectures on selected topics in ecology. Emphasis on an in-depth study of a restricted topic. 2 seminars. Prerequisite: Graduate standing and/or consent of instructor.

#### **BIO 542** Multivariate Biometry (4)

Design of biological experiments involving multivariate observations. Experimental design, sampling, computer analysis, and interpretation of results. 3 seminars, 1 laboratory. Prerequisite: STAT 313, BIO 442.

### **BIO 543** Morphometrics (3)

Biological phenomena from problem definition and field collection of data through multivariate analysis of data and presentation of results. 2 seminars, 1 laboratory, 2--4 weekend field trips. Prerequisite: BIO 542.

#### BIO 570 Selected Topics in Biology (1-3)

Directed group study of selected topics for graduate students. *Class Schedule* will list topics for selection. Total credit limited

to 9 units. 1 to 3 seminars. Prerequisite: Graduate standing and/or consent of instructor.

#### BIO 585 Cooperative Education Experience (6) (CR/NC)

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

#### **BIO 590** Seminar in Biology (1)

Problems and topics in advanced biology selected according to the interest and needs of the students enrolled. Total credit limited to 5 units. 1 two-hour seminar. Prerequisite: Graduate standing and/or consent of instructor.

#### BIO 595 Cooperative Education Experience (12) (CR/NC)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

#### BIO 599 Thesis (3)

Individual research under the general supervision of the faculty, leading to a graduate thesis of suitable quality. Total credit limited to 9 units. Prerequisite: Graduate standing, consent of instructor, and consent of thesis committee.

# **BOT-BOTANY**

#### BOT 121 General Botany (4) GEB B.1.b.

Introduction to structures and functions of seedbearing plants. 2 lectures, 2 laboratories.

#### BOT 223 Introductory Plant Taxonomy (4) GEB B.1.b.

Introduction to classification and identification of vascular plants, emphasizing major plant families; field and herbarium techniques. An extended field trip (3-4 days). 2 lectures, 2 laboratories. Prerequisite: BIO 152 or BOT 121.

#### BOT 238 Native Plant Materials (3)

Classification, identification, and associations of native plants. Factors which affect plant growth in natural environments. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: BOT 121.

#### BOT 322 Introductory Plant Physiology (4) GEB B.1.b.

Consideration of the principal physiological processes of plants including water relations, mineral nutrition, photosynthesis, respiration, and growth of the plant. 3 lectures, 1 laboratory. Prerequisite: BIO 152 or BOT 121, and CHEM 326.

# BOT 323 Plant Pathology (4)

#### GEB B.1.b.

Comprehensive study of the causes and effects of disease in plants. Designed to lead to an understanding of the science and modern control methods. 2 lectures, 2 laboratories. Prerequisite: BIO 152 or BOT 121.

# BOT 325 Plant Nematology (4)

**BOT 324** Ornamental and Forest

Pathology (4)

**GEB B.1.b.** 

**GEB B.1.b.** 

Plant parasitic nematodes, their morphology, classification, and the damage they cause plants, alone or in combination with other pathogens. 2 lectures, 2 laboratories. Prerequisite: BOT 323 or BOT 324.

Causes and effects of diseases of important ornamental and

lectures, 2 laboratories. Prerequisite: BIO 152 or BOT 121.

# BOT 326 Plant Ecology (4)

Plant communities, population dynamics, and effects of the following enryionmental factors on plant growth and development: soil, water, temperature, light, atmosphere, topography, organisms, and fire. 3 lectures, 1 laboratory. Prerequisite: BOT 223.

# BOT 333 Field Botany (4)

GEB B.1.b.

Plant communities of California. Field identification of native and introduced plants in nature. Factors affecting plant distribution and relationships. Emphasis on local species. Several field trips. Miscellaneous course fee required-see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: BOT 223.

# BOT 334 Morphology of Vascular Plants (4) GEB B.1.b.

Phylogenetic relationships of the plant kingdom as illustrated by comparative morphology of the vascular plants including living and fossil forms, 2 lectures, 2 laboratories, Prerequisite: BIO 152 and BOT 223.

#### BOT 335 Plant Anatomy (4)

GEB B.1.b.

Microscopic study of vascular plants dealing with the origin, development and structure of cells, tissues and organs. 2 lectures, 2 laboratories. Prerequisite: BIO 152 or BOT 121.

### BOT 425 Plant Virology (4)

Plant pathogenic viruses, their plant, insect, nematode and fungal host-pathogen relationships, symptom recognition, isolation and identification methods. 2 lectures, 2 laboratories. Prerequisite: BOT 323 or BOT 324.

#### BOT 426 Mycology (4)

Comparative morphology and nuclear behavior of the fungi. Summary of the science with special attention given to forms important in agriculture, medicine and industry. 2 lectures, 2 laboratories. Prerequisite: BIO 152 or BOT 121.

#### **BOT 431** Advanced Plant Pathology (4)

Methods, instruments, and materials used in diagnosis of plant diseases and in plant disease research. 2 lectures, 2 laboratories. Prerequisite: BOT 323 or BOT 324.

# BOT 437 Algology (4)

Classification of marine and fresh-water algae. Consideration of ecological, physiological and economic aspects. 2 lectures, 2 laboratories. Prerequisite: BIO 152.

# BOT 443 Systematic Botany (3)

Current theory of and approaches to botanical systematics, including use of morphological, cytological, biochemical, ecological and evolutionary data in classification. Rules of botanical nomenclature. 2 lectures, 1 laboratory. Prerequisite: BOT 223.

#### BOT 450 Plant Cell and Tissue Culture (5)

Principles and methods of plant cell and tissue culture important to industry and basic science. 3 lectures, 2 laboratories. Prerequisite: BOT 322.

# **BUS-BUSINESS**

# BUS 100 Study Skills Adjunct (2) (CR/NC)

Offered concurrently with BUS 101 to assist students in developing and improving their study skills, textbook comprehension, critical analysis, application and retention of the subject matter presented in the specific content course. Credit/No Credit grading only. 1 lecture, 1 activity.

#### **BUS 101** The Business Enterprise (4)

Orientation to the business administration program. Examination of the business enterprise, stressing its historical, environmental, and economic setting. Business organization and functions. 4 lectures.

#### BUS 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

#### BUS 201 Business Law Survey (3)

Overview of business law for other than business majors. Similar in scope to BUS 207, but in less detail. Not acceptable for credit toward Business Administration degree. 3 lectures.

#### BUS 207 Business Law (4)

American legal system, contracts, agency, business organizations, and real property. 4 lectures. Prerequisite: Sophomore standing.

#### BUS 308 Business Law II (4)

Legal aspects of management decisions, including problems arising in sales, commercial paper, personal property and bailments, secured transactions, bankruptcy, and securities regulation, with emphasis on the uniform commercial code. 4 lectures. Prerequisite: BUS 207 or equivalent and junior standing.

#### **BUS 400** Special Problems for Advanced Undergraduates (1-4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units. Prerequisite: Senior standing or consent of instructor.

#### **BUS 404** Governmental and Social Influences on GEB D.4.b. **Business** (4)

Analysis from legal, economic, political, and ethical perspectives, of the changing domestic and international environments of the business enterprise. Topics include administrative law and regulatory policy, antitrust law, public policy analysis, and the interaction of business and government. Case studies. 4 lectures. Prerequisite: Senior standing.

#### **BUS 411 Legal Aspects of High Technology** Management (4)

Practical legal decisions required to conduct business for or with high technology companies. Examination of methods to protect high technology developments, including copyrights,

GEB B.1.b.

patents, trade secrets, trademarks and contracts. 4 lectures. Prerequisite: BUS 207 or equivalent.

### BUS 430 Internship (4-8) (CR/NC)

Placement as an employee in a business firm approved by the department head. Periodic written progress reports required. Collateral reading correlated with the work experience. Credit/No Credit grading. Prerequisite: Approval of department head.

# BUS 461, 462 Senior Project (2) (2)

Selection and analysis of a problem under faculty supervision. Problems typical of those which graduates must solve in their fields of employment. Formal report is required. Minimum 120 hours total time. For Finance and Marketing Concentration students only.

# BUS 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

### BUS 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

# BUS 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.

#### BUS 490 The Legal Environment of International Business (4)

U.S. Law, International Law and Foreign Law affecting international business. The cultural and political settings of foreign law. The world's legal traditions and systems. Case analysis. 4 lectures. Prerequisite: Senior standing, a course in American business law, one Political Science course, or consent of instructor.

#### BUS 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

#### BUS 500 Independent Study (1-4)

Advanced study planned and completed under the direction of a member of the Business Administration department faculty. Open only to graduate students who have demonstrated ability to do independent work. Prerequisite: Formal petition with approval.

# **CE-CIVIL ENGINEERING**

### CE 111 Civil Engineering Fundamentals I (1) (CR/NC)

Description of the field of civil engineering and the function of the professional civil engineer. Introduction to the major subdivisions of civil engineering including environmental, geotechnical, structural, and water resource engineering. Credit/No Credit grading only. 1 lecture.

### CE 112 Civil Engineering Fundamentals II (2)

Continuation of CE 111. Application of basic design criteria to specific design problems, use of Civil Engineering department library computer programs for planning, analysis, and design. 1 lecture, 1 laboratory. Prerequisite: MATH 141, PHYS 131.

# CE 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

# CE 202, 203 Mechanics of Materials (3) (2)

Stresses, strains and deflections due to axial, torsional, and flexural loading. Statically indeterminate members and columns. Mohr's Circle and column buckling. Emphasis on problem solving. May not be substituted for CE 204 or CE 205. CE 202: 3 lectures. CE 203: 1 lecture, 1 laboratory. Prerequisite: ETME 205.

#### CE 204, 205 Strength of Materials (3) (2)

Stresses, strains and their relations applied to axial, torsional and flexural loads. Statically indeterminate axial members, beams and shafts. Columns, dynamic loads, repeated loads. Tension, compression, bending, shear, and torsion tests. Use of the SR-4 strain rosette for determining principal strains. CE 204: 3 lectures; CE 205: 2 lectures. Prerequisite: ME 211, CE 204 (for CE 205).

# CE 206 Strength of Materials Laboratory (1)

Physical properties of engineering materials. Tension, compression, bending, shear, and torsion tests. Stress and strain transformation. Current strain gauge technology. 1 laboratory. Concurrent: CE 205.

# CE 221 Fundamentals of Transportation Engineering (4) GEB F.2.

Review of highway, air, rail, mass transit and other modes of transportation. Evolution of U.S. transportation systems. Transportation planning and operations. Feasibility analysis. Systems analysis, policy and management. 3 lectures, 1 laboratory. Prerequisite: MATH 141.

#### CE 259 Civil Engineering Materials (2)

Experimental determination of mechanical properties of concrete, asphalt, and soils as required for engineering applications. Experimental verification of assumptions made in mechanics of materials procedures. Use of strain measuring devices. Preparation of technical reports. 2 laboratories. Prerequisite: CE 204.

# CE 336 Water Resources Engineering (4)

Hydraulics of open channel flow, flow through hydraulic structures, stream flow and stream flow hydrographs, hydrologic routing, 4 lectures. Prerequisite: CE 112, ME 341.

#### CE 337 Hydraulics Laboratory (1)

Application of basic fluid dynamic principles to various mechanical systems. Exposure to experimental problems and techniques with guided laboratory projects related to civil engineering discipline. 1 laboratory. Prerequisite: ME 341.

# CE 352, 353 Structural Analysis I, II (3) (3)

General structural theorems, energy methods, influence diagrams, deflection of structures, analysis of statically determinate and indeterminate structures. Introduction to matrix methods of analysis and dynamic response. 3 lectures. Prerequisite: CE 204, CE 205.

#### CE 355 Reinforced Concrete Design (3)

Analytical and design principles of reinforced concrete in designing civil engineering systems. Origin of code requirements. Fundamentals of proportioning. Details of elements and structural systems. 3 lectures. Prerequisite: CE 259, CE 353.

# CE 381 Geotechnical Engineering (4)

Elementary mass-volume relations, clay-water interaction, soil classification, geostatic stress distributions, 1-D and 2-D steadystate flow. Consolidation settlement and rate of consolidation. Shear strength under drained and undrained conditions. Standard laboratory testing. 3 lectures, 1 laboratory. Prerequisite: CE 205, ME 341.

#### CE 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

#### CE 405 Advanced Strength of Materials (3)

Equations of equilibrium and continuity in elastic solids. Generalized Hooke's Law. Two-dimensional solutions of beams, disks, rings under various loading conditions. Stress concentrations and their engineering significance. Strain-energy methods of solution. Fundamentals of plates and shells. 3 lectures. Prerequisite: CE 353, senior standing.

# CE 407 Structural Dynamics (4)

Effect of vibration and transient loads on structural elements. Dynamics load factors, support motion, damping and natural frequencies of multidimensional structural systems. Modal analysis. 3 lectures, 1 laboratory. Prerequisite: CE 353, ME 212.

#### CE 421 Traffic Engineering (4)

Elements of ground circulation and planning. Driver and vehicle performance. Traffic counting analysis and control. Planning of ground transportation units and terminals as elements of complete transportation systems. 3 lectures, 1 laboratory. Prerequisite: CE 221 or consent of instructor.

#### CE 422 Highway Geometrics and Design (4)

Location and safe geometric design of highway and other transportation facilities. Earthwork and drainage related to highway, railway, dock, and airport design. Theory and practice in design of alignments, highway cross-sections, intersections, interchanges, and freeways in urban and rural areas. 3 lectures, 1 laboratory. Prerequisite: CE 221 or consent of instructor.

# CE 424 Public Transportation (4)

Interdisciplinary aspects of public transportation problems, systems-team design approach to solutions. History and present state of public transportation; role of public transportation in urban environment; legislative, political, social, and economic aspects of public transportation systems. Methodology and procedures for transit planning. Review of transit studies. 3 lectures, 1 laboratory. Prerequisite: CE 221 or consent of instructor.

# CE 431 Coastal Hydraulics (3)

Waves and their characteristics, types of waves, water wave theories, orbital velocities, refraction of waves, wave diffraction, wave reflection, application of linear theory to wave forces on cylindrical structures, submerged pipelines and vertical flat barriers (sea walls), wave uprush, rubble mound breakwaters. 3 lectures. Prerequisite: ME 341.

# CE 434 Groundwater Hydraulics and Hydrology (3)

Differential equations of groundwater flow, Darcy Law, solutions of the steady and unsteady flow, differential equations for confined and unconfined flows. Pumping test design. Groundwater models, leaky aquifers. Saltwater intrusion. 3 lectures. Prerequisite: CE 336.

#### CE 440 Hydraulic Systems Engineering (3)

Water and wastewater flows. Design of water distribution systems, transmission and storage reservoirs, wastewater collection systems, and storm water systems. Pumps and pump systems, flow measurements. Water sources for municipal supply. 3 lectures. Corequisite: CE 336.

#### CE 453 Structural Steel Design (3)

Design and behavior of the elements of steel structures. Proportioning of members and connections. Introduction to plastic design. 3 lectures. Prerequisite: CE 353.

#### CE 454 Structural Design (4)

Design of reinforced concrete, steel and timber structures. Loading standards, code design methods, connection design. Comprehensive design projects. 2 lectures, 2 laboratories. Prerequisite: CE 353, CE 355, CE 453.

#### CE 461, 462 Senior Project (2) (2)

Selection and completion of a project which is typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time. Prerequisite: Senior standing.

#### CE 464 Professional Practice (3)

Principles of professional engineering practice, the consulting engineer, engineering management, engineer-client relationships, professional ethics, marketing of engineering services, engineering agreements, case studies, analysis of uncertainty in engineering design. 3 seminars. Prerequisite: Upper division standing.

#### CE 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units.1 to 3 lectures. Prerequisite: Consent of instructor.

# CE 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

#### CE 481 Analysis and Design of Shallow Foundations (4)

Subsurface exploration and sampling techniques. Stress distribution beneath footings. Bearing capacity and settlement analyses for footings and mats. Design of reinforced concrete spread footings. Methods for reducing settlement and accelerating consolidation. Compaction and soil improvement. Computer-aided analysis and design. Laboratory and standard field testing. 3 lectures, 1 laboratory. Prerequisite: CE 381.

#### CE 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.

#### CE 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.

# CE 500 Individual Study (1-3)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.

#### CE 521 Airfield and Highway Pavement Designs (4)

Theories, principles, and procedures in the structural design of highway and airfield pavements. Design of rigid and flexible pavements. Construction and maintenance procedures for pavements and stabilized bases. 3 lectures, 1 laboratory. Prerequisite: CE 221, CE 259, graduate standing or consent of instructor.

#### CE 522 Advanced Transportation Design (4)

Application of computers to advanced highway and transportation systems and geometrics. Use of computers for the solution of transportation planning, design, and operations. Use of traffic signal timing, and urban traffic demand forcasting. 2 lectures, 2 laboratories. Prerequisite: CE 422, graduate standing, or consent of instructor.

#### CE 523 Transportation Systems Planning (4)

Planning of urban and statewide transportation systems. Air, water, rail, highway, and pipeline systems separately and in combination. Selection of routes and types of systems based on economic, social, technological, and other characteristics. Planning of terminals for all types of transportation systems. 3 lectures, 1 laboratory. Prerequisite: CE 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; air traffic control; site selection; airport configuration; geometric design of landing area; planning and development of terminal areas; lighting; pavement design and drainage; design of heliports. 3 lectures, 1 laboratory. Prerequisite: CE 221, graduate standing, or consent of instructor.

#### CE 527 Traffic Engineering–Operations and Controls (4)

Techniques for making traffic engineering investigations. Traffic laws and ordinances, speed regulation, curb parking regulations. Through controls, one-way streets, right-of-way regulations. Design and application of signs, markings, lighting. Traffic engineering. 3 lectures, 1 laboratory. Prerequisite: CE 421, graduate standing, or consent of instructor.

#### CE 528 Transportation Analysis (4)

Principles and applications of engineering systems analysis to transportation using examples from specific modes such as highways and traffic. Identification of transportation benefits, user and non-user impacts, vehicle operating characteristics, traffic volume estimates, taxation, construction programming and scheduling. 3 lectures, 1 laboratory. Prerequisite: CE 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. Applications in California. Simulation model development, calibration and use. 2 lectures, 2 laboratories. Prerequisite: CE 421, graduate standing, or consent of instructor.

#### CE 533 Advanced Water Resources Engineering (3)

Matrix and simulation methods in hydrology, statistical studies in hydrology and their applications to civil engineering problems. Generalized hydrologic characteristics. Hydrologic simulation, computer applications, urban and small watershed hydrology, macroscopic and microscopic approach. Storm water management models. Hydrologic design. 3 lectures. Prerequisite: CE 336 or graduate standing.

#### CE 554 Matrix Analysis of Structures (3)

Matrix terminology and operations. Matrix procedures for analysis of continuous beams, plane frames, and space frames under static and quasi-static loading. Stiffness and flexibility methods. Computer applications. Special techniques for larger systems. 3 lectures. Prerequisite: CE 352, CE 353, CE 407 concurrently, or graduate standing.

#### CE 555 Advanced Civil Engineering Materials Laboratory (2)

Fundamental properties of new and advanced materials. Experimental techniques. Fracture characteristics and composite response of cement matrix composites. New materials and products to advanced applications such as automation. 2 laboratories. Prerequisite: CE 259 or graduate standing.

#### CE 558 Introduction to Finite Element Analysis (3)

Formulation of the finite element method. Finite elements and their properties. Analysis of plates, shells and framed structures under static and dynamic loads. Digital computer implementation of the finite element method. 3 lectures. Prerequisite: CE 554.

# CE 559 Advanced Structural Design (3)

Advanced analysis, design and behavior of structural concrete. Reinforced, prestressed, and precast concrete elements. Linear and nonlinear structural systems. Origin of code requirements. Detailed design of components of civil engineering systems. Beams, slabs, columns, continuous systems, walls, connections, and composite systems. 3 lectures. Prerequisite: CE 355 or graduate standing.

# CE 570 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 seminars. Prerequisite: Graduate standing or consent of instructor.

# CE 571 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

# CE 573 Public Works Administration (3)

Management and engineering of transportation and related systems in public jurisdictions. Traffic systems, streets and highways, illumination, distribution systems, etc. Personnel management, financing, public relations, and contract management. 3 seminars. Prerequisite: Graduate standing.

# CE 574 Computer Applications in Civil Engineering (3)

Overview of computer application, hardware and software alternatives, use of selected application programs, CAD, microcomputers, management and application of resources. 1 lecture, 2 laboratories. Prerequisite: Graduate standing.

# CE 581 Advanced Geotechnical Engineering (3)

Stress-strain-deformation response of soils under both drained and undrained loading. Computer-aided analysis using modern constitutive models. Conventional and advanced strength testing using the Bishop-Weşley Triaxial Cell and the Rowe Consolidometer. 2 lectures, 1 laboratory. Prerequisite: CE 481, graduate standing or consent of instructor.

# CE 582 Advanced Geotechnical Testing (3)

Standard penetration, cone penetration, and flat-plate dilatometer testing. Equipment operation and maintenance. Interpretation of CPT/DMT sounding data. Stratigraphic analysis. CPT/DMT-based analysis and design of shallow and deep foundations. 1 lecture, 2 laboratories. Prerequisite: CE 481, graduate standing or consent of instructor.

# CE 583 Soil Dynamics (3)

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Machine and earthquake-induced ground motion, wave propogation through soil. Behavior of soil and foundations under cyclic and dynamic loading. Evaluation of design loading and soil response parameters. Analysis of liquefaction potential. 3 lectures. Prerequisite: CE 481, graduate standing or consent of instructor. Corequisite: CE 407.

# CE 584 Lateral Support Systems (3)

Classical and modern earth pressure theories. Lateral earth pressure calculations for general surface and subsurface conditions. Analysis and design of cantilever reinforced concrete walls, cantilever and anchored sheetpile walls. Braced excavations, reinforced earth, and tie-back walls. 3 lectures. Prerequisite: CE 381, graduate standing or consent of instructor.

# CE 585 Slope Stability Analysis (3)

Analysis of stability by planar, circular arc, piecewise-linear, and composite-surface techniques. Analysis of earth dams and reservoirs for both static and steady flow conditions. Stability under earthquake loading. Computer-aided analysis, field reconnaissance and slope stabilization techniques. 3 lectures. Prerequisite: CE 381, graduate standing or consent of instructor.

# CE 587 Analysis and Design of Deep Foundations (3)

Bearing capacity analysis, settlement analysis. Design of single piles and pile groups for vertical, lateral, and combined loading. Analysis and design of drilled piers and caissons. 3 lectures. Prerequisite: CE 481, graduate standing or consent of instructor.

# CE 591 Graduate Seminar (2)

Current trends and characteristics of civil engineering. Group discussions of skills, techniques and practices. Reports and discussions by students, based on topics of interest to persons preparing for a career in civil engineering. 1 seminar, 1 laboratory. Prerequisite: Graduate standing in Civil/Environmental Engineering or consent of instructor.

# CE 599 Design Project (Thesis) (2) (2) (5)

Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis. Prerequisite: Graduate standing.

# **CHEM-CHEMISTRY**

#### CHEM 106 Introductory Chemistry (3)

Introductory course in chemistry. Measurement, metric system, properties of matter, chemical symbols, atomic structure, chemical formulas, nomenclature, chemical equations, the mole concept, stoichiometry. Not open to students who have credit in a college chemistry course. 3 lectures. Prerequisite: MATH 103 or equivalent.

#### CHEM 121 General Chemistry (4) GEB B.1.a.

Fundamental principles including atomic structure, bonding, nomenclature, chemical equations, states of matter, solutions, and energy with attention to applications to related fields. Intended primarily for students whose majors are not in the Schools of Engineering or Science and Mathematics. Not open to students with credit for CHEM 124 or CHEM 127. 3 lectures, 1 laboratory. Prerequisite: CHEM 106 or equivalent or consent of instructor.

# CHEM 122 General Chemistry (4) GEB B.1.a.

Continuation of CHEM 121. Colloids, kinetics, equilibrium, acids and bases, electrochemistry, nuclear chemistry, nonmetals, applications to related fields. Intended primarily for students whose majors are not in the Schools of Engineering or Science and Mathematics. Not open to students with credit for CHEM 125 or CHEM 128. 3 lectures, 1 laboratory. Prerequisite: CHEM 121.

#### CHEM 124 General Chemistry (4) GEB B.1.a.

Atomic structure, chemical equations, stoichiometry (mass balance in chemical reactions), naming of simple inorganic compounds, solutions. Introduction to carbon compounds emphasizing fuels and polymers. Intended primarily for engineering majors, except Engineering Technology and Industrial Technology. Not open to students with credit for CHEM 121 or CHEM 127. 3 lectures, 1 laboratory. Prerequisite: CHEM 106 or equivalent or consent of instructor.

### CHEM 125 General Chemistry (4) GEB B.1.a.

Introduction to chemical thermodynamics (energy balance in chemical reactions), equilibrium, rates of reaction, acids and bases, coordination compounds, oxidation-reduction reactions, electrochemistry, corrosion, nuclear chemistry. Intended primarily for students whose majors are in the School of Engineering. Not open to students with credit for CHEM 122 or CHEM 128. 3 lectures, 1 laboratory. Prerequisite: CHEM 124.

# CHEM 127 General Chemistry (4) GEB B.1.a.

Introduction to atomic theory, chemical reactions, bonding, stoichiometry, nomenclature, gas laws, colligative properties, colloids, and solutions. Intended primarily for students whose majors are in the School of Science and Mathematics. Not open to students with credit in CHEM 121 or CHEM 124. 3 lectures, 1 laboratory. Prerequisite: High school algebra and chemistry or CHEM 106.

# CHEM 128 General Chemistry (4) GEB B.1.a.

Continuation of CHEM 127. Oxidation-reduction reactions, electrochemistry, kinetics, equilibria, thermodynamics, acids and bases. Intended primarily for students whose majors are in the School of Science and Mathematics. Not open to students with credit in CHEM 122 or CHEM 125. 3 lectures, 1 laboratory. Prerequisite: CHEM 127.

#### CHEM 129 General Chemistry (4) GEB B.1.a.

Acid and base equilibria, buffers, transition elements, solubility, complex ions, hybridization, nuclear chemistry. Laboratory study of the chemical properties and semi-micro qualitative analysis of the representative group elements of the periodic table. Intended primarily for students whose majors are in the School of Science and Mathematics. 3 lectures, 1 laboratory. Prerequisite: CHEM 125 or CHEM 128.

# CHEM 156 General Chemistry Laboratory (1)

#### GEB B.1.a.

Additional laboratory to be taken with CHEM 129. Includes chemical properties and semi-micro qualitative analysis of the transition and post-transition metal ions of the periodic table, methods of inorganic synthesis. 1 laboratory. Prerequisite: CHEM 122, CHEM 125, or CHEM 128.

#### CHEM 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: CHEM 121, CHEM 124, or CHEM 127 and consent of department head.

#### CHEM 252 Laboratory Glassblowing (1)

Techniques of glassblowing applied to the making of simple laboratory apparatus. 1 laboratory. Prerequisite: CHEM 121, CHEM 124 or CHEM 127.

#### CHEM 253 Chemical Literature (2)

Information searches in primary and secondary chemical literature and computer database. Organizing and presenting chemical information in written documents. 1 lecture, 1 activity. Prerequisite: CHEM 316 or CHEM 326.

#### CHEM 301 Biophysical Chemistry (3) GEB B.1.a.

Basic physical chemistry for the study of biological systems. Kinetic-molecular theory, gas laws, principles of thermodynam-

ics as applied to biochemical systems. Not open to students with credit in CHEM 305. 3 lectures. Prerequisite: CHEM 328 or concurrent CHEM 371, PHYS 123 or PHYS 133, MATH 132 or MATH 142.

# CHEM 302 Biophysical Chemistry (4) GEB B.1.a.

Application of physical chemistry to biochemical systems. Buffers, electrochemistry, reaction rate theory, enzyme kinetics, viscosity, surface and transport properties of macromolecules. Not open to students with credit in CHEM 306. 3 lectures, 1 laboratory. Prerequisite: CHEM 301 or CHEM 305; CHEM 328 or CHEM 371; CHEM 331.

# CHEM 305 Physical Chemistry (3) GEB B.1.a.

Introduction to chemical thermodynamics. Thermochemistry. Phase equilibria. Chemical equilibrium. 3 lectures. Prerequisite: PHYS 123 or PHYS 133, CHEM 125 or CHEM 129, MATH 132 or MATH 142.

# CHEM 306 Physical Chemistry (3) GEB B.1.a.

Applications of chemical thermodynamics. Electrochemistry. Kinetic theory of gases. Chemical kinetics. 3 lectures. Prerequisite: CHEM 305.

# CHEM 307 Physical Chemistry (4) GEB B.1.a.

Introduction to quantum theory. Chemical bonding and molecular structure. Spectroscopy and diffraction. 3 lectures, 1 laboratory. Prerequisite: CHEM 302 or CHEM 306 and CHEM 356, or consent of instructor.

# CHEM 316 Organic Chemistry (4) GEB B.1.a.

Structure, bonding, nomenclature, isomerism, stereochemistry and physical properties of organic compounds. Reactions and mechanisms of alkanes, alkenes, alkynes, cycloalkanes. Laboratory techniques in organic preparations. 3 lectures, 1 laboratory. Prerequisite: CHEM 122, CHEM 125 or CHEM 129.

#### CHEM 317 Organic Chemistry (5) GEB B.1.a.

Reactions and reaction mechanisms of organic halides, alcohols, phenols, epoxides, ethers, carboxylic acids and their derivatives, aldehydes, ketones; acidity and basicity; infrared and NMR spectroscopy. 3 lectures, 2 laboratories. Prerequisite: CHEM 316.

#### CHEM 318 Organic Chemistry (5) GEB B.1.a.

Chemistry of amines, aromatic compounds, heterocycles, macromolecules, some biomolecules, carbanions, rearrangements; mass spectrometry. Practice in organic synthesis. 3 lectures, 2 laboratories. Prerequisite: CHEM 317.

# CHEM 326 Survey of Organic Chemistry (4) GEB B.1.a.

Structure, nomenclature, some characteristic reactions of functional groups and applications of organic chemicals in agriculture, medicine, industry and the home. A terminal survey course not open to students with credit in CHEM 316. 3 lectures, 1 laboratory. Prerequisite: CHEM 122, CHEM 125 or CHEM 128.

#### CHEM 328 Survey of Biochemistry (4) GEB B.1.a.

Fundamental chemistry of carbohydrates, proteins, fats, vitamins, enzymes and hormones as applied to their function in plant and animal metabolism. Special reference to the application of chemistry to the areas of agriculture, human health and nutrition, and the production of food and animal feeds. 3 lectures, 1 laboratory. Prerequisite: CHEM 326.

#### CHEM 331 Quantitative Analysis I (5) GEB B.1.a.

Introduction to the principles of analytical chemistry. Sampling, interpretation of data, and the application of chemical equilibria to analytical problems. Survey of important analytical methods emphasizing the theory and implementation of titrimetric methods. 3 lectures, 2 laboratories. Prerequisite: CHEM 129.

#### CHEM 332 Quantitative Analysis II (4) GEB B.1.a.

Theory and analytical techniques associated with gravimetric analysis and titrimetric precipitimetry. Continuation of redoximetry. Introduction to instrumental methods of analysis, with theory and application of electrogravimetry, potentiometry and spectrophotometry. 2 lectures, 2 laboratories. Prerequisite: CHEM 331.

#### CHEM 335 Clinical Chemistry (3) GEB B.1.a.

Basic principles of physiological chemistry including clinical significance of medical laboratory data. Introduction to medical laboratory techniques used in the quantitative determination of glucose, protein, hemoglobin and lipids in biological fluids including blood, serum, and urine. 2 lectures, 1 laboratory. Prerequisite: CHEM 328 or CHEM 371, and CHEM 331.

#### CHEM 336 Clinical Chemistry (4)

### GEB B.1.a.

Advanced principles of physiological chemistry including clinical significance of medical laboratory data. Theoretical and practical aspects of diagnostic enzymology and biochemical profiling. Medical laboratory techniques used in the determination of renal and liver function, electrolytes, enzymes, hormones, and toxic substances. 3 lectures, 1 laboratory. Prerequisite: CHEM 335 or CHEM 372 or permission of instructor.

#### CHEM 341 Environmental Chemistry I (3) GEB B.1.a.

Nature, composition, reactions, redox equilibria and complexation in natural water systems. Microorganisms as aquatic catalysts, heterogeneous reactions, chemical aspects of water treatment and pollution. 3 lectures. Prerequisite: CHEM 129 and CHEM 326 or CHEM 316.

#### CHEM 342 Environmental Chemistry II (3) GEB B.1.a.

Nature and composition of the atmosphere. Oxides of carbon, sulfur and nitrogen. Organic and inorganic pollutants, particulate matter, photochemical smog. Environmental chemistry of soil and mineral resources. 3 lectures. Prerequisite: CHEM 129 and CHEM 326 or CHEM 316.

#### CHEM 344 Chemical Process Principles (3) GEB B.1.a.

Fundamental terms, concepts, and principles used in the chemical processing industries. 3 lectures. Prerequisite: CHEM 316 or consent of instructor.

#### CHEM 350 Chemical Safety (1)

Laboratory regulations, equipment hazard analysis, hazardous chemicals, classification of chemicals, toxic materials handling, reaction hazards, radiation, emergency procedures, safety management programs and legal concerns. Includes project. 1 lecture. Prerequisite: CHEM 326 or equivalent.

#### CHEM 355 Physical Chemistry Laboratory (1) GEB B.1.a.

Experimental studies of gases, solutions, thermochemistry and chemical equilibria. 1 laboratory. Corequisite: CHEM 305. Prerequisite: CHEM 331.

#### CHEM 356 Physical Chemistry Laboratory (1)

#### GEB B.1.a.

Experimental studies of phase rule, electrochemistry and chemical kinetics. 1 laboratory. Corequisite: CHEM 306. Prerequisite: CHEM 331.

# CHEM 371 Biochemical Principles (4) GEB B.1.a.

Chemical and physical factors in biological processes. Chemistry and function of major cellular constituents: proteins, nucleic acids, lipids, carbohydrates, vitamins. 3 lectures, 1 laboratory. Prerequisite: CHEM 326 or CHEM 317. Strongly recommended: CHEM 331.

#### CHEM 372 Metabolism (3) GEB B.1.a.

Intermediary metabolism, regulation and integration of metabolic pathways, bioenergetics, photosynthesis, electron transport, nitrogen fixation, biochemical function of vitamins and minerals. 3 lectures. Prerequisite: CHEM 371.

# CHEM 373 Molecular Biology (3) GEB B.1.a.

Synthesis, conformation and structure of biopolymers: nucleic acids and proteins. Function of macromolecular complexes: cell walls, ribosomes, membranes, and others. Biochemical genetics, cell differentiation and regulation, viruses and biochemical evolution. 3 lectures. Prerequisite: CHEM 371.

#### CHEM 374 Biochemistry Laboratory (2) GEB B.1.a.

Experiments in metabolism, including animal and microbial studies; isolation and characterization of enzymes and nucleic acids. 2 laboratories, offered during the same day or on consecutive days to simulate biochemical research conditions. Prerequisite: CHEM 371.

#### CHEM 375 Molecular Biology Laboratory (2) (Also listed as BIO 375) GEB B.1.a.

Introduction to techniques used in molecular biology and biotechnology; plasmid DNA extraction, agarose gel electrophoresis, restriction endonuclease mapping, transduction, transformation, and gene cloning. 2 laboratories. Prerequisite: BACT 221 or BACT 224 and BIO 304 or CHEM 373.

#### CHEM 377 Chemistry of Drugs and Poisons (3)

GEB B.1.a.

Introduction to pharmacology: history, sources, development and testing, physical and chemical properties, biochemical and physiological effects, mechanisms of action, and the therapeutic uses and toxicology of common drugs and poisons acting on the nervous, cardiovascular, immune and hormone systems, and on cancer, infectious disease, etc. Especially applicable to students in nonbiochemical disciplines. 3 lectures. Prerequisite: CHEM 328 or CHEM 371 or consent of instructor.

#### CHEM 385 Geochemistry (3) GEB B.1.a.

Application of chemical principles to terrestrial and extraterrestrial systems. Formation of the elements; chemical influences on the earth's formation; chemical evolution studies; age-dating techniques; reactions in sea water; petroleum and ore formation; distribution and movement of the elements. 3 lectures. Prerequisite: CHEM 316, CHEM 331.

#### CHEM 400 Special Problems for Advanced Undergraduates (1-3)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 3 units per quarter. Prerequisite: Junior standing and consent of department head.

#### CHEM 419 Intermediate Organic Chemistry (3)

The synthesis of functional groups in biochemical systems. Mechanisms of acid-base reactions, nomenclature, stereochemistry, spectrospcopy, cycloaddition. 3 lectures. Prerequisite: CHEM 318.

### CHEM 435 Food Analysis (4)

Techniques used commercially in the chemical analysis of seed and cereal crops, fruit and vegetable crops, forage crops, meat and meat products, milk and dairy products, eggs and poultry products. Vitamin determinations, microbiological assay, quality control, taste testing, legal specifications, grading and labeling. 3 lectures, 1 laboratory. Prerequisite: CHEM 328 or CHEM 371.

#### CHEM 436 Agricultural Chemicals (4)

Chemistry of fungicides, insecticides, rodenticides, plant growth regulators, soil conditioners, and fertilizers. Special reference to the analysis, manufacture, toxicology, legal specification, and regulations. 3 lectures, 1 laboratory. Prerequisite: CHEM 328 or CHEM 371.

#### CHEM 439 Instrumental Analysis (5)

Theory, practice and method selection of modern instrumental analytical techniques, including spectroscopic, electrochemical, chromatographic and thermal methods. Current industrial applications. Laboratory work emphasizes optimization of experimental parameters. 3 lectures, 2 laboratories. Prerequisite: CHEM 331, CHEM 356 or CHEM 302. Recommended: CHEM 307.

#### CHEM 444 Polymers and Coatings I (3)

Physical properties of polymers and coatings and their measurement. Molecular weight averages, glass transition, thermodynamics of polymers. Viscoelastic properties, rheology, molecular weight determination. Thermal analysis, spectroscopic analysis, mechanical testing. 3 lectures. Prerequisite: CHEM 317.

#### CHEM 445 Polymers and Coatings II (3)

Introduction to polymerization methods and mechanisms. Chemistry of initiators, catalysts and inhibitors. Uses of representative polymer types. Synthesis, film formation, structure and properties of polymers commonly used in coatings and adhesives. 3 lectures. Prerequisite: CHEM 317.

# CHEM 446 Surface Chemistry of Materials (3) (Also listed as MET 446)

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.

#### 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 446, CHEM 447.

### CHEM 449 Internship in Polymers and Coatings (2)

Selected students will spend up to 12 weeks with an approved polymers and coatings firm engaged in production or related business. Time will be spent applying and developing production and technical skills and abilities in the polymers and coatings industry. Prerequisite: CHEM 317 or consent of instructor.

# CHEM 450 Chemical Warfare (2)

History, development, and use of chemical weapons. Chemical disarmament. Production and destruction of modern agents. Use of chemical agents in Southeast Asia and Middle East. Ethics of chemical warefare. 2 seminars. Prerequisite: CHEM 326 or CHEM 316.

# CHEM 457 Qualitative Organic Analysis (3)

Experimental determination of the identity of organic compounds. Emphasis on chemical methods. 1 lecture, 2 laboratories. Prerequisite: CHEM 317.

#### CHEM 458 Instrumental Organic Qualitative Analysis (3)

Separation, purification, and identification of organic molecules using chemical and instrumental methods, including nuclear magnetic resonance, infrared and ultraviolet spectroscopy and mass spectroscopy, and techniques in high resolution FT-NMR. 1 lecture, 2 laboratories. Prerequisite: CHEM 318.

#### CHEM 459 Undergraduate Seminar (2)

Oral presentation of current developments in chemistry based on current literature. Preparation for employment and for independent work in chemistry. 2 seminars. Prerequisite or corequisite: CHEM 253 and junior standing.

#### CHEM 461, 462 Senior Project (2) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time. Prerequisite: CHEM 459.

#### CHEM 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: CHEM 301, or CHEM 305, or CHEM 317 or consent of instructor.

#### CHEM 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

#### CHEM 473 Immunochemistry (3)

Theory and practice of immunochemistry including the structure, genetics, chemical modification and production of antibodies, immunochemical techniques and the biochemistry of the immune defense process. 3 lectures. Prerequisite: CHEM 371 or consent of instructor.

# CHEM 474 Protein Techniques Laboratory (2)

Experiments in protein affinity chromatography, electrophoresis and blotting, immunoprecipitation techniques, antibodyenzyme conjugation, and immunoassay. 2 laboratories. Prerequisite: CHEM 473 or ZOO 426.

# CHEM 475 Tissue Culture Techniques (4) (Also listed as BIO 475)

Introduction to the principles and methods of tissue culture with emphasis on the manipulation and study of animal cells. 2 lectures, 2 laboratories. Prerequisite: BACT 221 or BACT 224, BIO 303 and CHEM 328 or CHEM 371.

#### CHEM 477 Biochemical Pharmacology (3)

Consideration of current selected topics in pharmacology including drug design, biochemical mechanisms of drug activity and issues pertaining to the disposition of drugs to the public. Lecture, professional consultation, library research, and student presentations. 3 lectures. Prerequisite: CHEM 377 or equivalent as determined by instructor.

#### CHEM 481 Inorganic Chemistry (3)

A systematic study of chemical and physical properties of inorganic compounds based on periodic groupings with emphasis on chemical bonding and structure. Topics will include coordination chemistry and kinetics, organometallic chemistry, advanced acid-base relationships and bonding theories plus other selected topics. 3 lectures. Prerequisite: CHEM 306 and CHEM 331 or consent of instructor.

#### CHEM 483 Inorganic Synthesis (1)

Synthetic methods involving the preparation and characterization of a variety of inorganic, organometallic and coordination compounds employing high temperature, inert atmosphere, photolytic, electrolytic and other synthetic techniques. 1 laboratory. Prerequisite or concurrent: CHEM 481.

#### CHEM 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. 2 units only applicable to approved chemistry electives. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

#### CHEM 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. 2 units only applicable to approved chemistry electives. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

#### CHEM 500 Individual Study (1-3)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate

students who have demonstrated the ability to do independent work. Total credit limited to 4 units. Prerequisite: Graduate standing and consent of department graduate coordinator.

#### CHEM 501 Physical Chemistry-Thermodynamics (3)

Deductive systematization of classical thermodynamics and its chemical applications. Introduction to statistical thermodynamics and its application to the calculation of thermodynamic properties. 3 seminars. Prerequisite: CHEM 307, CHEM 316 or consent of instructor.

#### CHEM 502 Physical Chemistry–Quantum Chemistry (3)

Theory and methods of quantum chemistry with application to the investigation of molecular structure, chemical bonding, and molecular spectra. 3 seminars. Prerequisite: CHEM 405 or consent of instructor.

#### CHEM 503 Kinetics and Catalysis (4)

Reaction rates and mechanisms of homogeneous and heterogeneous, noncatalyzed and catalyzed reactions. Interdisciplinary laboratory skills development related to industrial catalysis research. 2 lectures, 2 laboratories. Prerequisite: CHEM 307, CHEM 318 or consent of instructor.

# CHEM 514 Advanced Organic Chemistry-Synthesis (3)

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 318.

#### CHEM 515 Advanced Organic Chemistry-Mechanisms (3)

Advanced study of organic reaction mechanisms and physical organic methods. Mechanistic topics may include carbocations, carbanions, free radicals, carbenes and pericyclic reactions. Physical organic methods may include kinetics, solvent effects, isotope effects, linear free energy relationships and stereochemistry. 3 seminars. Prerequisite: CHEM 318.

#### CHEM 516 Advanced Organic Chemistry-Natural Products (3)

Structure determination and total synthesis of compounds of biological origin. 3 seminars. Prerequisite: CHEM 318.

#### CHEM 528 Nutritional Biochemistry (3)

Nutritional aspects of biochemistry. Lecture, library research and student presentations. Topics include vitamins and minerals, essential and energy providing nutrients, deficiency, degenerative and genetic diseases of metabolism. Emphasis on current research and controversy. 3 lectures. Prerequisite: CHEM 328 or CHEM 372 or consent of instructor.

#### CHEM 572 Advanced Biochemistry (3)

Protein structure and function. Lecture, library research and student presentations. Topics encompass considerations of the physical structure of proteins, domain theory, protein folding, and current methods of structural analysis as well as methods for determining enzyme mechanisms including kinetics, isotope effects, stereochemistry, cryoenzymology, trapping of intermediates, and transition state analogues. 3 lectures. Prerequisite: CHEM 371 and CHEM 302 or CHEM 306 or equivalents as determined by instructor.

#### CHEM 573 Advanced Biochemistry (3)

Advanced study of nucleic acid structure and function. Format includes lecture, library research and student presentations.

Topics include immunochemistry or mechanisms of genetic regulation and cell differentiation, advances in knowledge of nucleic acid sequence and organization, chromosome structure, and molecular aspects of genetic diseases, including cancer. 3 lectures. Prerequisite: CHEM 373 or equivalent.

# CHEM 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.

#### CHEM 590 Graduate Seminar (1)

Advanced topics in chemistry, including original work by faculty, guests, and graduate students. Topics vary each quarter. Total credit limited to 3 units. Required of all graduate students in chemistry. 1 seminar. Prerequisite: Graduate standing in chemistry, or consent of instructor.

#### CHEM 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.

# CHEM 598 Internship (3-6)

Supervised technical field experience in areas such as chemical sales, manufacturing, process development, clinical chemistry, analytical chemistry, pollution control. Prerequisite: Graduate standing or consent of instructor, and approval of the department head and school dean.

#### CHEM 599 Thesis (3) (3) (3)

Individual research under the general supervision of the staff leading to a graduate thesis of suitable quality. Prerequisite: Graduate standing in chemistry.

# **CM-CONSTRUCTION MANAGEMENT**

#### CM 201 Introduction to Construction Management (3)

Overview of the construction industry and its markets, impact, practices, methods, and ethics. 3 lectures. Prerequisite: Second-year standing.

# CM 321 Concrete Technology (2)

Modern concepts which form the basis for solutions to problems of concrete construction. Includes significant developments in concrete chemistry and strength theory. Development of a rational basis for writing concrete specifications and for proportioning concrete mixes. 2 lectures. Prerequisite: ARCE 222.

#### CM 322 Concrete Technology Laboratory (1)

Concrete mix design, physical properties of concrete, use of admixtures, concrete batching, concrete curing, testing of concrete and concrete specifications. Includes mix design, batching and physical testing of the designed mixes. 1 laboratory. Concurrent: CM 321 recommended.

# CM 325 Construction Management Practices (3)

Overview of construction methods, building systems, construction and contract documents, cost estimating and scheduling and other practices used in the contracting process. For non-majors. 2 lectures, 1 activity. Prerequisite: Second year standing or consent of instructor.

# CM 331 Construction Cost Control (3)

Basic application of construction cost control systems and the use of cost information and associated reports. 3 lectures. Prerequisite: CM 201 or consent of instructor.

#### CM 332 Cost Alternatives Evaluation (4)

Basic principles of economic evaluations between cost alternatives. 4 lectures. Prerequisite: CM 201 or consent of instructor.

# CM 333 Construction Contracts Administration (3)

Administration of construction documents including invitation to bid, addenda, proposals, change orders, subcontracts, liens, claims, waivers, and arbitration. 3 lectures. Prerequisite: CM 201 or consent of instructor.

#### CM 341 Residential and Light Commercial Construction Practices (3)

Building systems, equipment, materials, and techniques. Construction practices related to residential and light commercial structures. One designated field trip required. 3 laboratories. Prerequisite: Third-year standing.

#### CM 342 Commercial, Institutional and Industrial Construction Practices (3)

Building systems, equipment, materials, and techniques. Construction practices related to large commercial, institutional and industrial structures. One designated field trip required. 3 laboratories. Prerequisite: Third-year standing.

#### CM 343 Earthwork and Civil Works Construction Practices (3)

Earthwork and civil works construction methods, stressing field operations management, engineering estimating. 3 laboratories. Prerequisite: Third year standing.

#### CM 350 Computer Applications in Construction Management (2)

Application of computer systems to control construction operations in the building industry. Development of construction management games. 2 lectures. Prerequisite: CSC 110 or ARCH 250.

#### CM 351 Building Support System Construction Practices (3)

Equipment, materials and techniques of installation and construction of water supply, waste water, fire protection and other piping systems. Emphasis on the role of specialty contractors in the construction process. 3 activities. Prerequisite: ARCH 231, PHYS 133 or PHYS 137.

#### CM 352 Building Support System Construction Practices (3)

Equipment, materials and techniques of installation and construction of electrical power systems. Includes conveyance systems. Emphasis on the role of specialty contractors in the construction process. 3 activities. Prerequisite: ARCH 231, PHYS 133 or PHYS 137.

#### CM 353 Building Support System Construction Practices (3)

Equipment, materials and techniques of installation and construction of environmental systems. Emphasis on the role of specialty contractors in the construction process. 3 activities. Prerequisite: ARCH 231, PHYS 133 or PHYS 137.

### CM 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per guarter. Prerequisite: Consent of department head.

#### CM 412 Survey of Building Codes and Regulations (2)

Building codes and legal problems related to the construction industry. Contractor's licensing laws, labor and lien laws. 2 lectures. Prerequisite: Fourth-year standing.

#### CM 431 Management of Interdisciplinary Functions in Construction (3)

Management activities applicable to the building process including conceptual, planning, design, bid, negotiation, construction, and occupancy phases of public and private projects. Emphasis on the integration of planning, design and construction efforts to achieve maximum project quality and value. 3 lectures. Prerequisite: Upper division standing.

#### CM 433 Economic Analysis for Engineers (2)

Engineering economics, and engineering studies including feasibility and alternate problem analysis. 2 lectures.

#### CM 443 Principles of Construction Management (3)

Applications of a broad range of construction management techniques to case studies involving a variety of operations in construction firms. 3 activities. Prerequisite: Fourth-year standing.

# CM 444 Concrete Formwork and Temporary Structures (3)

Methods and techniques used in the design and construction of concrete formwork, temporary earth retaining systems, and other temporary construction structures. 3 activities. Prerequisite: Fourth-year standing or consent of instructor.

# CM 445 Heavy Construction Methods and Techniques (2)

Methods and procedures; field operations for heavy construction projects. 2 activities. Prerequisite: Fourth-year standing or consent of instructor.

#### CM 452 Project Controls (4)

Planning, organization, scheduling, and control of construction projects. 4 laboratories. Prerequisite: Fourth-year standing or consent of instructor.

# CM 453 Project Development (4)

Methods and procedures used in the development of a residential, commercial, or industrial project. 4 laboratories. Prerequisite: Fourth-year standing, CRP 212, LA 213 or consent of instructor.

# CM 454 Building Estimating (4)

Procedures for determing quantities of materials and estimating costs for construction projects. 4 laboratories. Prerequisite: Fourth-year standing or consent of instructor.

# CM 461, 462 Senior Project (2) (1) (CR/NC)

Selection and completion of a comprehensive project under faculty supervision. Problems to involve the student's technical and creative skills. Construction and team projects encouraged. To be completed in two consecutive quarters. 90 hours minimum total time. Credit/No Credit grading only. Prerequisite: CM 341, CM 342, CM 343.

#### CM 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

#### CM 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

#### CM 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

#### CM 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

#### CM 531 Construction Cost and Material Control (3)

Advanced theory and practice of cost and material control for construction projects. Emphasis on computer applications. 2 lectures, 1 activity. Prerequisite: CM 331 or consent of instructor.

#### CM 533 Case Histories in Contract Administration (3)

Common points of disputes between design professional, owner, and contractor. Methods of avoidance and dispute resolution. 3 activities. Prerequisite: CM 333, 4th year architectural practice or consent of instructor.

# CM 542 Construction Estimating and Bidding Strategy (3)

Advanced theory and practice of cost estimating techniques. Includes standard, conceptual and parameter estimating; risk analysis. Emphasis on computer applications. 2 lectures, 1 activity. Prerequisite: CM 420 or consent of instructor.

# CM 552 Construction Project Scheduling (3)

Basic and advanced network scheduling techniques as applied to architectural building projects. Emphasis on computer applications. 2 lectures, 1 activity. Prerequisite: CM 542 or consent of instructor.

#### CM 570 Selected Advanced Topics in Construction Management (3)

Directed study of selected topics in Construction Management. *Class Schedule* will list topic selected. Total credit limited to 9 units. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

# **CONS-CONSERVATION**

# CONS 120 Fisheries and Wildlife Management (3)

Survey of fisheries and wildlife resources and management practices. Relationships to recreational values, land management, food production, and preservation. 3 lectures.

# CONS 207 Resource Survey (3)

Introduction to survey and analysis methods used in assessing biological resources. Inventory methods of vegetation and wildlife sampling and questionnaire surveys. 2 lectures, 1 laboratory.

# CONS 210 Biology and Conservation of Endangered Species (3)

Importance of species diversity. Past and present causes of endangerment and extinction. Biological attributes which predispose species to extinction. Modern recovery efforts, including habitat preservation and captive propagation. Emphasis on North American plants and animals. 3 lectures. Prerequisite: One course in Biological Sciences.

# CONS 221 Wildlife Techniques (3)

Techniques for terrestrial wildlife investigations. Field and lab procedures including telemetry, marking, capture, age and sex determination, and population analysis. 2 lectures, 1 laboratory. Prerequisite: CONS 120.

# CONS 311 Introductory Conservation (3)

Basic principles and problems of conservation. Interrelationships of living organisms and their biotic and abiotic environments. Regional and global perspectives on manipulations and alterations in marine, freshwater and terrestrial ecosystems. 3 lectures. Prerequisite: One course in Biological Sciences.

#### CONS 320 Fishery Resource Management (4)

Management of recreational and commercial fisheries to produce sustained annual crops of fishes. Survey, inventory, and evaluation techniques used for the management of a fishery. Methods of dealing with fish populations, aquatic habitats, and user groups. 3 lectures, 1 laboratory. Prerequisite: BIO 325 or consent of instructor.

#### CONS 422 Freshwater Fisheries (4)

Biological, geographical, historical, political and economic aspects of freshwater fishes, fishery resources, and fresh waters of the Pacific Coast. Identification, life history, distribution and ecology of important western and local species. Field trips to water projects, warm and cold water fishery facilities, major aquarium. 3 lectures, 1 laboratory. Prerequisite: ZOO 322.

### CONS 426 Population Dynamics (3)

Growth, fluctuations, balance, and natural mechanisms controlling terrestrial wildlife populations. 3 lectures. Prerequisite: BIO 325 or one course in ecology.

### CONS 427 Habitat Management (4)

Habitat design, development, and management of wetlands and uplands that support wildlife. Habitat development planning project required. 3 lectures, 1 laboratory. Some weekend labs necessary. Prerequisite: BIO 325 or consent of instructor.

# CONS 431 Game Management (4)

General principles, problems and techniques of increasing the harvest of waterfowl, upland game, and big game. Identification and life histories of important western game species. Several weekend field trips. 3 lectures, 1 laboratory. Prerequisite: BIO 325 or ASCI 229.

#### CONS 433 Aquaculture (4)

Propagation and rearing of fishes, invertebrates and algae from marine and freshwater habitats. Current methodologies and general life histories. Global perspective with focus on aquacultural development in developed and undeveloped countries. 3 lectures, 1 laboratory. Prerequisite: BIO 152, ZOO 336 or consent of instructor.

# **CPE-COMPUTER ENGINEERING**

# CPE 461, 462 Senior Project (3) (2)

Selection and completion of a project under faculty supervision. Project results are presented in a formal report. Miscellaneous course fee required-see *Class Schedule*. Minimum 150 hours total time. Prerequisite: CSC 315, EL 319.

# CPE 463 Undergraduate Seminar (1) (CR/NC)

Discussion of new developments in the field of computer engineering. Fields of employment and job considerations. Credit/No Credit grading only. 1 seminar. Prerequisite: Senior standing.

#### CPE 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.

#### CPE 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.

# CPE 587 Cooperative Education Experience (6)

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Prerequisite: Graduate standing and consent of instructor.

#### CPE 597 Cooperative Education Experience (12)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Prerequisite: Graduate standing and consent of instructor.

# **CRP-CITY AND REGIONAL PLANNING**

#### CRP 101 Introduction to the Profession of City and Regional Planning (1) (CR/NC)

Orientation to the jobs and responsibilities of professional planners working in the public and private sectors. Credit/No Credit grading only. 1 lecture.

#### CRP 111 Introduction to Drawing and Perspective (3)

Basic techniques used in graphic communication. Orthographic and isometric projection. Mechanical perspective, shades and shadows. 3 laboratories.

#### CRP 112 Basic Graphics (3)

Drawing as a communication tool in the environmental design fields. Exercises to develop basic skills and speed in the representation of ideas. Use of various drawing media. 3 laboratories. Prerequisite: CRP 111.

#### CRP 201, 202 Environmental Design Fundamentals (3) (3)

Elements of visual perception. Theories of environmental design. Program development. Analytic techniques and problem solving methodologies. Behavioral and social implications of environmental design decisions. Projects in the environmental context. 3 laboratories. Prerequisite: CRP 111, CRP 112.

#### CRP 203 Applied Design and Planning Fundamentals (3)

Applications of basic design fundamentals and the design of environments through design exercises. 3 laboratories. Prerequisite: CRP 202, LA 213.

#### CRP 211 Introduction to Urbanization (3) GEB F.2.

Evolution, planning, and design of cities. Interpretation of environmental, social, economic, and technological factors that have influenced the physical organization, planning, and design of cities. 3 lectures.

# CRP 212 Introduction to Urban Planning (3) GEB F.2.

Problems and responses to contemporary urban growth and change. Development of theories of urban planning and design. Introduction to zoning, planning regulations and codes, professional practice. Relationship of environmental design disciplines, citizen groups, and individuals to planning. 3 lectures.

# CRP 213 Population and Housing Studies (3)

Collection, organization, analysis and presentation of information and data related to city and regional planning. Analytical applications to population composition and distribution; housing needs, characteristics and markets; community services. 3 lectures. Prerequisite: CRP 212.

#### CRP 214 Land Use and Transportation Studies (3)

How cities and regions work. Relationship between human activities and patterns of land use and circulation. Spacial

analysis and locational theories. Methods for conducting studies to describe, analyze, and map land uses. Transportation analysis, traffic impact, and circulation patterns. 3 lectures. Prerequisite: CRP 212.

### CRP 216 Computer Applications for Planning (3)

Introduction to the use of computer facilities and software programs with special applications for planners including drawing, design, graphs, data base, spreadsheets, statistical applications. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 2 laboratories. Prerequisite: CSC 110.

#### CRP 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 314 Planning Theory (3)

Theory of planning and the role of theory in planning. Role of planner in society, purpose of planning, administrative framework in which planning takes place, and the rational model. 3 lectures. Prerequisite: CRP 212.

#### CRP 315 Economic and Fiscal Analysis for Planning (3)

Basic theoretical frameworks for understanding regional economic trends. Techniques for analyzing the strengths and weaknesses of local and regional economies. Fiscal impact analysis and feasibility studies at the local level. 3 lectures. Prerequisite: CRP 212, CRP 213, CRP 214.

# CRP 347, 348 Urban and Regional Design (3) (3)

Three-dimensional design of urban and regional areas within the comprehensive planning process. Effect of human activities on the form of the natural and built environment at differing scales. Miscellaneous course fee required–see *Class Schedule*. 3 laboratories. Prerequisite: CRP 203.

#### CRP 351, 352, 353 Community Planning Laboratory (4) (4) (4)

Case study application of planning theory to the community, its components, and to the city and the region. Relationships of city spaces and structures. Redevelopment. Field trips. Individual team, and interdisciplinary approaches. Computer applications. Miscellaneous course fee required-see *Class Schedule*. 4 laboratories. Prerequisite: CRP 213, CRP 214, CRP 216, LA 213, GEOL 201, STAT 211.

#### CRP 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 404 Environmental Law (3) (Also listed as FNR 404)

Detailed examination of the law governing use and protection of natural resources with focus on the legal institutions entrusted with the public duty of protecting the environment. 3 lectures. Prerequisite: Senior standing, POLS 206, or consent of instructor.

# 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 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 government or related agency. Prior contract specifying the product of internship required between student, agency and faculty. Thirty hours work experience per unit of credit. Total credit limited to 4 units. Credit/No Credit grading. Prerequisite: Consent of instructor.

# CRP 420 Planning Law (4)

Public controls protecting natural environmental systems. Land use and environmental controls. Review of control mechanisms. State and federal legislation. Legal implications of controls, public planning and policy issues. 4 lectures. Prerequisite: CRP 351, urban planning laboratory, or consent of instructor.

# CRP 427 Local Economic Development Planning (3)

Goals, processes and approaches for planning local economic development. Theoretical principles and assumptions underlying local economic development programs. Alternative strategies and analytical techniques for planning economic development programs and projects. 3 seminars. Prerequisite: Senior standing.

### **CRP 430** Planning Administration (3)

Relationships of planning agencies to other governmental bodies, public agencies and citizen groups. The public planning agency and the private practitioner. Public and personnel relations. Current topics in planning administration. 3 lectures. Prerequisite: Senior standing.

### CRP 435 Transportation Theory (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 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 352, ENVE 331 or senior standing.

# CRP 447 Design Regulations (3) (Also listed as ARCH 447)

Practical application of fundamental building code requirements and zoning regulations in the design process. Codes and regulations used including city zoning regulations, city parking and driveway standards, the Uniform Building Code, and the architectural barrier laws. 3 lectures. Prerequisite: ARCH 342, or consent of instructor.

#### CRP 451, 452 Regional and Environmental Planning Laboratory (4) (4)

Case study application of planning theory and methods to regional and environmental systems. Regional spatial develop-

ment and resource use. Interrelationships between natural, economic, social and political systems. Field trips. Individual, team and interdisciplinary approaches. Miscellaneous course fee required-see *Class Schedule*. 4 laboratories. Prerequisite: CRP 353, FNR 304.

## CRP 453 Planning and Design Laboratory (4)

For the final laboratory application, the student may choose between a regional rural planning focus and an urban and regional design focus. Miscellaneous course fee required-see *Class Schedule*. 4 laboratories. Prerequisite: CRP 348, CRP 452.

# CRP 457 Planning Information Systems (3)

Use of a problem-oriented system to retrieve statistical information pertinent in planning. Miscellaneous course fee required-see *Class Schedule*. 2 seminars, 1 laboratory. Prerequisite: CRP 353.

# CRP 461, 462 Senior Project (2) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results presented in a formal report. To be completed in two consecutive quarters. Minimum 120 hours time. Prerequisite: CRP 353.

# CRP 463 Undergraduate Seminar (2)

Discussion and lectures on problems of professional practice in planning. Professional ethics. Students present organized material on some subject of interest. 2 seminars. Prerequisite: CRP 409, CRP 452.

# CRP 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

# CRP 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

# CRP 472 Planning Colloquium (1) (CR/NC)

Panel discussion by two or more faculty members and invited guests on controversial or topical planning related subject matter at campus and/or off-campus locations. Topics to be announced in advance by CRP Department. Total credit limited to 3 units. Credit/No Credit grading only. 1 seminar. Prerequisite: Upper division standing.

### CRP 500 Individual Study (2-3)

Independent research, studies, or surveys of selected subjects. Total credit limited to 9 units. Prerequisite: Graduate standing with minimum of 12 core units.

#### CRP 501 Foundations of Urban and Regional Planning (4)

Origins and evolutionary stages of settlement patterns and the use of land and natural environment. Changes and the dynamics involved in the development of cities and regions through the modern epoch. 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, value systems and planning processes. Current approaches and philosophies in the United States and other countries. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

#### CRP 513 Survey and Research Methods (4)

Research design, field surveys, reduction of data to produce information for planning. Miscellaneous course fee required -see *Class Schedule*. 3 seminars, 1 supervision. Prerequisite: Graduate standing, STAT 211 or equivalent, or consent of instructor.

#### CRP 514 Computer Applications for M.C.R.P. (2)

Computer applications used by planners. Focus on planners' adaptations of data base systems, spreadsheets, statistical applications, drawing, graphics, mapping. Miscellaneous course fee required-see *Class Schedule*. 2 laboratories. Prerequisite: Graduate standing.

### CRP 515 Graphic Communication for Planners (3)

Basic techniques used in graphic communication. Orthographic, isometric and perspective drawing. Introduction to various drawing media and delineation and presentation techniques for planners. Designed to develop three-dimensional visualization, graphic skills and basic proficiency in the exploration and communication of information and design ideas. Miscellaneous course fee required-see *Class Schedule*. 3 laboratories. Prerequisite: Graduate standing.

#### CRP 516 Quantitative Methods in Planning (4)

Problem recognition, data selection, analysis and synthesis with applications of system design, statistical techniques and symbolic modeling to urban design and regional growth and development policies. Miscellaneous course fee required–see *Class Schedule*. 3 seminars, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

#### CRP 520 Feasibility Studies in Planning (4)

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 (3)

Theory and practice of plan implementation. Zoning and legal background as a device to guide urban growth. Zoning ordinance, districting plan. Subdivision regulations. Growth management. Capital improvement programs, redevelopment. 3 seminars. Prerequisite: CRP 510 or consent of instructor.

#### CRP 530 Planning Agency Management (3)

Preparation for mid-level and higher positions in public planning agencies and private firms. Work programs, staff supervision, budgets, contracting, proposal preparation, conflict management, coordination of tasks internally and with other agencies and firms, relationships with clients, public and media. 3 seminars. Prerequisite: CRP 501, CRP 510 or consent of instructor.

#### CRP 548 Principles of Urban Design (3)

Introduction to the philosophy and theory particular to environmental design. Exploration of evaluation criteria and critical analysis of man's environment related to design and human needs. Spatial and form relationships, scale, human activities, concept formation, visual organization of the city, landscaping and architecture. 3 seminars.

## CRP 552 Community Planning Laboratory (4)

Application of planning theory and methods to urban (community) planning. Analysis of issues, consideration of future alternatives, preparation of plan elements. Interrelationships and impacts of natural and built environments, economic and social conditions. Field trips. Individual, team and interdisciplinary approaches. Miscellaneous course fee required-see *Class Schedule*. 4 laboratories. Prerequisite: CRP 501.

## CRP 553 Project Planning Laboratory (4)

Project-scale planning problems. Arranging structures, circulation systems, utilities and plant material on natural and urban sites to support human activity while minimizing disruption to natural systems. Includes planned unit developments, waterfronts, hillsides, campuses and commercial centers. Field trips. Miscellaneous course fee required-see *Class Schedule*. 4 laboratories. Prerequisite: CRP 515, CRP 548.

## CRP 554 Regional Planning Laboratory (4)

Application of advanced planning theory and methods to regional problems and issues. Research, analysis, synthesis and implementation practice. Interrelationships between natural, economic and political regions, technology, resource use. Field trips. Individual, team and interdisciplinary approaches. Miscelaneous course fee required–see *Class Schedule*. 4 laboratories. Prerequisite: CRP 505.

### CRP 570 Selected Topics in Planning (3)

Directed group study of selected topics in planning theory. Total credit limited to 9 units. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

#### CRP 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 quanitative methods. 4 seminars. Prerequisite: CRP 409, CRP 510, CRP 516, CRP 530, CRP 552.

#### CRP 599 Thesis/Project (6)

Individual research under the general supervision of the faculty, leading to a graduate thesis or project of suitable quality. Prerequisite: Advancement to candidacy.

# **CRSC-CROP SCIENCE**

### CRSC 100 Enterprise Project (1-4) (CR/NC)

Selection and completion of a management/production project under faculty supervision. Project participation is subject to approval by the department head and the Cal Poly Foundation. Degree credit limited to 12 units. Credit/No Credit grading only.

## CRSC 101 Orientation to Crop Science (1) (CR/NC)

Understanding the depth and breadth of field crops, fruit and vegetable production and plant protection. Examination of the potential career opportunities and introduction to both student and professional organizations and affiliations. Required of all Crop Science Department students. Credit/No Credit grading only. 1 activity.

# **CRSC 110** Techniques of Application (3)

Principles of application techniques relating to crop production systems. Theory of and practical methods to calibrate various types of application equipment used in crop production. Focus on practical applications problem solving. One field trip is required. Miscellaneous course fee required–see *Class Schedule*. 2 lectures, 1 laboratory.

# CRSC 123 Forage Crops (4)

Production, harvest, utilization and value of important forage crops. Adaptation, identification and relative merits of grasses and legumes will be covered. Miscellaneous course fee may be required-see *Class Schedule*. 3 lectures, 1 laboratory.

# **CRSC 131** Introduction to Crop Science (4)

Production principles for field and vegetable crops. Fundamental botany, taxonomy and cultural practices. Soil tillage, fertilization, seed selection, planting and harvesting methods, irrigation, weed control, pest control, and crop rotation. Production practices for cotton. A field trip to a major California production area is required. Not open to students with credit in CRSC 230. Miscellaneous course fee may be required-see *Class Schedule.* 3 lectures, 1 laboratory.

### CRSC 132 Grain Crops (4)

Production, adaptation, distribution, and utilization of major grain crops harvested by combine, including wheat, barley, oats, corn, rice, sorghum, rye, triticale, and millets. Field trips to major California cereal production areas. Miscellaneous course fee may be required-see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: CRSC 131 or CRSC 230.

### CRSC 133 Row Crops (4)

Adaptation, production, processing, and utilization of major row crops such as potatoes, tomatoes, dry beans, and sugar beets. Field trip to a major California row crop production area required. Miscellaneous course fee may be required-see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: CRSC 131 or VGSC 230.

### CRSC 200 Special Problems for Undergraduates (2-4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

## CRSC 221 Weed Control (4)

Identification, life histories, and control of common, noxious, and poisonous California weeds. Weed control chemicals and equipment for cultivated crops, irrigation systems, range, wastelands, aquatics, forests. 3 lectures, 1 laboratory. Prerequisite: BOT 121 or CRSC 131 or FRSC 131.

# CRSC 230 General Field Crops (4) GEB F.2.

Production, harvest, and use of important cereal and field crops in California. Production areas, crop rotations, disease and pest control. Field trip required. Not open to students with credit in CRSC 131. Miscellaneous course fee may be required-see *Class Schedule*. 3 lectures, 1 laboratory.

#### CRSC 231 Commercial Seed Production and Conditioning (4)

Production and conditioning of certified and commercial seed including seed analysis, germination, quality control, cleaning and storage techniques, and seed laws. Field trip to a seed conditioning plant required. Miscellaneous course fee may be required-see *Class Schedule* . 3 lectures, 1 laboratory. Prerequisite: CRSC 131 or BOT 121.

## CRSC 304 Plant Breeding (4)

Application of principles of plant improvement through plant introduction, selection, hybridization, and *in vitro* techniques. Miscellaneous course fee may be required–see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: BIO 303.

### CRSC 311 Insect Pest Management (4)

Principles of controlling insect pests including biological, cultural, physical, mechanical, and chemical controls. Identification of insects injurious to California field, fruit, and vegetable crops including stored products and livestock. Insecticide formulation and methods of application. 3 lectures, 1 laboratory. Miscellaneous course fee may be required-see *Class Schedule*. Prerequisite: CHEM 121 or introductory courses in biology, botany or zoology or consent of instructor.

#### CRSC 322 Crop Technology (4)

Recent developments in technology relating to advancements in crop production under different cropping systems. Field trip required. Miscellaneous course fee may be required-see *Class Schedule.* 3 lectures, 1 laboratory. Prerequisite: CRSC 133 or FRSC 133, BOT 121, junior standing, or consent of instructor.

### CRSC 327 Vertebrate Pest Management (4)

Vertebrate pests injurious to crops, livestock, forest products, wildlife, stored products and humans. Life habits, identification, control methods, and materials. Related laws and regulations. Miscellaneous course fee may be required–see *Class Schedule.* 3 lectures, 1 laboratory. Prerequisite: Junior standing.

### CRSC 330 Advanced Forage Crops (4)

Three methods of producing, harvesting and utilizing forage species; grazing, haying and ensiling plant materials. Forage identification, hay grades and quality; preservatives to enhance quality. Grazing systems; forage mixtures versus single species; problems in pasturing, fencing, the silage-making process and silo structures. Field trip to a production area required. Miscellaneous course fee may be required-see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: CRSC 123, CRSC 131 or CRSC 230 or consent of instructor.

### CRSC 333 Greenhouse Vegetable Production (4)

Development, practices, history, and future of crop production in greenhouses. Research applications, commercial applications, production problems, marketing, and economics. Field trip to a commercial greenhouse operation required. Miscellaneous course fee may be required-see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: CHEM 122, CRSC 133, SS 221 or consent of instructor.

#### CRSC 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Any CRSC 100- or 200-level course or consent of department head.

### CRSC 405 Advanced Weed Science (4)

Group study and discussion of the importance of the ecology and biology of weeds for successful management; integrated weed management; herbicide selectivity based on mode of actions; herbicides and the environment; regulatory aspects of weed control. Field trip required. Miscellaneous course fee may be required-see *Class Schedule*. 3 seminars, 1 laboratory. Prerequisite: CRSC 221 or consent of instructor.

## CRSC 410 Crop Physiology (4)

Life processes of plants, such as photosynthesis and respiration, and the application of knowledge of these processes to crop production practices. 3 lectures, 1 laboratory. Prerequisite: CRSC 131, CRSC 230, FRSC 131, FRSC 230 or VGSC 230; and CHEM 328.

### CRSC 411 Experimental Techniques and Analysis (4)

Principle experimental designs used in agriculture and methods of analysis of data collected from each. Statistics and computers utilized. Field practice in planning and layout of typical experiments. 3 lectures, 1 laboratory. Prerequisite: Junior standing and MATH 117 or equivalent, and STAT 211 or consent of instructor.

### CRSC 421 Oil and Fiber Crops (4)

Culture, harvest, grading, and marketing of cotton, soybean, sunflower, safflower, and other oil and fiber crops. Field trips to major centers of production and marketing required. Miscellaneous course fee may be required–see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: CRSC 133, CRSC 221 and BOT 121.

#### CRSC 422 Tropical Crop, Fruit and Nut Production (4) (also listed as FRSC 422)

Production, distribution and utilization of major agronomic, vegetable, fruit and nut crops of economic importance in tropical areas. 3 lectures, 1 laboratory. Prerequisite: CRSC, VGSC or FRSC 100/200-level course, or consent of instructor.

#### CRSC 431 Advanced Insect Pest Management (4)

Strategies, economics and case histories of insect pest management. Insect population monitoring and modeling. Insect identification. Field trips required. Miscellaneous course fee may be required-see *Class Schedule* . 3 lectures, 1 laboratory. Prerequisite: CRSC 311 or consent of instructor.

### CRSC 441 Biological and Cultural Control of Insects (4)

Biological control of insects to include history of classical methods, augmentation and innundative release of beneficial insects, nematodes, microbials, and other biorational agents. Cultural techniques encompassing rotations, exclusion, quarantine, and trap crops. Field trips to insectaries. 3 lectures, 1 laboratory. Prerequisite: CRSC 311 or consent of instructor.

#### CRSC 445 Cropping Systems (4)

Systems approaches to improvement of agricultural situations. Consideration of human factors and the agroecosystem in efforts to create a more sustainable agriculture. Field trip required. Miscellaneous course fee may be required-see *Class Schedule.* 3 lectures, 1 laboratory. Prerequisite: SS 121 and BOT 121, or CRSC 131, or BOT 326, or consent of instructor.

#### CRSC 461, 462 Senior Project (3) (3)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 180 hours total time. Prerequisite: CRSC 411.

### CRSC 463 Undergraduate Seminar (2)

Oral presentation and leadership of group study on recent developments in the major field. 2 seminars.

#### CRSC 470 Selected Advanced Topics (2-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 2–4 lectures. Prerequisite: Consent of instructor.

# CRSC 521 Advanced Crop Production (4) (Also listed as VGSC 521)

Production and management of crops under intensive and extensive cultural systems and low-input agriculture. Interaction between the various growth factors at various levels of production and interaction of cultural practices and plant requirements. Miscellaneous course fee may be required—see *Class Schedule.* 3 lectures, 1 laboratory. Prerequisite: Graduate standing and consent of instructor.

#### CRSC 527 Animal Damage Management (4)

Animal damage management in natural ecosystems, agroecosystems, disturbed environments, and urban settings. Ecological aspects of various problem wildlife species in both nation and international settings. Holistic approach to identifying and mitigating damage or losses caused by problem wildlife species. One field trip is required. Miscellaneous course fee may be required-see *Class Schedule*. 3 seminars, 1 laboratory. Prerequisite: CRSC 327 or consent of instructor.

#### CRSC 581 Graduate Seminar in Crop Production (3)

Group study and oral reports on current technical problems and research results pertaining to field and vegetable crops production or marketing. 3 seminars. Prerequisite: Graduate standing.

# **CSC-COMPUTER SCIENCE**

#### CSC 110 Computers and Computer Applications: MS-DOS (3) GEB F.1.

The computer as a problem-solving tool. A working introduction to microcomputers, networked computer systems and related concepts. The demonstrated ability to make effective use of applications software packages including electronic mail. Credit not allowed for CSC majors. 2 lectures, 1 activity.

#### CSC 111 Introduction to Computer Applications for the Sciences (3) GEB F.1.

Exploration of capabilities of computers as tools in science and undergraduate studies. Emphasis is on an introduction to computer applications and application software in both Macintosh and MS-DOS environments with examples drawn from biology, physics, chemistry and statistics. Credit not allowed for CSC majors. 2 lectures, 1 laboratory.

#### CSC 112 Pascal Programming (3)

Fundamental concepts of computing. Techniques for problem solving with computers. Writing and running programs in the programming language Pascal. Hands-on experience with text editors and other programming support tools. Credit not allowed for CSC majors. 2 lectures, 1 activity.

#### CSC 113 Computers and Computer Applications: Macintosh (3) GEB F.1.

The computer as a problem-solving tool. A working introduction to microcomputers, networked computer systems and related concepts. Several applications software packages, including electronic mail and word processing. Credit not allowed for CSC majors. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 activity.

# CSC 118 Fundamentals of Computer Science I (4)

Introduction to algorithmic problem solving and programming. Emphasis on top-down design, stepwise refinement, and procedural abstraction. Basic control structures, data types, inputoutput, arrays, records, and the use of library packages. Introduction to development tools, compilers, linkers, and debuggers. Ethical issues in computing. 3 lectures, 1 activity.

#### CSC 120 Principles of Business Data Processing (4) GEB F.1.

Fundamental concepts of digital computing. Survey of computing devices, languages, methods and applications for business data processing. Credit not allowed for CSC majors. 4 lectures. Prerequisite: High school algebra.

### CSC 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

### CSC 201 FORTRAN Programming (3)

Programming in extended FORTRAN language with emphasis on program efficiency and advanced features. Comparison of FORTRAN implementations. 3 lectures. Prerequisite: CSC 118, and MATH 131 or MATH 141.

# CSC 203 COBOL Programming (3)

Structure of the Common Business-Oriented Language (CO-BOL). Coding fundamentals and program logic. Writing of complete COBOL programs applied to typical business data processing problems. 3 lectures. Prerequisite: Any computer programming course.

#### CSC 204 C and UNIX (3)

#### **GEB F.1.**

GEB F.1.

Extensive programming in the C language. Operators, standard I/O functions, strings, pointers and arrays, data types and storage classes. The UNIX programming environment: features of the UNIX shell, shell programming and using UNIX system functions from C. Credit not allowed for CSC majors. 3 lectures.

# CSC 207 BASIC Programming (3)

Advanced programming methods using the BASIC language. Language features, data types, file structures, error handling, and string processing. Structured programming and problem solving techniques in BASIC. 3 lectures. Prerequisite: CSC 110, CSC 111, CSC 112, CSC 113 or equivalent, or consent of instructor.

#### CSC 209 Selected Programming Languages (3)

Language to be studied will be selected from high level programming languages of current interest. Emphasis on language syntax and usage, and unique features. Intended for proficient programmers who want to learn another programming language. *Class Schedule* will list topic selected. Total credit limited to 6 units. 3 lectures. Prerequisite: CSC 218.

#### CSC 215 Computer Architecture I (4)

Elements of architecture and assembly language. Primarily designed for majors. 3 lectures, 1 laboratory. Prerequisite: EL 219 (or concurrent) and CSC 218.

# CSC 218 Fundamentals of Computer Science II (3)

Software development using procedural and object-based methods. Algorithm development with recursion, exceptions, pointers, files, dynamic memory allocation, packages, and generic units. Design of simple data abstractions and objects: stacks, queues, and lists. Sorting. Specification methods for software units. Introduction to the analysis of algorithms. 3 lectures. Prerequisite: CSC 118.

#### CSC 219 Linear Programming (3)

Introduction to linear programming, the simplex algorithm, duality, sensitivity and post optimal analysis. Use of linear programming techniques to solve linear optimization models. 3 lectures. Prerequisite: 6 units of college mathematics.

# CSC 221 Assembly Language Programming (4)

Techniques of structured assembly language programming on micro-computers. Credit not allowed for CSC majors. 3 lectures, 1 laboratory. Prerequisite: A minimum of 3 units of high level languages, e.g. FORTRAN, Pascal, Modula 2, Ada or C.

### CSC 240 Programming Environments I (3)

Design and implementation of programs in system development environment; tools and programming language(s) of that environment. Interface specifications, class libraries and the object-oriented paradigm. Run-time libraries, memory management and system calls. 3 lectures. Prerequisite: CSC 218.

### CSC 245 Discrete Structures (3)

Introduction to structures and proof techniques of computer science: sets, functions, relations, elementary combinatorics, propositional and predicate logic. Boolean algebra, proof techniques, verification of algorithm correctness, elementary complexity of algorithms, recurrance relations, applications of graph theory. 3 lectures. Prerequisite: CSC 118, EL 219, MATH 143.

### CSC 248 Computer System Administration (2)

Fundamental concepts of system administration in a Unix operating system environment; use of shell scripts and utilities; techniques of networks and data communications; methods of system maintenance and accounting. 2 seminars. Prerequisite: CSC 240 or permission of instructor.

### CSC 251 Digital Computer Applications (2) GEB F.1.

Programming techniques and procedures with applications to engineering problems in FORTRAN. Introduction to numerical methods and simulation. 2 activities. Prerequisite: MATH 142 or MATH 132, PHYS 131 or PHYS 121.

#### CSC 255 Computer Graphics Applications (4)

For students who wish to learn to use computer graphics in their own disciplines. Plotter and interactive graphic display characteristics and programming. Use of computer graphics facilities. Introduction to interactive graphic display characteristics. Credit not allowed for both CSC 255 and CSC 455. 3 lectures, 1 laboratory.

#### CSC 302 Computers and Society (3) GEB F.2.

Social, ethical, political and technological implications and effects of computers in the modern world. Examination of the benefits and side-effects of computer applications and automation. 3 lectures. Prerequisite: junior standing and F.1. computer literacy course.

#### CSC 311 Numerical Engineering Analysis (4)

An intensive survey of numerical analysis techniques used for solving problems in engineering. Areas include solution of nonlinear equations, solution of linear systems, interpolation, numerical quadrature, ordinary differential equations, boundary value problems. 4 lectures. Prerequisite: Knowledge of a high level programming language, e.g. FORTRAN and/or C, and MATH 242 or equivalent.

# CSC 315 Computer Architecture II (4)

Intermediate architecture topics. Levels of virtual machines and their languages. Special emphasis on level 1 and microprogramming. Design of conventional machines, study of tradeoffs in various designs. 3 lectures, 1 laboratory. Prerequisite: CSC 215, CSC 345, EL 219.

#### CSC 316 Computer Architecture III (4)

Microprocessor architecture and interfacing. Emphasis on study of one microprocessor and how it interfaces with other chips such as serial and parallel 1/O, static and dynamic RAM, ROM, DMA's and FDC's. 3 lectures, 1 laboratory. Prerequisite: CSC 315.

#### CSC 331 Numerical Linear Analysis (3)

Introduction to methods currently available to engineers, scientists and mathematicians for solving nonlinear equations. Computer methods in matrix algebra. Solution of a system of linear equations by direct and iterative methods. Curve Fitting techniques. Applications to problems in engineering and science. 3 lectures. Prerequisite: MATH 133 or MATH 143 or equivalent, and knowledge of a high level of programming language, e.g. FORTRAN, Pascal, Modula 2, or C.

#### CSC 332 Numerical Analysis I (3)

Computer solutions of nonlinear equations and systems of linear equations. Polynomial interpolation. Numerical quadrature. Introduction to the solution of ordinary differential equations. 3 lectures. Prerequisite: MATH 143 or equivalent and knowledge of a high level of programming language, e.g. FORTRAN, Pascal, Modula 2, or C.

# CSC 333 Numerical Analysis II (3) (Also listed as MATH 333)

Solution of systems of differential equations, predictorcorrector methods, stiff equations. Approximation methods: cubic splines, B-splines, Bezier curves, least squares, methods for solving boundary value problems. 3 lectures. Prerequisite: CSC 332 or equivalent.

#### CSC 342 Programming Environments II (4)

Windowing programming environments and the software development tools of those environments. Development of window-oriented programs using the environments' systems programming language. 3 lectures, 1 laboratory. Prerequisite: CSC 240 and CSC 345.

# CSC 345 Data Structures (3)

Abstract data types and their specification and implementation for basic data structures, stacks, queues, tables, trees and graphs. Complexity analysis and recursive algorithms. Strategies for constructing algorithm solutions. 3 lectures. Prerequisite: CSC 218.

#### CSC 346 File Structures (3)

Principles of file organization. Analysis of time-space trade offs for secondary searching and sorting algorithms. Sequential, indexed sequential, hashed, B-Tree and multiple-key files. Secondary storage devices, blocking and buffering, data compression. 3 lectures. Prerequisite: CSC 345.

# CSC 347 Introduction to Database Systems (4)

Introduction to basic principles of database management systems (DBMS) and of application development using DBMS. Topics covered: DBMS objectives, systems architecture, database models with emphasis on entity-relationships and relational models, data definition and manipulation languages, the Structured Query Language (SQL), database design, application development tools. 3 lectures, 1 laboratory. Prerequisite: CSC 345.

#### CSC 350 Discrete Dynamic Systems (3)

Analytical and simulation modeling and analysis of systems. Statistics and techniques of performance measurement and evaluation. Operational analysis. Introduction to discrete event and continuous simulation. 3 lectures. Prerequisite: Knowledge of a high level of programming language, e.g. FORTRAN, Pascal, Modula 2, or C, STAT 211 or STAT 321 or consent of instructor.

#### CSC 351 Programming Languages I: Design (3)

Comparison of structure and semantics of various high level programming languages. BNF grammars. Language design issues and techniques, including parameter passing, storage allocation and mapping and binding time. 3 lectures. Prerequisite: CSC 215, CSC 245, CSC 345.

### CSC 353 Computer Systems Programming (3)

Design of assemblers, macroprocessors, linkers and loaders. Advanced macrowriting, I/O programming, and interrupt handlers. 3 lectures. Prerequisite: CSC 215, CSC 240, CSC 345.

#### CSC 360 Continuous Dynamic Systems (3)

Modeling, computer simulation and analysis of dynamic systems represented by ordinary differential equations. Applications of high level languages for continuous system simulation. Selected applications. 3 lectures. Prerequisite: MATH 242 and knowledge of a high level programming language, e.g. FOR-TRAN, Pascal, Modula 2, or C.

#### CSC 400 Special Problems for Advanced Undergraduates (1–2)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

#### CSC 401 Real-Time Programming and Ada (3)

Ada programming language emphasizing real-time programming, software engineering, and parallel programming. Basics of the language and the architecture of Ada software systems. Includes packages, exceptions, generic types, pragma's representation clauses, and tasks. Tools in the Ada Programming Support Environment (APSE). 3 lectures. Prerequisite: CSC 345.

# CSC 404 Computer Networks (4)

Fundamentals of communication technology for asynchronous and synchronous transmission systems. Introduction to communication network architecture and topologies. Layered protocols, protocol standards and network design. Introduction to communication system analysis and performance evaluation. 3 lectures, 1 laboratory. Prerequisite: CSC 315 or CSC 453 or consent of instructor.

#### CSC 405 Computer Networks II (4)

Network architectures and protocols; network performance analysis; the theory of error detection and correction; other advanced topics such as routing, network management, integrated services, satellite networks, fiber optics. 3 lectures, 1 laboratory. Prerequisite: CSC 404 or consent of instructor.

#### CSC 410 Computer Fundamentals for Educators (3)

#### GEB F.1.

Computer as a teacher's aid and administrative tool. Computer fundamentals, programming techniques, problem-solving. Credit not allowed for CSC majors. 2 lectures, 1 activity. Prerequisite: Junior standing or consent of instructor.

#### CSC 411 Advanced Programming for Educators (3)

Intermediate and advanced techniques of programming in a high level language for microcomputers. Arrays, string processing, user defined functions, error trapping, subroutines, and files. 3 lectures. Prerequisite: CSC 110 or CSC 410 or consent of instructor.

### CSC 413 Authoring Languages (4)

Introduction to the fundamental concepts of authoring languages. Survey of the attributes and applications of authoring languages. 3 lectures, 1 laboratory. Prerequisite: CSC 112 or CSC 118.

#### CSC 414 Authoring Languages and Systems (4)

Advanced techniques utilizing the computer to assist individualized instruction. Comparison between authoring languages and authoring systems. Emphasis on advanced features of authoring languages and their applications in computer-based education. 3 lectures, 1 laboratory. Prerequisite: CSC 413.

#### CSC 415 Microcomputer Systems (4)

Recent advances in microcomputer architectures. RiSC, parallel processing advances and component communication. 3 lectures, 1 laboratory. Prerequisite: CSC 316.

#### CSC 416 Computer Applications in School Administration (3)

Applications of computer techniques to data processing and other management applications in the administration of schools and school districts. Credit not allowed for CSC majors. 3 lectures. Prerequisite: CSC 410.

### CSC 420 Artificial Intelligence (4)

Programs and techniques that characterize artificial intelligence. Programming in LISP. 3 lectures, 1 laboratory. Prerequisite: CSC 345.

#### CSC 421 Knowledge Based Systems (4)

In-depth treatment of knowledge representation, utilization and acquisition in a programming environment. Emphasis on the use of domain-specific knowledge to obtain expert performance in programs. 3 lectures, 1 laboratory. Prerequisite: CSC 420.

#### CSC 427 Computer-Based Educational Systems I (4)

Introduction to the design and implementation of computerbased educational systems. Emphasis on sound generation and vidisc overlay to create a multi-media learning environment. 3 lectures, 1 laboratory. Prerequisite: CSC 414.

#### CSC 433 Numerical Analysis III (3) (Also listed as MATH 433)

Methods for solving special systems of equations. Iterative and direct methods. Solution of partial differential equations by the finite difference method. Method of characterisitcs. Methods for finding eigenvalues and eigenvectors including the QR method. 3 lectures. Prerequisite: CSC 332 or equivalent.

## CSC 440 Software Engineering I (3)

Introduction to the software lifecycle. Methods and tools for the analysis, design, and specification of large, complex software systems. Project documentation, organization and control, communication, and time and cost estimates. Group laboratory project. 2 lectures, 1 laboratory. Prerequisite: CSC 345.

#### CSC 441 Software Engineering II (3)

Continuation of the software lifecycle. Methods and tools for the implementation, integration, testing and maintenance of large, complex software systems. Program development and test environments. Group laboratory project. 2 lectures, 1 laboratory. Prerequisite: CSC 440.

#### CSC 445 Theory of Computing I (3)

Topics chosen from such areas of theoretical computer science as theory of automata (including cellular automata), formal language theory, computation theory, computational complexity, and program verification. 3 lectures. Prerequisite: CSC 245.

#### CSC 447 Database Management Systems Implementation (3)

Techniques used in the implementation of centralized and distributed database systems (DBMS). Data structures and algorithms used in the implementation of data managed access methods interfaces, transaction managers (locking and recovery), query processors and optimizers, external views, integrity constraints, and access controls. 3 lectures. Prerequisite: CSC 346, CSC 347.

#### CSC 450 Programming Languages II: Description and Analysis (4)

Regular languages and finite automata. Table-driven lexical analysis. Recognition of reserved words. Symbol table construction. Parsing: top-down (LL) and bottom-up (LP). Table-driven versus recursive descent parsing. Context-free languages and pushdown automata. Continuation of CSC 351. 3 lectures, 1 laboratory. Prerequisite: CSC 351.

## CSC 451 Programming Languages III: Compiler Implementation (4)

Intermediate translation forms. Runtime representations. Generation of object code by compilers. Local optimization: constant propagation, folding, common subexpression removal. Global optimization, invariant code removal, operator strength reduction. Register allocation. Continuation of CSC 450. 3 lectures, 1 lab. Prerequisite: CSC 450.

# CSC 453 Introduction to Operating Systems (4)

Introduction to sequential and multiprogramming operating systems; kernel calls, interrupt service mechanisms, scheduling, files and protection mechanisms, conventional machine attributes that apply to operating system implementation, virtual memory management, and I/O control systems. 3 lectures, 1 laboratory. Prerequisite: CSC 315.

# CSC 454 Implementation of Operating Systems (4)

Design and implementation of multiprogramming kernels, systems programming methodology, interprocess communications, synchronization, device drivers and network access methods. 3 lectures, 1 laboratory. Prerequisite: CSC 453.

# CSC 455 Computer Graphics (4)

Graphics hardware and primitives. DDA, polygon filling, windowing and clipping. 2D and 3D transformations, 3D rendering, backface removal, depth sorting. Shading and illumination techniques. Basic fractal forgeries. 3 lectures, 1 laboratory. Prerequisite: CSC 345 and knowledge of C.

# CSC 456 Computer Graphics II (4)

Parametric representations. Curves and surface patches (B-splines, Catmull-Rom, Bezier), Oslo-algorithm. Ray-tracing polyhedra, general conics. Principles of solid modeling. Pattern and texture mapping, fractal geometry. 3 lectures, 1 laboratory. Prerequisite: CSC 455 and knowlege of C.

# CSC 461, 462 Senior Project (2) (3)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: Recommended: CSC 440 for CSC 461; CSC 441 for CSC 462.

# CSC 463 Undergraduate Seminar (2) (CR/NC)

Presentations by students of topics of interest to computer science professionals. Each student makes at least two presentations of professional quality. At least one is of technical nature. Possible topics for the course include computers and society, ethical issues in computing, social and legal implications of computing, interpretation of technical material for management. Offered only on a Credit/No Credit basis. 2 activity periods.

# CSC 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

### CSC 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.

# CSC 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.

# CSC 500 Directed Study (2-3) (CR/NC)

Individual directed study of advanced topics. Total credit limited to 4 units. Credit/No Credit grading only. Prerequisite: Fully classified graduate standing and consent of instructor.

# CSC 501 Languages and Translators (4)

Advanced programming language and translator concepts. Language concepts to be covered will be selected from current state-of-the-art languages and current issues in language design. Compiler concepts will include retargetable code generation, use of translator-writing systems, and error recovery. 4 seminars. Prerequisite: CSC 451, graduate standing or consent of instructor.

# CSC 502 Database Systems (4)

Topics in database systems: recovery, integrity, concurrency, security, data models, distributed databases, database machines, database system implementation, and semantic database design. 4 seminars. Prerequisite: CSC 447, graduate standing or consent of instructor.

# CSC 503 Operating Systems (4)

General concepts of computer architecture and operating systems. Design features of advanced computers, general time-sharing systems and schemes for dynamic memory allocation, scheduling and protection. Dynamic linkage between subroutines. Intercommunication between input/output and processors. 4 seminars. Prerequisite: CSC 453, graduate standing or consent of instructor.

### CSC 504 Computer Architecture (4)

Comparative study and design of multiprocessor, dataflow, RISC, high level language and other new computer architectures. VLSI processor design techniques. 3 seminars, 1 laboratory. Prerequisite: CSC 315, graduate standing or consent of instructor.

# CSC 505 Theory of Computing II (4)

Advanced topics in theoretical computer science from such areas as automata theory, cellular theory, computational complexity, and program verification. 4 seminars. Prerequisite: CSC 445, graduate standing or consent of instructor.

### CSC 506 Artificial Intelligence (4)

Advanced programming approach to the study of artificial intelligence. Experience in developing programming tools such as discrimination nets, pattern matching and agendas. Extensive programming in at least one Al language. 3 seminars, 1 laboratory. Prerequisite: CSC 420, graduate standing or consent of instructor.

### CSC 507 Computer Simulation I (4)

Principles and organization of simulation software. Executive programs for interactive control of continuous, discrete and combined system simulations. Specification, design and development of simulation support packages. Structure and techniques for development of real-time, queue management, graphics interface, and validation components of simulation systems. 4 seminars. Prerequisite: CSC 350, graduate standing or consent of instructor.

# CSC 517 Computer Simulation II (4)

Advanced topics in simulation. Simulation languages and systems, distributed simulation, training systems. Management of simulation projects. Verification and validation methodologies. 3 seminars, 1 laboratory. Prerequisite: CSC 507, graduate standing or consent of instructor.

# CSC 527 Computer-Based Educational Systems II (3)

Comparison of several authoring languages and systems as they affect the design of multi-media computer-based educational systems. Emphasis on features for special purposes such as education of the handicapped. 3 seminars. Prerequisite: CSC 427, graduate standing or consent of instructor.

### CSC 531 Numerical Methods I (4)

Introduction to advanced methods used in numerical analysis. Finite element methods for one and two-dimensional problems. Study of transforms including the Fast Fourier Transform and the Fast Hartley Transform. Review of the software supporting these methods. 4 seminars. Prerequisite: CSC 332 or equivalent, graduate standing or consent of instructor.

#### CSC 559 Practicum in Computer Science I (1) (CR/NC)

Preliminary planning and feasibility studies for the practicum projects of CSC 560. Credit/No Credit grading only. 1 activity. Prerequisite: Consent of instructor.

### CSC 570 Current Topics in Computer Science (2-3)

Directed group study of selected topics for graduate students. Topics will normally consist of continuations of those in CSC 501–CSC 506 and other topics as needed. *Class Schedule* will list topic selected. Topic credit limited to 9 units. 2 to 3 seminars. Prerequisite: Graduate standing and evidence of satisfactory preparation in computer science.

### CSC 587 Cooperative Education Experience (6)

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Prerequisite: Graduate standing and consent of instructor.

#### CSC 590 Seminar in Computer Science (3)

Current problems and research in the field of computer science through discussions and selected readings. Group study of selected advanced topics. 3 seminars. Prerequisite: Graduate standing.

### CSC 597 Cooperative Education Experience (12)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Prerequisite: Graduate standing and consent of instructor.

#### CSC 599 Thesis/Project (2-3) (2-3)

Individual research or activity under faculty supervision leading to an acceptable thesis or project. Prerequisite: Graduate standing and consent of instructor.

# **DANC-DANCE**

# DANC 131 Beginning Ballet (2)

Fundamentals of ballet technique stressing alignment, turn-out, five basic positions, seven movements of dance, and terminology. 2 activities.

#### DANC 132 Beginning Modern Dance (2)

Fundamentals of modern technique stressing alignment, offcentered use of torso, floorwork, movement phrases, and improvisation exercises. 2 activities.

#### DANC 133 Beginning Jazz Dance (2)

Introduction of jazz dance techniques stressing a variety of styles, alignment, isolation, polyrhythms, syncopation, improvisation, and phrasing. Performance technique and presentation of simple dance phrases. 2 activities.

#### DANC 134 Beginning Social Dance (2)

Selected ballroom dances including the cha-cha-cha, foxtrot, jitterbug, merengue, rumba, samba, tango, waltz and discotheque. Emphasis on alignment, etiquette, leading and following, performance techniques, and presentation of simple dance phrases. 2 activities.

#### DANC 135 International Folk Dance (1)

Introduction to international folk dances including round, longway, and square sets. Study of various dance steps, formation, positions, historical and cultural background. 1 activity.

#### DANC 211 Dance Fundamentals (2)

Body placement, alignment, rhythmic analysis and movement techniques. Theory and practice of fundamentals to promote ease and efficiency of movement. Introduction to dance forms such as ballet, modern, jazz, folk, square and social. 2 activities.

# DANC 221 Dance Appreciation (3) GEB C.2.

Concentrates on major dance works and artists from the 19th century to present. Includes cultural contexts as well as styles and forms used in dance. Introductory survey of major experiments in dance. 3 lectures.

#### DANC 231 Intermediate Ballet (2)

Continuation of training in basic technical skills in ballet stressing phrasing, performance, and more complex step patterns. 2 activities. Prerequisite: Consent of instructor.

#### DANC 232 Intermediate Modern Dance (2)

Continuing study of DANC 132 with emphasis on various movement styles, phrasing, more complex step patterns, and performance. 2 activities. Prerequisite: Consent of instructor.

#### DANC 233 Intermediate Jazz Dance (2)

Continuation of DANC 133 with emphasis on more extensive movement vocabulary. 2 activities. Prerequisite: Consent of instructor.

#### DANC 234 Intermediate Social Dance (2)

Continuation of DANC 134. Emphasis on variations, styles, and performance skill. 2 activities. Prerequisite: Consent of instructor.

#### DANC 320 Dance Notation (3)

Introduction to the major dance notation systems, emphasizing the theory, reading and writing of Labonotation. 1 lecture, 2 activities. Prerequisite: One DANC activity class or consent of instructor.

#### DANC 321 Dance History (3) GEB C.3.

Historical influences on contemporary Western dance from prehistoric times to the present, with special emphasis on European, African and Hispanic sources. 3 lectures. Prerequisite: One DANC activity class or consent of instructor.

#### DANC 340 Dance Improvisation and Composition (3)

Principles of dance composition and improvisation. Exploring movement potentials through studies in use of various stimuli, process of construction, and structuring of compositional forms. 1 lecture, 2 activities. Prerequisite: Consent of instructor.

#### DANC 345 Choreography and Workshop in Concert Preparation (3)

Problems connected with dance choreography. Workshops in concert preparation for Cal Poly's major dance production. Total credit limited to 9 units. 1 seminar, 2 laboratories. Prerequisite: By audition only.

#### DANC 346 Dance Production (3)

Directed experience in production of annual Orchesis dance concert and other public performances. Total credit limited to 12 units. 3 laboratories. Prerequisite: DANC 345 or consent of instructor.

#### DANC 381 Methods of Teaching Dance (4)

Dance forms such as folk, social, square, modern, ballet and jazz studies. Rhythmic structure and analysis of dance steps. Development of teaching methods and techniques, curricular materials and evaluation procedures related to teaching dance forms. 2 lectures, 2 activities. Prerequisite: DANC 211 or consent of instructor.

#### DANC 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research and studies or survey of selected problems in dance and related areas. Total credit limited to 4 units with a maximum of 2 units per quarter. Prerequisite: Consent of instructor and department head.

#### DANC 470 Selected Advanced Topics (1-3)

Directed study of selected topics for advanced dance students. *Class Schedule* will list topics selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

#### DANC 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for dance students. *Class Schedule* will list topics selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

# **DH–DAIRY HUSBANDRY**

#### DH 100 Enterprise Project (1-4) (CR/NC)

Selection and completion of a management/production project under faculty supervision. Project participation is subject to approval by the project supervisor and the Cal Poly Foundation. Degree credit limited to 12 units. Credit/No Credit grading only.

#### DH 101 Dairy Feeds and Feeding (4)

Introduction to Dairy Cattle/Ruminant Nutrition. Classification and metabolism of nutrients. Nutrient content and identification of feeds common to dairy cattle. Nutrient analysis procedures and requirements. Ration formulation, feeding practices for maximizing growth and milk production. 3 lectures, 1 laboratory.

#### DH 121 Elements of Dairying (4)

General information on statistics and opportunities in the dairy industry. Composition and food value of dairy products. Common tests to determine quality of products. Principles and practices of the feeding and management of dairy cattle. 3 lectures, 1 laboratory.

#### DH 133 Fitting and Showing Dairy Cattle (2)

Selection, preparation, presentation of dairy cattle for shows, sales, and photographing. 1 lecture, 1 laboratory.

#### DH 142 Dairy Cattle Selection (2)

Selection of dairy cattle with consideration to breed characteristics and conformation. Evaluation of type characteristics. Correlation between type and production. 2 laboratories.

#### DH 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

#### DH 221 Milk Production (4)

Factors affecting milk production. Dairy production problems and methods. Practice in many of the frequently used dairy production skills. 3 lectures, 1 laboratory. Prerequisite: DH 101, DH 121, DH 142.

#### DH 222 Commercial Dairy Herd Management (4)

Commercial dairy practices from the standpoint of cost of feeding and management. Visits are made to successful dairy farms. 3 lectures, 1 laboratory. Prerequisite: DH 221.

#### DH 230 General Dairy Husbandry (4) GEB F.2.

Selection, breeding, feeding, and management of dairy cattle. Composition and food value of dairy products. Milk pricing, political influences, dairy industry statistics and opportunities. Producing and handling products. For non-Dairy majors. 3 lectures, 1 laboratory.

#### DH 250 Dairy Farm Safety and Production Practices (3)

Communication of dairy farm safety practices with emphasis on equipment operation, livestock handling and common farm hazards. Applied practices necessary for successful operation of a modern dairy farm. 2 lectures, 1 activity. Prerequisite: DH 121 or consent of instructor.

#### DH 301 Advanced Dairy Cattle Feeding (3)

Nutrition requirements of dairy cattle. Successful, economical feeding practices, ration formulation utilizing the computer. 2 lectures, 1 activity. Prerequisite: DH 101 or ASCI 101 and computer literacy elective.

#### DH 323 Breeds, Pedigrees and Management of Dairy Cattle (3)

Methods of establishing and developing a purebred dairyherd. Advertising, promoting and marketing registered cattle. Origin of modern dairy cattle breeds, organization of cattle clubs. Breed families and herds. 2 lectures, 1 activity. Prerequisite: DH 221, DH 222.

#### DH 330 Artificial Insemination (3)

Semen collection, evaluation processing and handling. Inseminating techniques. Fertility problems. Record keeping and measurements of reproductive efficiency. Endocronology of reproduction. Estrous synchronization, embryo transfer and splitting of embryos. Ovarian structure and palpation of ovaries. 2 lectures, 1 laboratory. Prerequisite: DH 121.

# DH 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

#### DH 422 Breeding and Selection of Dairy Cattle (4)

Evaluation of inherited characteristics in dairy cattle from an economic standpoint. Proving and selecting sires and dams. 3 lectures, 1 laboratory. Prerequisite: BIO 303, DH 142.

#### DH 432 Advanced Dairy Herd Management (4)

Dairy herd management skills needed in dairy operations. Instruction and lab experience in management, records, feeding and nutrition, herd health, milk secretion, reproduction, mating and selection. 3 lectures, 1 laboratory. Prerequisite: DH 301, DH 323, DH 330, and DH 422.

#### DH 461, 462 Senior Project (2) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

#### DH 463 Undergraduate Seminar (2)

Reports on student papers, bulletins, periodical articles, and dairy research experiments. Sources of dairy husbandry information. Practice in oral reporting. Recent developments and research work in the dairy industry. 2 lectures.

#### DH 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units.1 to 3 lectures. Prerequisite: Consent of instructor.

# **DPT-DAIRY PRODUCTS TECHNOLOGY**

### DPT 100 Enterprise Project (1-4) (CR/NC)

Selection and completion of a management/production project under faculty supervision. Project participation is subject to approval by the project supervisor and the Cal Poly Foundation. Degree credit limited to 12 units. Credit/No Credit grading only.

## DPT 134 Introduction to Dairy Products Technology (4)

Science and technology in the development and manufacture of dairy food products. Equipment and dairy processing techniques for fluid milk, butter, cheeses, ice cream, yogurt, concentrated dairy foods and dried dairy foods. 3 lectures, 1 laboratory.

#### DPT 202 Dairy Product Marketing Programs (3)

Promotional programs of national dairy companies, integrated supermarket firms and independents. Programs of major dairy organizations; for example, National Dairy Council and Dairy Board, California Dairy Council, and Milk Advisory Board. 2 lectures, 1 activity. Prerequisite: DPT 134 or consent of instructor.

#### DPT 222 Frozen Dairy Foods (4)

Selection of ingredients, calculating, and processing ice cream, ice milk, and sherbet mixes. Equipment and methods required to process, freeze, package, and harden ice cream and related products. 3 lectures, 1 laboratory. Prerequisite: DH 121.

#### **DPT 230** General Dairy Manufacturing (4)

Composition and properties of fluid milk and manufactured milk products. Chemistry and microbiology of dairy products. Processes and equipment involved in the manufacture of butter, cheeses, and other fermented dairy products, frozen, condensed, and dried dairy foods. Elective course for nondairy students. Survey course for dairy husbandry majors. 3 lectures, 1 laboratory.

#### DPT 233 Milk Processing and Marketing (4)

Composition and properties of fluid milk and its constituents. Equipment used to handle, process, and distribute fluid milk and related products. Product promotion, advertising and merchandising. Survey of national and local dairy marketing organizations. 3 lectures, 1 laboratory. Prerequisite: DPT 134.

#### DPT 234 Dairy Foods Evaluation (2)

Basic principles of sensory examination of dairy foods. Physiology of the various senses and their relationship to distinguishing the quality of dairy products by sight, flavor, body and texture. Product defects, causes, and methods of prevention. 1 lecture, 1 laboratory.

### DPT 326 Fermented Dairy Foods (3)

Methods, ingredients, and equipment used in the manufacture of fermented dairy products, such as sour cream, buttermilk, and yogurt. Plant practice and field trips to study commercial applications. 2 lectures, 1 laboratory. Prerequisite: BACT 221.

#### DPT 331 Concentration and Fractionation of Dairy Fluids (3)

Technology of evaporation and membrane separation processes applied to dairy fluids. Design and performance of evaporators and membrane processing systems (microfiltration, ultrafiltration, reverse osmosis). 2 lectures, 1 laboratory. Prerequisite: FSN 217 and DPT 134 or DPT 230.

#### **DPT 332** Dairy Inspection (3)

California dairy codes and score cards used for dairy plants and farms. Quality tests of dairy products. Practice in inspecting and scoring dairy farms and factories. Organizational structure of inspection services. 2 lectures, 1 laboratory. Prerequisite: DPT 233, BACT 221.

# DPT 334 Technology of Cheese Manufacture (4)

Chemistry and microbiology of cheese manufacture. Equipment, techniques and ingredients used to produce, handle, package, preserve and age different cheese varieties. Cheesemaking laboratory instruction in University dairy plant. 3 lectures, 1 laboratory. Prerequisite: BACT 221, DPT 233 or consent of instructor.

#### DPT 336 Drying and Butter Technology (3)

Equipment, ingredients, and methods needed to manufacture butter, dairy spreads, and dried dairy products. Practice in university dairy plant and field trips to commercial operations. 2 lectures, 1 laboratory. Prerequisite: FSN 217 and DPT 134.

#### DPT 401 Physical and Chemical Properties of Dairy Products (3)

Composition, structure and properties of milk and other dairy foods. Physical and chemical changes which occur during processing and storage of dairy products. Objective measurement of physical and chemical properties. 2 lectures, 1 laboratory. Prerequisite: CHEM 328.

#### DPT 402 Quality Assurance and Control of Dairy Products (3)

Current methods used to evaluate dairy products with respect to plant economics and consumer safety. Accurate procedures for chemical and biological testing, statistical approach to sampling, and design and interpretation of HACCP programs for assuring product quality and safety. 2 lectures, 1 laboratory. Prerequisite: DPT 233.

#### DPT 433 Dairy Plant Management and Equipment (4)

Basic management principles applied to the dairy industry. Industrial organization and control. Dairy plant location, design facilities and layout. Survey of financing applied to the dairy industry. Maintenance and operation of the equipment. 3 lectures, 1 laboratory. Prerequisite: PHYS 121 and junior standing.

#### DPT 522 Bioseparation Processes in Dairy Product Technology (3)

Physical and chemical principles governing bioseparation processes in dairy product technology. Factors influencing mass transport phenomena as it relates to filtration, size exclusion chromatography, ion exchange, dialysis, centrifugation, crystallization and other unit operations. Laboratories emphasize application of bioseparations of commercial importance. 2 lectures, 1 laboratory. Prerequisite: DPT 401 or FSN 407, FSN 435. CHEM 302 recommended.

# **ECON-ECONOMICS**

#### ECON 105 Personal and Consumer Economics (3)

Personal choices-goals, savings, investment, buying methods, borrowing, taxes, insurance. Practical applications of principles of marginalism, indexing, expected value. Emphasizes personal welfare with some social welfare analysis and contemporary consumer issues. 3 lectures.

#### ECON 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Sophomore standing and consent of department head.

### ECON 201 Survey of Economics (3) GEB D.3.

Basic material covered in Principles of Economics, ECON 211, 212 in a less detailed and technical manner. For majors requiring one quarter of economics. Not open to students with previous credit in ECON 211 or 212 or equivalent. 3 lectures. Prerequisite: Sophomore standing.

# ECON 211 Principles of Economics (3) GEB D.3.

Macroeconomics: principles and applications in the theory of national income, output and employment. Determination and measurement of the national product. Inflation, money, banking, monetary and fiscal policies. Not open to majors in Economics and Business. Not open to students with credit in ECON 222. 3 lectures. Prerequisite: Sophomore standing.

#### ECON 212 Principles of Economics (3)

Microeconomics: principles and applications in the theory of producer and consumer behavior, and the distribution of factor income with focus on the output market. Effect on the national economy. Not open to majors in Economics and Business. Not open to students with credit in ECON 221. 3 lectures. Prerequisite: Sophomore standing.

#### ECON 221 Microeconomics (4)

Microeconomic principles. Marginal and equilibrium analysis of commodity and factor markets in determination of price and output. Normative issues of efficiency and equity. Mathematical and statistical analysis and computer simulation. Not open to students with credit in ECON 212 or equivalent. 4 lectures. Prerequisite: Sophomore standing, CSC 120, STAT 251, and STAT 252.

#### ECON 222 Macroeconomics (4) GEB D.3.

Macroeconomics analysis and principles. Aggregate output, employment, prices, and economic policies for changing these variables. Mathematical and statistical analysis and computer simulation. Not open to students with credit in ECON 211 or equivalent. 4 lectures. Prerequisite: ECON 221.

#### ECON 301 Introduction to Managerial Economics (4)

Fundamental principles and analytical tools of economics useful in managerial decision making. Risk evaluation, supply and demand analysis, price setting and capital budgeting. Case studies of managerial decision making with microcomputer applications. 3 lectures, 1 activity. Prerequisite: CSC 120, ECON 212 or ECON 221.

#### ECON 304 Comparative Economic Systems (3)

### GEB D.4.b.

Analysis of economic principles and institutions applicable to capitalism, socialism, and communism. 3 lectures. Prerequisite: ECON 201 or ECON 211 or ECON 222.

# ECON 306 Applied Forecasting (4)

Causes and measurement of business fluctuations. Techniques of forecasting with microcomputer applications. 3 lectures, 1 activity. Prerequisite: ECON 201 or ECON 211 or ECON 222, CSC 120 and STAT 252.

# ECON 311, 312 Intermediate Microeconomics (4) (4)

Economics of prices and markets. Demand and supply. Returns and costs, factor pricing and income distribution, welfare and economic progress. 4 lectures. Prerequisite: ECON 212 or ECON 221, MATH 221, MATH 222, STAT 251, STAT 252. For ECON 312: ECON 311.

# ECON 313 Intermediate Macroeconomics (4)

Economic activity related to production and resource use to meet goals of society. Income, employment, economic growth and progress of the United States and its regions. Application of theory with microcomputer simulation models. Miscellaneous course fee required--see *Class Schedule*. 3 lectures, 1 activity. Prerequisite: ECON 211 or ECON 222, CSC 120, MATH 221, MATH 222, STAT 251, STAT 252, ECON 337.

# ECON 314 Monetary and Fiscal Policies (4)

National economic fluctuation models and related corrective monetary and fiscal policies on income, employment, output, growth and prices. Application of theory with microcomputer simulation models. 3 lectures, 1 laboratory. Prerequisite: ECON 313.

# ECON 323 European Economic History (3)

Analysis of the growth, development, and economic institutions of the European economies from about 1600 to the present. Includes the relationship of European economies to colonial empires, industrial development, role of banking, transportation, government actions, economic imperialism, international trade. 3 lectures. Prerequisite: ECON 201 or ECON 211 or ECON 222.

# ECON 324 American Economic History (3)

Topical economic analysis of major events and institutions of American economic history as viewed against their causes, origin and development. Economic development of America from an underdeveloped nation. Agriculture, transportation, monetary and banking policies, business, labor, and growth of governmental activities. 3 lectures. Prerequisite: ECON 201 or ECON 211 or ECON 222.

# ECON 325 Underdevelopment and Economic Growth (3) GEB D.4.b.

Economic development: the less developed world and the American interest. 3 lectures. Prerequisite: ECON 201 or ECON 211 or ECON 222.

# ECON 337 Money, Banking and Credit (4)

Principles and practices of monetary banking and credit institutions as applied to business activity and public policy. Use of mathematical analysis and computer simulation. 4 lectures. Prerequisite: ECON 211 or ECON 222, CSC 120, MATH 221.

#### ECON 338 Stochastic Modeling in Decision Making Systems (4)

Introduction to the theory and practice of decision making. Decision support systems applications of the microcomputer, exploring prevailing concepts through the development of topical projects related to the technology of decision making in economics and business. Practical applications discovering and exploring model applications and formulation. General techniques with applications in various areas of microeconomics and macroeconomics. Computerized projects required. 3 lectures, 1 activity. Prerequisite: CSC 120, STAT 252, MATH 221, ECON 211, ECON 212 or ECON 221, ECON 222.

## ECON 339 Econometrics (4)

Application of statistical methods useful in economics. General linear regression model. Specific issues and problems related to economic models: multicollinearity, autocorrelation, heteroscedasticity, dummy variables, lagged variables, and simultaneous equation estimation. Application and evaluation of selected examples of empirical economic research. Microcomputer applications. 3 lectures, 1 activity. Prerequisite: CSC 120, MATH 221, MATH 222, STAT 251, STAT 252, or consent of instructor.

#### ECON 400 Special Problems for Advanced Undergraduates (1-4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units. Prerequisite: Consent of department head.

# ECON 401 International Trade (4)

Theory of comparative advantage, gains from trade, and recent developments in trade theory; examination of tariffs, quotas, exchange controls, other trade barriers and underlying policy issues; review of U.S. commercial policy, GATT, the common market, regional and world economic organizations. 4 lectures. Prerequisite: ECON 212 or ECON 221.

# ECON 402 International Monetary Economics (4)

Nature of international payments, U.S. balance of payments. Theory and practice of foreign exchange rate determination under the gold standard, paper standard, and IMF system; international money and capital markets; problems of international liquidity and monetary stability. 4 lectures. Prerequisite: ECON 401.

### ECON 403 Industrial Organization (4)

Application of basic tools of economics to American Industry. Case studies of individual firms and industries. Performance of various business structures, such as monopoly and oligopoly. Effects of government regulation and antitrust policy. 4 lectures. Prerequisite: ECON 212, or ECON 221.

### ECON 410 Public Finance and Cost-Benefit Analysis (4)

Principles of rational decision making with respect to government revenues and spending. Measurement of costs and benefits, and criterion selection. Taxation, user fees, deficit financing, public goods, neighborhood effects and zoning. Microcomputer applications. 3 lectures, 1 activity. Prerequisite: ECON 312, CSC 120.

# ECON 413 Labor Economics (4)

Wage determination theory, basic economic factors that affect the labor movement, economic impact of union activities on employment, output, income, wages, prices, and national economic policy. 4 lectures. Prerequisite: ECON 212 or ECON 221.

### ECON 417 Development of Economic Analysis (3)

Analysis of ideas related to the development of economic theory in the Western civilization from the Greeks through the classical, neoclassical, and Keynesian to the current post-Keynesian concepts. 3 lectures. Prerequisite: ECON 211, ECON 212 or ECON 221, ECON 222.

# ECON 430 Internship (2-8) (CR/NC)

Placement of student for part-time supervised work experience in a business enterprise or government agency approved by the

department head. Collateral reading correlated with work assignments and periodic written progress reports required. Credit/No Credit grading. Prerequisite: Junior standing.

## ECON 431 Environmental Economics (4)

Economic dimensions of environmental abuse and protection. Use of simple economic models in developing and evaluating environmental policies. Overview of current environmental problems. Issues related to the sustainability of economic growth at the national and international levels. 4 lectures. Prerequisite: ECON 201 or ECON 211 or ECON 221.

#### ECON 432 Economics of Energy and Resources (4)

Economic theory and public policies as applied to problems of natural resources and energy. Dynamic resource and energy models developed with reference to public and private sector growth. Application of the principles of capital theory emphasized. Case studies. Computer software applications in the study of natural resources and energy under uncertainty. 4 lectures. Prerequisite: ECON 201 or ECON 211 or ECON 222.

#### ECON 433 Transportation Economics (4)

Analysis of the allocation of resources to the U.S. transport sector and specific transport modes as a result of their natural economic characteristics and public policy. 4 lectures. Prerequisite: ECON 201 or ECON 211 or ECON 222.

#### ECON 434 Urban Economics (4)

Application of basic tools of economic analysis to problems of urban regions. Causes and possible cures for inadequate growth rate, income levels, and the quality of life in urban regions. 4 lectures. Prerequisite: ECON 201 or ECON 211 or ECON 222.

### ECON 461, 462 Senior Project (2) (2)

Selection and analysis of a problem under faculty supervision. Problems typical of those which graduates must solve in their fields of employment. Formal report is required. Minimum 120 hours total time.

### ECON 463 Undergraduate Seminar (2)

Seminar in applications of economic theory with emphasis on current problems. 2 seminars. Prerequisite: ECON 462.

# ECON 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

#### ECON 500 Independent Study (1-4)

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 school's programs as they relate to individual aptitudes. The design process. Visiting speakers. Credit/No Credit grading. 2 lectures.

# **EDUC-EDUCATION**

# EDUC 125 Efficient Reading (2) (CR/NC)

Development of reading efficiency required in modern business, industry, and the professions, as well as study skills in subject matter content areas. Total credit limited to 4 units. Credit/No Credit grading only. 1 lecture, 1 activity.

#### EDUC 300 Introduction to the Teaching Profession (3) (CR/NC)

Supervised observation and participation in cooperating schools. Discussion focuses on subject matter taught in grades observed. Separate class sections for students interested in elementary or secondary teaching-see *Class Schedule*. Total credit limited to 6 units. Credit/No Credit grading only.

#### EDUC 301 The Learners and the Learning: Teaching Process in Elementary School (3)

Current theories of human learning and the social, emotional and cognitive development of students and teachers. The application of this knowledge to elementary school teaching will be emphasized. 2 seminars, 1 activity. Prerequisite: Junior standing.

#### EDUC 302 Multicultural Education in the Secondary School (3)

Multicultural elements which influence the academic and social environment of the American secondary school; professional responsibilities and legal requirements; review of successful programs aimed at making fundamental changes in the rules, roles and relationships in schools. 2 lectures, 1 activity. Prerequisite: Any course in GEB Area D.

#### EDUC 303 Effective Teaching, Classroom Management and Discipline in the Elementary School (4)

Instructional skills that can serve as guidelines for teaching. Effective classroom management, discipline and group dynamics. 3 seminars, 1 activity. Prerequisite: Junior standing.

# EDUC 305 Teaching and Learning Processes in the Secondary School (3)

Learning processes: selected theories of learning related to teaching; theories of human development and learning; psychological principles involved in the teaching-learning event; self-evaluation of the prospective teacher. 3 lectures. Prerequisite: Any course in GEB Area D.

#### EDUC 400 Special Problems for Undergraduates (1-3)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Junior standing and consent of instructor.

# EDUC 401 Teaching Reading in the Elementary School (4)

Application of reading approaches, methods, and materials in the elementary classroom along with supervised field experience in teaching reading in an elementary school setting. Methods for teaching reading and discussions pertaining to field experience activities, observations, and participation. 3 seminars, 1 activity. Prerequisite: Junior standing.

# EDUC 402 Teaching Language Arts and Reading in the Elementary School (4)

Selection, organization, and presentation of lessons in all language arts areas. Integration of language arts with other curriculum areas and particularly reading. Cultural factors which influence language acquisition and the learning of English as a second language. Miscellanous course fee required-see *Class Schedule*. 3 seminars, 1 activity. Prerequisite: EDUC 301, EDUC 303, EDUC 401, and admission to the Teacher Education Credential Program (Step I).

# EDUC 403 Teaching Reading in the Secondary School (5)

Discussion of reading approaches, methods and materials in the secondary classroom with supervised field experience in teaching reading in a secondary school. 3 seminars, 2 activities. Prerequisite: EDUC 302, EDUC 305, or consent of instructor.

#### EDUC 406 Teaching Science and Mathematics in the Elementary School (4)

Curriculum and methods in teaching science and mathematics. Selecting, organizing, presenting, and evaluating science and mathematics lessons at the appropriate level throughout the curriculum. Emphasis on thinking processes, manipulative and process skills within the context of the state curriculum frameworks. Miscellaneous course fee required-see *Class Schedule.* 2 seminars, 2 activities. Prerequisite: EDUC 301, EDUC 303, EDUC 401, and admission to the Teacher Education Credential program (Step 1).

## EDUC 407 Teaching Multicultural and Social Science Education in the Elementary School (4)

Curriculum and methods of teaching social science and multicultural education in the elementary school. Emphasis on thinking processes, problem solving, and process skills within the context of the state *History/Social Science Framework*. 3 seminars, 1 activity. Prerequisite: EDUC 301, EDUC 303, EDUC 401, EDUC 402, or consent of multiple subject coordinator. Concurrent: EDUC 410.

# EDUC 409 Teaching in the Secondary School (4)

Principles of effective teaching; planning for instruction; management techniques involving instruction; peer coaching. Taken immediately prior to preliminary student teaching. 3 seminars, 1 activity. Prerequisite: Admission into the Single Subject Credential program.

# EDUC 410 Preliminary Student Teaching (6) (CR/NC)

Part-time assignment in a classroom. Includes teaching activities under the direction of a selected cooperating teacher in consultation with a university supervisor. Assignment consists of an entire morning in the classroom (or the equivalent) for one quarter. Credit/No Credit grading only. Prerequisite: Completion of courses and requirements to preliminary student teaching and approval of campus screening committee for credential candidates.

### EDUC 411 Classroom Management and Disciple for Secondary School (3)

Principles of establishing classroom routines and procedures; maintaining classroom control; managing groups; school law; parent-teacher relations. 2 seminars, 1 activity. Prerequisite: EDUC 409. Concurrent enrollment in EDUC 410 recommended.

# EDUC 420 Student Teaching (12) (CR/NC)

Full-time assignment in a classroom. Includes teaching activities under the direction of a selected cooperating teacher in consultation with a university supervisor. Assignment consists of an entire teaching day in the school for one quarter. Credit/No Credit grading only. Prerequisite: Completion of all courses and requirements prerequisite to full-time student teaching and approval by campus screening committee for credential candidates.

# EDUC 421 Student Teaching Practicum (3)

Emphasis on solving problems related to field experience. Refining of organizational and instructional strategies, including an interdisciplinary approach to curriculum. Preparation for a job search. Professional and legal responsibilities of classroom teachers. 2 seminars, 1 activity. Concurrent enrollment in EDUC 420 required.

# EDUC 422 Student Teaching Practicum (Single Subjects) (3)

Practices and problems of student teaching. Current innovations in teaching procedures and materials. Taken concurrently with single subject student teaching. 2 lectures, 1 activity.

# EDUC 426 Bilingual Reading Methods and Field Experience in the Elementary School (4)

Patterns of classroom organization, application of reading programs, approaches, methods in English and Spanish, and supervised field experiences in elementary classrooms with bilingual students. Miscellaneous course fee required-see *Class Schedule*. 3 seminars, 1 activity. Prerequisite: EDUC 301, EDUC 303, minimal fluency in Spanish, and consent of instructor.

# EDUC 440 Educating the Exceptional Individual (4)

Characteristics, incidence, and etiology of individuals with exceptional needs. Problems, assessment, and approaches toward accommodating exceptional students in the regular classroom. 4 seminars. Prerequisite: Any course in GEB Area E.1. or E.2.

# EDUC 444 The Atypical Infant (4) (Also listed as HD 444)

Exploration of issues pertinent to the development of atypical infants. The readings and assignments will be used to relate theory and research to intervention efforts with handicapped, developmentally delayed infants, and other at-risk infants. 3 seminars, 1 activity. Prerequisite: Junior standing, HD 296 or HD 299, and EDUC 440 or consent of instructor.

### EDUC 450 Behavior Disorders and Classroom Management Strategies (4)

Assessment of students with disruptive classroom performance. Basic strategies for facilitating social-emotional techniques which shift disruptive behavior to appropriate behavior. Evaluation of classroom modifications. 3 seminars, 1 activity. Prerequisite: EDUC 440 or consent of instructor.

### EDUC 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

# EDUC 480 Computer Based Curriculum (3)

Computer assisted instruction and computer based technology. Lesson planning and integration of technology into the K-12 curriculum. Familiarization with available educational courseware and software. Emphasis on classroom application. Miscellaneous course fee required-see *Class Schedule*. 2 seminars, 1 activity. Prerequisite: Completion of computer literacy GEB F.1. course, CSC 410 or CSC 416, or equivalent.

## EDUC 500 Individual Study (1-3)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Only 6 units may be applied to degree requirements. Prerequisite: Consent of department head, graduate major adviser, and supervising faculty member.

### EDUC 501 Problems and Practices in Curriculum Development (3)

Overview of major curriculum trends; planning and development of a comprehensive curriculum project geared to individual needs and interests. Emphasis on practicality. 3 seminars. Prerequisite: Graduate standing.

#### EDUC 503 Seminar in Language Arts Curriculum and Methods (3)

Language arts curriculum: objectives, methods, content, materials, evaluation, current trends and research. 3 seminars. Prerequisite: Graduate standing.

#### EDUC 504 Seminar in Science and Mathematics Curriculum and Methods (4)

In-depth study of science and mathematics curriculum. Objectives, methods, content, materials, evaluation, current trends, and assessments. Miscellaneous course fee required-see *Class Schedule.* 3 seminars, 1 activity. Prerequisite: Graduate standing.

#### EDUC 505 Seminar in Social Studies Curriculum and Methods (3)

In-depth study of the social studies curriculum: objectives, methods, content, materials, evaluation, current trends. 3 seminars. Prerequisite: Graduate standing.

### EDUC 506 Models of Instruction (4)

Analysis of a wide variety of approaches to elementary and secondary teaching that guide instruction in the classroom and in other educational settings. In-depth analysis and implementation of selected teaching strategies. 3 seminars, 1 activity. Prerequisite: Graduate standing.

### EDUC 507 Instructional Materials and Technology (3)

Examination of commercial and teacher-made supplemental materials, software, and technological tools in curriculum, and their implementation. Systematic evaluation of the effective-ness of materials and technology. Miscellaneous course fee required-see *Class Schedule*. 2 seminars, 1 activity. Prerequisite: Graduate standing.

#### EDUC 510 Educational Finance and Resource Allocation (3)

Financing public schools in America: historical and current sources and types of funding. District level and site level funding and budgeting including priorities and purchasing procedures. Financial implications of personnel contracts and obligations. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

# EDUC 511 Educational Law and Governance (3)

Legal aspects of school administration including unions, collective bargaining, and contract administration. Governing roles of federal, state, and local agencies including boards and district administrators. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

# EDUC 512 Educational Organization and Management (4)

Principles of organization, management, and leadership and their relationship to educational effectiveness and productivity. Activity experience in the application of management theory in schools. 3 seminars, 1 activity. Prerequisite: Graduate standing or consent of instructor.

### EDUC 513 Educational Planning and Decision Making (4)

Concepts of planning and decision making in educational administration including administrators' responsibilities associated with decision making roles in public schools. 3 seminars, 1 activity. Prerequisite: Graduate standing and consent of instructor.

# EDUC 514 School Site Administration (4)

Principles and practices of effective building level administration in multicultural/multilingual environment. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

#### EDUC 515 Educational Program Management and Evaluation (3)

Supervision, management, and evaluation of educational curriculum and educational programs. Current trends in program management including mapping, monitoring, alignment. 2 seminars, 1 activity. Prerequisite: EDUC 501, graduate standing, or consent of instructor.

#### EDUC 516 Educational Personnel Management and Evaluation (4)

Principles and processes for the supervision and evaluation of certificated and classified staff including legal, research, and professional considerations. 3 seminars, 1 activity. Prerequisite: Graduate standing or consent of instructor.

# EDUC 517 Organizational Development in Education (3)

Educator's role in group processes, including fundamentals of human relations, working with formal and informal groups, and applying organizational development strategies to enhance school effectiveness. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

### EDUC 518 Administrative Services Fieldwork (3) (CR/NC)

Supervised fieldwork in school administration for supervision at the elementary and secondary level. Assignments must encompass an entire school year and must involve some multicultural experience. Total credit limited to 18 units, only 9 of which may be applied toward master's degree. Credit/No Credit grading only. Prerequisite: Admittance to the Administrative Services Credential program or consent of instructor.

# EDUC 525 Reading Processes, Programs and Technology (4)

Physiological, psychological and psycholinguistic components of the reading process. Applications of research findings of teaching reading, including innovative programs and the use of reading technology. 3 seminars, 1 activity. Prerequisite: Graduate standing.

# EDUC 526 Diagnosing and Remediating Reading Problems (4)

Formal and informal methods of diagnosing and remediating reading problems in classrooms and reading clinics. 3 seminars, 1 activity. Prerequisite: Graduate standing.

#### EDUC 529 Bilingual Special Education and Reading Instruction (4)

Principles, procedures and materials for teaching reading to bilingual students coupled with diagnostic and prescriptive methods for understanding reading problems of the bilingual and bilingual special education student. 2 seminars, 2 activities. Prerequisite: Graduate standing.

#### EDUC 530 Secondary, College, and Adult Reading Practices (4)

Principles, procedures, and materials for improving reading in the subject matter areas with students of different backgrounds and abilities in grades 7 through college. Field experiences in teaching reading to adults, college, or secondary students. 3 seminars, 1 activity. Prerequisite: Graduate standing.

# EDUC 531 Supervision of Reading Programs (4)

Acquisition and application of the principles of supervision in a field setting by organizing, equipping and staffing classes; communicating with individuals and others employed in teaching reading; provide inservice programs and develop reading curriculum. Assessment of school reading programs. 2 seminars, 2 activities. Prerequisite: Graduate standing.

# EDUC 532 Advanced Field Experiences in Education (3-12) (CR/NC)

Supervised advanced field experience and practical application of specialty for classroom teachers, reading and special education specialists, administrators and school support personnel. Total credit limited to 18 units for specialist credentials. Total credit limited to 6 units for the master's degree. 30 hours work experience per unit of credit. Credit/No Credit grading only. Prerequisite: Graduate standing, completion of basic teaching or administrative credential, or consent of instructor.

### EDUC 540 Counseling and Career Guidance of Exceptional Students (4)

Basic guidance techniques for teachers working with exceptional individuals and their families. Career selection, preparation, and counseling. Transition from school to work, and community resource utilization. 3 seminars, 1 activity. Prerequisite: Graduate standing.

# EDUC 542 Administration of Special Programs and Services (3)

Principles and practices of organizing and administering special education, reading, counseling, and other support programs. Assessment and placement procedures, middle management's role, overview of specially funded programs, historical precedents and future trends. 3 seminars. Prerequisite: Graduate standing.

# EDUC 545 The Learning Handicapped: Characteristics and Teaching Strategies (4)

Characteristics of, and instructional strategies for students with learning handicaps. Organization and management of the special classroom. Evaluation of the instructional system. Individualization of instruction, and interaction in the total school environment. 3 seminars, 1 activity. Prerequisite: EDUC 440.

# EDUC 546 Teaching Strategies for the Severely Handicapped (3)

Instructional strategies; current methodology and techniques of curriculum modification necessary to individualize instructional activities for the severely handicapped student. 3 seminars. Prerequisite: EDUC 551.

# EDUC 547 Atypical Learning Patterns (4)

Theoretical considerations of learning patterns deviating from normal development. Educational implications of current theories of cognitive development and brain function as applied to disabled individuals. Development and application of a remedial therapy with appropriate individual(s). 3 seminars, 1 activity. Prerequisite: EDUC 440.

# EDUC 550 Assessment of the Exceptional Individual (4)

Using norm referenced, criterion referenced, and curriculum based testing for assessing academic, behavioral, and physical status of exceptional individuals for referral purposes. Instructional and evaluation decisions regarding exceptional students in school settings. 3 seminars, 1 activity. Prerequisite: Graduate standing.

# EDUC 551 Characteristics of the Severely Handicapped (3)

Characteristics, identification procedures, causation, needs, legal issues, community attitudes, educational and social programs for severely handicapped person. 3 seminars. Prerequisite: EDUC 440.

# EDUC 553 Current Issues in Special Education (3)

Consideration of assumptions and techniques of educational research regarding the educational, personal, social and vocational difficulties affecting the development of individuals with exceptional needs; emphasizing their applicability to general and specific educational programs. 3 seminars. Prerequisite: Admission to Special Education Program or consent of instructor.

# EDUC 555 Counseling and Communication (4)

Overview of the counseling profession, history, philosophy, theory and ethics. Emphasis on developing interviewing, assessment and communication skills. Required practicum. 3 seminars, 1 activity. Prerequisite: Graduate standing.

### EDUC 556 Ethnic Counseling (4)

Socio-psychological and psycho-historical analysis of the visible ethnic and ethnic experience. Effects of poverty, history and the significance of oppression. Counseling techniques, assessment, community relations and required activities. 3 seminars, 1 activity. Prerequisite: Graduate standing.

### EDUC 557 Career Development (4)

Counselor role in career decision making to include career choice theory, appraisal instruments, community referral resources, occupational information, computerized retrieval systems, and personal and social data and required activities. Miscellaneous course fee required-see *Class Schedule.* 3 seminars, 1 activity. Prerequisite: Graduate standing.

# EDUC 558 Academic Counseling in Elementary Schools (4)

Effective developmental and preventative counseling in an elementary school's academic setting. 3 seminars, 1 activity. Prerequisite: Graduate standing and P.P.S. credential candidate, or consent of instructor.

# EDUC 559 Academic Counseling in Secondary Schools (4)

Effective procedures in teaching and counseling in secondary schools to increase the academic and test taking performance of students. To include study skills, career planning and decision making, and application of computer software. 3 seminars, 1 activity. Prerequisite: Graduate standing and P.P.S. credential candidate, or consent of instructor.

### EDUC 560 Counseling Theories and Assessment (4)

Counseling theories and concepts applied to individuals. Develop skills in interviewing, assessment intervention selection, termination and crisis intervention. Ethics and law included. 3 seminars, 1 activity. Prerequisite: EDUC 555, PSY 452 or consent of instructor.

### EDUC 561 Group Counseling (3)

Theory and practice of group counseling, client selection, group structure, process and termination, and application of theories to specific developmental groups. Communication and facilitation skills emphasized with relevant ethics and law. 2 seminars, 1 activity. Prerequisite: EDUC 555 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: Graduate standing.

### EDUC 573 Field Experience, Counseling (3–12)

Practical application of guidance services and counseling in public schools, colleges and community settings. Weekly seminars with university staff included. Total credit limited to 24 units. Maximum of 6 units may be applied toward Master of Arts. in Education. Prerequisite: EDUC 555, EDUC 557 and consent of Counseling Coordination Committee.

### 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 582 Seminar in Educational Administration (4)

Review of current management practice, research, and literature related to school site and central office administration. 4 seminars. Prerequisite: Graduate standing and completion of the Preliminary Administrative Services Credential or master's degree in administration.

### EDUC 583 Advanced Educational Personnel Management and Evaluation (4)

Theory, practice, and skill development in the management and evaluation of educational personnel. Practice and skill development in the implementation of effective evaluation strategies. 4 seminars. Prerequisite: Graduate standing and completion of the Preliminary Administrative Services Credential or master's degree in administration.

#### EDUC 584 School Management, Communication and Organizational Effectiveness (2)

Application of principles of school management with emphasis on presentation, communications, and interpersonal relationships as they impact school effectiveness. 2 seminars. Prerequisite: Graduate standing, completion of the Preliminary Administrative Services Credential or master's degree in administration.

# EDUC 587 Educational Foundations and Current Issues (4)

Historical, organizational, legal and philosophical characteristics of American education. Emphasis on the analysis of contemporary issues focusing on these characteristics. 4 seminars. Prerequisite: Graduate standing.

# EDUC 588 Education, Culture, and Learning (4)

Cultural characteristics of educational institutions and practice. Review of theory and research relating to the social and organizational context in which learning and teaching takes place. 4 seminars. Prerequisite: Graduate standing.

# EDUC 589 Research Methods and Analysis in Education (5)

Compare and contrast educational research methods to develop a plan which demonstrates a student's knowledge of basic research methodology, integration and application of descriptive and inferential statistics to research designs, computer technology. 4 seminars, 1 activity. Prerequisite: Graduate standing; completion of GEB F.1. computer literacy elective or equivalent, or consent of instructor.

# EDUC 590 Research Applications in Education (4)

Application of research techniques to problems in education and human services. Students will be involved in applied research. 2 seminars, 2 activities. Prerequisite: Master's degree candidate, EDUC 589, EDUC 587, EDUC 588 and a minimum of 15 units in a master's degree curriculum.

# EDUC 599 Thesis or Project (3) (3)

Completion of a thesis or project pertinent to the field of education. Students must enroll every quarter in which advisement is received. Prerequisite: Consent of graduate committee and supervising faculty member(s).

# EE-ELECTRONIC AND ELECTRICAL ENGINEERING

# EE 110 Orientation (1)

Familiarization with the field of electrical and electronic engineering. 1 lecture.

### EE 112 Electric Circuit Analysis I (2)

Introduction to basic circuit analysis. Resistive circuits, voltage and current sources, network theorems, op-amp circuits. 2 lectures. Prerequisite: MATH 142 or equivalent.

# EE 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per guarter. Prerequisite: Consent of department chair.

### EE 208 Electronic Devices (3)

Internal operation, terminal characteristics, and models of diodes, transistors (bipolar and field-effect), and optical devices (LED's and phototransistors). 3 lectures. Prerequisite: EE 211, PHYS 211.

## EE 211 Electric Circuit Analysis II (3)

Continuation of basic circuit analysis. Energy storage elements, RC and RL circuits, and phasors. 3 lectures. Prerequisite: EE 112, MATH 143. Concurrent: EE 241.

# EE 212 Electric Circuit Analysis III (3)

AC power, 3-phase circuits. Mutual inductance, series and parallel resonance and two-port networks. 3 lectures. Prerequisite: MATH 242 (or concurrent), EE 211. Concurrent: EE 242.

# EE 219 Logic and Switching Circuits (3)

Modulo-N arithmetic and digital coding techniques. Fundamentals of Boolean Algebra and minimization techniques. Multiple function synthesis using ROM's and PLA's. Combinational circuit design as it applies to computers. Sequential circuit elements, flip-flops, counters and shift-registers. 3 lectures. Prerequisite: CSC 118 or CSC 204.

# EE 241 Electric Circuit Analysis Laboratory II (1)

Use of electrical and electronic test equipment. Experimental verification of circuit analysis concepts including Kirchhoff's Laws, Thevenin's Theorem, maximum power transfer and superposition. 1 laboratory. Concurrent: EE 211.

# EE 242 Electric Circuit Analysis Laboratory III (1)

Observation of transient and steady-state phenomena, phaseshift circuits, resonance. Use of phasor diagrams. 1 laboratory. Prerequisite: EE 241 or consent of department chair. Concurrent: EE 212.

### EE 248 Electronic Devices Laboratory (1)

Experimental determination of device characteristics and models. 1 laboratory. Prerequisite: EE 241. Concurrent: EE 208.

### EE 259 Logic and Switching Circuits Laboratory (1)

Laboratory synthesis of combinational and sequential logic circuits. Introduction to laboratory equipment such as digital oscilloscopes and logic state analyzers. Use of software (both off-the-shelf and customized) for logic simulation. Introduction to switch bouncing, hazards, and other logic faults. 1 laboratory. Concurrent: EE 219.

### EE 301 Linear Systems Analysis (3)

Fourier analysis. Fourier and Laplace analysis with applications. Transfer functions. Pole-zero locations and system response. Development and use of Bode plots. 3 lectures. Prerequisite: EE 212, MATH 317.

### EE 302 Linear Control Systems (3)

Automatic feedback control systems. Analysis of linear dynamic systems. 3 lectures. Prerequisite: EE 301.

# EE 303 Power Transmission (3)

Electrical characteristics of three-phase overhead and underground power transmission lines. Development of models for different types of lines as well as interconnected power systems. Introduction of per unit calculations. Introduction of computer simulation methods. 3 lectures. Prerequisite: EE 301.

## EE 304 Random Signals and Noise (3)

Probabilistic treatment of signals and noise in electrical engineering. Topics include the concept of probability, sample space, distributions, random variables, independence, moments, covariance, random processes, time and ensemble averages, stationarity, common processes, correlation functions, spectra, shot and thermal noise, filtering. 3 lectures. Prerequisite: EE 301.

# EE 307 Digital Integrated Electronics (3)

Integrated logic circuits: RTL, DTL, TTL, I<sup>2</sup>L, ECL, MOS, CMOS, interfacing different logic families. 3 lectures. Prerequisite: EE 208, EE 219.

### EE 308 Electronic Circuits (3)

Analysis and design of linear small-signal amplifiers. 3 lectures. Prerequisite: EE 301, EE 307.

# EE 309 Integrated Electronic Circuits (3)

Analysis and design of feedback amplifiers; operational amplifier applications. Design of analog/digital and digital/analog converters. Power supply design. Emphasis on IC implementation. 3 lectures. Prerequisite: EE 302, EE 308.

# EE 311 Electric Circuit Theory (3)

Application of fundamental circuit laws and theorems to the analysis of DC, and steady-state single-phase and three-phase circuits. For engineering majors except electronic/electrical. 3 lectures. Prerequisite: MATH 242, PHYS 133.

### EE 313 Signal Transmission (3)

Distributed-circuit concepts and traveling waves. Transmission line parameters. Lines with and without reflection. Standing waves. Smith Chart and its applications. Transmission line measurements and impedance matching techniques. 3 lectures. Prerequisite: EE 301.

### EE 319 Digital System Design (3)

Introduction to finite automata theory and the design of digital systems utilizing state-machines, analysis and synthesis of state-machines. Design of synchronous, asynchronous, and pulse mode sequential circuits. Role of the microprocessor in implementing state-machines. Trade-offs between system design utilizing hardware, firmware and microprocessors. 3 lectures. Prerequisite: EE 219, EE 307.

### EE 321 Electronics (3)

Semiconductor devices and circuits. Instrumentation amplifiers, power control rectifiers, feedback, pulse circuits, digital logic circuits. Not for Electronic or Electrical Engineering majors. 3 lectures. Prerequisite: EE 311.

# EE 325 Energy Conversion Electromagnetics (3)

Fundamentals of electro-mechanical energy conversion. Magnetic circuits and electromagnetic devices. Theory of operation and operating characteristics of transformers, DC machines, AC induction machines, and synchronous machines. Stepper motors. 3 lectures. Prerequisite: EE 212, PHYS 133.

#### EE 327 Electronic Instrumentation and Measurement (4)

Principles and characteristics of instruments and instrumentation systems; analog and digital transducers; A/D conversion; data and signal transmission and amplification problems. Low level signal, high frequency signal, and high accuracy signal measurement problems. Automated instrumentation systems. 3 lectures, 1 laboratory. Prerequisite: EE 301, EE 308.

# EE 328 Discrete Time Systems (3)

Discrete-time signals and the sampling theorem, basic systems concepts, solution of linear difference equations, Z transform. Discrete-time Fourier Transform, Discrete Fourier Transform (DFT). Cyclic convolution application of transforms to system analysis. Introduction to digital filtering. Relationships of digital filters to their continuous-time counterparts. 3 lectures. Prerequisite: EE 301.

# EE 334 Electromagnetic Fields I (3)

Advanced treatment of static vector electric and magnetic fields and their sources. Magnetic fields in ferromagnetic materials. Laplace's equation and boundary value problems. 3 lectures. Prerequisite: PHYS 133, MATH 317.

# EE 341 Linear Analysis Laboratory (1)

Fourier analysis. Two-port networks, frequency response and Bode plots. 1 laboratory. Prerequisite: EE 242. Concurrent: EE 301.

# EE 342 Control Systems Laboratory (1)

Laboratory work in feedback control systems. 1 laboratory. Prerequisite: EE 341. Concurrent: EE 302.

# EE 347 Digital Integrated Electronics Laboratory (1)

Experimental investigation of the characteristics of different logic families. 1 laboratory. Prerequisite: EE 248. Concurrent: EE 307.

### EE 348 Electronic Circuits Laboratory (1)

Design, construction and testing of solid state amplifier to meet stated specifications. 1 laboratory. Prerequisite: EE 341, EE 347. Concurrent: EE 308.

# EE 349 Integrated Electronic Circuits Laboratory (1)

Design of electronic subsystems using integrated circuits. 1 laboratory. Prerequisite: EE 342, EE 348. Concurrent: EE 309.

### EE 351 Electric Circuits Laboratory (1)

Techniques of measurement of DC and steady-state AC circuit parameters. Equivalent circuits, nonlinear elements, resonance. 1 laboratory. Concurrent or prerequisite: EE 311.

### EE 353 Signal Transmission Laboratory (1)

Transmission and reflection measurements. Impedance matching techniques. 1 laboratory. Prerequisite: EE 341. Concurrent: EL 313.

### EE 359 Digital System Design Laboratory (1)

Laboratory synthesis of combination and sequential logic circuits. Sequential subsystems analysis with the logic state analyzer. Fault testing and automated checkout procedures. Familiarization with the characteristics of SSI and MSI logic components. 1 laboratory. Prerequisite: EE 259, EE 347. Concurrent or prerequisite: EE 319.

# EE 361 Electronics Laboratory (1)

Instrumentation amplifiers, feedback, rectifiers and power control, pulse and digital logic circuits. 1 laboratory. Prerequisite: EE 351. Concurrent or prerequisite: EE 321.

# EE 365 Energy Conversion Laboratory (1)

Single-phase and three-phase transformers. Starting of rotating machines, evaluation of characteristics of rotating machines. 1 laboratory. Prerequisite: EE 242. Concurrent: EE 325.

### EE 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

# EE 401 Electromagnetic Fields II (3)

Time changing electric and magnetic fields. Maxwell's equations, with the relationship between field and circuit theory. Plane waves in dielectric and conducting media. Selected topics from wave polarization, reflection and refraction. 3 lectures. Prerequisite: EE 313, EE 334.

## EE 402 Microwave Engineering (3)

Application of Maxwell's equations and boundary value problems to wave guide structures. Microwave equivalent circuit theorem. Passive microwave devices including treatment of attenuation, insertion loss power division, directional coupling, and the scattering parameters. Introduction to stripline and microstrip techniques. 3 lectures. Prerequisite: EE 401.

## 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 displays. Design of optical communication systems with applications in telecommunications and local area networks (LANs). 3 lectures. Prerequisite: EE 309, EE 401 or PHYS 207 and PHYS 323.

#### EE 404 Microprocessor System Design Methodologies (3)

Classification and functional configurations of existing microprocessors and analysis of hardware system designs and system economics. Interface design techniques utilizing programmable I/O interfaces, real-time clocks, interrupts, and DMA channels. Representative applications. 3 lectures. Prerequisite: EL 319, CSC 221, or consent of instructor. Concurrent: EE 446.

## EE 405 High-frequency Amplifier Design (3)

Design of modern electronic amplifiers and amplifier systems with advanced techniques. Small signal wideband lowpass amplifier design utilizing both discrete and integrated devices. VHF, UHF amplifier design using S parameters. GaAs FET microwave distributed amplifier. Noise analysis. 3 lectures. Prerequisite: EE 313, EE 309.

### EE 406 Power Systems Analysis I (4)

Introduction to electric power systems. Representation of power systems and components. One line diagrams and per unit calculations. Power limits and stability, system model representation of the synchronous machine, symmetrical faults, electrical insulation, grounding. Solution of power system problems by microcomputer techniques and time-share methods. 4 lectures. Prerequisite: EE 303.

#### EE 407 Power Systems Analysis II (4)

System protection, relays and relay systems, faults, load flow calculation, computer solutions, power system instrumentation and measurement techniques. Solution of power system problems by microcomputer techniques and time-share methods. 4 lectures. Prerequisite: EE 406.

#### EE 408 Digital Computer Systems (3)

Design of computer ALU's microprogram controllers, memory systems, and 1/0 controllers. Use of LSI components in CPU design. Microprogram and nanoprogram development. 3 lectures. Prerequisite: EE 427 or consent of instructor.

# EE 409 Computer Peripheral Interfacing (3)

Design of the more common computer peripherals (paper devices, floppy disks, etc.) with the emphasis on the controller and interfacing aspects. Use of microprocessors and/or LSI controller chips in the design of intelligent peripherals. 3 lectures. Prerequisite: EE 404, or consent of instructor.

#### EE 410 Power Control I (4)

Power semiconductor devices. Theory of power diodes, SCR, Triac, MOSFET, HEXFET, Diac, Unijunction transistor, etc., modeling of diode and SCR circuits, SCR trigger circuits, analysis of SCR circuit in rectifiers, choppers and dc motor control. 3 lectures, 1 laboratory. Prerequisite: EE 309, EE 325.

#### EE 411 Power Control II (4)

Analysis of SCR circuits in inverters and cycloconverters; modeling of inverter-induction motor drive system; regenerative braking; electric propulsion; digital computer study of motor control system. Line commutated inverters and HVDC converters, phase-locked loops and microprocessor based control systems. 3 lectures, 1 laboratory. Prerequisite: EE 410.

#### EE 412 Advanced Analog Circuits (3)

Application of linear integrated circuits to data acquisition problems: transducer interfacing, linear and nonlinear preprocessing, phase-locked loops, and high performance quantization and recovery (A/D, D/A conversion). 3 lectures. Prerequisite: EE 309, EE 414.

### **EE 413** Electronic Circuit Design (4)

Design of electronic circuits and sub-systems. Non-linear circuit applications, signal generators, voltage references, switched capacitor filters and noise in OP AMPs. 3 lectures, 1 laboratory. Prerequisite: EE 309.

#### EE 414 Introduction to Communication Systems (3)

Amplitude modulation. Frequency and phase modulation. Demodulation techniques. Bandwidth and power considerations. Noise in communication systems. 3 lectures. Prerequisite: EE 302, EE 304, EE 328.

### EE 415 Communication Systems Design (3)

Design of modern electronic communication and telemetry systems. Emphasis: practical implementation and comparative evaluation of various modulation systems. 3 lectures. Prerequisite: EE 309, EE 414.

### EE 416 Digital Communication Systems (3)

Baseband (PCM, PAM, DM) signals and transmission. Bandpass (PSK, FSK, ASK) modulation and demodulation techniques. Digital communication signals in the presence of noise and detection of signals in Gaussian noise. 3 lectures. Prerequisite: EE 414.

## EE 417 Alternating Current Machines (4)

Alternating current machines. Generalized, operational and dynamic analysis. Steady-state and transient operation of synchronous machines and linear induction machines. 3 lectures, 1 laboratory. Prerequisite: EE 325, EE 365.

## EE 418 Electro-Optical 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 arrays. Miscellaneous course fee required-see *Class Schedule*. 3 lectures. Prerequisite: EE 401 or equivalent 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: EE 328. 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: Senior standing.

#### EE 423 Microwave Electronics (3)

Charge and field interactions in oscillators and amplifiers. Transferred electron devices, avalanche transit-time devices, microwave transistors. Circuits associated with oscillators and reflection type amplifiers. 3 lectures. Prerequisite: EE 401.

### EE 424 Antenna Theory and Application (3)

Linear antenna theory. Antenna as a matching device. Antenna directivity, gain, efficiency, resistance, aperture, and reciprocity. Application of antenna theory to various types of antennas. 3 lectures. Prerequisite: EE 401.

#### EE 425 Analog Filter Design (3)

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 309.

#### EE 427 Digital Computer Subsystems (3)

Design of registers, counters, sequencers, accumulators, encoders, decoders, memories, and other computer subsystems. Use of modern techniques and devices in implementation. Consideration given to cost, speed, and dependability. 3 lectures. Prerequisite: EE 319.

### EE 431 Computer-Aided Design of VLSI Devices (3)

Design of VLSI circuits, design of subsystems, PLA's and finite-state machines, patterning, hand layout, and CIF programming. 3 lectures. Prerequisite: EE 319, EE 309.

## EE 432 Digital Control Systems (3)

Theory and applications of digital computers in linear control systems. Discrete time methods are used in analysis and design studies. Digital control systems are synthesized. 3 lectures. Prerequisite: EE 302 or consent of instructor.

# EE 433 Computer-Aided Design in Magnetics (4)

Variational principles, integral and partial differential equation methods. Application of integral and partial differential equation methods to electromagnetic field problems. Computeraided design of electrical devices. Use of commerically available software. 3 lectures, 1 laboratory. Prerequisite: EE 325, EE 334.

# EE 441 Microwave Laboratory (1)

Experimental investigation of vacuum-tube and solid state microwave sources, crystal and power detectors, coaxial cables, directional couplers and n-port devices. Measurement of SWR by slotted line and reflectometer techniques. Techniques for measurement of attenuation, frequency and power. 1 laboratory. Prerequisite: EE 313, EE 353, EE 401.

# EE 443 Fiber Optics Laboratory (1)

Experimental investigation of the properties of optical fibers, sources, and detectors. Measurement of fiber physical characteristics, attenuation, losses, and bandwidth. Evaluation of an analog and digital fiber optic data link. 1 laboratory. Prerequisite: EE 349. Prerequisite or concurrent: EE 403.

### EE 444 Power Systems Laboratory (1)

Protective relaying, coordination, and relay calibration. Power control using transformers, parallel operation of generators, and computer simulation of power systems. 1 laboratory. Prerequisite: EE 341, EE 406.

# EE 445 Advanced Amplifier Design Laboratory (1)

Experimental investigation employing advanced techniques. Design of electronic amplifiers and amplifier systems utilizing recently developed components. 1 laboratory. Prerequisite: EE 353, EE 349. Concurrent or prerequisite: EE 405.

### EE 446 Microprocessor Interfacing Laboratory (1)

Design and construction of selected digital systems. Utilization of superstrip boards to construct MSI, LSI based logic circuits. Interfacing of student built systems with several representative microprocessors. Hardware/software performance evaluation of microprocessor interfacing techniques. 1 laboratory. Prerequisite: Consent of instructor. Concurrent: EE 404.

# EE 448 Digital Computer Systems Laboratory (1)

Laboratory analysis and synthesis of digital computer subsystems. Microprogramming of a simple digital computer via computer simulation. Interfacing with digital systems. 1 laboratory. Prerequisite: EE 359, and EE 427 or EE 409 or consent of instructor.

### EE 451 Solid State and Microelectronic Laboratory (1)

Laboratory investigation of electronic properties of semiconductor materials. Experimental projects in design, fabrication and evaluation of hybrid/monolithic microelectronic devices and circuits. 1 laboratory. Prerequisite: Senior standing or consent of instructor.

# EE 455 Active Network Synthesis Laboratory (1)

Advanced laboratory study of sensitivity and stability of active networks prescribed for realization of transfer functions by active network synthesis techniques. Formal experiments and individual project work. 1 laboratory. Prerequisite: EE 349. Concurrent or prerequisite: EE 425.

# EE 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 342, EE 414.

### EE 458 Electro-Optical Engineering Laboratory (1)

Experimental investigation of the techniques used in processing optical signals. Formal experiments on electro-optic modulation, acousto-optic modulation. Construction of an RF spectrum analyzer. Analog processing of optical signals, and charge-coupled array devices. 1 laboratory. Prerequisite or concurrent: EE 418.

# EE 459 Digital Signal Processing Laboratory (1)

Experiments in digital filter design and digital signal processing emphasizing various areas of applications (communications, audio signals, speech processing). Formal experiments and individual project work. 1 laboratory. Prerequisite: EE 341. Concurrent enrollment in EE 419 and knowledge of C or assembly language desirable.

# **EE 461, 462** Senior Project (3) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Miscellaneous course fee required-see *Class Schedule*. Minimum 150 hours total time. Prerequisite: EE 325, EE 309, EE 334.

### EE 463 Undergraduate Seminar (1) (CR/NC)

Discussion of new developments in the fields of power systems and control. Fields of employment and job considerations. Credit/No Credit grading only. 1 seminar. Prerequisite: Senior standing.

### EE 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

### EE 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

### EE 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.

## **EE 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.

## EE 500 Individual Study (1-3)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department chair, graduate adviser, and supervising faculty member.

# EE 511 Electric Machines Theory (3)

Advanced topics in electric machines theory. Introduction to Park's transformation. Analysis of electric machines using Kron's generalized concept. Excitation systems. 3 seminars. Prerequisite: EE 325 or equivalent, graduate standing or consent of instructor.

### EE 513 Control Systems Theory (4)

State representation of dynamic systems. Mathematical models of physical devices, controllability and observability. Design of closed-loop systems. Optimal control theory. 4 seminars. Prerequisite: EE 302 or equivalent, graduate standing or consent of instructor.

#### EE 514 Digital and Nonlinear Control Systems Theory (4)

Nonlinear control systems analysis, discrete-time control. Finite-precision digital controllers. Microprocessor mechanizations of linear and non-linear controls. Efficient coding of control algorithms. Overflow characteristics and optimal saturating control structures. 4 seminars. Prerequisite: EE 432 or EE 328, graduate standing or consent of instructor.

### EE 515 Discrete Time Filters (4)

Analysis and design of digital filters using time-domain and transform techniques. Frequency response, aliasing problems and sampling issues. Recursive and no-recursive filters, digital filtering in numerical analysis, image processing, prediction algorithms. 4 seminars. Prerequisite: EE 414, graduate standing or consent of instructor.

### EE 517 Information Theory (4)

Introduction to information theory and coding. Self and mutual information. Discrete and continuous information sources and transmission channels. Additive white Gaussian noise channel. Channel capacity. The Source- and Channel-Coding Theorems. Data compression. Huffman code. Block codes, including Hamming and linear codes. Parity and syndrome decoding. Convolutional codes. 4 seminars. Prerequisite: EE 414, EE 525, graduate standing or consent of instructor.

### EE 518 Advanced Power System Analysis (3)

Symmetrical components. Unbalanced faults. Analysis by digital computer simulation. Load flow studies. Elements of power system stability. 3 seminars. Prerequisite: EE 406 or equivalent, graduate standing or consent of instructor.

### EE 519 Power System Design (4)

Design studies involving aspects of an electric power system. Current industrial designs. Computer simulation techniques used extensively. 4 seminars. Prerequisite: EE 518, graduate standing or consent of instructor.

## EE 520 Solar-Photovoltaic Systems Design (3)

Solar cell and storage battery theory, examination of insolation variability and optimization techniques, principles of grounding protection and control, a survey of power conditioning equipment and system integration techniques. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

## EE 521 Computer Systems (4)

Organization of modern general purpose, high speed digital computer systems. Arithmetic units, control units, memories and memory subsystems. Peripheral equipment. Cost and speed trade-offs in the design of such systems. 4 seminars. Prerequisite: EE 427, or consent of instructor.

# EE 522 Microprocessor-Based Digital System Design (4)

Design and implementation of microprocessor-based digital systems. Their analysis and cost effective use in system design problems. Data acquisition and control systems. Role of microperipheral controllers. Laboratory problems associated with interfacing microprocessors to various systems. 3 seminars, 1 laboratory. Prerequisite: EE 404, or consent of instructor.

# EE 523 Digital Systems Design (3)

Design of asynchronous sequential machines and pulse mode logic circuits. Selected automata theory topics include state compatibility analysis, state partition analysis, threshold logic, fuzzy logic. Modern digital system design. Analysis of MOS-LSI multiphase logic structures. Comparison of digital subsystems. Microprocessor as a digital subsystem module. 3 seminars. Prerequisite: EE 319, graduate standing or consent of instructor.

### **EE 524** Solid State Electronics (3)

Physical theory of solid-state devices. Properties of metalsemiconductor junctions and p-n junctions. Derivation of properties of diodes, transistors, and four-layer devices from basic physical and mathematical considerations. 3 seminars. Prerequisite: PHYS 412 or equivalent, graduate standing or consent of instructor.

### **EE 525** Stochastic Processes for Engineers (4)

Probability and stochastic processes used in random signal analysis. Response of linear systems to random inputs. Autocorrelation and power spectral densities. Applications in signal processing using the discrete Kalman filter. 4 seminars. Prerequisite: EE 304 or equivalent, graduate standing or consent of instructor.

### EE 526 Digital Communications (4)

M-ary signals. Vector space representation of signals. Optimum receiver principles. Other topics may include: synchronization, quantization, multiplexing and multiple access, spread spectrum techniques. 4 seminars. Prerequisite: EE 416, EE 525.

# 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 threephase inverters, sinusoidal modulation techniques, control strategies for AC three-phase variable speed motor control using voltage source inverters, current source inverters and speed control of AC motors. Torque and speed pulsations. HVDC converters and DC transmission. 4 seminars. Prerequisite: EE 410, EE 411 or equivalent, graduate standing or consent of instructor.

### EE 528 Digital Image Processing (4)

Two-dimensional spatial frequency transforms. Image enhancement, histogram equalization. Smoothing and sharpening. Image restoration, image encoding and segmentation. Descriptors. 4 seminars. Prerequisite: EE 414, EE 525, graduate standing or consent of instructor.

# EE 529 Advanced Topics in Microwave Device Electronics (3)

Emphasis on device and circuit principles of active microwave solid-state devices, their noise aspects and systems applications. 3 seminars. Prerequisite: EE 401, PHYS 412 or equivalent, graduate standing or consent of instructor.

### EE 530 Electro-Optics Systems (4)

Design of radiametric information optics and imaging systems. Remote sensing, guidance and tracking, fiber optic and laser communications. Component modeling and optimization of systems for detection of radiant flux with maximum signal to noise ratio. Modeling of source, intervening media, optical subsystem, focal plane, signal-conditioning electronics, and output and display. 4 seminars. Prerequisite: EE 401, EE 414 or equivalent, graduate standing or consent of instructor.

# EE 563 Graduate Seminar (1)

Current developments in the fields of electrical and electronic engineering. Participation by students, faculty and guest lecturers. Open to graduate students with a background in electrical or electronic engineering. Total credit limited to 3 units. 1 seminar.

### EE 570 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to graduate students and selected seniors with electrical and electronic engineering background. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 seminars. Prerequisite: Graduate standing or consent of instructor.

## EE 587 Cooperative Education Experience (6)

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Prerequisite: Graduate standing and consent of instructor.

### EE 597 Cooperative Education Experience (12)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Prerequisite: Graduate standing and consent of instructor.

### EE 599 Design Project (Thesis) (2) (2) (5)

Each individual or group will select, with faculty guidance and approval, a topic for independent research or investigation resulting in a thesis or project to be used to satisfy the requirement for the degree. An appropriate experimental or analytical thesis or project may be accepted. Prerequisite: Graduate standing.

# EET-ELECTRONIC ENGINEERING TECHNOLOGY

## EET 124 Introduction to Electronic Circuits (4)

Application of DC and AC circuit concepts to the solution of electronic circuit problems. 3 lectures, 1 laboratory. Prerequisite: MATH 120.

## EET 125 Introduction to Electronic Devices (4)

Application of AC/DC principles to the understanding of basic electronic devices. 3 lectures, 1 laboratory. Prerequisite: EET 124.

# EET 218 Digital Circuits I (3)

Mathematical and logic foundations of digital systems. Number systems, Boolean algebra, logic symbology, implementation of combinational networks, flip-flops, registers. 3 lectures. Prerequisite: MATH 120. Prerequisite or concurrent: EET 125.

## EET 226 Fundamentals of Electrical Power Systems (4)

Introduction to theory and practice of polyphase circuits. Transformer and AC generators. Fundamentals of industrial power distribution. Electrical safety. Industrial wiring practices. 3 lectures, 1 laboratory. Prerequisite: EET 124, PHYS 123.

# EET 231 Passive Network Analysis (4)

Application of Thevenin and Norton theorems to steady state AC networks. Complex numbers in circuit analysis. AC passive circuit transfer functions with gain-phase versus frequency analysis (Bode plots). Series-parallel equivalent circuits of RLC circuits and transformers. RC and RL transients analysis. 3 lectures, 1 laboratory. Prerequisite: EET 125, MATH 131, CSC 110, or consent of instructor.

### EET 232 Electronic Circuits and Devices I (4)

Semiconductor devices and circuits. H and R-parameters and load line techniques in analyzing amplifiers. Computation of current, voltage, and power gains, input and output impedances. Bias stability and leakage current considerations. 3 lectures, 1 laboratory. Prerequisite: EET 231.

### EET 233 Electronic Circuits and Devices II (4)

Active discrete and integrated devices. Use of device parameters and specifications to analyze simple linear circuits. Use of pulse and timing circuits, active filters, power amplifier circuits, and active regulated DC power supplies. 3 lectures, 1 laboratory. Prerequisite: EET 232.

# EET 302 Electronics: Concepts, Applications, and Safety (3) GEB F.2.

Electronic revolution and its impact on society. Concepts and terminology. Major applications including electronics in the home, office, business, and medicine. Electronic mail. Evolution of computers and computing. Hazards, risks, and safety measures. 3 lectures. Prerequisite: Junior standing or instructor's consent.

### EET 305 Advanced Electronic CAD/CAE (2)

Design, implementation, analysis and testing of electronic printed circuit boards (PCB). Industry standard PC-based software packages used for electronic schematics, simulation and PCB layouts. PCB problems such as EMI, Cross talk, Noise, Shielding, Thermal Effects, etc. are presented. 2 laboratories. Prerequisite: EET 218, EET 233, ETMP 157.

## EET 310 System and Circuit Analysis (4)

Laplace transform applications in circuit and system analysis. Singular forcing functions, transient analysis, transfer function, pole-zero locations and system response. Bode plots development and application. Computer-aided circuit analysis (applications of Spice/Pspice for circuit analysis). 3 lectures, 1 laboratory. Prerequisite: ENGL 218, EET 231, MATH 133.

# EET 311 Transmission Lines and Antennas (4)

Application of transmission lines and antennas. Smith charts and the propagation of the radio signal from various antennas. 3 lectures, 1 laboratory. Prerequisite: EET 231. Prerequisite or concurrent: ENGL 218, MATH 132.

### EET 312 Active Linear Circuits (4)

Analysis and design of multistage transistor amplifiers with emphasis on the operational amplifier and its applications. Low-frequency and high-frequency limitations, pulse testing, Bode plots, stability criteria, oscillators. Construction of op amp circuits. 3 lectures, 1 laboratory. Prerequisite: EET 233, EET 310, ENGL 218, MATH 133.

### EET 330 Electric Machinery (4)

Magnetics, electromagnetic forces and torque, generated voltage and energy conversion. DC and AC motors and generators: construction, operation, application and selection. DC motor control using power electronics. Stepper motors: construction, operation and selection. Stepper motor drivers and motion control systems. 3 lectures, 1 laboratory. Prerequisite: EET 125, EET 226, ENGL 218, MATH 132.

### EET 334 Digital Circuits II (4)

Analysis of electronic digital circuits. Topics include: Bipolar and MOS logic gates, loading and interfacing, counters, adders, memories, encoders, decoders, digital displays, A/D and D/A converters. 3 lectures, 1 laboratory. Prerequisite: EET 218, EET 233, ENGL 218.

### EET 335 Communications I (4)

Communication signal spectrum investigation including time domain to frequency domain conversions using Fourier analysis. Evaluation of various modulation techniques including amplitude, angle, frequency, and pulse forms. Noise, its use and effects in communications. 3 lectures, 1 laboratory. Prerequisite: EET 310, EET 311, EET 312, ENGL 218.

### EET 338 Fundamentals of Computer Technology (4)

Selected computer components, circuits and systems and their influence on programming in machine language. Problem solving using a digital computer. 3 lectures, 1 laboratory. Prerequisite: EET 334, CSC 110, ENGL 218.

### EET 411 Radio Frequency and Microwave Technology (4)

Fundamentals of high frequency components commonly used in communication systems. Application of analysis methods, physical realization and testing techniques related to the RF and microwave frequency spectrum. 3 lectures, 1 laboratory. Prerequisite: EET 311.

### EET 432 Automatic Control (4)

Electronic and electromechanical systems used in servomechanisms. Stability criteria. Nichols chart utilization. Compensation networks and control system testing. 3 lectures, 1 laboratory. Prerequisite: EET 310, EET 312.

# EET 435 Communications II (4)

Analysis and application of communication systems, receivers, transmitters, analog and digital techniques. Equipment specifications, measurement techniques, application of modems. 3 lectures, 1 laboratory. Prerequisite: EET 335.

# EET 438 Computer Technology I (4)

Analysis of computer circuits and components in a specific digital computer. Effects of computer architecture on machine and assembly language programming. Use of hardware and software aids for troubleshooting and development. 3 lectures, 1 laboratory. Prerequisite: EET 338.

# EET 440 Audio Technology (4)

Fundamentals of specifications, standards, devices, circuits, and systems used in audio. Operational analysis of hi-fi and professional audio circuits. Circuit responses observed in laboratory. Field trip to local audio manufacturing facility. 3 lectures, 1 laboratory. Prerequisite: EET 312.

### EET 441 Video Technology (4)

Fundamental principles of colorimetry. Review of television system synchronization and compatibility requirements. Analysis of the operation of circuits in a solid state television. Circuit responses observed in laboratory. Field trip to a major network television facility. 3 lectures, 1 laboratory. Prerequisite: EET 335.

# EET 449 Computer Technology II (4)

Computer controlled testing and instrumentation using a particular computer and the associated operating system. Test instruments and techniques for interfacing. Locating system malfunctions using lab equipment, maintenance manuals, and diagnostic programs. 3 lectures, 1 laboratory. Prerequisite: EET 338.

### EET 452 Filter Networks (4)

Theory and application of filter networks. Butterworth, Chebyshev, Bessel and elliptic passive filters and use of IC operational amplifiers in active filters. Special filters such as ceramic, crystal, mechanical, SAW and digital. 3 lectures, 1 laboratory. Prerequisite: EET 310, EET 312.

# EET 455 Electro-Optics Technology (4)

Fundamentals of electro-optics devices and circuits. Parameters, units, sources and systems found in electro-optics. Solving problems encountered in electronics and optics. Laboratory study of devices, circuits and systems. 3 lectures, 1 laboratory. Prerequisite: EET 335.

### EET 457 Digital Signal Processing (3)

Fundamentals of discrete-time signals and systems. Introduction to Discrete Fourier Transform, Fast Fourier Transform (FFT) and Z-Transform techniques. Introduction to Digital filter design and DSP chips using commercial computer programs. 3 lectures. Prerequisite: EET 335, EET 338.

# **ENGL-ENGLISH**

### ENGL 101 Basic Writing I (4) (CR/NC)

Practice in writing expository prose with attention paid to sentence variety, fluency, and editing skills. Emphasis on reading and the writing process. Directed readings of exemplary writings. Credit/No Credit grading only. Repeatable. 4 lectures.

# ENGL 102 Basic Writing II (4) (CR/NC)

Instruction in the writing process. Practice in the strategies of writing, revising, and editing paragraphs and essays with attention paid to focus, support, and organization. Directed readings of exemplary prose. Credit/No Credit grading only. Repeatable. 4 lectures.

#### ENGL 111 English Sentence Structure for ESL/EFL Students (4) (CR/NC)

Focus on the fundamentals of sentence patterns, sentence construction, and sentence combining within the context of the paragraph and story. Practice in writing a variety of effective sentences; practice in linking sentences in a unified paragraph controlled by a topic sentence. Credit/No Credit grading only. 4 lectures. Prerequisite: Non-native English speakers who need to develop skill in writing English sentences.

#### ENGL 112 English Paragraph Development for ESL/EFL Students (4) (CR/NC)

Focus on the fundamentals of paragraph development within the context of the essay and story. Writing paragraphs with strong topic sentences that control paragraph unity; linking paragraphs for a unified essay through transitions and the control of the thesis statement. Credit/No Credit grading only. 4 lectures.

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

Writing and stylistic analysis of expository papers. Study and application of techniques of exposition. Critical reading of model essays. 4 lectures.

#### ENGL 125 Critical Thinking (3) (Also listed as PHIL 125 and SPC 125) GEB A.2.

Nature of critical thinking. Analysis of inductive and deductive arguments. Practice in the composing of arguments in English. 3 lectures. Prerequisite: ENGL 114 or equivalent.

#### ENGL 215 Writing: Argumentation (4) GEB A.4.

Writing and critical evaluation of argumentative papers. Techniques of research and evaluation of research sources. Discussion of elements of argumentation, inductive and deductive reasoning and use of supporting documentation in written discourse. Examination of special problems in invention, form, style and evaluation. Not open to students with credit in ENGL 218. 4 lectures. Prerequisite: ENGL 114 and ENGL 125 or PHIL 125 or SPC 125.

#### ENGL 218 Professional Writing: Argumentation and Reports (4) GEB A.4.

Extensive writing practice in professional situations: reports, proposals, letters, memoranda. Composing and conveying technical information. Methods of research. Analysis of writing situations. Analysis and criticism of student reports and technical reports. Not open to students with credit in ENGL 215. 4 lectures. Prerequisite: ENGL 114 and ENGL 125 or PHIL 125 or SPC 125.

#### ENGL 230 Masterworks of British Literature: Through the Eighteenth Century (4) GEB C.1.

Selected readings in British literature from its beginnings through the Eighteenth Century. Early and middle English works read in translation. Includes works by such authors as Chaucer, Shakespeare, Milton, Swift, Pope and Johnson. 4 lectures. Prerequisite: ENGL 114 or equivalent.

#### ENGL 231 Masterworks of British Literature: Romantic Period to the Present (4) GEB C.1.

Selected readings in British literature from the Romantic period to the present. Includes works by such Romantic, Victorian, Edwardian and Twentieth Century writers as Wordsworth, Byron, Tennyson, Shaw, Yeats and Eliot. 4 lectures. Prerequisite: ENGL 114 or equivalent, or consent of instructor.

ENGL 240 American Tradition in Literature (4)

GEB C.1.

GEB C.1.

Selected readings from major authors that show the American literary tradition from the Colonial period into the Twentieth Century. Literary expression of movements that shaped the American character, including Puritanism, Deism, Transcendentalism and Naturalism. Includes works by such authors as Franklin, Emerson, Poe, Whitman, Dickinson, Twain, Frost, Hemingway and Faulkner. 4 lectures. Prerequisite: ENGL 114 or equivalent, or consent of instructor.

#### ENGL 251 Great Books of World Literature: Classical and Ancient World (3) GEB C.1.

Selected readings from world writings, beginning with the earliest epics through the literature of Greece and Rome. Includes such authors as Homer, Aeschylus, Sophocles, Euripedes, Plato and Ovid. 3 lectures. Prerequisite: ENGL 114 or equivalent, or consent of instructor.

#### ENGL 252 Great Books of World Literature: Middle Ages, Renaissance and Enlightenment (3)

Selected masterpieces from the fall of the Roman Empire up to the Eighteenth Century. Includes such authors as Dante, Cervantes, Shakespeare, Molière, Voltaire and Swift. 3 lectures. Prerequisite: ENGL 114 or equivalent, or consent of instructor.

#### ENGL 253 Great Books of World Literature: Romanticism and the Modern World (3) GEB C.1.

Selected works from the beginning of Romanticism up to the present. Includes material from literary movements such as Realism, Naturalism, Symbolism and Existentialism, with works by such authors as Goethe, Hugo, Keats, Wordsworth, Flaubert, Balzac, Dostoevsky, Woolf, Joyce and Beckett. 3 lectures. Prerequisite: ENGL 114 or equivalent, or consent of instructor.

#### ENGL 260 Children's Literature (3)

Analysis and evaluation of realism, traditional fantasy, modern fantasy, and poetry for children in multiple subject classroom grades K–8. 3 lectures. Prerequisite: ENGL 114 or equivalent, or consent of instructor.

#### ENGL 290 Introduction to Linguistics (4)

Overview of linguistics from its origin to present forms and practices. 4 lectures. Prerequisite: ENGL 114 or equivalent, or consent of instructor.

#### ENGL 302 Writing: Advanced Composition (4)

Writing and analysis of expository and argumentative papers at an advanced level. Discussion and application of rhetorical, stylistic and grammatical principles through writing and critical reading of essays. Practice in revising and editing papers. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

GEB C.3.

GEB C.3.

GEB C.3.

## ENGL 310 Corporate Communication (4)

Instruction and practice in forms of communication characteristic of business and industry. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

# ENGL 311 Advanced Professional Writing (4)

Professional writing as produced in industry and government. Analytic reports, manuals, instructions, specifications. Trade journal articles. Editing skills. Orientation to professional communication careers. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

#### ENGL 318 Writing for Scientific Journals (4)

Practice of the skills necessary in the preparation of articles for scientific journals. Extensive writing and copy-editing, and study of the forms and styles required by the professional societies in each field. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

## ENGL 325 Creative Writing (4)

Instruction and practice in the writing, revising, and evaluating of fiction, poetry, or drama. Total credit limited to 8 units. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

#### ENGL 326 Literary Criticism (4)

Instruction and practice in writing, revising, and evaluating various kinds of critical writing. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

#### ENGL 330 British Literature: Medieval Period (4)

GEB C.3.

Major works of the Old and Middle English periods in modern translation, including epic and lyric poetry, early religious writings, romance cycles and mystery and morality plays. Representative works include Beowulf, the Arthurian legends, Everyman and Chaucer's Canterbury Tales. 4 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

#### ENGL 331 British Literature: The Renaissance (4)

#### GEB C.3.

GEB C.3.

Major works of Elizabethan and Jacobean prose, poetry and drama. Literary responses to the foundations of humanism, individualism, nationalism and other forces of change leading from the medieval to the modern world. Representative writers include Spenser, Sidney, Donne, Jonson, Bacon and Milton. 4 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

#### ENGL 332 British Literature: The Enlightenment (4)

Major prose, poetry, and drama from 1660 to 1800, emphasizing the period's interest in order, reason, rules and decorum in both life and literature. Representative writers include Dryden, Swift, Pope, Johnson, Boswell and Defoe. 4 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

**ENGL 333 British Literature: Romanticism (4) GEB C.3.** Major works of the Romantic period. Romantic concepts of imagination, individualism, nature and the organic qualities of art. Representative writers include Blake, Wordsworth, Coleridge, Byron, Shelley and Keats. 4 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

## ENGL 334 British Literature: The Victorians (4)

Major prose and poetry of the Nineteenth Century. Victorian concerns such as progress, belief, alienation and threats to the sense of personal identity in a technological age. Representative writers include Carlyle, Ruskin, Tennyson, Browning and Arnold. 4 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

### ENGL 335 British Literature: Twentieth Century (4)

Selected prose, poetry, and drama reflecting major movements of British literature from Modernism through Postmodernism, including Conrad, Joyce, Woolf, Waugh, Amis, Drabble, Yeats, Eliot, Smith, Stoppard. 4 lectures. Prerequisite: ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

## ENGL 338 Shakespeare in London (4) GEB C.3.

Readings from such works as Hamlet, King Lear, A Midsummer Night's Dream, and the sonnets. Attendance at performances of these plays in or near London. Not open to students with credit in ENGL 339. 3 lectures, 1 activity. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

# ENGL 339 Introduction to Shakespeare (3) GEB C.3.

Readings from such works as Hamlet, King Lear, A Midsummer Night's Dream and the sonnets. 3 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

### ENGL 340 American Literature to 1860 (4) GEB C.3.

Selected prose and poetry by American writers to 1860, showing the Colonial foundation of our national literature, developments of the Enlightenment and achievements of the Romantic age. Representative writers include Bradstreet, Edwards, Franklin, Paine, Emerson, Poe, Hawthorne, Thoreau and Melville. 4 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

### ENGL 341 American Literature: 1860–1914 (4) GEB C.3.

Selected prose and poetry by American writers from the Civil War to World War I with the focus on local-color fiction and on literary Realism and Naturalism. Representative writers include Whitman, Dickinson, Twain, James, Howell, Chopin and Crane. 4 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

#### ENGL 342 American Literature: 1914 to the Present (4)

Selected prose, poetry and drama by American writers from World War I to the present, depicting the social and psychological complexities of the Twentieth Century. Representative authors include Frost, Eliot, Stevens, Fitzgerald, Hemingway, Faulkner and O'Neill. 4 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

# ENGL 345 Women Writers (4)

# GEB C.3.

Literature by women with attention to the woman artist and the creative process. Women writers and the dominant literary tradition with consideration of the existence of a women's literary tradition. 4 lectures. Prerequisite: ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253, or consent of instructor.

# ENGL 346 Ethnic American Literature (4) GEB C.3.

Literature written in English by Black, Latino, Asian American, and Native American writers. Historical contexts which affected these writers and the effect of marginalization on the creative process. Relationship of such writers to the American canon and a revised canon. 4 lectures. Prerequisite: ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253, or consent of instructor.

# ENGL 350 Modern Novel (3) GEB C.3.

Readings in representative Twentieth Century novels with special emphasis on form and ideas. 3 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

# ENGL 351 Modern Poetry (3)

GEB C.3.

Readings in representative Twentieth Century poetry with special emphasis on form and ideas. 3 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

### ENGL 352 Modern Drama (3) GEB C.3.

Readings in representative Twentieth Century drama with special emphasis on form and ideas. 3 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

### ENGL 353 Modern Drama in London (4) GEB C.3.

Readings in representative Twentieth Century drama with special emphasis on form and ideas. Attendance at play performances required. 3 lectures, 1 activity. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

# ENGL 355 The Bible as Literature (3)

Old and New Testaments with historical background. Literary forms and characteristics of Hebraic writing. Appreciation of the far-reaching use of Biblical narrative and reference in literature, speeches, art, drama, and modern film. 3 lectures. Prerequisite: ENGL 114 or equivalent or consent of instructor.

# ENGL 360 Literature for Adolescents (3)

Readings in literature suitable for use in secondary schools. 3 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

# ENGL 362 Classics for Children and Youth (4)

Classic works of children's literature from the Eighteenth Century to the present. 4 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253, or consent of instructor.

# ENGL 370 World Cinema (4) GEB C.3.

Major works of international cinema with emphasis on critical interpretation, on the ways film communicates visually and verbally, and on the historical and cultural contexts in which films are created. Contains films by directors such as Howard Hawks, Orson Welles, Ingmar Bergman and Akira Kurosawa. 3 lectures, 1 laboratory. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

## ENGL 372 Film Directors (4)

GEB C.3.

Significant film directors from the Western world and non-Western world, and their cinematic and technical achievements. Demonstrates relationships of Twentieth Century modes of thought. *Class Schedule* will list topic selected. Total credit limited to 12 units. 3 lectures, 1 laboratory. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253, or consent of instructor.

# ENGL 380 Contemporary Literary Ideas (4) GEB C.3.

Literature of the modern period. Significant writers, both from the Western world and the non-Western world, and their literary achievements. Demonstrates relationships of prevailing Twentieth Century modes of thought. *Class Schedule* will list topic selected. Total credit limited to 12 units. 4 lectures. Prerequisite: ENGL 114 and ENGL 230, ENGL 231, ENGL 240, ENGL 251, ENGL 252, ENGL 253 or consent of instructor.

# ENGL 385 Mass Media Criticism (4) (Also listed as JOUR 385 and SPC 385)

Examines mass media (especially broadcasting) from a rhetorical/critical perspective. Aims to expand students' understanding of media issues, media's role as critic, and the role of criticism. 4 lectures. Prerequisite: SPC 201 or SPC 202.

# ENGL 390 Modern English Grammar (4)

Linguistic analysis of the English language. Phonology, morphology, and syntax. Traditional, descriptive-structural, and transformational-generative grammars. 4 lectures. Prerequisite: ENGL 114 or equivalent.

### ENGL 391 Topics in Applied Linguistics (4)

Issues in applied linguistics including sociolinguistics, first and second language acquisition, literacy, bilingualism, and dialectology. Applications to teaching the English language. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

### ENGL 395 History of the English Language (4)

Development of the English language from its origins to its present forms and practices. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

#### ENGL 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

### ENGL 415 Advanced Creative Writing (4)

Instruction and practice in advanced writing, revising and evaluating of fiction or poetry. Total credit limited to 8 units. 4 lectures. Prerequisite: ENGL 325 or consent of instructor. ENGL 325 (Fiction) must be taken as prerequisite to ENGL 415 (Fiction).

# ENGL 418 Technical Communication Practicum (2–4) (CR/NC)

Supervised work experience in government, corporate, or volunteer setting, as approved by department head. Placement

may be student or employer initiated, or through Cooperative Education. Proposal, progress reports, and final report. Total credit limited to 8 units, with a maximum of 4 units per quarter. Credit/No Credit grading only. Prerequisite: Senior standing, two technical writing courses.

## ENGL 421 Writing in Secondary Schools (4)

Approaches to writing in secondary schools. Overview of composition theory and examination of current research on the teaching of writing. Exploration of classroom techniques appropriate to student needs and program goals. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

# ENGL 424 Organizing and Teaching English (4)

Introduction to the organization, selection, presentation, application, and interpretation of subject matter in English in secondary schools. 4 lectures. Prerequisite: Admission to teacher education program or valid teaching credential.

# ENGL 430 Chaucer (4)

Selected readings from Canterbury Tales and Chaucer's other major poems. 4 seminars. Prerequisite: ENGL 330, or ENGL 331, or ENGL 332, or ENGL 333, or ENGL 334.

# ENGL 431 Shakespeare (4)

Representative comedies, tragedies, and histories. 4 seminars. Prerequisite: ENGL 330, or ENGL 331, or ENGL 332, or ENGL 333, or ENGL 334, or ENGL 339.

### ENGL 432 Milton (4)

Paradise Lost, Paradise Regained, and Samson Agonistes, with some attention to the minor poems. 4 seminars. Prerequisite: ENGL 330, or ENGL 331, or ENGL 332, or ENGL 333, or ENGL 334.

### ENGL 439 Significant British Writers (4)

Selected British writers, as individual writers or in groups. Each course will have a subtitle descriptive of the content. Total credit limited to 8 units. 4 seminars. Prerequisite: ENGL 330, or ENGL 331, or ENGL 332, or ENGL 333, or ENGL 334.

### ENGL 449 Significant American Writers (4)

Selected American writers, as individual writers or in groups. Each course will have a subtitle descriptive of the content. Total credit limited to 8 units. 4 seminars. Prerequisite: ENGL 340, or ENGL 341, or ENGL 342.

### ENGL 459 Significant World Writers (4)

Selected world writers, as individual writers or in groups. Each course will have a subtitle descriptive of the content. Total credit limited to 8 units. 4 seminars. Prerequisite: 8 units of literature or consent of instructor.

### ENGL 460 Senior Project Seminar (1)

Discussion of selected subjects such as Renaissance Drama, comedy or tragedy, creative writing, and the like, for purposes of defining individual topics for completion in ENGL 461. 1 seminar. To be taken concurrently with ENGL 461. Prerequisite: English department approval.

# ENGL 461 Senior Project (3)

Selection and completion of a project under faculty supervision. Projects typify problems which a graduate may face in his field of employment. Project results are presented in a formal written report. Minimum of 90 hours total time. Prerequisite: Prior consent of instructor.

# ENGL 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

# ENGL 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

### ENGL 495 Applied Language Study (4)

Linguistic theory applied to human communications, human relations, and literature. Each course will have a subtitle descriptive of the content. Total credit limited to 8 units. 4 seminars. Prerequisite: ENGL 390 or consent of instructor.

#### ENGL 496 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

# ENGL 497 Theories of Language Learning and Teaching (4)

Theories of first and second language learning and acquisition in the context of teaching English as a second language/dialect. 4 lectures. Prerequisite: Eight units of linguistics or consent of instructor.

# ENGL 498 Approaches to Teaching English as a Second Language/Dialect (4)

Approaches to teaching English to second language and second dialect students. Attention to materials development and testing. Practicum allows for experience within the ESL classroom. 4 lectures. Prerequisite: ENGL 497.

# ENGL 501 Techniques of Literary Research (4) (CR/NC)

Purposes and methods of literary research in literature. Acquaintance with printed materials of research and practical experience in collecting material, weighing evidence, reaching conclusions, and writing scholarly articles. Analysis of dissemination of scholarly information. Discussion of ethics of scholarship. Credit/No Credit grading only. 4 seminars. Prerequisite: Graduate standing.

### ENGL 502 Seminar in Critical Analysis (4)

Basic approaches used by critics. Multiple points of view. Application to literary works. *Class Schedule* will list topic selected. Total credit limited to 8 units. 4 seminars. Prerequisite: Graduate standing.

### ENGL 503 Seminar in English Linguistics (4)

Current modes of linguistic study and their application to English grammar. *Class Schedule* will list topic selected. 4

seminars. May be repeated to 12 units. Prerequisite: ENGL 290, ENGL 390 or consent of instructor.

## ENGL 504 Seminar in Applied English Linguistics (4)

Consideration of applications of linguistics to literature, dialectology, language acquisition, literacy, bilingualism, or discourse analysis. *Class Schedule* will list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: ENGL 290, ENGL 390, or ENGL 503, or equivalent, or consent of instructor.

### ENGL 505 Seminar in Composition Theory (4)

Special problems in composition. Direct application of new language information to composition or detailed analysis of relationship between rhetorical principles and writing. Total credit limited to 12 units. 4 seminars. Prerequisite: Graduate standing in English.

#### ENGL 506 Pedagogical Approaches to Composition (4) (CR/NC)

Practical problems in the teaching of English composition. Application and study of practical approaches. Discussion of day to day experiences in the classroom. Discussion of and research into the nature and solution of student writing problems. Required of all new teaching assistants in English. Total credit limited to 8 units. Credit/No Credit grading only. 4 seminars. Prerequisite: Graduate standing in English.

### ENGL 510 Seminar in Authors (4)

Intensive study of major British and American literary figures, singly, doubly or in small groups. Written and oral reports of individual investigation. *Class Schedule* will list topic selected. Total credit limited to 8 units. 4 seminars. Prerequisite: Graduate standing, completion of or concurrent enrollment in ENGL 501.

### ENGL 511 Seminar in American Literary Periods (4)

American periods. Written and oral reports of individual investigation. *Class Schedule* will list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: Graduate standing in English, completion of or concurrent enrollment in ENGL 501.

### ENGL 512 Seminar in British Literary Periods (4)

British periods. Written and oral reports of individual investigation. *Class Schedule* will list topic selected. Total credit limited to 12 units. 4 seminars. Prerequisite: Graduate standing, completion of or concurrent enrollment in ENGL 501.

### ENGL 513 Seminar in Special Topics (4)

Themes and ideas in language and literature not ordinarily covered in the routine graduate course offerings. Written and oral reports of individual investigation. *Class Schedule* will list topic selected. Total credit limited to 8 units. 4 seminars. Prerequisite: Graduate standing, completion of or concurrent enrollment in ENGL 501.

# ENGL 515 Apprenticeship in Teaching Literature or Linguistics at College Level (2) (CR/NC)

Supervised experience in planning, teaching, and evaluating a 200- or 300-level linguistics or literature class taught by English faculty member. Planning, selecting texts, conferring with students, discussing and constructing assignments, lecturing, leading small group discussions. Credit/No Credit grading only. Prerequisite: ENGL 506 and successful teaching experience in ENGL 114 or ENGL 215.

# ENGL 518 Technical Communication Theory (4)

Theory of technical communication for teachers, managers, advanced writers, and editors. Applications to science, agriculture, engineering. Evolving concepts and uses of literacy in a technological age: e.g., readability, information retrieval, document design. 4 seminars. Prerequisite: ENGL 318 or equivalent or consent of instructor.

# ENGL 520 Problems in Secondary English (3)

Topical issues in teaching secondary school English. Designed especially for credentialed teachers in the field. Alternate topics like the following: writing instruction workshop, teaching masterworks and young adult literature, implications of rhetorical and discourse theories, computer technology in English, literary criticism and teaching, research in reading and writing. Written reports of topic investigations. Total credit limited to 9 units. 3 seminars. Prerequisite: Graduate standing in English.

### ENGL 590 Directed Study (4)

Supervised independent or group study of special problems in selected areas of language, composition, or literature. Total credit limited to 12 units. Prerequisite: Graduate standing in English.

# **ENGR-ENGINEERING**

# ENGR 141 Engineering Orientation (2) (CR/NC)

Study skills for the technical student, including time management, test-taking and note-taking skills for both technical and non-technical courses. Utilization of campus resources. Academic, career and personal assessment as it relates to the educational process. Specifically for students enrolled through Student Academic Services and the Minority Engineering Program. Credit/No Credit grading only. 1 lecture, 1 activity.

### ENGR 142 Engineering Careers (2) (CR/NC)

Career investigation, resume writing, job search and interview skills, speakers from industry and time management. Specifically for students enrolled through Student Academic Services and the Minority Engineering Program. Credit/No Credit grading only. 1 lecture, 1 activity.

# ENGR 301 Technology in the 20th Century (3)

GEB F.2.

Role of science, engineering and technology in the Twentieth Century. Effects of technological change, the function of the scientist-engineer in society. Computer as a tool, case studies of systems to compare alternative approaches to problem solving. 3 lectures. Prerequisite: Junior standing or consent of instructor.

### ENGR 303 Professional Development (2) (CR/NC)

Integration of principles of Engineering with industrial realities via professional problem solving modules. Research and field investigation at cooperating industry sites. Advanced learning systems. Specifically designed for transfer students. Credit/No Credit grading only. 2 lectures. Prerequisite: Junior standing or consent of instructor.

### ENGR 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.

# ENGR 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.

# 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: BACT 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 587 Cooperative Education Experience (6)

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Prerequisite: Graduate standing and consent of instructor.

## ENGR 597 Cooperative Education Experience (12)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Prerequisite: Graduate standing and consent of instructor.

# ENGR 599 Design Project (Thesis) (2) (2) (5)

Each individual or group will select, with faculty guidance and approval, a topic for independent research or investigation resulting in a thesis or project to be used to satisfy the degree requirement. An appropriate experimental or analytical thesis or project may be accepted. Prerequisite: Graduate standing.

# **ENT-ENTOMOLOGY**

### ENT 220 Agricultural Entomology (4)

Major insect orders and families of agricultural importance. Taxonomy, identification, life cycles, histories, and natural controls of insects. 2 lectures, 2 laboratories.

## ENT 326 General Entomology (4)

Introduction to the study of insects. Structure, major orders and families of insects, life histories, medical and economic importance. Insect collection required. 2 lectures, 2 laboratories.

### ENT 332 Economic Entomology (4)

Identification, life histories and control of insects beneficial or injurious to various crops, fruits, stored products, domestic animals and man; important invertebrates such as mites, ticks and spiders. 3 lectures, 1 laboratory. Prerequisite: ENT 220 or ENT 326 or consent of instructor.

# ENT 421 Immature Stages of Insects (4)

Identification, biology, and economic importance of preimaginal insect forms. 2 lectures, 2 laboratories. Prerequisite: ENT 220, ENT 326 or consent of instructor.

# ENVE-ENVIRONMENTAL ENGINEERING

### ENVE 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

#### ENVE 304 Thermodynamics of Processes (3)

Material balances, energy balances, liquids and mixtures, vapor-liquid equilibria, solubility and absorption, equilibrium in chemical reactions. 3 lectures. Prerequisite: ME 302, CHEM 125.

### ENVE 309 Noise and Vibration Control (3)

Behavior of sound waves, selection of instrumentation, practical measurements, criteria for noise and vibration control. Assessment of noise produced by transportation and other engineering facilities. 2 lectures, 1 laboratory. Prerequisite: CE 112, MATH 241, PHYS 133, and CSC 204 or CSC 251.

# ENVE 316 Automatic Process Control (2)

Introduction to automatic control instrumentation. Methods of analysis of control systems. Analytical determination of control response. 2 lectures. Prerequisite: MATH 242, ME 302, ME 313, ME 341.

### ENVE 324 Introduction to Air Pollution (3) GEB F.2.

Causes and effects of air pollution on the individual, the community and industry. Legal and economic aspects. For non-majors. 3 lectures. Prerequisite: Junior standing.

#### ENVE 325 Environmental Air Quality (3)

Consideration of ambient air contamination inside and outside. Factors included in establishing, monitoring and maintaining air guality standards. 3 lectures. Prerequisite: CHEM 125.

# ENVE 330 Environmental Quality Control (3) GEB F.2.

Application of scientific and engineering principles to control the development and use of air, water and land resources. Control of pollution of the environment. Disposal of wastes. Administrative and legal aspects. For non-Engineering majors. 3 lectures. Prerequisite: Junior standing.

#### ENVE 331 Introduction to Environmental Engineering (3)

Application of scientific, engineering, and economic principles to development and control of environmental problems. Air pollution control. Water and wastewater treatment. Hazardous wastes. Resource recovery. Noise control. Legal and administrative aspects. 3 lectures. Prerequisite: MATH 242, CHEM 125.

#### ENVE 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

# ENVE 411 Air Pollution Control (3)

Theory, principles and practices related to the control of particulate emissions. Mechanical separations. Cost and design of control systems. 3 lectures. Prerequisite: ENVE 325 or ENVE 331 and senior standing.

#### ENVE 421 Mass Transfer Operations (3)

Theory and practices related to using mass transfer principles to solve environmental problems. Design principles dealing with air and water pollution control and hazardous waste management. Computer simulation. 3 lectures. Prerequisite: ENVE 325, ME 313, ME 341.

#### ENVE 426 Air Quality Measurements (3)

Planning and conducting air quality measurements in the atmosphere, indoors and at the source. Topics include both particulates, gases and meteorological measurements. 2 lectures, 1 laboratory. Prerequisite: ENVE 325, CHEM 326.

# ENVE 434 Water Quality Measurements (2)

Methods employed in the qualitative and quantitative determination of water and waste water constituents. Physical, chemical and biological procedures used in determining water quality. Testing of effluents from industrial and municipal treatment plants. 1 lecture, 1 laboratory. Prerequisites: CHEM 129, CHEM 326.

#### ENVE 435 Principles of Water and Wastewater Engineering (3)

In depth coverage of water and wastewater characteristics. Theory of various physical unit operations and biological unit processes encountered in water and wastewater treatment. 3 lectures. Prerequisite: CE 336.

# ENVE 436 Introduction to Hazardous Waste Management (3)

Overview of industrial processes which produce hazardous wastes. Principles of toxicology and review of state federal regulations for hazardous wastes, including RCRA, TSCA, and superfund laws. Storage, handling, and transport of hazardous wastes. Unit operations and processes treatment and reduction. Ultimate disposal including incineration and secure landfills. 3 lectures. Prerequisite: ENVE 325 or ENVE 331 and senior standing.

### ENVE 438 Water and Wastewater Treatment Design (3)

Design of facilities for physical and chemical treatment of water and wastewater, biological treatment of wastewater, and treatment and disposal of sludge. Design of land treatment systems and septic tanks. Use of computers for design problems. 3 lectures. Prerequisite: ENVE 331 or ENVE 435.

#### ENVE 439 Solid Waste Management (3)

Chemical and physical properties of municipal and industrial refuse. Landfill disposal, incineration, composting. Industrial and commercial solid waste disposal problems and treatment methods. Pyrolysis. Salvage and recycle operations. Economics of disposal methods. Interrelationship between water quality and landfill operations. 2 lectures, 1 laboratory. Prerequisite: Senior standing.

#### ENVE 442 Advanced System Design (3)

Individual and team project work in designing environmental systems including air and water pollution control, solid waste disposal and hazardous waste management. 1 lecture, 2 laboratories. Prerequisite: ENVE 411, ENVE 435, and ME 456.

## ENVE 461, 462 Senior Project (2) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum of 120 hours total time. Prerequisite: Senior standing.

#### ENVE 465 Environmental Management and Urban Systems (2)

Interdisciplinary study of urban pollution sources and control. Political, economic, and technological interrelationships. Participation in METRO-APEX, assuming roles of several urban decision makers. 1 lecture, 1 activity. Prerequisite: Senior standing.

# ENVE 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

#### ENVE 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

#### ENVE 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.

#### ENVE 500 Individual Study (1-3)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Total credit limited to 4 units. Prerequisite: Graduate standing and consent of department head.

#### ENVE 534 Advanced Design of Pollution Control Systems (3)

Comprehensive problems in pollution control. Methods of analysis, design of unit operations and processes for environ-

mental engineering facilities. 1 seminar, 2 laboratories. Prerequisite: ENVE 411 or ENVE 435, and graduate standing.

# ENVE 535 Advanced Wastewater Treatment (3)

Operations and processes used in tertiary treatment. Chemical coagulation, flocculation, sedimentation, filtration, absorption. Methods for removal of phosphorous, nitrogen, solids and organics. Integration of advanced wastewater treatment processes. 3 seminars. Prerequisite: Graduate standing.

## ENVE 536 Biological Wastewater Treatment Processes Engineering (3)

Fundamentals of reactor engineering. Biochemical and microbiological background. Modeling and design of biochemical reactors. 3 lectures. Prerequisite: Graduate standing.

# ENVE 541 Resource and Energy Recovery (3)

In-depth evaluation of physical and biological processes for the recovery of resources and energy from solid waste. Preparation of an engineering design report. Use of computer models for process engineering and cost estimation of resource recovery facilities. 2 lectures, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

# ENVE 551 Environmental Unit Operations (4)

In-depth laboratory study of unit operations and processes used in environmental engineering. Performance tests on laboratory scale equipment. Computer simulations. 2 lectures, 2 laboratories. Prerequisite: ENVE 421 and graduate standing.

# ENVE 570 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 seminars. Prerequisite: Graduate standing or consent of instructor.

# ENVE 571 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

# ENVE 599 Design Project (Thesis) (2) (2) (5)

Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis. Prerequisite: Graduate standing.

# **ES-ETHNIC STUDIES**

# ES 114 Racism in American Culture (3)

Survey and analysis of racism in the development of American institutions and its effect upon minority ethnic groups and society. 3 lectures.

## ES 210 Cultural Heritage (3)

History and culture of selected ethnic groups, their role in and contributions to the American cultural heritage. 3 lectures.

# **ET-ENGINEERING TECHNOLOGY**

# ET 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

#### ET 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation of techniques, studies or laboratory application of selected problems. Total credit limited to 4 units, with maximum of 2 units per quarter. Prerequisite: Consent of department head.

# ET 461, 462 Senior Project (2) (3)

Selection and completion of a project under faculty supervision. Projects are typical of problems graduates must solve in their fields of employment. Project results are presented in a formal report. Miscellaneous course fee required-see *Class Schedule*. Minimum 150 hours total time. Prerequisite: Senior standing and consent of instructor.

# ET 463 Undergraduate Seminar (2)

Special studies and technical developments in the field. Individual reports on important technology in the engineering technology field. 2 seminars. Prerequisite: SPC 201 or SPC 202 and senior standing.

# ET 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

# ET 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

### ET 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.

### ET 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.

# ETME-ENGINEERING TECHNOLOGY-MECHANICAL

### ETME 131 Introduction to Engineering Drawing (2)

Basic instruction in drafting methods, techniques and use of equipment. Geometric constructions. Principles and practices of isometric, oblique, and multiview drawing systems. 1 lecture, 1 laboratory.

### ETME 141 Applied Descriptive Geometry (2)

Computer-aided solutions of problems involving geometry in three-dimensional space by method of multiview projection.

View structure in CAD. Intersections and development of geometric solids. Application to engineering design. 1 lecture, 1 laboratory. Prerequisite: High school drafting or ETME 131.

#### ETME 142 Engineering Drawing I (1)

Advanced principles and methods of multiview and pictorial drawing. Conventional industrial drafting practices including sectioning and dimensioning techniques. Auxiliary views. Threads and fasteners. Dimensioning and tolerancing. Surface finishes. Drawing reproduction processes. 1 laboratory. Prerequisite: ETME 131 or recent high school drafting.

#### ETME 143 Engineering Drawing II (1)

Drawings of mechanical components; layout, details, and assemblies. Selection of views, scales, dimensions, symbols and notes. Engineering change systems. Introductory geometric tolerancing. Computer-aided drafting utilizing the CRT, keyboard, and light pen/ditizer. Introduction to view structure. 1 laboratory. Prerequisite: ETME 142.

#### ETME 205 Statics for Engineering Technology (3)

Statics by scalar methods. Includes forces, couples, resultants, equilibrium, trusses, cables, friction, centroids, and moments of inertia. 3 lectures. Prerequisite: CSC 110, MATH 132, PHYS 121.

#### ETME 206 Dynamics for Engineering Technology (4)

Dynamics by scalar methods. Includes kinematics (both absolute and relative motion of particles and bodies) and kinetics, force, mass, acceleration, work and energy, impulse and momentum, and fundamentals of vibrations. 4 lectures. Prerequisite: ETME 205.

#### ETME 240 CAD Project Laboratory (1) (CR/NC)

Computer-aided design methods and applications utilizing a CAD system on individual or group investigation of selected projects. Total credit limited to 4 units, with a maximum of 1 unit per quarter. Credit/No Credit grading only. 1 laboratory. Prerequisite: ETME 143 or consent of instructor.

#### ETME 301 Thermodynamics for Engineering Technology (3)

Fundamental concepts of work, heat, and energy. First and second laws of thermodynamics. Properties of ideal gases and vapors, combustion, vapor and gas power cycles. 3 lectures. Prerequisite: PHYS 122, CHEM 121, MATH 132.

#### ETME 302 Heat Transfer for Engineering Technology (3)

Modes of heat transfer. Fluid mechanics principles for heat transfer. Steady state conduction, radiation, convection. Applications in heat absorption and heat exchangers. 3 lectures. Prerequisite: CHEM 121, MATH 132, PHYS 122.

#### ETME 303 Applied Mechanics Laboratory (1)

Experimental studies in statics, dynamics, and fluid mechanics with applications involving friction, conservation of energy and momentum, vibrations, pipe flow and flow measurement. 1 laboratory. Prerequisite: ETME 141, ETME 206, ETME 311, ENGL 218.

#### ETME 311 Fluid Mechanics for Engineering Technology (3)

Principles that underlie the flow of various fluids. Fluid statics, kinematics of fluid flow, viscosity and fluid friction. Incompressible flow in pipes and open channels, flow measurement,

fluid machinery and lubrication. 3 lectures. Prerequisite: PHYS 122, ETME 206.

### ETME 320 Mechanisms (3)

Motion of machine parts. Graphical methods for determining displacements, velocities, and accelerations in linkages, cams, gears, and other mechanical assemblies. 1 lecture, 2 laboratories. Prerequisite: ETME 142, ETME 206, ENGL 218.

#### ETME 333 Industrial Hydraulics and Pneumatics (4)

Basic principles of hydraulics and pneumatics. Characteristics and performance of various hydraulic and pneumatic components such as pumps, compressors, cylinders, motors, valves, accumulators, lines, fittings, filters, etc. Hydraulic fluids. Component selection and circuit layout using American National Standard graphic symbols. 3 lectures, 1 laboratory. Prerequisite: ETME 311 or consent of instructor, ENGL 218.

### ETME 335 Selection of Engineering Materials (2)

Concepts and properties of materials and their relevance to industrial applications. Selection of metals, plastics, ceramics, composites, etc. 2 lectures. Prerequisite: ETMP 144, ETWT 144, IE 141, MET 235.

## ETME 337 Instrumentation of Mechanical Systems (3)

Principles of process instrumentation and control. Temperature, pressure, flow and level measurement. Analytical instrumentation. Pneumatic and electric transmission devices and controllers. Signal conditioning. Recorders and indicators. 2 lectures, 1 laboratory. Prerequisite: EET 125, ETME 311, ENGL 218.

#### ETME 338 Industrial Engines (4)

Types of power plants and their application to vehicles and stationary plant generators, compressors, and other industrial equipment. Includes various types of engines, turbines, boilers and some of the newer developments being applied in industry. Fuel conservation and pollution control. 3 lectures, 1 laboratory. Prerequisite: ETME 301, ETME 337, ENGL 218.

#### ETME 344 Design Systems and Practices (2)

Preparation of detail and assembly drawings from design layouts. Tolerances on lineal dimensions and geometric form. Surface finish symbols, production notes and parts lists. Piping, electrical and tooling drawings. Computer aided drafting. 2 laboratories. Prerequisite: ETME 143, ENGL 218.

# ETME 406 Vibrations for Technology (2)

Free and forced vibration in damped and undamped systems. Rotating balance, critical speeds, measuring and monitoring techniques, vibration and acoustical noise isolation and reduction. 2 lectures. Prerequisite: ETME 206, CE 202.

#### ETME 421, 422 Applied Machine Design I, II (4) (4)

Machine design emphasizing properties of materials relative to structural loading and design; layout of machine elements. Calculations for selecting hardware such as gears, bearings, fasteners, etc. Laboratory includes solution of realistic design projects both with and without computers. 2 lectures, 2 laboratories. Prerequisite: ETME 320, ETME 344, CE 202, CE 203, MATH 133.

#### ETME 437 Applied Fluid Power Systems (4)

Application of hydraulic and pneumatic equipment. Design, selection and layout of devices and systems including electrical

and pneumatic control logic. 2 lectures, 2 laboratories. Prerequisite: ETME 333.

## ETME 443 Mechanical Systems (4)

Application of technical principles incorporating various components into an integrated system. Project design oriented activities so that the student becomes familiar with component selection and layout of mechanical systems, emphasizing industrial handbook and catalog material. 4 laboratories. Prerequisite: ETME 333, ETME 335, ETME 422.

# ETMP-ENGINEERING TECHNOLOGY-PROCESSES

### ETMP 121 Manufacturing Survey (1)

Overview of manufacturing processes relating to metals and plastics. Includes study of materials, thermal cutting systems, welding, forming, machining, and foundry processes. Open to all majors. 1 lecture.

### ETMP 144 Manufacturing Processes: Machining I (2)

Uses, capabilities, and theoretical and operational characteristics of lathe and milling machine tools, including conventional, automatic and numerical control. Study of cutting tool characteristics, machining parameters, quality control, and production methods. Design considerations for manufacturing. Introduction to robotics and automation. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 1 laboratory.

### ETMP 145 Manufacturing Processes: Machining II (1)

Relationship between engineering design and production fabrication. Hole forming by drilling, boring, broaching, punching, piercing and nontraditional methods. Forming and assembling of gage metal components. Engineering and economic significance of various production techniques. Miscellaneous course fee required-see *Class Schedule*. 1 laboratory. Prerequisite: ETMP 144 or consent of instructor.

### ETMP 157 Electronic Manufacturing (3)

Design, documentation and fabrication of electronic units with emphasis on CAD/CAM. Prototyping techniques, project planning, and production methods. Student completes working unit from start to finish in 60 hours of project-oriented laboratory. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 2 laboratories.

### ETMP 158 Introduction to Robotics (2)

Introduction to applied industrial robotics. Concepts in programming, tooling and general application of robots in industry. Opportunity to program and operate full-size industrial robots. Open to all majors. 1 lecture, 1 laboratory.

# ETMP 240 Additional Engineering Laboratory (1)

Advanced production and toolroom problems. Design and construction of laboratory tooling and instrumentation. Individual and group investigation of selected problems. Total credit limited to 4 units, with a maximum of 1 unit per quarter. Miscellaneous course fee required-see *Class Schedule*. 1 laboratory. Prerequisite: ETMP 144 or consent of instructor.

### ETMP 244 Machining Technology I (3)

Principles of metal cutting. Theory and operational problems of turning and milling machines. Investigation of machine operating parameters, tool materials, surface texture and cutting fluids.

Machinability of materials. 1 lecture, 2 laboratories. Prerequisite: ETMP 144.

# ETMP 245 Machining Technology II (3)

Advanced applications of manual and automatic machine tools. Use of machine accessories, workholding fixtures and attachments. Fundamentals of surface and cylindrical machine grinding, emphasizing productivity, attainment of surface finish and comparison to other processes. Material planning and routing techniques. 1 lecture, 2 laboratories. Prerequisite: ETMP 244 or consent of instructor.

# ETMP 246 Machining Technology III (3)

Producibility testing relating tool life to various machining variables. Instrumentation, analysis, and test report writing of results. Quality control and inspection methods for manufacturing. Nontraditional machining processes, sheet metal fabrication, gear cutting and other specialty manufacturing processes. 2 lecture, 1 laboratory. Prerequisite: ETMP 245 or consent of instructor.

# ETMP 247 Duct Design and Fabrication (2)

Relationships between engineering design and production fabrication and installation. Air distribution systems, duct work, materials, commercial fabrication methods. Installation techniques and cost estimating. 1 lecture, 1 laboratory. Prerequisite: ETME 141.

### ETMP 321, 322 Tool Design I, II (3) (3)

Design of manufacturing tools such as jigs, fixtures, and dies. Material selection, tolerance stacking, and quality control requirements as economic design factors. Field trips to manufacturing centers. 2 lectures, 1 laboratory. Prerequisite or concurrent: ETMP 244, ETME 344, ENGL 218, or consent of instructor.

# ETMP 336 Numerical Control Programming (3)

In-depth study of numerical control (NC) machine tool programming. Computer-aided, manual, and conversational NC methods. Use of NC to produce and inspect parts. Role of NC in CAD/CAM. 2 lectures, 1 laboratory. Prerequisite: IE 233 or consent of instructor, ENGL 218.

### ETMP 337 Computer Aided Manufacturing Technology (3)

Advanced APT programming concepts. Design and implementation of computer driven manufacturing cells and flexible manufacturing systems. Integration of CAD/CAM systems to machine tool and robot motion. 2 lectures, 1 laboratory. Prerequisite: ETMP 336, ENGL 218.

# ETMP 357 Electronic Fabrication Technology (4)

Electronic manufacturing engineering overview with emphasis on new technologies, planning, producibility, product assurance, packaging and testing. Advanced fabrication techniques and advanced use of electronic CAD/CAM. 2 lectures, 2 laboratories. Prerequisite: EET 233, ETMP 157, ENGL 218, IE 222.

# ETWT-ENGINEERING TECHNOLOGY-WELDING TECHNOLOGY

# ETWT 144 Manufacturing Processes: Welding (2)

Theory and application of metal cutting and welding processes. Includes shielded metal arc, flux cored arc, submerged arc, gas metal arc, gas tungsten arc, brazing, resistance, and oxyacetylene processes. Bonding theory, joint design, codes and testing. 1 lecture, 1 laboratory.

# ETWT 155 Industrial Welding Technology (1)

Application of various electric welding processes to joining of steel sheet and plate. Includes short circuiting arc, flux cored electrode, gas metal arc, and shielded metal arc processes. Gas welding of steel pipe and hard surfacing. 1 laboratory. Prerequisite: ETWT 144.

# ETWT 156 Welder Qualification Technology (1)

Out of position fillet and groove welds in carbon steel plate. Welder qualification tests according to code requirements. 1 laboratory. Prerequisite: ETWT 144.

### ETWT 240 Additional Welding Laboratory (1)

Individual investigation of current methods and applications. Studies of laboratory procedures and selected problems. Total credit limited to 4 units, with a maximum of 1 unit per quarter. 1 laboratory. Prerequisite: ETWT 144 or consent of instructor.

### ETWT 335 Nondestructive Evaluation (3)

Theory and application of nondestructive evaluation systems for quality control. Includes radiography, ultrasonic, magnetic particle, penetrants, and eddy current. 2 lectures, 1 laboratory. Prerequisite: ENGL 218, PHYS 123, junior standing.

#### ETWT 351 Advanced and Automated Welding Processes (4)

Survey of modern metals joining processes. High energy density plasma arc, electron beam and laser beam welding processes. Welding fixtures and positioners. Welding automation and control. Robotic arc welding. 2 lectures, 2 laboratories. Prerequisite: ETWT 144, ENGL 218.

### ETWT 352 Weldability of Ferrous Alloys (4)

Welding metallurgy and weldability of carbon, low alloy and stainless steels. Metallography, mechanical testing and weld defects. 2 lectures, 2 laboratories. Prerequisite: MATE 306, MATE 341, ENGL 218, ETWT 144.

### ETWT 353 Weldability of Nonferrous Alloys (4)

Welding metallurgy and weldability of aluminum, nickel, copper, titanium and their alloys. Dissimilar metal welding and weldability tests. 2 lectures, 2 laboratories. Prerequisite: ETWT 352.

### ETWT 451 Advanced Welding Theory (4)

Heat flow, residual stresses and distortion in welding. Physics of welding and power sources. 2 lectures, 2 laboratories. Prerequisite: ETWT 353.

### ETWT 452 Welding Codes and Qualification (4)

Detailed study of common welding codes including the AWS Structural Welding Code, ASME Section IX and API 1104. Welding, evaluation and testing of procedure qualification test joints. 2 lectures, 2 laboratories. Prerequisite: ETWT 451, ETWT 335.

#### ETWT 453 Design and Performance of Welded Joints (4)

Design for welding. Preferential corrosion of welded joints. Joining of advanced ceramic, polymer, and composite materials. Directed individual and/or group study of selected topics related to current welding technology. 2 lectures, 2 laboratories. Prerequisite: ETWT 452.

# **FIN-FINANCIAL MANAGEMENT**

## FIN 330 Real Estate Principles (4)

Introduction to the field of real estate providing a basic background for further study. Includes legal aspects, financing, valuation, economics, public control, title insurance and escrow, closing, safeguards for the buyer. Investment and leasing. 4 lectures. Prerequisite: BUS 201 or BUS 207. Junior standing required.

### FIN 342 Financial Management (4)

Theory and applications of financing business operations. Financial management of current and fixed assets from internal and external sources. Analysis, planning, control, and problem solving. 4 lectures. Prerequisite: ECON 222, MATH 221, STAT 252. ACTG 301 recommended. Junior standing required.

### FIN 388, 389 Financial Management II, III (4) (4)

Development of analytical and decision-making techniques in applying financial theory to business management problems. FIN 388 emphasizes valuation, cost of capital, capital structure, capital budgeting and leasing. FIN 389 emphasizes working capital management, financial analysis and forecasting, mergers and acquisitions, and other current topics in finance, including the discussion of ethical issues in finance. Case studies of practical problems; microcomputer-based software to analyze cases. Miscellaneous course fee required—see *Class Schedule*. 3 lectures, 1 activity. Prerequisite: FIN 388: Junior standing, FIN 342. FIN 389: ACTG 321 and FIN 388.

#### FIN 411 Security Analysis and Portfolio Management (4)

Analysis of securities, markets, and valuation. Security price movements related to money and capital market factors and corporate events. Portfolio planning, risk, media, and objectives of individual and institutional investors. 4 lectures. Prerequisite: ECON 337, FIN 342, STAT 252.

### FIN 412 Law of Real Property (4)

Legal problems of acquisition, ownership and transfer of real property. Contracts, agency, estates, and co-ownership, mortgages and deeds, covenants, conventions, and restrictions, easements, landlord-tenant, and zoning. 4 lectures.

#### FIN 430 International Business Finance (4)

Financial management of international business. International capital and money markets, international financial institutions, special problems in evaluating direct foreign investment, and financial techniques used in international business operations. 4 lectures. Prerequisite: FIN 342.

#### FIN 432 Real Estate Finance (4)

Analysis of the relationship between national and local money markets. Real estate financing techniques, sources of funds, government participation, legal instruments of finance. 4 lectures. Prerequisite: FIN 342. FIN 330 recommended.
#### FIN 434 Real Estate Investment (4)

Effects of federal, state and local taxes on investment transactions. Intensive investigation and computer analysis of urban investment opportunities. Problems in exchanging and property management. 4 lectures. Prerequisite: FIN 342. Recommended: FIN 432.

## FIN 440 Commercial Bank Management (4)

Analysis of the management of a commercial bank as a profit-making entity. Emphasis put on cases in bank management, especially those which deal with the management of a bank's asset and liability structure. 4 lectures. Prerequisite: Senior standing, FIN 342, FIN 411, and ECON 337.

#### FIN 480 Advanced Seminar in Investment (4)

Current topics in investments. An in-depth analysis of the efficient markets hypothesis and capital market theory. 4 seminars. Prerequisite: FIN 411.

# FNR-FORESTRY AND NATURAL RESOURCES

## FNR 100 Forest Resources Enterprise Project (1-4) (CR/NC)

Selection and completion of a forest management/production project under faculty supervision. Project participation is voluntary and subject to approval by the department head and the Cal Poly Foundation. Degree credit limited to 12 units. Credit/No Credit grading only.

## FNR 101 Natural Resources Management and Society (3) GEB F.2.

Integrated development, utilization and management of the nation's and world's natural resources for the continuous benefit of humankind and the conservation of the resources. Discussion of natural resources management practices and technologies which may provide a more flexible range of societal benefits for the wise use of our natural resources. 3 lectures.

## FNR 112 Parks and Outdoor Recreation (3)

Introduction to national, state, county, city and private park systems. History, philosophy, policy and principles of the formation, administration and functioning of wildland recreational units at the park, county, regional, national, and international levels. 3 lectures.

#### FNR 140 Career Development and Planning in Natural Resources Management (1) (CR/NC)

Analysis and development of career goals in natural resources. Acquainting students with potential career options and assisting them in planning and implementation phases of an academic career program at Cal Poly. Credit/No Credit grading. 1 activity. Prerequisite: Consent of instructor.

#### FNR 201 Forest Resources (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.

GEB F.2.

#### FNR 202 Environmental Management (3) GEB F.2.

Environmental management as a process within functioning societies seeking a harmonious balance between human activ-

ities and intrinsic behavior of the natural environment. Major components of the natural environment and the political and social activities that impact that environment. 3 lectures.

#### FNR 203 Resource Law Enforcement (3)

Law enforcement applied to natural resource conservation on public and private lands. Examination of state and federal laws related to fish and wildlife management. Problems associated with implementation of resource laws examined. 3 lectures.

## FNR 204 Resource Fire Control (2)

Basic fire control techniques used on various wildland fuels. Elementary fire physics, fuels, weather, fire behavior, line construction, mop-up, fire line safety, and fire organization. Meets basic fire fighter certification requirements for U.S. Forest Service and California Department of Forestry and Fire Protection. Miscellaneous course fee required-see *Class Schedule.* 1 lecture, 1 laboratory.

## FNR 208 Dendrology (4)

Identification, classification, silvical characteristics, distribution, environmental requirements and economic importance of trees and shrubs in parks, forest and wildlife areas of the United States. Emphasis on Pacific Coast species. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: BOT 121.

### FNR 250 Survey and Management of Mediterranean Ecosystems (2)

Woody vegetation found in worldwide Mediterranean ecosystems. Distribution, historical development and use of these ecosystems. Fire influences and fire management problems. Animal use and other management problems. 2 lectures.

## FNR 290 Intercollegiate Forestry Activities (1) (CR-NC)

Beginning through advanced skills in the event areas of college forestry activities. Instruction in use of specialized equipment and safety. Minimum of 4 hours of laboratory per week. Total credit limited to 8 units. Credit/No Credit grading only. Prerequisite: Enrollment limited to those qualified to compete in intercollegiate forestry activities and consent of instructor.

## FNR 300 Computer Applications in Resource Management (2)

Resource management applications of microcomputers. Software programs include forest and natural resource management planning, forecasting, analysis of systems, and resource data base management for multiple use objectives. Forestry and natural resource examples will be used. 1 lecture, 1 laboratory. Prerequisite: AG 250 or CSC 113, junior standing or consent of instructor.

#### FNR 302 Natural Resources Policy (3)

Historical development and significance of natural resource policies. Policy process approach to understanding the efforts to resolve natural resource problems in the public and private sector. 2 lectures, 1 laboratory. Prerequisite: FNR 112, FNR 201.

#### FNR 303 Forest Protection (5)

Impact and losses to forested areas caused by physical and biotic agents (such as insects and diseases) other than fire; relation of direct and indirect control practices to forest management. Saturday field trips required. 4 lectures, 1 laboratory. Prerequisite: FNR 304 or consent of instructor.

### FNR 304 Ecology of Resource Areas (4)

Resource ecology and management implications in the major ecosystems of North America. Importance of maintaining the natural dynamics of energy flow and nutrient cycles at the community and ecosystem level for the benefit of man. Humanity's role as a principal factor of change of the resources in natural systems. 3 lectures, 1 laboratory. Prerequisite: One course in biological sciences.

#### FNR 305 Forest Harvesting (3)

Relationships between forest production and harvesting methods, preparation of timber harvest plans, site preparation, harvesting effects, and cost analysis of harvesting methods. Overnight field trips are required to visit timber operations. Miscellaneous course fee required-see *Class Schedule*. 3 lectures and required field trip. Prerequisite: Junior standing or consent of instructor.

#### FNR 311 Environmental Interpretation (4)

Interpretation of the biological, physical and aesthetic values of the natural elements of our environment; organization and presentation of interpretive materials by oral, written, and display methods of communication. 3 lectures, 1 laboratory. Prerequisite: SPC 201 or SPC 202.

### FNR 314 Forest Mensuration (5)

Methods and principles of measurement for contents of trees, stands and felled timber. Construction and use of volume tables. Use of statistical measures, sampling and inventory techniques. Miscellaneous course fee required-see *Class Schedule*. 3 lectures, 2 laboratories. Weekend field trips required. Prerequisite: MATH 120 or equivalent, STAT 212, and AE 237.

#### FNR 316 Growth and Yield (3)

Site, growth and yield mensuration and prediction; techniques of growth determination for plantations, even-aged and allaged forests. Use of models such as CACTOS, CRYPTOS and STAG. Volume from logs. Thinnings and growth response. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 laboratory. Saturday field trips required. Prerequisite: FNR 314.

#### FNR 318 Applications of GIS in Natural Resources (2) (Also listed as LA 318)

ARC/INFO Geographic Information System (GIS) computer software to explore relevant environmental issues utilizing natural resources data such as vegetation, soils, habitats, topography and geology. Develop data base, use software and apply to relevant, natural systems. Miscellaneous course fee required-see *Class Schedule*. 2 laboratories. Prerequisite: Junior standing, and AG 250 or CSC 113 or consent of instructor.

#### FNR 325 Woodlot and Christmas Tree Management (3)

Farm and small forest holdings. Measurement, care and improvement of existing woodlots. Establishment of new woodlands. Woodland management design and plans for fuel and other products, including Christmas tree operations. Integration with range, wildlife and recreation values. Weekend or full-day field trips required. 2 lectures, 1 laboratory. Prerequisite: FNR 201, FNR 208, FNR 314 or consent of instructor.

#### FNR 332 Forest Products (4)

Manufacturing and marketing of wood products, wood identification, study of wood structure and mechanical properties. Weekend or full-day field trip required. Miscellaneous course fee required-see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: FNR 201, FNR 208, PHYS 104, or consent of instructor.

#### FNR 333 Hardwood Management (3)

Hardwood forest types, their historical development, management, protection, measurement, and utilization. Discussion of land use conflicts among public resource agencies, private companies, landowners, and governments representing views of ranchers, wildlife managers, foresters, environmental groups, recreation, etc. 2 lectures, 1 laboratory. Saturday field trips required. Prerequisite: FNR 208 or consent of instructor.

#### FNR 339 Internship in Forest and Natural Resources (1-12) (CR/NC)

Selected students will spend up to 12 weeks with an approved forest or natural resources firm engaged in production management or related business. Applying and developing production management and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Credit/No Credit grading. Prerequisite: Consent of instructor.

#### FNR 340 Resource Fire Management (2)

Wildland fuels, fire weather, fire behavior, and fire danger ratings in the chaparral, grassland, and wooded areas of forests, parks, and wildlands. Management implications, policy and objectives of fire management organizations. Saturday field trips may be required. 2 lectures. Prerequisite: FNR 204 or consent of instructor.

#### FNR 342 Fire Ecology (3)

Effects of wildland fires on shrub, woodland, and forest environments to inlcude fuels, plants, soil, water, wildlife, and air. Emphasis is on western U.S., worldwide forest and shrub ecosystem. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: FNR 304 or ecology course, and FNR 204 or consent of instructor.

#### FNR 345 Chaparral Management (3)

Chaparral community management techniques, management alternatives and the effects of management on fire, water production, erosion and potential utilization of the biomass. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: FNR 304 or consent of instructor.

#### FNR 350 Urban Forestry (3)

Establishment and management of city forests, small forest holdings, shelter belts, and plantings for erosion control, wildlife enhancement, and pollution abatement. Management of forest areas requiring special attention because of heavy recreational use, fire hazard, watershed, and societal values. Weekend or full-day field trips required. 2 lectures, 1 laboratory. Prerequisite: FNR 208, FNR 325 or consent of instructor.

### FNR 400 Special Problems for Advanced Undergraduates (2-4)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units. Prerequisite: Consent of department head.

#### FNR 401 Natural Resource Economics (3)

Principles of optimum use of renewable and nonrenewable natural resources, set in a framework of historical resource concerns and real world resource markets. Key resource sectors treated in detail: forestry, fisheries, water resources and natural environments. 2 lectures, 1 laboratory. Prerequisite: ECON 201.

#### FNR 403 Environmental Impact Analysis (3)

Federal and state environmental impact assessment process. Historical background, legislation and techniques currently in use in the preparation of environmental documents. Selected aspects of environmental law and regulations. Proposal preparation for environmental impact analysis. Miscellaneous course fee required–see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: FNR 304 or equivalent, and senior standing.

# FNR 404 Environmental Law (3) (Also listed as CRP 404)

Detailed examination of the law governing use and protection of natural resources with focus on the legal institutions entrusted with the public duty of protecting the environment. 3 lectures. Prerequisite: Senior standing, POLS 206, or consent of instructor.

## FNR 405 Applied Resource Analysis (4)

Environmental impacts in responses to resource management programs and activities. Preparation, implementation, and coordination of environmental activities. Criteria for measurements, interpretation, and evaluation. Resource inventories, analysis, synthesis, evaluation, environmental assessment writing and preparation. Miscellaneous course fee required-see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: FNR 403 or senior standing.

#### FNR 406 Natural Resources Administration (3)

Administration of private and public natural resource units, including planning, budgeting, organizing, directing, staffing and controlling units. Key resources administered include forests, water, fish and wildlife, grasslands. 2 lectures, 1 laboratory. Prerequisite: FNR 302.

#### FNR 407 Silviculture and Vegetation Management (4)

Interaction of forest and chaparral plant communities; influence of external factors upon wildlands, particularly those suited to forestry practices; growth and development of individual plants; cultural practices and tolerance of forest and chaparral plant communities. Impacts of intermediate and harvest treatments. Miscellaneous course fee required-see *Class Schedule*. Overnight and/or weekend field trips required. 3 lectures, 1 laboratory. Prerequisite: FNR 208, FNR 314.

## FNR 408 Water 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 302 or instructor approval, senior standing.

## FNR 409 Coastal Resource Management Users (3)

Natural resource identification and management techniques in coastal environments (land and water), including overview

and integration of physical, biological and man-made systems (including regulating) as they influence resource management decisions. 2 seminars, 1 laboratory. Field trips with lab are mandatory. Prerequisite: FNR 304 or one course in biological or physical sciences.

### FNR 410 Resource Recreation Management (4)

Practices of management of resource recreation on private and public lands. Consideration of the following management systems: biophysical, user/visitor, facilities, equipment, fiscal, personnel will be made in the provision of resource recreation services. Case studies in mass recreation and wilderness areas will be examined. 3 lectures, 1 laboratory. Some weekend labs necessary. Prerequisite: FNR 112 or consent of instructor.

### FNR 415 Forest Resources Valuation (3)

Wildland, timber, and non-market appraisal, valuation and appraisal techniques. Financial and business aspects of forestry. Economic alternatives in addition to timber production. 2 lectures, 1 laboratory. Prerequisite: FNR 401. FNR 407 recommended.

#### FNR 417 Resource Recreation Planning (3)

Development and analysis of resource recreation plans. Planning theory, types of plans, scheduling techniques, projecting supply and demand, application of models, and economic evaluations. Basic recreation planning skills examined. Examples emphasize planning for parks and recreation. 2 lectures, 1 laboratory. Prerequisite: FNR 112 or consent of instructor.

# FNR 418 Forest Management and Multiple-Use Planning (4)

Methods of organizing forest resources for sustained yield management; regulation of annual cut, and preparation of management plans. Multiple-use resource management will be emphasized. Discussion of Forestry Practices Act. Impact of timber management decisions on wildlife, recreation, range, and watershed resources; importance of human relations, ethics and communication. International aspects of multiple use forest resource management. Miscellaneous course fee required-see *Class Schedule*. Saturday or full-day field trips required. 3 lectures, 1 laboratory. Prerequisite: FNR 314, FNR 407.

#### FNR 434 Tree Growth and Wood Properties (2)

Physiology of wood formation, effects of hereditary and environmental factors on the structure, properties and uses of wood. Weekend or full-day field trips required. 1 lecture, 1 laboratory. Prerequisite: FNR 332 or consent of instructor.

## FNR 438 Wood Energy and Residue Utilization (2)

Present and potential uses, including wood energy, of 1) residue produced by forest and industrial utilization, and 2) biomass plantations. Technologies available for increasing utilization. International and tropical aspects of wood fuel are also considered. Miscellaneous course fee required-see *Class Schedule*. Overnight or full-day field trips required. 1 lecture, 1 laboratory. Prerequisite: FNR 305 or FNR 332 or consent of instructor.

#### FNR 440 Watershed Management (3)

Concepts of the hydrologic cycle and measurement of its components. Streamflow with emphasis on surface water behavior as affected by land management practices. Saturday field trips required. 2 lectures, 1 laboratory. Prerequisite: FNR 304 and SS 121.

## FNR 441 Forest and Range Hydrology (3)

Influence of forest and range vegetation on wildland water resources for optimum production and regulation of water yields. Hydrograph analysis. Techniques for managing wildlands for increases in usable water yields and predicting impacts of land management practices. Analytical evaluation and prediction of watershed disturbances. Overnight field trips required. 2 lectures, 1 laboratory. Prerequisite: FNR 440.

#### FNR 442 Watershed Protection (2)

Watershed protection and rehabilitation, erosion, sedimentation and other water quality aspects of land use. Sampling techniques, landslide evaluation, cumulative watershed impacts. 1 lecture, 1 laboratory. Overnight field trips required. Prerequisite or concurrent enrollment in: FNR 440.

### FNR 450 Community Forestry (3)

Development and management of the urban/wildland interface. Socio-economic problems related to forest tree establishment, care, and harvest utilization. International implications also covered. Weekend or full-day field trips required. 2 seminars, 1 laboratory. Prerequisite: FNR 350 or consent of instructor.

#### FNR 461, 462 Senior Project (3) (3)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 180 hours total time.

#### FNR 463 Undergraduate Seminar (1)

Study and oral presentation of current developments and problems in the subject field. Discussion of recent findings and research and their application. 1 seminar.

## FNR 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

## FNR 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

## FNR 500 Individual Study (1-3)

Advanced independent study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Total credit limited to 4 units. Prerequisite: Graduate standing and consent of department head.

## FNR 502 Resource Conservation (3)

Conservation, planning and administration for broad treatment of land, water, mineral, forest, range, and wildlife resources. 3 seminars. Prerequisite: Graduate standing and consent of instructor.

## FNR 503 Tropical Forest Ecosystem Management (3)

Tropical forest ecosystem classification, function and limitations. Applied tropical forest management systems; tropical problems, management, and political strategies; over-grazing and desertification; overcutting and fuelwood shortages. 3 seminars. Prerequisite: Graduate standing or consent or instructor.

#### FNR 504 Agroforestry Systems (2)

Principles and practical applications of tree crop systems which are managed to provide fuel, fiber, fodder, and food. Tree crop identification and tree product uses. Plantation design, establishment, and cultural practices. Soil management. Integration of forest, and range management practices and values. Special applications to tropical forest ecosystems. 2 lectures. Prerequisite: Graduate standing or consent of instructor.

## FNR 506 World Forestry in Social Context (2)

Problems in design and implementation of technical assistance projects. How social elements impact technical aspects of development programs. Social forestry, community development and extension techniques to coordinate social and technical aspects of development. International development aspects of social forestry. 2 lectures. Prerequisite: FNR 504 or consent of instructor.

#### FNR 521 Natural Resources Management for Educators (3)

Philosophy (theoretical and applied) of natural resource management strategies functioning in today's environment. Ecological principles applicable to specific resource components as they relate to the present perception of today's resource base, use demands and projected utilization. 3 seminars. Prerequisite: Graduate standing.

## FNR 570 Selected Topics in Forest Resources (1-3)

Directed group study of selected topics for advanced students. *Class Schedule* will list topic selected. Total credit limited to 9 units. 1–3 seminars. Prerequisite: Graduate standing or consent of instructor.

#### FNR 571 Selected Topics in Forest Resources Laboratory (1-3)

Directed group laboratory of selected topics for advanced students. *Class Schedule* will list topic selected. Total credit limited to 9 units. 1–3 laboratories. Prerequisite: Graduate standing and consent of instructor.

## FNR 581 Graduate Seminar in Forest Resources (3)

Group study of selected developments, trends and problems in the field of forest and natural resources. 3 seminars. Prerequisite: Graduate standing.

#### FNR 599 Thesis (1-9)

Individual research in forest or natural resources management under the general supervision of faculty, leading to a graduate thesis. Prerequisite: Graduate standing and consent of instructor.

## FORL-FOREIGN LANGUAGE

## FORL 101, 102, 103 Foreign Language (4) (4) (4)

Organized group instruction arranged for students who wish to acquire basic skill in a foreign language indicated by subtitle. Laboratory drill required. Language taught in its cultural context. To be taken in numerical sequence. 3 lectures, 1 activity.

## FORL 303 Culture (3)

Aspects of cultures of the French-, German-, or Spanishspeaking peoples. History, society, political movements, art, music and literature are discussed. Topic and language of instruction vary to provide specific focus. 3 lectures. Prerequisite: FR, GER or SPAN 202, depending on language offered, equivalent, or consent of instructor.

## FORL 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units. Prerequisite: Consent of department head.

## FORL 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

## **FR-FRENCH**

## FR 101, 102, 103 Elementary French (4) (4) (4)

For beginners. Class practice and assigned outside work in pronunciation, sentence structure, reading, writing, and basic conversation. Laboratory drill required. Language taught in its cultural context. Credit not available for students who have completed FR 104. To be taken in numerical sequence. 3 lectures, 1 activity.

## FR 104 Intensive Elementary French (12)

Class practice in pronunciation, syntax, reading, writing and conversation including appropriate cultural information. Offered in summer only. Laboratory drill required. 9 lectures, 3 activities.

## FR 201, 202 Intermediate French (4) (4)

Review of French grammar and practice in writing and oral expression based on social and cultural values. 3 lectures, 1 activity. Prerequisite: FR 103 or consent of instructor.

## FR 233 Critical Reading in French Literature (4)

GEB C.1.

Selected readings in French from major Francophone authors that show the French literary tradition from the Middle Ages to the present in both France and other French-speaking countries. Includes such works by Medieval, Renaissance, Classical, Romantic, post-Romantic, and 20th Century writers as Crétien de Troyes, Rabelais, Molière, Voltaire, Flaubert, Proust, Gide, Sartre, Camus. 4 lectures. Prerequisite: FR 202.

# FR 301 Advanced French Composition and Grammar (4)

Oral and written development of structural grammar, syntax and complex components of French. Expansion of vocabulary and idiomatic expressions through text study. Translation from English to French and written composition. 4 lectures. Prerequisite: FR 202 or equivalent, or consent of instructor.

# FR 302 Advanced French Conversation and Grammar (4)

Topics based on student interest. Outlines and/or abstracts constitute written assignments. Individual presentations to elicit spontaneous response. Group presentations to allow cooperative research and preparation. 4 lectures. Prerequisite: FR 202, or consent of instructor.

## FR 305 Significant Writers in French (4) GEB C.3.

Critical analysis and oral discussion of poetry, essays, novels, plays. Each course will have a subtitle descriptive of the content. May be repeated to 12 units. 4 lectures. Prerequisite: FR 233 or equivalent.

## FR 405 French Literature in English Translation (4) GEB C.3.

Selected works to be read by students in the original or in English translation. Critical analysis, interpretation, and comparison of individual works by outstanding French writers. Lecture in English. *Class Schedule* will list topics selected. Total credit limited to 8 units. 4 lectures. Prerequisite: One literature course or consent of instructor.

## FR 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

## **FRSC-FRUIT SCIENCE**

## FRSC 100 Enterprise Project (1-4) (CR/NC)

Selection and completion of a management/production project under faculty supervision. Project participation is subject to approval by the department head and the Cal Poly Foundation. Degree credit limited to 12 units. Credit/No Credit grading only.

## FRSC 123 Beekeeping (3)

Practical studies and exercises in the handling of European honey bees with special reference to pollination of commercial crops. Honey processing and marketing. Hive inspection and disease detection. 2 lectures, 1 laboratory.

## FRSC 131 Pomology (4)

History and outlook for California fruit growing. General principles of fruit production. Field laboratories in orchard management practices, tree and fruit identification, harvesting, grading and packing of university orchard products. Field trip required. Miscellaneous course fee may be required–see *Class Schedule*. Not open to students with credit in FRSC 230. 3 lectures, 1 laboratory.

## FRSC 132 Pomology (4)

Training and pruning of deciduous fruits. Culture of pome, stone and miscellaneous fruit species. Saturday lab may be required. 3 lectures, 1 laboratory. Prerequisite: FRSC 131.

## FRSC 133 Pomology (4)

Production practices common to deciduous nut crops produced in California. Normal spring cultural problems including thinning and spraying. Small fruit culture. 3 lectures, 1 laboratory. Prerequisite: FRSC 132.

## FRSC 230 California Fruit Growing (4) GEB F.2.

Production practices, areas of production, suitable varieties, harvest and processing of important deciduous and subtropical fruit crops. Methods of propagation and training. Field trip required. Miscellaneous course fee may be required-see *Class*  *Schedule.* Not open to students with credit in FRSC 131. 3 lectures, 1 laboratory.

### FRSC 231 Viticulture (4)

Growing wine, raisin and table varieties of grapes. Techniques in harvesting and handling, utilizing the university planting. 3 lectures, 1 laboratory.

#### FRSC 331 Advanced Viticulture (4)

Commercial production practices, mechanization and processing. Utilization of university vineyards for propagation, planting, training and pruning of grape vines. 3 lectures, 1 laboratory. Prerequisite: FRSC 231.

## FRSC 332 Fruit Plant Propagation (4)

Propagation by seed, cuttings, layering, grafting, and budding. Rootstocks for deciduous fruits, commercial nursery practices. Miscellaneous course fee may be required-see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: FRSC 100-or 200-level course or consent of instructor.

#### FRSC 342 Citrus and Avocado Fruit Production (4)

Growing and marketing oranges, lemons, grapefruit, tangerines, limes and avocados. Minor citrus species, rootstocks and ornamental types included. Orchard practice. Field trip to a major California production area required. Miscellaneous course fee may be required-see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: FRSC 131 or FRSC 230, or consent of instructor.

#### FRSC 421 Postharvest Technology of Horticultural Crops (4) (Also listed as VGSC 421)

Harvesting methods and procedures; current handling and packaging techniques. Containers, precooling, refrigerated and controlled atmosphere storage. Postharvest physiology of fresh market commodities. Field trip to major California production areas required plus local grower visits. Miscellaneous course fee may be required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: One production class in either fruits, vegetables or ornamentals, or consent of instructor.

#### FRSC 422 Tropical Crop, Fruit and Nut Production (4) (Also listed as CRSC 422)

Production, distribution and utilization of major agronomic, vegetable, fruit and nut crops of economic importance in tropical areas. 3 lectures, 1 laboratory. Prerequisite: CRSC, FRSC or VGSC 100/200-level course, or consent of instructor.

#### FRSC 436 Orchard Management (4)

Organization and management of labor and equipment in field and processing operations. Production problem analysis. Advanced work in production management. Job instruction training. 3 lectures, 1 laboratory. Prerequisite: FRSC 421.

## FRSC 581 Graduate Seminar in Fruit Production (3)

Group study of current problems of fruit production; current experimental and research findings as applied to production and marketing. 3 seminars. Prerequisite: Graduate standing.

## FSN-FOOD SCIENCE AND NUTRITION

## FSN 100 Enterprise Project (1-4) (CR/NC)

Selection and completion of a management/production project under faculty supervision. Project participation is voluntary and subject to approval by the department head and the Cal Poly Foundation. Degree credit limited to 12 units. Credit/No Credit grading only.

#### FSN 101 Orientation to Food Science and Nutrition (1) (CR/NC)

Understanding the depth and breadth of the Food Science and Nutrition Department, the major programs and the university. Emphasis on curriculum and career planning. Food Science and Nutritional Science students are required to complete this course within their first year in the major. Credit/No Credit grading only. 1 lecture.

#### FSN 150 Food Quality Inspection (3)

Food laws and safety regulations concerning the food industry and consumer protection. Fundamental principles and procedures for inspecting foods based upon federal, state and industry standards. Credit not allowed for Food Science majors. 3 lectures.

#### FSN 170 Introductory Food Science (4)

Principles and practices of food science and technology. Ingredient properties, methods of preservation, handling and processing of foods representing the major food groups. 3 lectures, 1 laboratory.

## FSN 200 Special Problems for Undergraduates (2-3) (CR/NC)

Individual investigation, research studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Credit/No Credit grading only. Prerequisite: Consent of department head.

## FSN 209 Meat Procurement and Use (3)

Selection, identification and cutting of meat. Physical and chemical composition of meat and its relationship to flavor, tenderness, nutritional value and related subjects. Meat inspection and grading. Credit not allowed for students having completed in FSN 211. 2 lectures, 1 laboratory.

#### FSN 210 Nutrition (3) (Also listed as HE 210) GEB E.2.

Nutrition as it relates to health throughout the life cycle, with emphasis on the young adult. 3 lectures.

#### FSN 211 Meats (3)

Meat industry processing methods and operations. Practice in slaughtering and cutting beef, pork and lamb. Meat inspection, grading, composition, curing, preservation and related topics. Credit not allowed for students having completed FSN 209. 2 lectures, 1 laboratory.

#### FSN 212 Meat Grading and Evaluation (2)

Factors related to carcass quality and yield. USDA meat grading principles and practices. Judging of carcass and wholesale cuts. Field trip to meat packing plants required. 1 lecture, 1 laboratory. Prerequisite: FSN 211.

#### FSN 217 Fundamentals of Food Processing Operations (4)

Introduction to the processing aspects of food plant operations and equipment. Relationship between unit operations and processes as well as equipment operations, adjustment, and maintenance. Calculations dealing with basic fundamentals of food processing operations. 3 lectures, 1 laboratory. Prerequisite: FSN 170, MATH 118, PHYS 104.

## FSN 230 Elements of Food Processing (4)

Principles of unit operations in food processing covering canning, freezing, dehydration, fermentation and concentration. Food quality and spoilage. For non-Food Science majors only. 3 lectures, 1 laboratory.

## FSN 301 Unit Processing Operations I (4)

Applied food manufacturing and processing technology emphasizing thermal process operations. Major processes discussed are retort operation, osmotic preservation, extraction and filtration. Product formulation and material balances. Students produce processed foods in a pilot plant. Field trip may be required. 3 lectures, 1 laboratory. Prerequisite: FSN 217.

## FSN 302 Unit Processing Operations II (4)

Continuation of FSN 301. Application of various processing operations to different product systems. Water removal in foods (evaporation, vacuum concentration, dehydration), heat removal (refrigeration and freezing), freeze drying and freeze concentration. Small scale food processing and group projects. Field trip may be required. 3 lectures, 1 laboratory. Prerequisite: FSN 301.

## FSN 310 Maternal and Child Nutrition (3)

Nutritional requirements from conception to adolescence; role of nutrition in normal development. 3 lectures. Prerequisite: FSN 210, sophomore standing.

## FSN 315 Nutrition in Aging (3)

Nutrition as it relates to the middle and later years, with emphasis on the elderly. 3 lectures. Prerequisite: FSN 210, junior standing.

## FSN 328 Advanced Nutrition I (3)

Metabolism of carbohydrates, fats and proteins as it applies to human nutrition. Evaluation of nutritional status. 3 lectures. Prerequisite: FSN 210, CHEM 328, ZOO 332.

## FSN 329 Advanced Nutrition II (3)

Continuation of FSN 328. Biochemical and physiological functions of vitamins and minerals and their interactions with other nutrients. Current topics in nutrition research. 3 lectures. Prerequisite: FSN 328.

## FSN 331 Principles of Food Plant Sanitation (3)

Organization, management and operation of a food plant sanitation and waste disposal program. Field trips required. 3 lectures. Prerequisite: FSN 302 or FSN 230 and consent of instructor.

## FSN 332 Statistical Quality Control (3)

Application of statistical methods in quality control programs and evaluation of operations in food industry. Calculator required. 3 lectures. Prerequisite: STAT 211, junior standing or consent of instructor.

## FSN 333 Food Quality Control (4)

Chemical, microbiological and physical methods of analyses of foods used in the food plant quality control and product development laboratory. Hazard analysis and critical control point principles for food production. Organization and management of quality control program. Development of food production standards. 3 lectures, 1 laboratory. Prerequisite: FSN 302, CHEM 326, or FSN 230 and consent of instructor.

## FSN 336 Food Packaging (3)

Packaging materials, packages and packaging methods applicable to a variety of processed and prepared foods. Field trip may be required. 3 lectures. Prerequisite: FSN 302 or FSN 230 and consent of instructor.

## FSN 338 Meat Processing (3)

Manufacturing of further processed meats including curing, fermenting, restructuring, smoking and cooking. Product formulation, use of equipment and product evaluation. Field trip required. 2 lectures, 1 laboratory. Prerequisite: FSN 209 or FSN 211.

## FSN 339 Cereal, Bakery and Snack Food Technology (3)

Applied technology of producing cereal, bakery items, sheeted and extruded snack food products. Milling of various flours. Functional properties of ingredients used and their effect on product quality. Comparative nutritional properties also discussed. Field trips may be required. 3 lectures. Prerequisite: FSN 302 or FSN 230 and consent of instructor.

## FSN 341 Wines and Fermented Foods (3)

Processing, manufacturing and bio-technical applications of fermentation technology for the production of food products. Wine, beer, pickles, olives and other fermented food products important to the post-harvest economy of California. Field trip may be required. 3 lectures. Prerequisite: Junior standing.

### FSN 400 Special Problems for Advanced Undergraduates (2-4) (CR/NC)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 4 units per quarter. Credit/No Credit grading. Prerequisite: Consent of department head.

## FSN 407 Food Composition Science (4)

Chemical and physical properties of food ingredients. Function and properties of carbohydrates, proteins, fats, pigments and other food ingredients used in the formulation and processing of foods. 3 lectures, 1 laboratory. Prerequisite: FSN 302, CHEM 328, senior standing or consent of instructor.

## FSN 409 Sensory Evaluation of Food (4)

Characteristics of food color, consistency, texture and flavor. Sensory difference and consumer acceptance testing methods. Panel training and selection techniques. Problem solving, statistical analysis of data, and management reporting methods. 3 lectures, 1 laboratory. Prerequisite: FSN 302, STAT 211.

## FSN 410 Nutritional Aspects of Food Processing (3)

Effects of food manufacturing practices on the nutritional quality of food products. Kinetics of nutrient losses. New developments in research and technology in the field. 3 seminars. Prerequisite: Senior standing, one course in Food Processing, FSN 329, or consent of instructor.

## FSN 412 Experimental Nutrition (2)

Nutrient requirements and their evaluation. Quantitative laboratory techniques used in nutrition research. 2 laboratories. Prerequisite: FSN 329.

## FSN 415 Methods of Teaching Nutrition (3)

Selection of valid content and learning activities for a variety of teaching situations and strategies in the classroom, community, or clinic setting. Writing of measurable objectives and the utilization of appropriate motivational and evaluation techniques. Activity designed to prepare students to teach nutrition at all stages of the life cycle. 2 lectures, 1 activity. Prerequisite: FSN 329, EDUC 305, and senior standing.

## FSN 416 Community Nutrition (3)

Focus on community nutrition problems and methods of solving these problems. Government and private programs involved in the solutions. Development of skills in communication, assessment, and planning needed by the community nutritionist. 2 lectures, 1 activity. Prerequisite: FSN 415.

### FSN 425 Quantity Food Preparation (3)

Economic principles and problems involved in planning and preparing food using institutional equipment to meet specific product standards for large groups. 1 lecture, 2 activities. Prerequisite: HE 321, MGT 206 and senior standing.

## FSN 426 Food Systems Management (3)

Principles of successful organization and management with their application to the effective operation of food service. Administrative responsibilities of the food service manager. Advance reservation with instructor required. 3 lectures. Prerequisite: HE 321, MGT 312, MGT 314 and senior standing.

#### FSN 427 Equipment and Layout (3)

Selection, maintenance, and arrangement of equipment and furnishings for food service departments with emphasis on materials, construction, and specifications. Designated field trips required. 2 lectures, 1 laboratory. Prerequisite: FSN 426, HE 321, and senior standing.

## FSN 429, 430 Diet Therapy I, II (3) (3)

Modification of normal food intake and dietary patterns, with emphasis on dietary adjustments necessitated by certain disease processes and conditions. 2 lectures, 1 laboratory. Prerequisite: FSN 328, FSN 329 and senior standing; 430: FSN 429.

## FSN 431 Advanced Meats (3)

Physical and chemical properties of meats and meat products. Quality control and special problems associated with the processing and distribution of meats. 2 lectures, 1 laboratory. Prerequisite: Junior standing, FSN 209 or FSN 211.

## FSN 435 Food Engineering (4)

Principles of material and energy balance as applied to food processing systems. Calculations regarding energy requirements, heat transfer, refrigeration and freezing systems, and pumping heads. Food processing control points, critical path methods, evolutionary operations, and machinery efficiency. 4 lectures. Prerequisite: FSN 302.

### FSN 436 Food Laws and Regulations (3)

Federal, state, and local laws and regulations to include case law history affecting the production, processing, packaging, marketing, and distribution of food and food products. 3 lectures. Prerequisite: FSN 302, senior standing.

#### FSN 437 Advanced Food Processing (4)

Advanced treatment of processing operations with emphasis in heat transfer, physical and chemical changes in foods as a function of processing conditions. Field trip may be required. 3 lectures, 1 laboratory. Prerequisite: FSN 435.

## FSN 440 Internship (1-12)

Career experience with private or public agencies. For Nutritional Science majors only. Total credit limited to 12 units. Maximum of 8 units may be applied toward degree requirements. Prerequisite: FSN 329, FSN 415 (or concurrent) and junior standing and consent of instructor.

## FSN 461, 462 Senior Project (3) (3)

Selection and completion of research related to the student's area of interest. Project requires a formal report which must follow departmental guidelines. Minimum of 180 hours required. Prerequisite: ENGL 215 or ENGL 218 and senior standing.

## FSN 463 Undergraduate Seminar (2) (CR/NC)

Exploration of students' career opportunities and factors to be considered in career decisions. Recommended enrollment not more than 3 quarters prior to graduation. Credit/No Credit grading only. 2 seminars. Prerequisite: Senior standing.

## FSN 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Senior standing.

## FSN 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Senior standing.

## FSN 501 Lipid Metabolism and Nutrition (3)

Normal and abnormal lipid metabolism in relation to human nutrition at physiological and biochemical levels. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

# FSN 581 Graduate Seminar in Food Science and Nutrition (3)

Current findings and research problems in the field and their application to food science and nutrition. *Class Schedule* will list topic selected. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

## **GEOG-GEOGRAPHY**

## GEOG 150 Human Geography (3)

GEB D.4.a.

Introduction to the basic concepts and content of human geography. Survey of the field with emphasis on the cultural universals of language, religion, systems of government, and economic activities. 3 lectures.

#### GEOG 215 Human Impact on the Earth (3)

Global assessment of human impact upon vegetation, animals, soils, water and atmosphere. Emphasis on problems stemming from the interactions of technology, population growth and natural resources. 3 lectures.

### GEOG 250 Physical Geography (3)

Emphasizes the origins of the earth's physical diversity. Seeks to account for the distribution and interrelationships of the earth's diverse patterns of climate, landforms, vegetation and soils. 3 lectures.

## GEOG 305 Political Geography (3)

Spatial influences on man's political behavior. Geopolitics. boundaries, significance of resources on power politics, internal spatial structure of the nation-state, relationships between nation-states. 3 lectures. Prerequisite: Junior standing.

#### GEOG 308 Global Geography (3)

### GEB D.4.b.

Survey of principal elements of global geography. Interrelations of human activities and natural elements as related to international developments and trends. Focus on selected regional examples. 3 lectures. Prerequisite: Junior standing.

## GEOG 310 Urban Geography (3)

Presentation of geographic concepts, principles, and generalizations related to urban functions, forms, distribution, and growth. Location, areal extent, and interaction among the various urban functions. 3 lectures. Prerequisite: Junior standing.

## GEOG 315 Geography of Resource Utilization (3)

World view of the interconnections of the following resource systems: food, energy, water and nonfuel minerals. Pervading theme: causes and characteristics of the great disparities in global living standards. 3 lectures. Prerequisite: Junior standing.

## GEOG 320 Geography of Hunger (3)

Geographic analysis of the world problem of hunger that considers the factors of environmental deterioration, energy deficiencies, the Green Revolution, and rapid population growth. Underdeveloped world and the cultural and physical restraints it must overcome to adequately feed a growing population. 3 lectures. Prerequisite: Junior standing.

## GEOG 325 Climate and Humanity (3)

Geographic perspective on the interrelationships between climate and humanity. Effects of people on climate and the influence of climate and weather upon human activities and behavior. Focus on global human conditions which are responsible for the alteration of climate and in turn are vulnerable to climate change. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## GEOG 340 Geography of California (3)

Physical environment of California; patterns of settlement and economic development; current problems. 3 lectures. Prereguisite: Junior standing.

## GEOG 350 Geography of the United States (3)

People, land utilization, and economic development viewed against the background of the physical environment. Topically and regionally organized. Pervading themes include current problems and regional cultural distinctiveness. 3 lectures. Prerequisite: Junior standing.

## GEOG 401 Area Geography (3)

Detailed study of geographic characteristics of a selected world area. Class Schedule will list topic descriptive of the particular world area to be studied. Total credit limited to 12 units. 3 lectures. Prerequisite: Junior standing.

## GEOG 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1-3 lectures. Prerequisite: Consent of instructor.

## **GEOL-GEOLOGY**

## **GEOL 201** Physical Geology (3)

GEB B.1.a.

Processes responsible for the Earth's rocks, structure and surface features. Volcanism, mountain building, plate tectonics, weathering, erosion and deposition by streams, glaciers, wind and waves. 3 lectures.

## GEOL 203 Fossils and the History of Life (3)

GEB B.1.a.

Fossil record. Mechanisms and patterns of evolution. Adaptation of ancient organisms to their environments. Fossils in the interpretation of Earth history. Important events in the history of life. Historical development of the major groups of invertebrates, vertebrates, and plants. 3 lectures.

#### **GEOL 204** Geologic History of California (3) GEB B.1.a.

Development of California through geologic time. Where and why the rocks appeared. Movement on faults, and mountain building. Geologic processes at work today and yesterday. Relationship of California geology to the rest of the world. 3 lectures. Prerequisite: GEOL 201 recommended.

## **GEOL 205** Earthquakes and Earth Hazards (3)

GEB B.1.a.

Plate tectonics, seismicity and faulting. Quake mechanisms, intensity and magnitude. Measurement and prediction. History. Prevention and planning. Related geological effects. 3 lectures.

#### **GEOL 206** Geologic Excursions (1) (CR/NC)

GEB B.1.a.

**GEB B.1.a.** 

Field trips to places of geologic interest. Class Schedule will indicate destinations. Students must provide their own transportation, food, and camping equipment. May be repeated for a maximum of 3 units provided field trips are taken to different locations. Credit/No Credit grading only. 1 laboratory. Recommended prerequisite or concurrent: GEOL 201 or GEOL 204.

## **GEOL 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. Prerequisite: GEOL 201 recommended.

## GEOL 211 Cities and Geology (3)

Relation of city sites to geology. Planning and geology. Hydrogeology. Foundations of cities. Excavations. Building materials. Urban geological hazards. Case histories and lessons for the future. 3 lectures.

**GEOL 241** Physical Geology Laboratory (1) GEB B.1.a. Properties and identification of minerals and rocks. Topographic maps and landform analysis. Geologic maps and interpretation of rock structure. 1 laboratory. Prerequisite or concurrent: GEOL 201.

## **GER-GERMAN**

## GER 101, 102, 103 Elementary German (4) (4) (4)

For beginners. Class practice in pronunciation, sentence structure, reading, writing and basic conversation. Laboratory drill required. Language taught in its cultural context. To be taken in numerical sequence. 3 lectures, 1 activity.

### GER 201, 202 Intermediate German (4) (4)

Review of German grammar and practice in writing and oral expression based on social and cultural values. 3 lectures, 1 activity. Prerequisite: GER 103 or consent of instructor.

## GER 233 Critical Reading in German Literature (4)

GEB C.1.

Selected readings in German from major German-speaking authors that show the German literary tradition from the Middle Ages to the present in Germany and other Germanspeaking countries. Includes works by such Medieval, Renaissance, Classical, Romantic, post-Romantic, and 20th Century writers as Wolfram von Eschenbach, Luther, Schiller, Goethe, Rilke, Mann, Böll and Brecht. 4 lectures. Prerequisite: GER 202.

#### GER 301 Advanced German Composition and Grammar (4)

Oral and written development of structural grammar, syntax and complex components of German. Vocabulary expansion and idiomatic construction. Written compositions. Translations to examine linguistic and semantic differences. 4 lectures. Prerequisite: GER 202, or equivalent, or consent of instructor.

#### GER 302 Advanced German Conversation and Grammar (4)

Topics based on student interest. Oulines and/or abstracts constitute written assignments. Individual presentations to elicit spontaneous response. Group presentations to allow cooperative research and preparation. 4 lectures. Prerequisite: GER 202 or consent of instructor.

### GER 305 Significant Writers in German (4) GEB C.3.

Critical analysis and oral discussion of poetry, essays, novels, and plays. *Class Schedule* will list topic selected. Total credit limited to 12 units. 4 lectures. Prerequisite: GER 233 or equivalent.

### GER 405 German Literature in English Translation (4) GEB C.3.

Selected works to be read by students in the original or in English translation. Critical analysis, interpretation, and comparison of individual works by outstanding German writers. Lecture in English. *Class Schedule* will list topics selected. Total credit limited to 8 units. 4 lectures. Prerequisite: One literature course or consent of instructor.

## GER 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

## **GRC-GRAPHIC COMMUNICATION**

## GRC 101 Introduction to Graphic Communication (4)

Graphic communication history, theory, processes, management and industry segments. Reproduction technology from a systems concept showing fundamental relationships between art and copy preparation and reproduction of print media. 4 lectures.

#### GRC 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

### GRC 204 Introduction to Printing Management (3)

Printing industry structure and business practices. Small business startup. Functional activities of a printing business. Applied organizational and management theory. 3 lectures.

### GRC 223 Copy Preparation (3)

Preparation of line and tone copy for the reproduction processes. Designing roughs and visuals and preparation of singleand multi-color mechanicals. Production planning. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 laboratory.

#### GRC 300 Typography (4)

Typographic principles, practice and layout of electronic display and text composition. Type classification, identification, and selection. Copyfitting and mark-up systems. Finer points of spacing. Miscellaneous course fee required-see *Class Schedule.* 2 lectures, 2 laboratories. Prerequisite: ENGL 215 or ENGL 218.

## GRC 301 Electronic Publishing Systems (3)

Typesetting, composition, and desktop publishing systems. Types of hardware and software used. Output devices common to the graphic communication industry. PostScript and its role in electronic publishing systems. Scanners, color capabilities of desktop systems, industry standards, and system evaluation. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: GEB area F.1. requirement and GRC 300.

### GRC 302 New Technologies in Graphic Communication (3)

New graphic communication technologies that are impacting the methods and procedures of producing and distributing print media. Application of computers and electronics, laser beams, telecommunication, photo-optics, integrated systems, robotics, and related technologies. Prerequisite: GRC 101 and junior standing.

#### GRC 307 Color: Theories and Applications (3)

Application of color theories from the sciences and arts to the color producing industries of printing, photography, television, textiles, paints, and plastics. Color technology for communication through images, products, and the environment. 3 lectures. Prerequisite: Junior standing.

#### GRC 311 Substrates and Ink (3)

Technical aspects of paper, other substrates, and ink used in the printing industry. Manufacture, computerized densitometric and performance testing, and interaction of these materials are examined in relation to particular processes and end use requirements. 2 lectures, 1 laboratory. Prerequisite: CHEM 122.

#### GRC 322 Advanced Typography (2)

Typographic principles, practice and design of complex text, display and tabular composition for mass print media. Copy markup and layout procedures for electronic composition, with consideration of printing process requirements. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 1 laboratory. Prerequisite: GRC 300.

## GRC 323 Pre-Separated Art for Camera (3)

Manual preparation and separation of line and continuous tone images for multicolor reproduction. Preparation of complex full-color mechanical layouts. Programmable, computer driven cameras, for half-tone and line copy manipulation. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 2 laboratories. Prerequisite: GRC 223.

## GRC 324 Finishing Processes (3)

Imposition techniques, cutting, folding, and use of computers in determining complex impositions for finishing processes. Stitch, case and perfect binding techniques and applications. Operational and aesthetic uses of die cutting, scoring, creasing, foil stamping and embossing techniques. Miscellaneous course fee required–see *Class Schedule.* 2 lectures, 1 laboratory. Prerequisite: GRC 101.

## GRC 326 Printing Equipment Management (3)

Procedures in designing, maintaining and decision making for printing equipment including pneumatics, hydraulics, mechanical and electrical systems. Pollution, safety and training in the graphic communication industry. 2 lectures, 1 laboratory. Prerequisite: GRC 101 and junior standing.

## GRC 327 Graphic Arts Photography (4)

Optical and electronic methods of graphic arts photography. Photographic materials and equipment for the graphic arts. Densitometry, light sources, exposure and development control. Line halftone, and color separation theory and practice. Color scanners and color electronic prepress systems. Miscellaneous course fee required-see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: GRC 101.

## GRC 328 Image Assembly and Platemaking (3)

Planning for lithographic press plates. Conventional and computerized ruling, scribing, opaquing, and retouching negatives and positives. Preparation of supports for black and white and color imaging using manual and computerized methods. Image assembly for large presses. Black and white and color proofing techniques. Preparation of various offset plates. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: GRC 101.

## GRC 331 Color Quality Control (4)

Color sciences and quality control techniques as they relate to the printing and allied industries. Application of color theory to color reproduction, color control, print inspection, process control, and quality measurement. Use of instruments to quantify color properties. 3 lectures, 1 laboratory. Prerequisite: GRC 327 or consent of instructor.

## GRC 333 Plant Layout Analysis (3)

Elements of printing plant site selections, equipment planning, inventory planning, and workflow optimization. Design and layout of printing plants for effective space utilization. Organization of plant services. 2 lectures, 1 activity. Prerequisite: Junior standing, GRC 101 and MATH 117, or MATH 118, or MATH 120.

## GRC 335 Line and Halftone Media (4)

Preparation and evaluation of original art copy for commercial use. Laboratory problems in drawing and layout for single and multiple color runs. Various approaches to registration through computer generated images and conversions. Use of color and texture in art copy. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: GRC 323.

## GRC 357 Screen Printing Technology (2)

Flexibility and directness of screen printing technology; frame, ink, fabric and stencil technology as they relate to printing characteristics. Mechanical art-registration tolerances; commercial production practices; screen printing presses and their applications. Safety and environmental consideration. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 1 laboratory. Prerequisite: GRC 328.

## GRC 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

## GRC 401 Printing Marketing and Sales (3)

Printing marketing and sales management. Graphic communication market determination, market strategy, and implementation. Salesmanship, sales forecasting techniques for printed products. 2 lectures, 1 laboratory. Prerequisite: GRC 101.

## GRC 403 Printing Estimating (4)

Estimating the cost of various kinds of printed products. Analysis of material, labor and other cost factors. Use of budgeted hour costs and production standards. Computer assisted estimating. 3 lectures, 1 laboratory. Prerequisite: GRC 101 and GRC 311.

## GRC 408 Newspaper and Publications Management (3)

Analysis of newspaper and publications production systems. Organization of the production function. Personnel and industrial problems peculiar to the industry. 3 lectures. Prerequisite: Senior standing.

## GRC 411 Printing Financial Management (3)

Coordination of customer service, sales and estimating functions to printing industry market trends. Estimating for web processes including color impositions. Evaluating printing company profitability using ratio analysis, effective data collection systems and innovative management practices. 3 lectures. Prerequisite: GRC 403 and GRC 416.

## GRC 414 Color Image Assembly (2)

Materials, equipment and facilities required for color image assembly. Registration, masking, chokes, spreads, film duplication and contacting. Use of screen tints in process color, composite film, color proofing, and color electronic pre-press systems. Miscellaneous course fee required-see *Class Schedule.* 1 lecture, 1 laboratory. Prerequisite: GRC 328.

## GRC 415 Sheetfed Lithographic Technology (5)

Theory, practice and applications of sheetfed lithographic technology to the printing industry segments of commercial, books, advertising, catalogs, packaging, reprographics. Computerized press controls, scanning densitometers. 4 lectures, 1 laboratory. Prerequisite: GRC 101 and CHEM 122.

## GRC 416 Web Printing Technology (5)

Web press for lithography, rotogravure, flexographic and letterpress printing. Applications for newspapers, packaging, business forms, magazines, books, catalogs and advertising materials. Applications of computers to the management and technical function of web technology. 4 lectures, 1 laboratory. Prerequisite: GRC 415.

## GRC 417 Advanced Web Printing Technology (2)

Advanced theory and applications of web printing technology to include copy and design reproduction and management decisions as they pertain to the graphic communication field. 2 lectures. Prerequisite: GRC 416.

## GRC 421 Printing Production Management (4)

Production planning, scheduling, and control for printed products. Equipment and inventory planning, resource optimization, and the application of quality management principles to the printing industry. 3 lectures, 1 activity. Prerequisite: GRC 101, and MATH 117, MATH 118, or MATH 120.

## GRC 422 Printing Personnel Management (3)

Applied techniques of printing plant personnel management. Investigation and determination of job descriptions, testing for staff and line employees. Setup of graphic arts in-plant training programs. Evaluation procedures for personnel working in the printing facility. Printing industry association relationships. 2 lectures, 1 laboratory. Prerequisite: GRC 101.

## GRC 423 Printing Labor Relations (4)

Trends in the graphic arts labor movement. Graphic arts labor unions. Collective bargaining and grievance procedures practiced in the printing industry. Administration of the labor contract by printing plant supervisor. Industry-specific case problems. 3 lectures, 1 activity. Prerequisite: GRC 101.

## GRC 427 Desktop Publishing (3)

Personal computers, page makeup, software, laser printers, and other output devices for desktop publishing. The publishing process, implications of desktop publishing on society, terminology, and design basics, creating, editing, transferring, and merging text and graphics. For non-GRC majors. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: GEB F.1. requirement.

## GRC 429 Computer Imaging (3)

Computer imaging systems in graphic communication. Digital typesetting, CAD systems, intergrated pre-press systems, page makeup devices, scanners, monochrome and color terminals, interfacing, and electronic publishing systems. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: GRC 301.

## GRC 432 Imaging Systems Management (4)

Management issues associated with the introduction and use of computerized electronic prepress systems. Strategic, technical, marketing, financial, production, operational, and personnel aspects of color prepress work in a capital-intensive environment. 4 lectures. Prerequisite: GRC 101, GRC 327, and GRC 328.

## GRC 437 Consumer Packaging (3)

Problem-solving strategies for package printing which integrate concepts from management, design and technology. Package manufacturing, function, quality, visual appeal, and economics are addressed. Consumer packaging industry. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: Junior standing.

## **GRC 438** Electronic Art Preparation (4)

Preparation and evaluation of current and experimental typographic images for the major printing processes; pagination and typographic modification by electronic means. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: GRC 301.

# GRC 439 Line and Halftone Media for Books and Publications (4)

Complex and experimental copy and art preparation and their limitations for use in line and halftone reproduction by gravure and offset lithography in book quality paperback and journal reproduction. Mechanical requirements and production procedures, implemented through computer-controlled production equipment. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: GRC 416, GRC 438.

#### GRC 440 Advanced Copy Technology for Newspapers and Magazines (4)

Complex copy preparation in line, tone and color for reproduction by offset, gravure, flexography and letterpress (relief) printing. Print production requirements for high-speed computer controlled reproduction presses. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: GRC 439.

#### GRC 460 Research Methods in Graphic Communication (1)

Research methods for preparing scholarly and defensible papers and senior projects, and in conducting qualitative and quantitative evaluations, testing, and research in graphic communication. Methods covered include statistical, historical, descriptive, questionnaires, interviewing, and sampling. 1 lecture. Prerequisite: Senior standing and STAT 211.

## GRC 461 Senior Project (4)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in formal report. Minimum 120 hours total time. Prerequisite: ENGL 215 or ENGL 218 and senior standing.

## GRC 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

#### GRC 471 Applied Graphic Communication Management Practices (2)

Management theories and practices in the graphic communication industry. Application of theories and practices to the University Graphic Systems as they apply to commercial printing, publication printing, and newspaper industries. Total credit limited to 6 units. 2 seminars. Prerequisite: Consent of instructor.

#### GRC 474 Applied Graphic Communication Practices (2) (CR/NC)

Application of theories and practices to the University Graphic Systems as they apply to commercial printing, publication printing, and newspaper industries. Total credit limited to 18 units, with a maximum of 2 units per quarter. Credit/No Credit grading only. 2 activities. Prerequisite: Consent of instructor.

## GRC 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

## GRC 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

## **GSB-GRADUATE STUDIES-BUSINESS**

## GSB 502 Foundations for Quantitative Analysis (4)

Basic quantitative concepts used in the MBA program. Matrices, linear systems of equations, introduction to calculus. Probability, basic statistical concepts and regression. Use of computer software to solve problems. This course may not be used for credit toward graduation. 4 seminars.

## GSB 511 Financial Accounting (4)

Financial accounting model and accounting systems concepts. Principles and concepts used in preparing published financial statements. Interrelationships among those statements. Analysis and interpretation of their content. 4 seminars.

## GSB 512 Quantitative Analysis (4)

Introduction to matrices and the concepts of statistical analysis. Probability distributions, point and interval estimation of population means, proportions, and variances. Analysis of variance, regression, correlation, multiple regression, time series, and forecasting. Use of computers to solve problems. 3 seminars, 1 laboratory. Prerequisite: GSB 502 or equivalent.

## GSB 513 Organizational Behavior (4)

Examination of major organizational behavior (individual, interpersonal, group, and organizational) concepts, theories and constructs. Presented from an applied perspective with the purpose of increasing one's effectiveness and skill in understanding, analyzing, and managing organizational processes. 4 seminars.

## GSB 514 Business, Government and Society (4)

Analysis from social, economic, political, legal and ethical perspectives of the changing domestic and international environment within which the American business enterprise operates. 4 seminars.

## GSB 521 Managerial Accounting (4)

Managerial accounting with emphasis on communication and information to assist management in planning and control. Development of an operational understanding of cost systems, budgeting concepts, performance evaluation and other quantitative accounting techniques to assist management in planning and control. Accounting data in computer modeling applications. 3 seminars, 1 activity. Prerequisite: GSB 511.

## GSB 522 Management Science (4)

Concepts and techniques of management science. Mathematical programming, decision theory, queuing models, network models, Markov analysis. Game theory. Dynamic programming. Use of computers to solve problems. 3 seminars, 1 laboratory. Prerequisite: GSB 512.

## GSB 523 Managerial Economics (4)

Microeconomic analysis and its application to business decisions. Topics include the use of calculus and other quantitative techniques in economic analysis, market structures, pricing strategies, cost analysis and input selection. Examination of the economic impact of various governmental policies on the business firm. 4 seminars. Prerequisite: GSB 512.

## GSB 524 Marketing Management (4)

Introduction to marketing management. Concepts and principles necessary to plan, direct and control the product, promotion, distribution and pricing strategies of the firm. 4 seminars.

## GSB 531 Managerial Finance (4)

Theories, practices and tools of financial decision making. Topics include financial statement analysis, financial forecasting, valuation, capital budgeting, capital structure, dividends, and an overview of financial markets and institutions. 4 seminars. Prerequisite: GSB 511 and GSB 512.

## GSB 532 Information Systems (4)

Overviews of management information systems and decision support systems. Structure of organizational information systems. Process of information systems development. File processing and integrated data base concept. Data communication and on line distributed systems. Management decision making using computer software packages. Report generation using word processing system. Interactive financial planning systems and the decision support systems. 3 seminars, 1 laboratory. Prerequisite: GSB 511.

## GSB 533 Aggregate Economics (4)

Theoretical framework and empirical dimensions of the aggregate economic environment in which business enterprise must operate. Understanding of national income accounting, monetary and fiscal policies, inflation, unemployment and balance of payments issues in static and dynamic contexts. Develops an ability to understand macroeconomic events in an evolving and interconnected world economy. 3 seminars, 1 activity. Prerequisite: GSB 523.

## GSB 534 Production and Operations Management (4)

Production function and its interaction with other functional areas in an organization. Application of quantitative and statistical methods to planning, control and decision making in operations management. Topics include economics of plant location, logistics, material management, and quality control. 4 seminars. Prerequisite: GSB 522.

## GSB 562 Business Strategy and Policy (4)

Integration of total organization imperatives. Case studies and analysis of problems faced by top management. Strategy and policy formulation as affected by environmental factors, competition, technological development, growth objectives and organizational capabilities. Appraisal of total performance and alternative strategies. 4 seminars. Prerequisite: Must be taken within last 16 units of graduation.

#### GSB 570 Entrepreneurship and Small Business Management (4)

Exploration in entrepreneurship with emphasis on the formation and management of new business ventures. Analysis of typical operating problems of these firms and application of appropriate techniques for their solution. 4 seminars. Prerequisite: GSB 513.

## GSB 571 Organizations and Management (4)

Examination of major theories and conceptual constructs relating to the operating requirements of complex organizations, including manufacturing, service, and nonprofit organizations; historical development of theory and practice; managerial behavior functions and processes. Current issues and actual cases. 4 seminars. Prerequisite: GSB 513.

## GSB 572 Seminar in Organization Design (4)

Organization design approaches, configurations, principles, and processes. Diagnosis and redesign of a wide variety of complex organizations in the public, private, and international sectors. Organization design as an organization development technology. 4 seminars. Prerequisite: Second-year standing.

## GSB 573 Market Research and Planning (4)

Makes the student a knowledgeable user of marketing research information to develop and implement marketing plans. Emphasis on development of ability for using research information to formulate marketing objectives and strategies and to analyze marketing problems in depth. 4 seminars. Prerequisite: GSB 524.

## GSB 574 Seminar in Labor-Management Relations (4)

Exploration of models of labor-management relationships from adversarial to cooperative, in both non-union and union, private and public sectors. Emphasis on labor-management relationships maximizing commitment and performance. Analysis of employee influence. Work organization, reward systems, conflict resolution. 4 seminars. Prerequisite: GSB 513.

## GSB 575 Legal Aspects of Business (4)

Managerial approach to important legal issues affecting business and the market system. Focus on those aspects of law which affect managers directly including contracts, products liability and corporations in perspective; principles of partnership authority, liability, and control; managerial duty and liability to the corporation; public control of managerial activity. 4 seminars.

#### GSB 576 Seminar in Quality and Performance Management (4)

Principles and techniques of quality and performance management as applied to organizations in the private and public sector. Emphasis on competitive implications. Integration of fundamental management techniques, existing improvement efforts, technical tools, and new management technologies focused on continuous organizational improvement. 4 seminars. Prerequisite: GSB 513.

## GSB 577 Advanced Quantitative Business Analysis (4)

Case studies using the concepts of GSB 512 Quantitative Business Analysis and GSB 522 Management Science, applied to selected problems in business and industry. These involve concepts of linear programming, quadratic programming, goal programming and advanced forecasting concepts. Solutions of these models obtained using computers. 3 seminars, 1 laboratory. Prerequisite: GSB 522.

## GSB 578 Management in an International Environment (4)

Impact of international factors on management. Organizational behavioral strategies in the context of differential economic, technological, political and cultural environments. 4 seminars. Prerequisite: GSB 513.

## GSB 579 Manufacturing Strategy (4)

Strategic role of manufacturing in the overall corporate competitive strategy. Matching manufacturing capabilities and marketing needs, capacity planning, matching process technology with product requirements. The experience curve, vertical integration, managing change, CIM, robotics, and managing international production. 4 seminars. Prerequisite: GSB 534.

## GSB 580 Industrial Marketing (4)

Marketing of business goods and services to other businesses, governmental agencies and social institutions by the manufacturer. Market analysis, sales forecasting, product strategy, effective use of sales force and industrial advertising media. 4 seminars. Prerequisite: GSB 524.

## GSB 581 Marketing Management Seminar (4)

Practice in the application of analytical tools and techniques to current and potential marketing problems. 4 seminars. Prerequisite: GSB 524.

## GSB 582 High-Technology Marketing (4)

Emphasis on marketing of high-technology products, processes, systems and services. Strategic high-tech product planning and high-tech new product development in the context of marketing management. Market forecast for a non-existing new high-tech product. 4 seminars. Prerequisite: GSB 524.

## GSB 583 Management of Human Resources (4)

Major functional areas of human resource management, including human resource planning, job analysis, recruitment, selection, performance measurement, employee training and career development, compensation, legal compliance and employee rights. Emphasis on analysis of human resource problems as they arise in real-world settings. 4 seminars. Prerequisite: GSB 513.

## GSB 584 Seminar in Financial Policy (4)

Application of financial theory and models to a variety of financial problems. Analysis and formulation of financial plans developed primarily through the use of cases and other real world examples. Working capital management, investment decisions under conditions of risk, and financing and capital structure decisions. 3 seminars, 1 activity. Prerequisite: GSB 531.

## GSB 585 Seminar in Investments (4)

Stock, bond and options market. Emphasis on operations of markets, the efficient markets hypothesis and portfolio theory. Setting investment objectives and managing portfolios given efficient capital markets. 4 seminars. Prerequisite: GSB 531.

## GSB 586 Financial Institutions and Markets (4)

Structure of money and capital markets and the financial institutions that operate in these markets. Evaluation of con-

temporary thought on the evolving market and institutional arrangements. Emphasis on the management policies of the institution. 4 seminars. Prerequisite: GSB 531.

## GSB 587 International Financial Management (4)

Analysis of the problems facing the financial manager of an international company. Topics include the international monetary system, mechanics of the foreign exchange market, determinants of exchange rates, financing and investment in foreign currencies, trade financing, international capital budgeting, and international working capital management. 4 seminars. Prerequisite: GSB 531.

## GSB 588 Cooperative Education Experience (6) (CR/NC)

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. A maximum of 8 units can be used toward graduation. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor and adviser.

## **GSB 589** Accounting Policy (4)

Role of management in establishing and directing accounting policy. Coverage includes the impact of management decisions on external reporting and taxes and the impact of financial reporting requirements on management decisions. 4 seminars. Prerequisite: GSB 521.

## GSB 590 Seminar in Sociotechnical Systems (4)

Systems theory. Manager's role and functions in managing technology. Organizations as sociotechnical systems. Sociotechnical system theory. Sociotechnical system analysis and design. Managing sociotechnical systems. Design experiments that foster the innovative process. 4 seminars. Prerequisite: GSB 513.

## GSB 591 Industry Analysis (4)

In-depth study of major industry using analytical tools developed in first-year courses. Intensive investigation of the dynamic environment, markets, technology, financial and economic structures, history and other key factors. Further prospects for the industry explored through preparation of a comprehensive forecast. 4 seminars. Prerequisite: Second-year standing.

#### GSB 592 Cooperative Education Experience (12) (CR/NC)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. A maximum of 8 units can be used toward graduation. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor and adviser.

#### GSB 593 Management and Control of Information Systems (4)

Overviews of information technology trends and implications. Information systems (IS) functions and organization. Strategic planning for information systems. Integration of IS plan with corporate strategy. IS administration and control. Management of IS development and computer operations. IS issues in a multinational environment. 3 seminars, 1 laboratory. Prerequisite: GSB 532.

## GSB 594 Future of Business (4)

Examination of the techniques and conclusions of representative future studies by research institutions such as the Rand Corporation, Hudson Institute and The Club of Rome. Analysis of the implications of those conclusions for the operations and role of business in society. 4 seminars. Prerequisite: GSB 514.

## GSB 595 Organization Development and Change (4)

Planned change within complex organizations. Organization development models and interventions, including action research, team development, intergroup conflict, structural, and comprehensive approaches. Design and use of action programs to improve organizational effectiveness. 4 seminars. Prerequisite: Second-year standing.

## GSB 596 Economic Forecasting (4)

Applications to business planning of selected economic forecasting techniques. Classical time series analysis, Box-Jenkins (ARIMA) models, adaptive (Kalman) filtering models, leading indicators and input-output analysis. Use of computers in solving problems. 3 seminars, 1 laboratory. Prerequisite: GSB 533.

## GSB 597 Seminar in Selected Economic Problems (4)

Selected problems analyzed at an advanced level in a particular field, such as international trade, public finance, urban, industrial organization or transportation. 4 seminars. Prerequisite: GSB 533.

#### GSB 598 Graduate Internship in Business (2–8) (CR/NC)

To permit students to correlate experience and academic knowledge. Placement in a supervised work program in a business or public organization. Minimum forty hours of work experience per two units of credit. A maximum of 8 units can be used toward graduation. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor and adviser.

## GSB 599 Individual Research (1--4)

Advanced individual research planned and completed under the direction of a member of the school faculty. Designed to meet the needs of qualified students who wish to pursue investigations which they cannot follow effectively in regularly offered elective courses. Prerequisite: Second-year standing.

## **HD-HUMAN DEVELOPMENT**

#### HD 102 Human Development: Introduction to Issues and Applications (3)

Introduction to Human Development as a multidisciplinary field and to Psychology and Human Development at Cal Poly. Illustrative applications of research and scholarship relating to individual, family, educational, and social issues. 3 lectures.

## HD 103 Pairing and Marriage (3)

Functional approach to contemporary dating and pairing patterns with emphasis on developing communication during the early developmental stages of the paired relationship. 3 lectures.

# HD 108 Child, Family, and Community (3) (also listed as HE 108)

Introduction to individual development and socialization processes from life span and human ecology perspectives with emphasis on interactions among the child, the family and community. Not open to HD majors. 3 lectures.

## HD 109 Parenting (2)

Philosophies and techniques explored out of which an individual can devise an effective parenting style. Basic skills for parent effectiveness. 2 lectures.

## HD 130 Supervised Study of Children (4)

Faculty supervised experience with children ranging in ages from infancy to middle childhood. Participant observation, data collection skills, planning and conducting activities for individuals and groups in educational or childcare facilities. 1 activity, supervision.

## HD 200 Special Problems for Undergraduates (1-3)

Supervised investigation, including a written report, of a topic chosen with prior approval of instructor. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Consent of department head.

# HD 203 Family Development (3) (also listed as HE 203)

Survey of family living at each stage of the life cycle. Emphasis on developmental approach to understanding families, family subsystems, and family developmental tasks, socio-economic and cultural influences, and family differences. 3 lectures.

## HD 228 Program Planning for Infants and Toddlers (3)

Creating an environment to meet the needs of the infant and toddler. Establishing communication in an atmosphere of trust and providing activities which enhance the emerging capabilities of the infant and toddler. 3 lectures. Prerequisite: HD 102, PSY 201 or PSY 202.

## HD 253 Functional and Dysfunctional Family Behavior (3)

Examination of functional and dysfunctional family behavior using a variety of models and dimensions including communication, structure, role, and family systems. 3 lectures. Prerequisite: HD 203.

## HD 296 Infancy (3)

Development and behavior from conception to age three. Characteristic social, physical and sensorimotor behavior patterns of infants and toddlers in relation to the environment. Not open to students who have completed HD 299. 3 lectures. Prerequisite: PSY 201 or PSY 202.

## HD 298 Early and Middle Childhood (3)

Development and behavior of children from age three through age ten. Intellectual, physical, emotional, social, and moral development of the growing child. Not open to students who have completed HD 299. 3 lectures. Prerequisite: PSY 201 or PSY 202.

#### HD 299 Early Development: Conception through Childhood (5)

Development and behavior of children from conception through age ten. Intellectual, physical, emotional, and social development of the growing child as s/he relates to the environment. Not open to students who have completed HD 296 or HD 298. 5 lectures. Prerequisite: PSY 201 or PSY 202, and HD 102 or consent of instructor.

## HD 303 Family Interaction (3)

Examination of the building blocks of family interaction that produce a distinctive family style or set. 3 lectures. Prerequisite: HD 203 and junior standing.

## HD 306 Adolescence (3)

Analysis of the years from prepubescence to young adulthood. Current research on individual development and behavior including interaction patterns with peers, family, and others. Multidisciplinary perspective on the interaction among physical, affective, cognitive, social and historical aspects of the youth culture. 3 lectures. Prerequisite: HD 299 or consent of instructor.

## HD 308 Adulthood (3)

Analysis of the stages of adulthood. Current research on adulthood including interaction patterns with the family, peers, and others, as well as interrelations among physical, cognitive, and social development of the individual. 3 lectures. Prerequisite: HD 306 or consent of instructor.

### HD 310 Early Childhood Learning: Applications for the Preoperational Period (5)

Activities, organizational practices, and methods which promote the development of young children during the preoperational period. 5 activities. Prerequisite: HD 102, HD 130, and PSY 201 or PSY 202, HD 228, HD 299, or consent of instructor.

## HD 311 Early Childhood Learning: Applications for the Transitional Period (5)

Activities, organizational practices and methods which promote children's development during the transitional period. 5 activities. Prerequisite: HD 310.

## HD 324 Guiding Young Children (3)

Group process and guidance techniques for adults working with young children in family, community, and educational settings. Examination of cases which require the application of theory to practical situations typically encountered by adults working with young children. 3 lectures. Prerequisite: HD 130, HD 299, HD 311.

## HD 325 Teaching Young Children (4)

Teaching experience with children aged 3–5 in a campus preschool laboratory setting. Participant planning, execution and evaluation of age-appropriate activities. Use and assessment of a variety of observation and performance evaluation tools. 4 laboratories. Prerequisite: HD 130, HD 324, PE 280.

## HD 330 Supervised Internship (6) (CR/NC)

Faculty-supervised internship in setting for early childhood education students. Role of professional apprentice is experienced and analyzed by each student. Credit/No Credit grading only. Prerequisite: HD 325, PSY 323, PE 280, junior standing and consent of instructor.

## HD 351 American Families: Past, Present, Future (3)

American families from the perspective of understanding how historical change led to the evolution of present day families. 3 lectures. Prerequisite: HIST 204, PSY 201 or PSY 202, SOC 105.

## HD 400 Special Problems for Advanced Undergraduates (1-3)

Supervised investigation, including a written report, of a topic chosen with prior approval of instructor. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Consent of department head.

# HD 401 History and Theories of Childhood Education (3)

Past, present and future perspectives in theory and practice of early childhood education. 3 seminars. Prerequisite: HD 330 or consent of instructor.

## HD 404 Administration of Children's Programs (3)

Organization and administration of programs for young children, preschool and child care centers. Staffing, finance, equipment, records, program evaluations, regulations, public policy and community relations. 3 lectures. Prerequisite: HD 330, HD 401.

### HD 405 Advanced Administration of Child Development Centers (3)

Problems of organization in site-specific child care programs. Personnel and child care legal issues. Finance and tax concerns. Public policy and current research. 3 seminars. Prerequisite: HD 404.

## HD 413 Parent-Child Relationships (3)

Application of major theories to understanding of parent-child relations. Examination of primary prevention strategies and programs. Review of current research and evaluation of literature on parent-child interactions. 3 lectures. Prerequisite: HD 203, HD 298 or HD 299, or consent of instructor.

## HD 421 Developmental Processes (3)

Critical examination of developmental processes in the three major domains of development: psychomotor-physiological, social-affective, and cognitive. Particular attention to the identification, assessment and relevance of specific processes, and to factors that influence and facilitate their development. *Class Schedule* will list topic selected. Total credit limited to 9 units. 3 seminars. Prerequisite: HD 299 or consent of instructor.

## HD 430 Advanced Internship (6) (CR/NC)

Faculty-supervised preprofessional experience in a careerrelated setting which complements the HD 330 internship. Such roles as master teacher, caseworker, therapeutic intern, administrative aide or program specialist are experienced and analyzed by each student. Credit/No credit grading only. Prerequisite: HD or Liberal Studies major, HD 330, and consent of instructor.

# HD 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, HD 296 or HD 299, and EDUC 440 or consent of instructor.

## HD 450 Family Therapy and Crisis Intervention (4)

Basic elements of marriage and family therapy and family crisis intervention. Emphasis on concepts, goals, and techniques of various family therapy approaches and family crisis intervention. 4 lectures. Prerequisite: PSY 307 and HD 253 or consent of instructor.

### HD 453, 454 Supervised Fieldwork (6) (6) (Also listed as PSY 453, PSY 454) (CR/NC)

Supervised fieldwork experience in various community, governmental, and educational settings. Applied psychological, developmental, or educational experiences determined by the participating institution, supervising faculty member, and the student. Maximum of 6 units per quarter. Credit/No Credit grading only. Prerequisite: PSY 323, HD majors, junior standing and consent of instructor.

## HD 461, 462 Senior Project (3) (3)

Selection and completion of a project under faculty supervision. Project must be related to psychology, human or family development fields. Results of the project must be presented in a formal, written report. Minimum of 150 hours total time. Prerequisite: PSY 329, HD 330 or HD/PSY 453, HD major, completion of Graduation Writing Requirement, and consent of instructor.

## HD 463 Senior Seminar (2)

Presentation of student investigations of career and graduate school options. Definition of personal goals. Career and life planning. Student presentations of current issues. 2 seminars. Prerequisite: HD major and senior standing.

## HD 464 Issues in Family Life Education (3)

Examination of the role of family life specialists in relation to the teaching profession, public agencies, and the community. Analysis of issues that impact on the family life educator. 3 lectures. Prerequisite: HD 453, HD 454.

## HD 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

## HD 481 Family Theory (3)

Critical analysis and discussion of the current theories used to explain family behavior including their application in the helping professions and family research. 3 seminars. Prerequisite: Senior standing.

## **HE-HOME ECONOMICS**

## HE 101 Home Economics as a Profession (1) (CR/NC)

Definition, history, career opportunities and future directions for professional home economists. Introduction to the department and the campus. Credit/No Credit grading only. 1 lecture.

# HE 108 Child, Family, and Community (3) (also listed as HD 108)

Introduction to individual development and socialization processes from life span and human ecology perspectives with emphasis on interactions among the child, the family and community. Not open to HD majors. 3 lectures.

## HE 121 Fundamentals of Food (4)

Theoretical aspects and practical applications of the principles of food science and food preparation. Miscellaneous course fee required-see *Class Schedule.* 3 lectures, 1 laboratory. Prerequisite: CHEM 121.

## HE 122 Design Analysis and Presentation (3)

Design elements and principles as they apply to specific areas of home economics: interior design, textiles and clothing, and food presentation. Principles and practices used in merchandise displays. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 activity.

#### HE 131 Apparel Construction (3)

Basic techniques in apparel construction. Emphasis on pattern and fabric selection, fit, and quality construction. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 2 laboratories.

#### HE 200 Special Problems for Undergraduates (1-3)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Consent of department head.

## HE 203 Family Development (3) (also listed as HD 203)

Survey of family living at each stage of the life cycle. Emphasis on developmental approach to understanding families, family subsystems, and family developmental tasks, socio-economic and cultural influences, and family differences. 3 lectures.

#### HE 204 Consumer Policy (3)

Individual and family as consumers in the marketplace. Sources of consumer protection, information, and recourse. 3 lectures. Prerequisite: GEB D.3.

#### HE 210 Nutrition (3) (Also listed as FSN 210) GEB E.2.

Nutrition as it relates to health throughout the life cycle, with emphasis on the young adult. 3 lectures.

#### HE 220 Textile End-Products (3)

Trends, selection, use and care of textile end-products. Carpets, draperies, upholstery, other interior textiles, and apparel. Legislation as it affects consumers and the industry. Resources for current information. 3 lectures.

## HE 224 Textiles and Clothing Design Applications (3)

Exploration and development of a variety of creative textile and apparel design projects through demonstrations and laboratory experiences. Course content will vary each quarter. Total credit limited to 6 units. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 activity. Prerequisite: HE 122, HE 131 or consent of instructor.

## HE 226 Methods of Home Food Preservation (2)

Preservation techniques to obtain maximum food quality. Emphasis on palatability, appearance, safety, and efficient use of resources. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 1 activity. Prerequisite: HE 121.

## HE 237 Fashion Analysis (3)

Application of aesthetic principles to apparel design. Fashion theory, personal color analysis, figure analysis, and wardrobe planning, 3 lectures. Prerequisite: HE 122.

## HE 241 Flat Pattern (3)

Principles of designing by drafting and flat pattern methods. Development of production patterns for selected designs. Advanced fitting techniques. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: HE 131 or consent of instructor.

## HE 242 Interior Design (3)

Basic interior design: visual, functional, and economic aspects of planning interior space. Laboratory experience in solving realistic design problems. Miscellaneous course fee required--see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: HE 122 or consent of instructor.

## HE 305 Housing and Society (3)

Analysis of the changing processes of producing, purchasing, and regulating housing. Emphasis on consumer housing problems. 3 lectures. Prerequisite: HE 203, HD 108, HD 203 and GEB D.3. (See page 114 for GEB requirements.)

#### HE 309 History of Interior Design (3)

Development of furniture styles and their environments from Antiquity to the Victorian Era. 3 lectures. Prerequisite: HE 242.

## HE 312 Computer Aided Design of Interiors (2)

Use of microcomputers for application of computer-aideddesign and drafting (CADD) software to interior space planning, fixturing, furnishing, detailing and drawing. 2 laboratories. Prerequisite: HE 122, HE 242, GEB F.1. course.

## HE 315 Textiles and Clothing Industries (3)

Commercial aspects of design, production, and distribution of textiles and clothing. External influences which affect the fashion industry. 3 lectures. Prerequisite: HE 220 or consent of instructor.

### HE 321 Meal Management (3)

Factors and principles involved in the choice, purchase, and preparation of foods for a meal. Application of management principles in the use of time, energy and money in relation to feeding diverse groups. Planning, preparing, and serving of meals with emphasis on nutritional, aesthetic, and economic aspects of foods. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: HE 121, HE 210, or consent of instructor.

#### HE 322 Textiles (3)

Physical and chemical characteristics of natural and synthetic fibers. Laboratory application of theory in understanding properties of fibers, yarns, fabrics, and finishes as related to the selection, use and care of textiles. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: CHEM 121, HE 220.

## HE 324 Management of Family Resources (3)

Application of an ecosystem framework as it relates to contemporary aspects of personal, family, and group living management. Analysis of selected resource management areas such as goal setting, budgeting, and time management. 3 lectures. Prerequisite: HE 305, or consent of instructor.

#### HE 326 Presentation Methods (3)

Development and evaluation of effective means of communication by use of a variety of presentation methods including demonstration. 3 activities. Prerequisite: HE 331, SPC 201.

#### HE 331 Residential Equipment (3)

Technological principles involved in construction, operation, energy consumption, selection, safety, and space utilization of residential equipment. 2 lectures, 1 laboratory.

## HE 333 Advanced Clothing Design (3)

Techniques of draping, drafting, and advanced flat pattern design as methods of apparel design production. Creation of original designs in fabric. Miscellaneous course fee required-see *Class Schedule.* 3 activities. Prerequisite: HE 241 or consent of instructor.

## HE 334 Evaluation of Textile and Apparel Quality (3)

Interrelationships of appropriate designs, equipment, and construction techniques to special fabrics. Care and storage of apparel constructed from special fabrics. Evaluation of textiles and ready-to-wear garment quality. Miscellaneous course fee required-see *Class Schedule*. 3 lectures. Prerequisite: HE 131, HE 322.

## HE 341 Clothing and Human Behavior (3)

Socio-cultural, psychological, economic and aesthetic aspects of clothing as related to human behavior. 3 lectures. Prerequisite: GEB D.4.a. and GEB E.1. (See page 114 for GEB requirements.)

## HE 345, 346, 347 Interior Design Materials and Techniques (4) (4) (4)

Developmental and sequencing processes for residential and contract interiors as they relate to professional practice, including materials, specifications, custom design, business procedures. Must be taken in sequence. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: HE 220, HE 242, ARCH 111, ARCH 112 or ART 230, HE 305.

## HE 400 Special Problems for Advanced Undergraduates (1-3)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Junior standing and consent of department head.

# HE 404 Seminar in Financial Responsibilities of the Family (3)

Individual and group study of the economic role of the family: factors affecting use of income, and cost of goods and services within the U.S. economic system. Opportunity to analyze and make decisions concerning families' financial situations and understand how their specific socio-economic levels relate to other families. 3 seminars. Prerequisite: HE 324 or consent of instructor.

## HE 407 Interior Lighting (3)

Introduction to artificial lighting for commercial and residential use. Basic definitions and fundamental applications through problem solving. 2 lectures, 1 laboratory. Prerequisite: HE 344.

## HE 410 Food Styling and Presentation (2)

Food styling and presentation as it applies to working with food professionally in a commerical setting. 2 activities. Prerequisite: HE 122, HE 421, or consent of instructor.

## HE 412 Home Economics Student Teaching Seminar (3)

Practices and problems of student teaching in home economics including current trends in program development. Curriculum in both CHE and FHA-Hero programs. Total credit limited to 6 units. 3 seminars. To be taken concurrently with student teaching.

## HE 420 Fashion Merchandising (3)

Planning, buying, and selling of fashion merchandise through various distribution channels. Retail management, organization, operations, and image. Pricing and retail math. 3 lectures. Prerequisite: HE 315 or consent of instructor.

## HE 421 Cultural and Aesthetic Aspects of Food (3)

Psychological, sociological, and economic factors that influence the formation of food habits and attitudes. Lab illustrates application of basic principles of food science to food consumption patterns of cultural groups. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: HE 321 or consent of instructor.

## HE 423 Clothing for Disabled People (3)

Analysis and discussion of designs and functions of clothing as related to special needs of people with physical differences. 3 seminars. Prerequisite: HE 241, HE 322 or consent of instructor.

## HE 424 Teaching Methods in Home Economics (3)

Selection of valid content and learning activities for a variety of teaching situations and strategies in the classroom, community, or business setting. 2 seminars, 1 activity. Prerequisite: HE 326.

## HE 425 Current Topics in Textiles and Clothing/Merchandising (3)

Analysis of current developments, issues, and trends in textiles, clothing, and merchandising. 3 seminars. Prerequisites: HE 237, HE 241, HE 322, HE 341, HE 420.

## HE 430 Advanced Textiles (2)

Seminar in advanced textiles including fiber structure, fabrics, and finishes as related to textile performance. Review and reporting of student independent investigations. 2 seminars. Prerequisite: HE 322.

## HE 431 Advanced Textiles Laboratory (1)

Advanced study of fiber structure, fabrics and finishes through laboratory experimentation. Individual and group research on fabric performance. Taken concurrently with HE 430. Miscellaneous course fee required-see *Class Schedule*. 1 laboratory. Prerequisite: HE 322.

## HE 433 Historic Costume (3)

Chronological study of costume designs as related to cultural influences. 3 lectures. Prerequisite: Junior standing.

# HE 435 Seminar in Interior Design Trends and Developments (3)

Contract and residential design trends as represented by major professional interior design firms. Current developments in resources available to interior designers. Miscellaneous course fee required-see *Class Schedule*. 3 seminars. Prerequisite: HE 347.

## HE 436, 437, 438 Advanced Interior Design (3) (3) (3)

Individual research and creative experiences in interior design with emphasis on real client projects. Must be taken in sequence. Miscellaneous course fee required-see *Class Schedule.* 1 lecture, 2 laboratories. Prerequisite: HE 347.

## HE 440 Internship (1-12) (CR/NC)

Career experience with private or public agencies. Total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: Consent of department head.

## HE 442 Comparative Tailoring (3)

Traditional and contemporary tailoring techniques. Garment construction and selection. Investigation of and reporting on tailoring types, methods, fabrics, and garment qualities. Miscellaneous course fee required-see *Class Schedule*. 1 seminar, 2 activities. Prerequisite: HE 241 or consent of instructor.

### HE 445 Merchandise Planning and Control (3)

Quantitative and qualitative analysis of retail buying, including: markup, markdown, costs, discounts, inventory, turnover, retail stock, open-to-buy and planned purchases. 2 lectures, 1 activity. Prerequisite: HE 315 and HE 420.

## HE 451, 452, 453, 454 Professional Study Tours (1) (2) (3) (4) (CR/NC)

Study tours of selected facilities related to home economics emphasis areas. Varying resources studied on different tours. Classroom and tour hours variable depending on course units. Total credit limited to 8 units for any combination of HE 451, HE 452, HE 453, HE 454. Miscellaneous course fee required--see *Class Schedule. Class Schedule* will list subtitle indicating tour location and emphasis area. Credit/No Credit grading only. HE 451: 1 laboratory. HE 452: 1 seminar, 1 laboratory. HE 453: 1 seminar, 2 laboratories. HE 454: 1 seminar, 3 laboratories. Prerequisite: Consent of instructor.

## HE 459 Undergraduate Seminar (2)

Discussion of individual capabilities, values, and academic preparation as they relate to the career process. Implications of current social issues for the profession. Introduction to the research process applied to home economics. 2 seminars. Should be taken prior to HE 461. Prerequisite: GEB A.4.

## HE 460 Fashion Promotion (3)

Visual merchandising principles and practices. Fashion sales promotion, special events, fashion advertising, and media planning. Personal selling techniques. 3 lectures. Prerequisite: HE 420 or consent of instructor.

## HE 461, 462 Senior Project (3) (3)

Selection and completion of research related to the student's area of interest. Project requires a formal report which must follow department guidelines. Minimum of 180 hours required. Prerequisite: HE 459 and completion of 135 units including all freshman, sophomore, and junior classes in the area of study.

## HE 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. Miscellaneous course fee may be required-see *Class Schedule*. 1–3 lectures. Prerequisite: Consent of instructor.

## HE 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topics selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

## HE 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.

#### HE 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.

#### HE 500 Individual Study (1-3)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Only 6 units may be applied to degree requirements. Prerequisite: Consent of department head, graduate program coordinator, and supervising faculty member.

#### HE 580 Seminar (1-3)

Advanced study of current issues and topics significant for professional home economists. *Class Schedule* will list topics selected. 1–3 seminars. Prerequisite: Graduate standing.

### HE 599 Thesis (3) (3) (3)

Individual research under the general supervision of the staff, leading to a graduate thesis of suitable quality. Only 9 units may be applied to degree requirements. Students must enroll every quarter in which advisement is received. Prerequisite: Graduate standing.

## **HIST-HISTORY**

#### HIST 101, 102, 103 History of Western Civilization (3) (3) (3)

Development of western civilization from earliest times to the present. Political, economic, social, intellectual, and religious contributions of the various peoples to contemporary life. 3 lectures.

## HIST 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

#### HIST 201 United States History (3)

GEB D.1.

Origins and development of the United States from the 15th century to the New Nation. HIST 201 satisfies the general education requirement of HIST 204 for History majors. 3 lectures.

#### HIST 204 History of American Ideals and Institutions (3) GEB D.1.

Comprehensive thematic study of the historical development of industry, corporations, racial relations, foreign policy and political and constitutional issues since the foundation of the Republic. Such an historical analysis will enable students to better understand contemporary America. Not open to students with credit in HIST 201. 3 lectures.

## HIST 270 History through Film (3)

Various historical themes examined through the medium of film. Influence and overall relationship of films to the societies that produced them examined. Total credit limited to 6 units. 2 lectures, 1 laboratory.

## HIST 300 Research Methods (3)

Introduction to historical methodology. Emphasis will be upon formulating a research topic; choosing appropriate research strategies and methods; and interpreting primary and secondary sources. Project in lieu of final examination. 3 seminars.

## HIST 301 Writing and Research Seminar in History (3)

Intensive writing and research to prepare a major historical essay with a strongly argued thesis and extensive historiographical context. Students prepare written and oral commentaries on papers presented in seminar. Completion of extensive paper in lieu of final examination. 3 seminars. Prerequisite: HIST 300, ENGL 114, and ENGL 125 or PHIL 125 or SPC 125.

## HIST 302 Historiography (3)

Theory, interpretation and philosophies of history. 3 seminars. Prerequisite: HIST 300, HIST 301 and junior standing.

## HIST 305 History of American Agriculture (3)

Agricultural development with emphasis upon economic, political and social implications. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 306 History of American Technology (3)

Development of industrial, transportation, and agricultural technologies in America. Miscellaneous course fee required--see *Class Schedule*. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 307 History of Science (3)

Historical impact of science on human and physical environments from ancient to modern times. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 308 American Warfare (3)

Inception, induction and impact of American warfare from 1775 to the present within the context of changing ideas and major political, social and economic developments. 3 lectures. Prerequisite: Junior standing.

## HIST 311 Early Britain (3)

History of the British Isles from the reconstruction of Celtic history to the end of the Medieval epoch. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 312 Early Modern Britain (3)

History of the British Isles from the end of the Medieval epoch to the era of the American revolution-from Richard III to George III. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 313 Modern Britain: Industry, Empire and War (3)

History of the British Isles from the loss of the American colonies through the era of the World Wars and the dissolution of the British Empire. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 314 The Middle East (3)

Islamic civilization, the Ottoman Empire, origins of Pan-Islamism, Arab, Turkish, Iranian nationalism, impact of World Wars I and II, and the background of contemporary problems. 3 lectures. Prerequisite: Junior standing or consent of instructor.

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

Analysis of the interaction of selected traditional and modernizing non-Western cultures with Western industrial imperialism and its attendant forces. Within this context, evaluation of both the nature of industrial imperialism and the way in which it influenced or interfered with the host culture. 3 lectures. Prerequisite: Junior standing.

#### HIST 325 Comparative History of American Minorities (3)

Analyzes the political, economic and social status of various racial and ethnic groups in the United States, focusing on the history of Asians, Blacks, Chicanos and Native Americans, emphasizing both the general and particular forces that influenced their experience in America and the varying degrees to which each was able to maintain its cultural identity. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 328 American Indian History (3)

Historical examination of Native American culture; topics of conflict and contributions emphasized. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 329 American Indian Thought (3)

Cultural, spiritual, and philosophical concepts of several Native American societies; the intellectual and religious influences of Indians upon American society; their adaptation to White domination. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 331 Afro-American History (3)

Political and social history of Afro-Americans from the early 17th century to the present; emphasizes the Afro-American contribution to American cultural and political life. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 339 History of Colonial Latin American (3)

Survey of Latin American history in the colonial period from 1492 to the early Nineteenth Century. Special attention to the indigenous cultures, the Iberian civilization, and the evolving relationship between them. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 340 History of Modern Latin America (3)

Social and political history of South America, Mexico, and Cuba during the Nineteenth and Twentieth Centuries. Historical development of economic structure and socio-political and cultural institutions in the region. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 341 History of Modern Central America (3)

Political, social, and economic development of Central American countries in the context of regional history and international politics during the Nineteenth and Twentieth Centuries. 3 lectures. Prerequisite: Junior standing or consent of instructor.

#### HIST 343 Greece and Rome (3)

Foundations of western civilization; origins and development of the science, technology, philosophy, religion, art, and sociopolitical institutions which produced the modern world; continuity between ancient times and the present. 3 lectures. Prerequisite: Junior standing or consent of instructor.

#### HIST 346 Medieval Europe (3)

Medieval society from the emergence of feudalism to the beginning of the Renaissance. Triumph of the papacy, development of feudal monarchies and institutions. The Crusades. Recovery of commerce. Rediscovery of Greek thought, and rise of universities. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 347 Renaissance and Reformation (3)

Decline of medieval universalism. Rise of commercial capitalism and dynastic nation-states. Flowering of the Renaissance. Protestant reformation. Economic, political, social, intellectual, and cultural influences. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 348 Religious Wars and Absolutism (3)

Era of the Counter-Reformation and Divine Right absolutism, religious and dynastic wars and their impact on the political, economic, social, religious and cultural fabric of European civilization. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 349 The Age of Revolution and Napoleon (3)

Europe from the death of Louis XIV (1715) to the settlement at Vienna of 1815. International rivalries, continental and global warfare, the philosophy of the Enlightenment. Enlightened Despotism, the French Revolution, and Napoleon. Political, intellectual, economic, and social developments and upheavals during the Eighteenth Century. 3 lectures. Prerequisite: Junior standing or consent of instructor.

#### HIST 351 Europe in the Age of Reaction and Revolution, 1815-1871 (3)

Reaction to the French Revolution. Industrialization. Liberal socialist and nationalist revolts against the conservative order of 1815. 3 lectures. Prerequisite: Junior standing or consent of instructor.

#### HIST 352 Europe in the Age of Imperialism and War, 1871-1919 (3)

Maturation of industrialization, socialism and nationalism. Imperialist competition of nation states for world hegemony. Explosion of the First World War. 3 lectures. Prerequisite: Junior standing or consent of instructor.

#### HIST 353 Europe in the Age of Fascism (3)

Democracy in crisis and the fascist alternatives. Second World War and the recovery of Europe in a bipolar world. 3 lectures. Prerequisite: Junior standing or consent of instructor.

#### HIST 375 Urban History of America (3)

Growth and development of American cities from the Colonial period through the 1970s. Includes a comparative analysis of American urban areas with city development in Europe, Asia and Africa. Evolution of urban culture, assimilation of European ethnic groups, clash of city and rural values, rise of racial ghettos. 3 lectures. Prerequisite: Junior standing or consent of instructor.

### HIST 381, 382 African History (3) (3)

Survey of African history from earliest times. Ancient African civilizations, Moslem penetration, indigenous kingdoms. European colonialism, rise of African nationalism. Development of independent Africa as illustrated by the history of selected

countries. 3 lectures. Prerequisite: Junior standing or consent of instructor.

#### HIST 383 History of American Thought (3)

Thought and culture in America since the Puritans. 3 lectures. Prerequisite: Junior standing or consent of instructor.

### HIST 384 Labor and Work in American History (3)

Labor and work from the colonial period to the present. Analysis of the organization and division of the labor process, formation of classes, rise of unions and the shift from an industrial to a service and high technology workforce. 3 lectures. Prerequisite: Junior standing or consent of instructor.

#### HIST 385 Topics in California History (3)

In-depth analysis of selected political, economic, and social issues involved in the development of California from the earliest times to the present. 3 lectures. Prerequisite: Junior standing or consent of instructor.

#### HIST 386 Frontiers in American History (3)

Development and evolution of the frontier experience in chronological and geographic context. Consideration given to the various political, economic, social, cultural and religious factors which helped to bring about the end of the so-called frontier. 3 lectures. Prerequisite: Junior standing or consent of instructor.

#### HIST 387 From Colony to Empire: A History of U.S. Foreign Relations (3)

Analysis of the evolution of this culture from an insecure appendage of European colonialism to a global power implementing a foreign policy based on hegemonic assumptions. Analysis of the impact of internal developments on foreign relations. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Miscellaneous course fee may be required-see *Class Schedule*. Prerequisite: Consent of department head.

#### HIST 401 Colonial America (3)

Age of exploration. European powers in eastern North America. English settlements, development of the English colonies, with emphasis on Virginia and Massachusetts. Proprietary interests, growth of internal control, and colonial conflicts. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 402 American Revolution (3)

Background of the Anglo-American imperial problem. The War for Independence and internal democratic upheaval of the era. Establishment of the new nation, origins of the Constitution, the party system. American foreign policy, the national economy. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 404 The Era of Civil War and Reconstruction (3)

Exploration of the different patterns of life in the United States, in order to comprehend the emergence of sectionalism, the violent struggle of the Civil War, and the readjustments of the Reconstruction years. Emphasis on the experiences of ordinary Americans. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 405 Rise of Industrial America (3)

Interaction between rising industrialism and traditional agrarian democracy. Relationship between the industrial system and the values of democratic institutions. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 406 Progressive Era (3)

Economic, social, intellectual, and political history, and foreign policy. Progressive response to problems of industrialization, agriculture, and urbanization. Development of the American corporate business system. Era of normalcy and onset of the Depression. 3 lectures. Prerequisite: Junior standing or consent of instructor.

#### HIST 407 Modern America (3)

Major developments of the mid-Twentieth Century. Change and growth in domestic and foreign policies. The Depression, New Deal, World War II, Cold War. Problems of world leadership and contemporary domestic problems. 3 lectures. Prerequisite: Junior standing or consent of instructor.

#### HIST 409 Vietnam War at Home and Abroad (3)

Interaction of revolutionary Vietnamese nationalism with U.S. foreign policy. Analysis of the war and its relationship to American society. 3 lectures. Prerequisite: Junior standing or consent of instructor.

#### HIST 415 East Asian Civilization (3)

Central ideas and institutions which have shaped Chinese, Japanese and Korean civilization since ancient times. Emphasis on cultural themes rather than a political continuum. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 416 Modern Japan (3)

Japan's development as a modern state in the 19th and 20th centuries. Emphasized themes include the conflict of modernity and cultural continuity, the persistence of traditional values and postwar reconstruction of Japanese society. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 417 Modern China (3)

Analysis of Chinese history in the twentieth century, the conflict between modernity and cultural continuity. Chinese Communist Party and People's Republic of China since 1949. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 424 Organizing and Teaching History (3)

Organization, selection, presentation, application, and interpretation of subject matter in history in secondary schools. 3 seminars. Prerequisite: Admission to teacher education program or valid teaching credential.

## HIST 426 Imperial Russia (3)

Evolution of Russian autocratic society from the foundation of tsarist absolutism in the Fifteenth Century to 1917. Reaction, reform and revolutionism. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 427 Soviet Russia (3)

Transformation of Russian autocracy from tsarist to Bolshevik under the impact of World War I and the Revolution of 1917. The formative force of Marxism-Leninism, forced collectivization and industrialization, the social engineering of the New Soviet Man. World War II, the Cold War and peaceful coexistence. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 434 American Women's History to 1870 (3)

Female ideology and experience from the colonial period to the creation of an independent women's movement after the Civil War. Considers how the history of women both reflects and shapes American culture and society. 3 seminars. Prerequisite: Junior standing or consent of instructor.

#### HIST 435 American Women's History from 1870 (3)

The female past in the more modern period of U.S. history. Considers how transformations in gender roles are reflective of other significant changes in American culture and society. Emphasis on class, race, and ethnic variations in women's experience. 3 seminars. Prerequisite: Junior standing or consent of instructor.

### HIST 437 Nazi Germany (3)

Intellectual, social and cultural roots of National Socialist ideology and how they combined under the influence of Adolph Hitler to produce the Nazi Revolution. 3 lectures. Prerequisite: Junior standing or consent of instructor.

# HIST 440 Topics and Issues in the History of the United States (3)

Selected topics and issues in United States history. Descriptive subtitles assigned to each course. May be repeated to six units. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 441 Topics and Issues in European History (3)

Selected topics and issues in European history. Descriptive subtitles assigned to each course. May be repeated to six units. 3 lectures. Prerequisite: Junior standing or consent of instructor.

# HIST 442 Topics and Issues in Latin American History (3)

Selected topics and issues in Latin American history. Descriptive subtitles will be assigned to each course. May be repeated to six units. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 443 Topics and Issues in Asian History (3)

Selected topics and issues in Asian history. Descriptive subtitles will be assigned to each course. May be repeated to six units. 3 lectures. Prerequisite: Junior standing or consent of instructor.

#### HIST 444 Topics and Issues in African History (3)

Selected topics and issues in African history. Descriptive subtitles will be assigned to each course. May be repeated to six units. 3 lectures. Prerequisite: Junior standing or consent of instructor.

#### HIST 445 Topics and Issues in Comparative History (3)

Selected topics and issues in comparative history. Descriptive subtitles will be assigned to each course. May be repeated to six units. 3 lectures. Prerequisite: Junior standing or consent of instructor.

### HIST 460, 461 Senior Project (2) (2)

Selection and completion of a project under faculty supervision. Results presented in a formal report. Minimum of 60 hours time per quarter. Student must enroll in second quarter. Prerequisite: HIST 300, HIST 301, HIST 302.

## HIST 463 Undergraduate Seminar (2)

Historical analysis of selected problems and topics for undergraduates. 2 seminars. Prerequisite: HIST 300, HIST 301.

#### HIST 468 Internship in State and National Park History (3) (3)

Work experience program in interpreting state and national park history. Weekly three-hour seminar and regularly scheduled work experience training at Hearst-San Simeon State Historical Monument. 90 hours of work experience per 3 units of credit. Miscellaneous course fee required-see *Class Schedule.* Recommended preparation: Western Civilization Survey, U.S. and California History, History of Art.

## HIST 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Junior standing or consent of instructor.

## HIST 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

## HIST 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

## HIST 590 Seminar in History (3)

Historical analysis of selected problems and topics. *Class Schedule* will list topic selected. Total credit limited to 6 units. 3 seminars. Prerequisite: Graduate standing.

## **HUM-HUMANITIES**

## HUM 302 Human Values in Agriculture (3) GEB C.3.

Nature of values at issue in agriculture which impact on the wider community. Technical-factual foundation of needs of agriculture which contribute to value conflicts, discrimination between resolvable and unresolvable conflicts, ethical principles and devices yielding resolutions. Interdisciplinary team taught, with guest lecturers and possible field trips. Literary materials, novels, short stories, and expository history giving dramatic expression to values. 3 seminars. Prerequisite: Junior standing and ENGL 215 or ENGL 218.

## HUM 310 Humanities in World Cultures (3) GEB C.3.

An interdisciplinary examination of the humanities in a selected culture. Special focus on the arts, literature, philosophy and foreign language in that culture. *Class Schedule* will list topic selected. Repeatable to 9 units with different course titles. 3 lectures. Prerequisite: Junior standing and ENGL 215 or ENGL 218.

## HUM 361 Modernism (4) GEB C.3.

Interdisciplinary survey of the nineteenth and early twentiethcentury concepts and cultural movements known as modernism throughout Europe, North America and Latin America. Disciplines include architecture, art, drama, literature, music, philosophy, and photography. 4 lectures. Prerequisite: Junior standing and ENGL 215 or ENGL 218.

## HUM 362 Postmodernism (4)

GEB C.3.

Development, major characteristics, and social implications of this significant movement within twentieth-century thought. Works studied to be chosen from disciplines including art, architecture, literature, music, literary criticism and philosophy. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

## HUM 400 Independent Study Project (1-2)

Independent study project focusing more than one discipline on a problem in the Humanities. May involve travel and/or independent research. Bibliography and study plan submitted in advance. 1–2 activities. Prerequisite: Junior or senior standing and consent of instructor.

HUM 402 Values and Technology (3) GEB C.3.

Humanistic investigation into the theoretical and practical applications of technology with specific reference to the social effects of technological change. For all majors. Nontechnical. 3 lectures. Prerequisite: Junior standing and ENGL 215 or ENGL 218.

## HUM 470 Selected Advanced Topics (2-4)

Focused interdisciplinary study of a problem in the Humanities combining the insight and expertise of more than one discipline, such as history, literature, religious studies, philosophy, fine arts and the sciences. *Class Schedule* will list topic selected. 2–4 lectures. Prerequisite: Junior standing and ENGL 215 or ENGL 218.

## **IE-INDUSTRIAL ENGINEERING**

## IE 101 Introduction to Industrial Engineering (1)

Development of the industrial economy and the profession of industrial engineering. Concepts and principles of industrial organization and management. Survey of industrial engineering techniques and areas of application in manufacturing and service systems. Career opportunities review. 1 laboratory.

## IE 121 Industrial Systems Analysis (2)

Systems, subsystems, and relationships (interfaces) of industrial systems. Productivity concepts and measurements. Trends in techniques for data gathering, analysis, including spread sheet analysis, and presentation for management decisions. 1 lecture, I laboratory.

## IE 141 Manufacturing Processes (1)

Metal casting as a net shape process in manufacturing. Properties of molding materials and methods of casting. Sand, shell and investment molding and casting, core making, and sand testing. Pattern and casting design principles. Miscellaneous course fee required-see *Class Schedule*. 1 laboratory.

## IE 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

## IE 201 Production Costs Estimating (3)

Estimating costs of manufactured products and services based on detailed estimates of labor, materials, overhead and general and administrative expenses. Break even points, price breaks, industrial learning, network cost analysis, multiple regression derived formulas, labor efficiency and cost indices. 3 lectures. Prerequisite: Sophomore standing. Credit not allowed for IE majors.

## IE 214 Production Control (2)

Coordination of production facilities to meet objectives of customer service, minimum inventory investment, and maximum manufacturing efficiency. Forecasting, statistical determination of order requirements, group technology concepts, input-scheduling and machine loading control techniques. Production systems computer modeling. 2 lectures. Prerequisite: Sophomore standing. Credit not allowed for IE majors.

## IE 222 Engineering Analysis (3)

Mathematical and statistical methods of evaluating and control of variability of engineering design parameters, predicting deviations from expected averages, grouping data for computations. Computer applications. Quality control concepts and applications. 2 lectures, 1 activity. Prerequisite: MATH 131. Credit not allowed for IE majors.

## IE 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 standard. 3 lectures, 1 laboratory. Prerequisite: MATH 141, IE 141.

## IE 233 Computer Aided Manufacturing (2)

Introduction to CAM. Manual and computer part programming. Basic concepts of part design, process planning, manufacturing operations. Tool path definition/verification to production phase. Use of commercially available software. 1 lecture, 1 laboratory. Prerequisite: ETME 142, ETMP 144, CSC 204 or CSC 251 or consent of instructor.

## IE 234 Robotic Assembly (2)

Product design and planning for robotic assembly. Robot characteristics required for product assembly. Off-line programming environment for robots. Selection of sensors, endof-arm tooling and control arrangements for robotic assembly. Practical applications using a robot programming language for assembly. 1 lecture, 1 laboratory. Prerequisite: Computer literacy course (F.1.)

## IE 239 Industrial Costs and Controls (3)

Estimation of manufacturing costs for production planning, cost analysis, and cost control. Planning, budgeting and control processes. Costs, accounting data and analysis of variances for managerial control, inventory valuation and decision making. Techniques of forecasting, pricing, cost estimating and cost reduction. 3 lectures. Prerequisite: IE 223.

## IE 240 Additional Engineering Laboratory (1-2)

Total credit limited to 4 units, with a maximum of 2 units per quarter. 1 or 2 laboratories.

## IE 251 Manufacturing Engineering (3)

State of the art electronics manufacturing, processes in manufacturing and assembly. Metrology. Coordinate measuring machines and surface profile analysis. Product design and manufacturability. Value engineering, group technology and parts codification. Analysis of cutting tool forces. 2 lectures, 1 laboratory. Prerequisite: ETMP 144, MATH 142.

## IE 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. Existing computer programs utilized. 4 lectures. Prerequisite: MATH 242.

## IE 303 Project Organization and Management (4)

Design, analysis and implementation of a major industrial/business systems problem. Emphasis on periodic impacting situations requiring resolutions and management decisions by groups representing various elements of an enterprise. Resource leveling and management under constraints. 4 lectures. Prerequisite: Junior standing.

## IE 304 Operations Research (3)

Introduction to operations research. Matrix theory, linear programming formulations and solution. Simplex method, sensitivity analysis, transportation and assignment algorithms. Introduction to goal programming. Existing computer programs and algorithms utilized. 3 lectures. Prerequisite: MATH 242.

## IE 305 Operations Research II (4)

Queuing models, dynamic programming and inventory models, Markovian processes, simulation modeling, computer programming in solution of problems. 4 lectures. Prerequisite: IE 301 or IE 304, STAT 321.

## IE 312 Data Management and System Design (3)

Design and management of industrial data bases and reporting systems. Relationships of financial accounting and production control systems, efficient data entry routines, report formats, data base managers and system benefit cost analysis. 3 lectures. Prerequisite: IE 239, IE 314, CSC 204 or CSC 251.

## IE 314 Engineering Economics (3)

Economic analysis of engineering decisions. Determining rates of return on investments. Effects of inflation, depreciation and income taxes. Application of basic principles and tools of analysis using case studies. 3 lectures. Prerequisite: ECON 201 or equivalent.

## IE 316 Manufacturing Automation (4)

Survey of the use of computers in the factory automation environment. Basic control theory including feedback and process synchronization. Programming and use of intelligent devices, programmable controllers, robotic arms, and industrial control systems. 3 lectures, 1 laboratory. Prerequisite: IE 251, MATH 143.

## IE 319 Human Factors Engineering (3) GEB F.2.

Analysis of factors influencing the efficiency of human work. Data on the physical and mental capacities of persons, the physical environment, work organization, and the problem of aging. Human reactions and capabilities related to specific tasks and systems. Design of machines, operations, human computer interface and work environment to match human capacities and limitations, including the handicapped. 3 lectures. Prerequisite: PSY 201 or PSY 202 and junior standing.

## IE 334 CAD/CAM (3)

Identification and study of the individual techniques of CAD-/CAM as being practiced in modern industry. 2 lectures, 1 laboratory. Prerequisite: IE 233, ETME 143, CSC 251 or a course in a high level computer language.

## IE 335 Computer-Aided Engineering (4)

Role of computer in data storage, file manipulation, information organization, graphical efficiency, user interface, and additional functions of digitally-controlled manufacturing. Fundamental theory of computer-aided design (CAD) and its relationship with computer-assisted analysis and computer-aided manufacturing (CAM). 3 lectures, 1 laboratory. Prerequisite: IE 101, CSC 204 or CSC 251, ETME 143, MATH 242.

## IE 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limit to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

## IE 401 Sales Engineering (2)

Concepts and principles of engineering in sales. Role of the professional engineer in the analysis, design, development, production, and final application of a product or system required by the buyer. 2 seminars. Prerequisite: Senior standing in engineering, or consent of instructor.

## **IE 403 Principles of Engineering Economics (3)**

Development of methods to assess economic merits of engineering proposals through mathematical models. Time value concepts and computations. Evaluating economic factors in the making of individual or industrial decisions. Effects of depreciation and income taxes on the analysis. 3 lectures. Prerequisite: Senior standing or consent of instructor. Credit not allowed for IE majors.

## IE 404 Engineering Economic Decision Management (3)

Quantitative approaches to engineering and management problems. Time value concepts, breakeven and replacement analysis, optimization techniques for scheduling. Project cost estimation, resource management and risk analysis. Use of computer software packages. For non-majors only. 3 lectures. Prerequisite: Junior standing.

## IE 407 Operations Research III (4)

Advanced linear programming as applied to problems in industrial systems. Integer and goal programming. Application of nonlinear, quadratic, dynamic programming concepts. Case studies of current topics in industrial engineering. 4 lectures. Prerequisite: MATH 242, IE 305, or equivalent.

## IE 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: IE 335, IE 305, IE 426, CSC 204 or CSC 251.

## IE 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: IE 305, IE 314.

## IE 410 Inventory Control Systems (4)

Inventory planning and control systems in modern manufacturing. Implementation of manufacturing resource planning (MRP II) including demand forecasting, production plan, master scheduling, bill-of-material, and inventory master file. Capacity requirements planning and shop floor control. Zero inventory management, just-in-time and Kanban systems of inventory management. 3 lectures, 1 laboratory. Prerequisite: IE 305, IE 312, or equivalent.

## IE 411 Production Systems Analysis (3)

Systems analysis for production control. Design of computer integrated planning and control systems for scheduling manufacturing orders, monitoring operating costs and control system performance evaluation. Development of computer-aided decision making framework. Interactive decision making using computer-based factory simulator. 2 lectures, 1 laboratory. Prerequisite: IE 410, or equivalent.

## IE 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: IE 305 or consent of instructor.

## IE 416 Automation of Industrial Systems (3)

Automation in manufacturing and warehousing. Selection of automation systems. Low cost automation in manufacturing and warehousing. Types of systems. Projects in low cost automation systems. Applicability of pneumatic systems towards low cost automation. 2 lectures, 1 laboratory. Prerequisite: IE 316, IE 335 or equivalent.

## IE 418 Manufacturing Process Design (4)

Sequence of product design, process planning, tooling, production support, and finalization of product manufacturing through process selection, tolerance and accuracy control, and machine operation coding. Use 3D solid modeling to exemplify the setup of a coherent architecture to achieve computerintegrated manufacturing (CIM). 2 lectures, 2 laboratories. Prerequisite: IE 251, IE 335, IE 426 or equivalent.

## IE 420 Simulation and Expert Systems (4)

Design and analysis of manufacturing and service systems by simulation. Basic concepts of simulation type models. Functions of random variables. Random number and function generators, basic programming concepts, characteristics of simulation languages. Introduction to rule-based expert systems. 3 lectures, 1 laboratory. Prerequisite: IE 305, IE 312.

## IE 421 Manufacturing Organization (3)

Theory and principles of manufacturing organizations. History of industrial organization. Engineering management concepts and practice. Use of case discussion method. Planning and operations in terms of human and other resources and factors within and external to the firm. 3 seminars. Prerequisite: IE 314, PSY 201/PSY 202.

### IE 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: IE 251, IE 426 or equivalent.

## IE 426 Engineering Test Design and Analysis (4)

Data gathering and statistical testing applied to industrial engineering and manufacturing fields. Experimental methods for evaluation and comparisons; interpretation of interference, fatigue, and field data. Engineering experiments including linear and nonlinear regression, ANOVA, and multifactor ANOVA. Utilization of existing computer software. 4 lectures. Prerequisite: STAT 321.

#### IE 429 Ergonomics Laboratory (1)

Investigation of various physiological, sensory, and cognitive capabilities and limitations of people in work and living environments through laboratory data collection and statistical analysis. 1 laboratory. Prerequisite: IE 319, IE 426.

## IE 430 Quality Engineering (4)

Quality control, reliability, maintainability, and integrated logistic support. Statistical theory of process control and sampling inspection. Risks associated with decisions based on operating characteristics of control charts and sampling plans. Reliability and life testing methods. Economics of statistical QC. 4 lectures. Prerequisite: IE 426 or equivalent.

## IE 433 Advanced Work Measurement (3)

Predetermined time systems. Time formulas. Standard data systems. Use of statistical methods. Standard data systems applied to clerical, manufacturing, and micro assembly. Developing and maintaining computerized systems. Course will be administered with project orientation. 2 lectures, 1 laboratory. Prerequisite: IE 223, IE 312, IE 426 or equivalent.

#### IE 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: IE 305, IE 430.

#### IE 437 Advanced Human Factors Engineering (3)

Principles, concepts and models used in maximizing human performance capabilities at the workplace. Experimental methods for generating rational data relative to human-machine interface. Data and multi-variate analysis. 2 lectures, 1 laboratory. Prerequisite: IE 319, IE 426.

#### IE 440 Quality Process Management (3)

Quantitative approaches to engineering and management of quality. Statistical process control, quality assurance concepts. Variability loss and off-line QC. Tolerance design and experimental design. Human factors and managerial dimensions influencing quality. For non-majors only. 3 lectures. Prerequisite: Junior standing.

#### IE 442 Fundamentals of Supervision (1)

Theory and principles of supervision. Application of fundamental concepts and techniques of supervision provided by assignment in engineering laboratories. 1 laboratory. Prerequisite: IE 141, IE 251, IE 335 (or IE 233), IE 421 and senior standing.

## IE 443 Facilities Planning and Design (4)

Design concepts and input requirements in planning and design of new or renovation of existing manufacturing systems. Product, process, and flow and activity analysis techniques. Flow lines and buffering techniques. Computer-aided layout design and evaluation. Design of handling systems. Math models of location problems. 3 lectures, 1 laboratory. Prerequisite: IE 251, IE 335, IE 420, or equivalent.

#### IE 454 Advanced Manufacturing Analysis I (3)

Design, fabrication, and use of jigs and fixtures in a production environment. Economic application of conventional, computer aided and specialized manufacturing processes. Application of management, communication, and quality control techniques to inhouse and industrial sponsored manufacturing projects. Field trips to manufacturing centers. 3 lectures. Prerequisite: IE 314, IE 335, IE 430 or equivalent.

#### IE 455 Advanced Manufacturing Analysis II (3)

Continuation of IE 454 in laboratory mode. 3 laboratories. Prerequisite: IE 454 or equivalent.

#### IE 456 Advanced Manufacturing Laboratory (1)

Extension of projects from ETMP 322 and/or IE 455. Directed individual and/or group study of selected topics in current manufacturing areas. Support of in-house and industry sponsored projects. 1 laboratory. Prerequisite: IE 455 or equivalent.

### IE 461, 462 Senior Project (2) (3)

Faculty supervised projects typical of problems which graduates encounter in their profession and which involve costs, planning, scheduling and research. Formal written report, suitable for reference library, discussing methods, results and conclusions. Minimum 150 hours total time. Prerequisite: Senior standing, IE 314, IE 443.

## IE 463 Undergraduate Seminar (2)

Preparation, oral presentation, and discussion by students of technical papers on recent engineering developments and/or subject matter pertinent to industrial engineering. 2 seminars. Prerequisite: Senior standing.

#### IE 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

#### IE 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

#### IE 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.

## IE 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.

### IE 500 Individual Study (1-3)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department chair, graduate adviser and supervising faculty member.

#### IE 501 Graduate Survey I (3)

Survey of current issues in the design and analysis of the workplace. Methods analysis, work measurement, human factors, automation, cost estimating, and facilities planning issues are covered. Not available for graduate credit in Industrial Engineering. Not for undergraduate students. 3 seminars. Prerequisite: Graduate standing with approval of instructor.

## IE 502 Graduate Survey II (3)

Survey of current issues in the mathematical analysis of systems. Industrial statistics, quality control, engineering economy, linear programming, integer programming, inventory theory, Markov processes, queuing theory, and dynamic programming. Not available for graduate credit in Industrial Engineering. Not for undergraduate students. 3 seminars. Prerequisite: Graduate standing or upper division with approval of instructor, MATH 242 or MATH 206, STAT 321.

#### IE 541 Advanced Operations Research (3)

Models for mathematical programming and operations research. Topics in linear programming, network analysis, and dynamic programming. Operations research models including queuing, inventory, simulation, and Monte Carlo. Special problems in nonlinear programming and integer programming. 3 seminars. Prerequisite: IE 305, IE 426, or equivalent and graduate standing.

#### IE 542 Reliability Engineering II (3)

Theory and techniques for determining the reliability of systems and system elements. Influence of failures in series, parallel, and redundant designs. Failure modes and effects. Frequency distributions of failures and failure rates. Methods of estimating, predicting, measuring, and testing for reliability and maintainability. 3 seminars. Prerequisite: IE 430, and graduate standing.

#### IE 543 Advanced Human Factors (4)

Theory and application of man-machine relations and system design. Concepts of mathematical models, human information input channels, decision making based on capability of human operator. 3 seminars, 1 laboratory. Prerequisite: IE 319 or equivalent, IE 426, or equivalent and graduate standing.

#### IE 544 Advanced Topics in Engineering Economy (3)

Advanced topics in engineering economy. Replacement analysis, capital budgeting and allocation theory, risk and uncertainty, and benefit-cost analysis. Impacts of governmental and industrial policy. 3 seminars. Prerequisite: IE 314, graduate standing.

#### IE 545 Advanced Topics in Simulation (3)

Validation of simulation models. Statistical techniques for variance reduction. Experimental design and optimization. Comparison of attributes of simulation language. Review of current manufacturing and service industry applications. 2 seminars, 1 laboratory. Prerequisite: IE 420 and graduate standing.

#### IE 555 Computer-Integrated Manufacturing (4)

CIM concepts and system architecture. Systems analysis methodologies and functional specifications. Technological and managerial strategies for system integration. Analysis of contemporary CIM frameworks. Information networks and protocols for integrated manufacturing systems. Implementation strategies for CIM and organizational impacts. 3 seminars, 1 laboratory. Prerequisite: IE 335, IE 411 or equivalent, graduate standing.

### IE 556 Technological Project Management (4)

Projects in industrial organizations and enterprises. Emerging technologies and project management. Relationship to strategic plans. Formulating, selecting, structuring, and planning projects. Project organization and control. Overcoming barriers. Role of computers. 4 seminars. Prerequisite: Graduate standing and experience using computers.

#### IE 557 Technological Assessment and Planning (4)

Assessing likely future technological environments, speed of industrial change, relationship to business plans of firms. Past and present technological evolution. Forecasting quantitative and qualitative approaches. Technological impact assessment and business strategy development. Use of case studies. 4 seminars. Prerequisite: STAT 321, IE 426 or equivalent and graduate standing.

### IE 558 Engineering Decision Making (4)

Principles, concepts, models, and case studies of decision making, both quantitative and 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: IE 304, STAT 321 or equivalent and graduate standing.

## IE 559 Engineering Research and Development (4)

Principles, approaches and practices for effective engineering innovation, design, research and development (R&D) in business and industry. Relationship of R&D with corporate strategy and technology base. R&D objectives through implementation. Integration of creativity, evaluation, design, and ongoing operations. Case studies. 4 seminars. Prerequisite: IE 314 or equivalent and graduate standing.

#### IE 560 Quality Engineering II (4)

Integrated total quality system engineering (manufacturing/service firms). Classical and modern quality philosophies and quality assurance/improvement methods. Statistical methods (statistical process control and Taguchi loss function). Designing for quality, continuous quality improvement, and total quality system integration. Case studies. 4 seminars. Prerequisite: IE 421, IE 430, or equivalent.

## IE 570 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to graduate students and selected seniors. Topic lists will be provided with class schedule outlines. 1–3 seminars. Prereguisite: Graduate standing and/or consent of instructor.

## IE 587 Cooperative Education Experience (6)

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Prerequisite: Graduate standing and consent of instructor.

## IE 597 Cooperative Education Experience (12)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Prerequisite: Graduate standing and consent of instructor.

## IE 599 Design Project (Thesis) (2) (2) (5)

Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis. Prerequisite: Graduate standing and consent of instructor.

## **IT-INDUSTRIAL TECHNOLOGY**

## IT 101 Technical Problem Solving (3)

Intensive investigation of the three major steps in technical problem solving. Defining the problem; planning and implementing the process for determining the solution; effective communication of the solution. Modern information processing systems, including computer usage. 3 lectures.

## IT 105 Industrial Processes (2)

Survey of materials, machines and processes used in producing consumer products. Emphasis on manufacturing methods and techniques utilized by contemporary industry. 1 lecture, 1 activity.

## IT 111 Principles of Technology (3)

Technology from a systems perspective. Emphasis on the interrelationships of CAD/CAM/CIM. Evaluation, utilization and significance of technology and its impact on society. 3 lectures.

## IT 125 Industrial Wood Processes (3) GEB F.2.

Theory and practice of woodworking processes, materials and equipment used in cabinetmaking and furniture industries. Impact of technology. Cultural and social implications of technology. Practical applications include the construction of a project. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 2 laboratories.

## IT 130 Automotive Fundamentals (2) GEB F.2.

Principles and components of the automobile for consumer understanding. How automobile technology impacts cultures and societies. The automobile throughout history. Economics of selection, operation, and preventive maintenance. Practical experience. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 1 laboratory.

## IT 141 Plastics Processes and Applications (2) GEB F.2.

Global, cultural and social implications and applications of plastics. Uses, capabilities, and operational characteristics of plastics machinery and processes including recycling. Properties and classes of molds and tools. Injection molding, extrusion, compression molding, rotational molding, foaming, casting, and plastic fabrication. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 1 laboratory.

## IT 200 Special Problems (1-4)

Individual investigations, research, studies or surveys of selected problems. Total credit limited to 8 units with a maximum of 4 units per quarter. Prerequisite: Consent of instructor.

### IT 212 Introduction to Technical Management and Industry (3)

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. Characteristics of various technical management fields. 3 lectures.

## IT 225 Graphic Interpretation and Communications (4)

Graphics used in construction and industry and interpreting the drawing language. Communicating by using CAD instruments and freehand graphics through the application of the principles of pictorial perspective drawing to inanimate objects. 1 lecture, 3 activities. Prerequisite: GEB F.1.

## IT 233 Metal Technology (3)

GEB F.2.

Practical applications of hand and machine tools. How metal technology impacts cultures and societies. Welding, forging, foundry, sheet metal, ornamental metal and applications of CIM. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 2 laboratories.

## IT 237, 238 Industrial Electricity (3) (3)

Theory and application of basic AC and DC circuits as they pertain to industry and teaching applications. Principles of motors and generators, instruments, control and control circuits, transformers and circuitry. 2 lectures, 1 laboratory.

## IT 250 Transportation Power (3)

Introduction to world transportation and transportation power: land, sea, air and space transport systems, regulation, operational theory; piston, rotary and turbine engines; ignition, fuel, charging, cooling and lubrication systems. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 laboratory.

## IT 301 Current Technological Issues (3) GEB F.2.

Technological issues, benefits and risks of technological decisions. The dynamics of technology and its impact on energy resources, the environment and quality of life. The effects of technological innovation on productivity, travel, communication, leisure and personal expression. Demonstrations of industrial processes will be conducted. 3 seminars. Prerequisite: ENGL/PHIL/SPC 125.

## IT 302 Plastics Design (2)

Properties of plastics as a class of materials. Interpretation of plastic design data. Principles underlying the properties of plastics. Design problems. Laboratory applications of plastics processes and their effects on design. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 1 laboratory. Prerequisite: CHEM 121 or consent of instructor..

#### IT 304 Product Quality Control (3)

Applications at the supervisory level of the overall quality plan for manufacturing. Quality assurance, testing, shop and field inspection techniques, material review, source inspection, vendor surveillance, and quality audit. 3 lectures. Prerequisite: ENGL/PHIL/SPC 125.

#### IT 311 Industrial Safety and Health Management (3)

Fundamentals of safety and health management. Background liabilities and safety legislation, hazards and their control in industry and industrial education. Falls, falling objects, impacts, mechanical injuries, pressure, electrical, fires, explosions, toxic materials, radiation, vibration, noise. 2 lectures, 1 activity. Prerequisite: ENGL/PHIL/SPC 125 or consent of instructor.

### IT 322 Energy and Power (4)

Introduction to energy sources, energy conversion and power. Fossil, atomic and solar resources. Conversion by current power technology including reactors, internal and external combustion and direct conversion. Power transmission systems and system maintenance including electrical, mechanical, pneumatic and hydraulic systems. Automobile used as one exemplary system. 4 lectures. Prerequisite: IT 101.

#### IT 323 Energy Management (3)

Energy sources, traditional and alternative. Energy management including system selection and energy auditing. Energy conservation including heat loss, gain and corrective measures for residential, commercial and industrial facilities. 3 lectures. Prerequisite: IT 322.

#### IT 325 Mechanical Systems (4)

Application of laws of physics and thermodynamics to various mechanical systems. Examines the basic principles of engines, pumps, heat exchangers, hydraulics, pneumatics, refrigeration and air conditioning. 4 lectures. Prerequisite: PHYS 122.

#### IT 326 Product Evaluation (3)

Practical application of value engineering. The systematic application of recognized techniques which identify the function of a product or service, establish the monetary value for that function, and provide the necessary function reliability at the lowest overall cost. 2 lectures, 1 activity. Prerequisite: IT 101 or consent of instructor.

## IT 327 Plastics Technology (3)

Materials, processes and applications of industrial polymers. Basic operations in processing, fabricating and finishing of thermal plastic and thermal setting resins, product and materials testing. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 activity. Prerequisite: CHEM 121 or CHEM 122.

## IT 329 Industrial Materials (3)

Investigation of the characteristics, applications and limitations of materials of industry including organics, ceramics and metallics. 2 lectures, 1 activity. Prerequisite: CHEM 121.

#### IT 330 Fundamentals of Packaging (3)

Overview of packaging. Historical development, functions, and materials. Processes and technology employed to protect goods during manufacture, handling, shipment and storage. Container types, package design, development, research and testing. Economic importance and perspective as an industrial activity. 3 lectures. Prerequisite: CHEM 121, PHYS 104 or PHYS 121.

## IT 331 Advanced Industrial Electrical Systems (4)

Industrial applications of electrical power distribution systems, industrial wiring, illumination, motors and controllers. Field trips. 3 lectures, 1 activity. Prerequisite: IT 238, IT 322, MATH 120.

### IT 332 Electronic Control Systems (4)

Automated control devices from an operational and servicing viewpoint. Modular approach to the study of electronic control systems. Field trips. 3 lectures, 1 laboratory. Prerequisite: PHYS 122, IT 238.

#### IT 333 Electronic Computer Applications (4)

Fundamentals of analog and digital computers and numerical control machines. Number systems, logical and sequential circuits and devices, basic and A.P.T. languages. Computer aided design and manufacturing. Word processing, simulation, documentation, personal computers and process control. 3 lectures, 1 laboratory. Prerequisite: IT 101, or consent of instructor.

## IT 334 Materials Handling and Packaging (3)

Technical interrelationships between materials handling and packaging. Design, materials, quality control, packaging and product manufacturing. Storage, transportation and marketing. 2 lectures, 1 activity. Prerequisite: IT 330 or consent of instructor.

## IT 350 Quality Systems Applications (3)

Philosophy and principles of quality system administration. Relationship to total systems program administration; impact on management information and data requirements. Quality system administration techniques applied to control performance, cost and schedule data, traceability, and retrievability. 3 lectures. Prerequisite: ENGL/PHIL/SPC 125.

#### IT 354 Industrial Machine Tool Service Systems (3)

Theory and practice in normal service or repair to common technological systems. Equipment maintenance, testing and repair of mechanical, electrical, pneumatic, hydraulic and other systems. Maintenance includes lubrication systems, sharpening, precision measurement and maintenance scheduling. 1 lecture, 2 activities. Prerequisite: IT 125, or IT 250, or IT 327.

#### IT 355 Cabinetmaking (3)

Examination of modern materials and construction techniques as related to cabinetmaking. Fieldwork in comprehensive projects stressing decision making and design solutions to the problems of cabinetmaking. Team projects with emphasis on job organization, scheduling and construction. 1 lecture, 2 activities. Prerequisite: IT 125.

#### IT 356 Building Construction (3)

Examination of modern materials and methods of construction as related to residential construction. Team fieldwork on actual construction projects, including decision making and design solutions, job organization, scheduling, bidding procedures and building codes. 1 lecture, 2 laboratories. Prerequisite: IT 125.

## IT 400 Special Problems for Advanced Undergraduates (1-4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter. Prerequisite: Consent of instructor.

## IT 402 Technical and Management Presentations (3)

Methods, techniques and evaluation of presenting technical and management information to groups. Individual-group presentations utilizing self-produced aids including transparencies, slides, charts, models, other media. Integration of commercial visual aids. Use of projectors, computers, video-cassettes, camera and monitor. 1 lecture, 2 activities. Prerequisite: Junior standing, IT 101, SPC 201 or SPC 202.

## IT 404 Customer Relations (3)

Customer contacts. Personal relationships, ethics, legal relationships. Service contracts, communication channels. 3 lectures. Prerequisite: MKTG 301 or equivalent, or consent of instructor.

## IT 405 Industrial Marketing (3)

Investigation of the institutions and channels involved in industrial marketing. Analysis of industrial products, competitors, and consumers. Problems in marketing research, personnel, and management. Individual reports on industrial products, companies or training programs. 3 lectures. Prerequisite: MKTG 301 or equivalent, or consent of instructor.

## IT 406 Industrial Management and Supervision (3)

Application of cost control techniques, CIM, and processes for the industrial manager. Techniques and procedures of cost reduction. Investigate methods of reducing waste and inefficiency in business and industry considering labor processes, products, materials and systems. 3 lectures. Prerequisite: IT 101, ACTG 211.

## IT 407 Industrial Product Development (3)

Organization for new industrial product development, linking marketing, operations and technology functions. Sources and screening of new product ideas, sizing and evaluation of market prospects. Budgeting, pricing, timing, advertising and distribution factors as they relate to new industrial products. Internal coordination during product development phases. 3 lectures. Prerequisite: IT 404, IT 405 or consent of instructor.

## IT 408 Protective Packaging (3)

Principles of protective packaging development. Packaging of different classes of products. Materials and test methods for cushioning, blocking, barriers, packing. Development of cushion design, problem solving. Analysis of package configurations, closing features, locking devices and labels. Examination of permeability of materials to gases, vapors and liquids, considerations of biological protection of packages and packaging materials. 2 lectures, 1 laboratory. Prerequisite: IT 330, PHYS 121, CHEM 121, or consent of instructor.

## IT 409 Machinery For Packaging (3)

Analysis of major types of packaging machinery from a practical, operational and marketing viewpoint. Basic processes utilizing packaging machinery. Specialized operations, contract specifications, selection, operation and maintenance. Required field trips to packaging operations. 2 lectures, 1 laboratory.

Prerequisite: IT 330, PHYS 104 or PHYS 121, or consent of instructor.

## IT 418 Technical Management Problems (4)

Familiarization with production and operational management including organizational positions of key personnel in corporate and technical management structure. Use of decision-making aids; solution and analysis of problems including use of computer programs and applications of CIM. 3 lectures, 1 activity. Prerequisite: Senior standing, GEB F.1. computer literacy, STAT 211.

## IT 419 Industrial Internship (2-6) (CR/NC)

Part-time industrial experience or early field experience in an approved school, with or without pay. Conducted under company or school personnel supervision, and University faculty supervision. Guided observations related to technical management or education. Report of experiences required at end of quarter. 30 hours work experience per unit of credit. Credit/No Credit grading only. Prerequisite: Consent of instructor.

## IT 420 Industrial Curriculum Management (3)

Developing and managing curriculum for an industrial learning setting. Assessing resources. Developing a philosophy, sequencing objectives, and properly using materials in training, evaluating and reporting effectiveness. Managing people within this process in an industrial setting. 3 lectures. Prerequisite: ENGL/PHIL/SPC 125.

### IT 424 Curriculum and Methods of Industrial and Technical Education (3)

Industrial and technical education curriculum and instructional processes. Organization, selection, presentation, application, interpretation and evaluation for teaching automotives, drafting, electronics, graphic arts, metals, plastics, power mechanics, woodworking. Preparation for student teaching. Field trips. 2 lectures, 1 activity. Prerequisite: ENGL/PHIL/SPC 125.

## IT 425 Automotive Technology, Fuel Systems (3)

Fuel systems and fuels used in internal combustion engines. Fuel injection, computer controlled systems, turbo-chargers, manifolds, pumps, and storage tanks. Emission control systems. Types of fuels and their compounding. 2 lectures, 1 laboratory. Prerequisite: IT 250, or consent of instructor.

# IT 427 Automotive Technology, Electricity and Electronics (3)

Applications of electronics and electrical systems in automotive type equipment including computer controls, ignition, lighting, starting, charging, and auxiliary systems. 2 lectures, 1 laboratory. Prerequisite: IT 250, or consent of instructor.

## IT 433 Production and Process Management (3)

Production equipment and systems, measurement, tooling and finishes. Production management and computer applications in management of production and processes (CIM). Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: IT 101.

## IT 437 Reinforced Plastics (3)

Mold preparation and production of reinforced plastic products. Standard specifications for reinforced materials and resin systems. 1 lecture, 2 laboratories. Prerequisite: IT 141 or consent of instructor.

### IT 443 General Metals (3)

Theory and application of various metal processes. Problem solving in joining, casting, machining and forming as applied in industrial education and industrial fabrication. Maintenance of metalworking equipment, application and techniques of CIM. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 2 activities. Prerequisite: IT 233, IT 329 or consent of instructor.

#### IT 444 Technical Drawing: Industrial Education (3)

Application of current drafting procedures in preparing complete graphic descriptions of industrial components. Sketching, lettering, instrument drawing. Preparation of work drawings and specifications. Analysis of drafting materials, equipment and processes. 1 lecture, 2 activities. Prerequisite: IT 225.

#### IT 451 Industrial Equipment and Systems (4)

Major mechanical equipment and systems making up the utility and production support systems of a modern industrial facility. Field trips to industrial facilities. 3 lectures, 1 activity. Prerequisite: IT 323, IT 431.

#### IT 452 Industrial Power and Lighting (3)

Major power systems in a modern industrial plant, including electrical distribution systems and industrial and commercial illumination. Planning and budgeting of industrial power and lighting systems. 3 lectures. Prerequisite: IT 331, IT 451.

## IT 453 Plant Maintenance Management (4)

Maintenance function. Maintenance repair, and operations of industrial plant facilities including utility and mechanical systems, preventive maintenance, job control systems, CIM, work estimating, budgeting, other essential services. Field trips to industrial facilities. 3 lectures, 1 activity. Prerequisite: IT 451.

#### IT 454 Plant Facilities Management (3)

Management of the modern industrial facility, including capital and operating budgeting, forecasting, organization. 3 lectures. Prerequisite: IT 452, IT 453, ECON 201.

#### IT 461 Senior Project (3)

Selection and completion of a project under faculty supervision. Projects are typical of problems graduates must solve in their field of employment. Project results are presented in a formal report and must be completed during one quarter. Minimum 90 hours total time. Prerequisite: Consent of instructor.

#### IT 463 Industrial Technology Seminar (2)

Functions, philosophies and current trends of industry, including CAD, CAM and CIM. Content will be presented using such methods as lectures, guest lecturers, panel discussions and debates. 2 seminars. Prerequisite: ENGL/PHIL/SPC 125, IT 326.

#### IT 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

## IT 471 Selected Advanced Activity (1-3)

Directed group study for advanced undergraduate and graduate students. *Class Schedule* will list topic selected. May be required with IT 470. Total credit limited to 6 units. 1 to 3 activities. Prerequisite: Consent of instructor.

## IT 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

#### IT 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

#### IT 500 Individual Study (1-6)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Maximum of 6 units may be applied to degree requirements. Prerequisite: Consent of department head or graduate adviser and supervising faculty member.

#### IT 505 Graduate Seminar (3)

Organize, build, and conduct experimental projects using research techniques. Physical problem solving initiated through research by the student. Prerequisite: Graduate standing.

### IT 515 History and Philosophy of Industrial Education (3)

Development of industrial education from its initial conception to the present time. Current philosophical concepts of the field. 3 seminars. Prerequisite: Graduate standing.

#### IT 520 Organization and Administration of Industrial and Technical Studies (3)

Current factors in the administration and organization of industrial and educational environments. 3 seminars. Prerequisite: Graduate standing.

## IT 521 Curriculum in Industrial and Technical Studies (3)

Basic principles and practices in the preparation of course guides, courses of instruction and related materials for industrial instruction. 3 seminars. Prerequisite: Graduate standing.

## IT 522 Facility Planning (3)

Analysis of major factors in planning and designing industrial and educational facilities. 3 seminars. Prerequisite: Graduate standing.

#### IT 527 Technical Trends and Issues (3)

Current and innovative practices in technology. Social impact, changing values and tradition. 3 seminars. Prerequisite: Graduate standing.

# IT 580 Graduate Research in Industrial and Technical Studies (3)

Advanced study and analysis of selected topics and problems in industrial and technical studies. 3 seminars. Prerequisite: Graduate standing.

## IT 599 Industrial and Technical Studies Thesis or Project (5)

Each student will propose, develop and complete a thesis or project involving individual research that is significant to the field of industrial and technical studies. Prerequisite: Acceptable academic standing in the master's degree program in Industrial and Technical Education and consent of instructor.

## **ITAL-ITALIAN**

## ITAL 101, 102, 103 Elementary Italian (4) (4) (4)

Italian for beginners. Class practice in pronunciation, sentence structure, reading, writing, and basic conversation. Laboratory drill required. Language taught in its cultural context. To be taken in numerical sequence. 3 lectures, 1 activity.

## **JOUR-JOURNALISM**

## JOUR 201 Journalism History (3)

Survey of historical influences in the development of today's journalism. 3 lectures.

## JOUR 203 Reporting I (4)

Introduction to the techniques of reporting and writing news for the news media. Intensive laboratory and field practice in gathering and evaluating information. Writing basic news stories under close supervision. 3 lectures, 1 laboratory. Prerequisite: ENGL 114 and typing proficiency.

## JOUR 205 Agricultural Communications (3)

Survey of the media of agricultural communication. Newspaper farm pages and sections, general and specialized agricultural magazines. Radio and TV farm broadcasts. Public and private agencies involved in agricultural communication. 3 lectures.

## JOUR 218 Mass Media in Society (4)

Traditional mass media and the emerging technologies, their methods, functions and dysfunctions. Responsibilities of journalists. Importance of media in society. 4 lectures.

## JOUR 233 Copy Editing (4)

Introduction to the techniques of newspaper and magazine copy desk work. Rewriting, editing, and writing headlines for news and feature copy. Selecting, cropping, and writing cutlines for photographs and line art. Practical laboratory experience in editing. 3 lectures, 1 laboratory. Prerequisite: JOUR 203 or equivalent.

## JOUR 302 Mass Media Law (4)

Legal basis for freedom of expression. Court decisions resolving conflicts between First Amendment and right to fair trial, privacy, reputation. Source confidentiality, freedom of information, contempt, copyright. Federal and state laws and regulations affecting mass media reporters, editors, publishers. 4 lectures. Prerequisite: JOUR 203.

## JOUR 304 Reporting II (4)

Intermediate experience in reporting and writing news and short feature stories for the news media. Intensive field and laboratory experience in interviewing, beat reporting, covering speeches and meetings and using library and other information sources. 3 lectures, 1 laboratory. Prerequisite: JOUR 203 and JOUR 233.

## JOUR 312 Introduction to Public Relations (4)

Growth and development of public relations as a practice in business and industry, government, volunteer agencies and other public institutions. Communications and activities utilized to gain public interest and support. 4 lectures. Prerequisite: Sophomore standing.

## JOUR 323 Photojournalism (3)

Application of photographic techniques to journalism. Use of lighting, particularly electronic flash. Use of 35mm camera and other cameras in journalism. Introduction to the principles of news photography for television. Application of darkroom techniques suitable for news media deadline requirements. Projects using still cameras and black and white and color film. Integration of photographic and writing skills. 2 lectures, 1 laboratory. Prerequisite: JOUR 203, ART 221.

## JOUR 331 Advertising (3)

Principles of advertising, advertising psychology, salesmanship, copy, layout, and production for print and broadcast media. 3 lectures.

## JOUR 333 Broadcast News I (4)

Beginning broadcast news writing, reporting and editing emphasis on radio. Gathering and producing audio and video materials for news and public affairs programming. Newsroom and studio equipment operation and procedures. 3 lectures, 1 laboratory. Prerequisite: JOUR 203 and JOUR 233.

## JOUR 342 Public Relations Media (4)

Application of public relations techniques with emphasis on writing for media and working with media editors. Preparing news releases, newsletters and other communications. Analysis of the use of broadcast media. Utilization of case studies. 4 lectures. Prerequisite: JOUR 203 and JOUR 312 or consent of instructor.

## JOUR 346 Broadcast Announcing (4)

Radio and television announcing of news, public affairs, sports, special events, commentary, features, commercials, and talk and discussion. 3 lectures, 1 laboratory. Prerequisite: JOUR 333, SPC 201 or SPC 202.

## JOUR 351 Broadcast Practice (3)

Practicum for students holding broadcast news positions on radio station KCPR, or other similar supervised experience as determined by the department. Total credit limited to 6 units. 1 lecture, 2 laboratories. Prerequisite: JOUR 233 and JOUR 304 or consent of instructor.

## JOUR 352 Reporting Practice (3)

Practicum for students holding editorial or photographic positions on *Mustang Daily* or other similar supervised experience as determined by the department. Total credit limited to 6 units. 1 lecture, 2 laboratories. Prerequisite: JOUR 233 and JOUR 304.

## JOUR 385 Mass Media Criticism (4) (Also listed as ENGL 385 and SPC 385)

Examines mass media (especially broadcasting) from a rhetorical/critical perspective. Aims to expand students' understanding of media issues, media's role as critic, and the role of criticism. 4 lectures. Prerequisite: SPC 201 or SPC 202.

## JOUR 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of instructor.

## JOUR 401 International Communication (4)

Global communications facilities and operations; world transmission of information; survey of world wire services and international print and electronic media. Analysis of press operations under varying government ideologies, including third world countries. 4 seminars. Prerequisite: Junior standing.

## JOUR 402 Social Responsibility of Mass Media (4)

Current issues revolving around the social responsibility of the mass media. Role of the public, government, and media in considerations of media accountability. Professional behavior in media organizations. 4 seminars. Prerequisite: Senior standing, JOUR 218.

## JOUR 405 Reporting III (4)

Advanced experience in specialized public affairs reporting and writing of investigative and interpretative stories for the news media. Frequent field assignments, with focus on municipal, county, state and federal government affairs. 3 lectures, 1 laboratory. Prerequisite: JOUR 304.

## JOUR 407 Feature Writing (3)

Practice in researching, interviewing, and data gathering for nonfiction newspaper and magazine articles. Analysis of articles printed in current publications. 3 lectures. Prerequisite: JOUR 203 or consent of instructor.

## JOUR 413 Advanced Public Relations (4)

Methods employed in dissemination of public information by organizations, institutions and governments. Interaction of media and PR practitioners, case histories, formation and measurement of public opinion. Public opinion survey projects. 4 lectures. Prerequisite: JOUR 203, JOUR 312, JOUR 351 or consent of instructor.

## JOUR 425 Advertising Layout and Copywriting (2)

Advertising typography and illustration, application of production processes in making of layouts and writing of copy. 1 lecture, 1 activity. Prerequisite: JOUR 331 or consent of instructor.

## JOUR 432 Broadcast News II (4)

Intermediate broadcast news writing, reporting, editing and producing television news and public affairs programming. Electronic news gathering techniques. Television studio and control room equipment and procedures. Discussion and evaluation of electronic news organizations and policies. 3 lectures, 1 laboratory. Prerequisite: JOUR 333 and ART 221 or consent of instructor.

## JOUR 434 Advanced Editing (4)

Advanced experience in rewriting and editing news and feature stories, designing and laying out pages for the print media. Experience in writing simple editorials and opinion columns. 3 lectures, 1 laboratory. Prerequisite: JOUR 233, JOUR 304.

## JOUR 444 Media Internship (4)

Application of techniques on daily basis with media under supervision of department faculty. Prerequisite: Junior standing in Journalism.

## JOUR 460 Senior Project (3)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 90 hours total time.

## JOUR 470 Selected Advanced Topics (2-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 8 units. 2–4 lectures. Prerequisite: Consent of instructor.

## JOUR 487 Cooperative Education Experience (6)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Prerequisite: Sophomore standing and consent of instructor.

## LA-LANDSCAPE ARCHITECTURE

#### LA 110 Graphic Communication for Landscape Architects (3)

Communication through descriptive drawing and professional plan graphics, including theories of perspective. 3 laboratories.

#### LA 111 Three Dimensional Graphics for Landscape Architects (3)

Elements of three dimensional perception/visualization with emphasis on freehand and mechanical perspective drawing methods. 3 laboratories. Prerequisite: LA 110 or consent of instructor.

#### LA 112 Graphic Communication Techniques for Landscape Architects II (3)

Exploration of two and three dimensional graphic techniques including presentation and rendering methods. Miscellaneous course fee required-see *Class Schedule*. 3 laboratories. Prerequisite: LA 111 or equivalent.

## LA 150 Graphics Fundamentals (6)

Elements of three dimensional perception/visualization with emphasis on freehand and mechanical perspective drawing methods. Exploration of two and three dimensional graphic techniques including presentation and rendering methods. Miscellaneous course fee required-see *Class Schedule*. 6 activities. Prerequisite: Transfer student status or consent of instructor.

## LA 151 Design Fundamentals (7)

Exploration of design and planning projects on different scales and in different environmental settings including site, neighborhood, community, city, region. Introduction to principles of environmental design including basic elements and composition. Contextual understanding of landscape architecture and other environmental design disciplines; relationships of natural and cultural elements in the environment and the landscape architect's role in environmental design. Basic principles of design, composition, design process and the creation of spatial settings for human use. Miscellaneous course fee required-see *Class Schedule.* 7 activities. Prerequisite: Transfer student status or consent of instructor.

## LA 152 Fundamentals of Design and Planning in Landscape Architecture (4)

Exploration of design and planning projects on different scales and in different environmental settings: site, community, city, region. Introduction to the principles of environmental design including basic design elements and composition. Contextual understanding of landscape architecture and other environmental design disciplines. Identification of natural and cultural elements in the environment. 4 laboratories. Prerequisite: LA 110.

## LA 153 Fundamentals of Design and Planning in Landscape Architecture (3)

Exploration of landscape architectural design and planning projects in various scaled environmental settings including site, neighborhood, urban, regional. Contextual relationships of natural and cultural elements in the environment and the landscape architect's role in environmental design. Basic principles of design, composition, design process and the creation of spatial settings for human use. Miscellaneous course fee required-see *Class Schedule*. 3 laboratories. Prerequisite: LA 152.

## LA 201 Survey of Landscape Architecture (2) GEB F.2.

Survey of the profession of landscape architecture from small space design to regional planning. Relationships between landscape architecture and society and professionals in related fields. 2 lectures.

## LA 202 Fundamentals of Design and Planning in Landscape Architecture (3)

Elements of environmental and visual perception including three dimensional site planning and design principles. Spatial design and sequencing of spaces with concern for human behavior and social implications. Behavioral, environmental and natural site factors for program concept and design development. Design process and development of verbal and graphic communication skills. Miscellaneous course fee required-see *Class Schedule*. 3 laboratories. Prerequisite: LA 153.

## LA 203 Applied Design and Planning Fundamentals (3)

Focus on the application of basic design fundamentals and design of environments through a series of design exercises. Miscellaneous course fee required-see *Class Schedule.* 3 laboratories. Prerequisite: LA 202.

## LA 212 Site Analysis (3)

Introduction to various inventory and analysis methodologies, case study reviews, mapping and overlay techniques, environmental ethics and an overall understanding of the function and structure of the natural landscape. Visual assessment, synthesis techniques and relating mapped analytical data with design program analysis for use in site planning. 2 lectures, 1 laboratory.

## LA 213 Site and Terrain Analysis (4)

Introduction to various inventory and analysis methodologies, case study reviews, mapping and overlay techniques, environmental ethics and an overall understanding of the function and structure of the natural landscape. Visual assessment, synthesis techniques and relating mapped analytical data with design program analysis for use in site planning. 2 lectures, 2 laboratories. Enrollment limited to CRP and LA majors.

## LA 214 Landscape Analysis and Planning (4)

Research and analysis techniques of primary natural components of a landscape. Contour maps, aerial photographs, soil reports, climate and hydrologic studies, vegetation surveys, visual and sensory assessments, program analysis, suitability-/sensitivity analyses, and ethics. Mapping, case study reviews, individual and team field studies, research and project analysis and land use planning. Miscellaneous course fee required-see *Class Schedule*. 4 laboratories. Prerequisite: LA 153, SS 121.

## LA 231 Landscape Architecture Construction I (3)

Introduction and application of formulas, principles, and criteria for grading and drainage. Horizontal and vertical road alignment. Cut and fill calculations. Runoff calculations. Miscellaneous course fee required—see *Class Schedule*. 3 laboratories. Concurrent: LA 202. Prerequisite: LA 214, AE 237, MATH 120.

## LA 240 Additional Landscape Architecture Laboratory (1-3)

Total credit limited to 6 units, with a maximum of 3 units per quarter. 1-3 laboratories.

## LA 247 Landscape Plant Composition (3)

Plant characteristics and ecological conditions as constraints and opportunities for the landscape architect. Investigation of plant material forms and composition for design effect. Miscellaneous course fee required-see *Class Schedule*. 3 laboratories. Prerequisite: LA 153, LA 214, BOT 238, SS 121. Concurrent: LA 202.

## LA 300 Internship (3) (CR/NC)

Involvement in a work setting related to landscape architecture. Thirty hours work experience per unit of credit. Credit/No Credit grading only. Prerequisite: Third year standing.

#### LA 310 Introduction to Computing in Landscape Architecture (2)

Introduction to computer software and hardware which is important to landscape architecture. Current issues and applications which can be used in the profession. Laboratory utilizes self-paced learning modules. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 1 laboratory. Prerequisite: GEB F.1. computer literacy elective or consent of instructor.

## LA 311 History of Landscape Architecture (3) GEB F.2.

Historical evaluation of man's interaction with outdoor space. Analysis of influences that direct, perpetuate, and form the landscape. 3 lectures.

#### LA 313 Architectural Design for Landscape Architects (3)

Exposure to architectural design concepts and theories with attention given to historical and contemporary case studies. Discussions and field trips emphasize architectural implications of materials and methods of construction. 2 seminars, 1 activity. Prerequisite: Third-year standing.

## LA 314 Site Planning (3)

Identifies the elements of a site and influences methods and examples of site planning for environmental design projects. Emphasis on interdisciplinary nature of site planning. Regulatory and technical requirements. Creation and evaluation of prototypical site planning projects. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: Upper division standing in ARCH, LA, CRP or related discipline.

## LA 318 Applications of GIS in Natural Resources (2) (Also listed as FNR 318)

ARC/INFO Geographic Information System (GIS) computer software to explore relevant environmental issues utilizing natural resources data such as vegetation, soils, habitats, topography and geology. Development of data base, use of software for application to relevant, natural systems. Miscellaneous course fee required-see *Class Schedule*. 2 laboratories. Prerequisite: Junior standing, AG 250 or CSC 110 or consent of instructor.

## LA 321 Concepts in Environmental Decision Making (3) GEB F.2.

Investigation of theoretical and attitudinal bases of environmentally concerned disciplines. Ecology, perception, behavior and design studies as organizational principles and theories in developing understanding of interface between built and natural environments. 3 lectures.

#### LA 323 History of Twentieth Century Landscape Architecture (3)

Work, philosophies and design theory of important personalities in the environmental design disciplines of the twentieth century. 3 lectures. Prerequisite: At least one course in either architecture, landscape architecture or planning history.

## LA 341 Landscape Architecture Construction II (3)

Application of formulas, principles, and criteria in the development of methods for solving problems of grading and drainage and developing skills for landform manipulation. Miscellaneous course fee required—see *Class Schedule*. 3 laboratories. Prerequisite: LA 231. Concurrent: LA 203.

## LA 342 Landscape Architecture Construction III (3)

Information and application of materials, connections, and details for landscape architecture construction. Miscellaneous course fee required-see *Class Schedule*. 3 laboratories. Prerequisite: LA 341, ARCE 311. Concurrent: LA 352.

## LA 348 Advanced Landscape Plant Composition (3)

Preparation of landscape planting contract documents. Emphasis on understanding installation, maintenance, and irrigation of planted areas as related to design and composition. Miscellaneous course fee required—see *Class Schedule*. 3 laboratories. Prerequisite: LA 247, LA 341, LA 351, AE 337, OH 237, OH 238. Concurrent: LA 353.

## LA 351, 352 Design for Landscape Architects (5) (5)

Process oriented site designs with emphasis on identification of problems and opportunities, creative problem solving, spatial design site analysis, landform, plantform, builtform, circulation, detail design and graphic communication. Miscellaneous course fee required-see *Class Schedule*. 5 laboratories. Prerequisite for LA 351: LA 203, LA 214, LA 341. For LA 352: LA 351. Concurrent for LA 352: LA 342.

## LA 353 Design for Landscape Architects (5)

Completion of design project, selected by instructor, of sufficient scale and complexity to encompass most fundamental design and technical decisions common to landscape architectural construction projects. Emphasis on identification of problems and opportunities; creative problem solving. Conceptual, design development, and working drawings prepared as a complete set. Miscellaneous course fee required-see *Class Schedule*. 5 laboratories. Prerequisite: LA 342, LA 352. Concurrent: LA 348.

# 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 thirdyear standing or consent of instructor.

#### LA 400 Special Problems for Advanced Undergraduates (1-3)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter.

#### LA 410 Information Systems in Landscape Architecture (2)

GIS applications using current software on advanced work stations. Basic GIS concepts including topological data structures, relational database concepts, data input techniques and issues and spatial analysis techniques. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 1 laboratory. Prerequisite: LA 451, LA/FNR 318 or consent of instructor.

## LA 411 Regional Landscape History (3)

Developmental history of the landscape in the western region with specific focus on the Basin and Range region and California. One or more field trips required. 3 lectures. Prerequisite: Fourth year standing or consent of instructor.

## LA 441 Professional Practice I (2)

Theoretical and practical aspects of professional practice. Addressing professional, human, and business skills. Practice diversity and inter-professional relationships. Professionalism and ethics. Licensure, communication skills, office management and marketing. Construction documentation. Miscellaneous course fee required-see *Class Schedule*. 2 lectures. Prerequisite: Fourth year standing, LA 353.

## LA 442 Professional Practice II (2)

Practical aspects of professional practice. Addressing methods of contracting professional services. Project management procedures, office practice and conditions. Goal setting, resume and portfolio preparation. Job procurement and licensure requirements. Miscellaneous course fee required-see *Class Schedule*. 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) tech-
niques. Land planning and design issues in regional scale environments. Miscellaneous course fee required-see *Class Schedule*. 6 laboratories. Prerequisite: LA 353 or consent of instructor.

#### LA 452 Urban Design for Landscape Architects (5)

Emphasis in urban and community design issues related to landscape architecture; scales of investigation and application; community involvement techniques. Miscellaneous course fee required-see *Class Schedule*. 5 laboratories. Prerequisite: LA 353.

#### LA 454, LA 455, LA 456 Design for Landscape Architects (4) (4) (4)

Advanced design studio. Emphasis is on complex design problems and special environmental situations or interdisciplinary work and involvement in current design issues. At least one course in the series must be self-directed. Miscellaneous course fee required-see *Class Schedule*. 4 laboratories. Prerequisite: Completion of fourth-year design sequence (LA 451, LA 452, LA 461).

#### LA 461 Senior Design Project (5)

Student selection and completion of approved design or research project sufficient in scale and complexity to encompass issues common to landscape architecture. Time management, documentation, and communication skills emphasized. Miscellaneous course fee required-see *Class Schedule.* 5 laboratories. Prerequisite: LA 442, LA 451, LA 452, LA 463.

#### LA 463 Undergraduate Seminar (2) (CR/NC)

Exploration of issues and problems in the environemtal design field. Research methods; preparation of a proposal for senior project. Credit/No Credit grading. 2 seminars. Prerequisite: Fourth-year standing.

#### 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. Credit/No Credit grading only. 1 seminar. Prerequisite: Fifth-year standing.

#### LA 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

#### LA 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

#### LA 481 Visual Resource Management Methods (3)

Investigation and application of the major visual resource management methods relevant to landscape architecture. Theoretical basis for visual resource assessment, the different assessment techniques, and the process of translating assessment results into visual resource management techniques. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: Fourth-year or graduate standing.

#### LA 482 Evaluating Social and Behavioral Factors for Open Space Design (3)

User oriented approach to open space design. Interview and survey techniques, behavioral trace mapping and systematic observation, post occupancy evaluation and similar methods are used to generate user input and feedback in the design process. Understanding the behavioral implications of designed environments. Miscellaneous course fee required-see *Class Schedule.* 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 guide-lines apply. Miscellaneous course fee required-see *Class Schedule.* 1–12 activities. Prerequisite: Fourth or fifth year standing.

#### LA 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

#### LA 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

#### LA 551 Regional Landscape Assessment I (4)

Definition, research and filing of data covering the biological, cultural and physical resources of a specific region. Concepts of regionalism, land planning, reclamation and preservation are integral to the course. Utilization of mainframe and microcomputer facilities and software. Miscellaneous course fee required–see *Class Schedule*. 4 laboratories. Prerequisite: LA 410, LA 411, graduate standing or consent of instructor.

#### LA 552 Regional Landscape Assessment II (4)

Application of data manipulation techniques in order to model both impacts on natural systems and land development potentials. Use of planning strategies to predict outcomes resulting from the land use decision process. Utilization of mainframe and microcomputer facilities and software. Miscellaneous course fee required-see *Class Schedule*. 4 laboratories. Prerequisite: LA 551 and graduate standing.

#### LA 585 Cooperative Education Experience (6) (CR/NC)

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

#### LA 595 Cooperative Education Experience (12) (CR/NC)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

# LIB-LIBRARY

#### LIB 101 Library Instruction (1)

Instruction and practice in the use of the on-line catalog, reference books, periodical indexes, government documents, and other library materials. Development of student independence and initiative in using the library as a source of information. 1 lecture.

# LIB 301 Library Resources in Biology and Agriculture (1)

Sources of information pertaining to biology and agriculture and closely related disciplines. Use of abstracts and indexes for journal articles, reviews, proceedings, dissertations, and government documents. Bibliographic database searching. Search strategy, reference books introduced, bibliographic techniques. 1 lecture. Prerequisite: Junior standing or consent of instructor.

#### LIB 302 Library Resources and Literature Searches (1)

Sources of information in major subject fields. Reference materials, bibliographic aids, indexing and abstracting tools, periodicals, serials, and other sources. Techniques used in literature searches and preparation of bibliographies. *Class Schedule* will list major subject area covered. Total credit limited to 3 units. 1 lecture. Prerequisite: Junior standing or consent of instructor.

#### LIB 303 Library Computer Searching (1)

Instruction and practice in use of computerized information retrieval systems including CD/ROM, local and remote on-line catalogs, and vendor services. Emphasis on efficient searching skills utilizing controlled and/or keyword searching, limiters, Boolean logic, and truncation. 1 lecture.

# **LS-LIBERAL STUDIES**

#### LS 101 Orientation to Liberal Studies (1) (CR/NC)

Exploration of the Liberal Studies Program as preparation for the Multiple Subjects Credential and for alternate career objectives. To be taken during the first quarter in attendance at Cal Poly as a Liberal Studies major. Credit/No Credit grading only. 1 lecture.

#### LS 461, LS 462 Senior Project (3) (3)

Selection and completion of a project or report under faculty supervision. Topic must be chosen with departmental approval. Results must be presented in a formal, written report. Prerequisite: Senior standing and consent of Liberal Studies Coordinator.

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# MATE-MATERIALS ENGINEERING

# MATE 121 Introduction to Materials Engineering (1)

A lecture series involving materials engineers from industry as well as Cal Poly faculty. 1 lecture.

#### MATE 122 Introduction to Materials Engineering Analysis (1)

Introduction to materials engineering laboratory practices through demonstrations of laboratory equipment for evaluation of material properties. 1 activity.

#### MATE 200 Special Problems for Undergraduates (1-4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

#### MATE 224 Metallography (3)

Interpretation of microstructures in metals and alloys and laboratory methods for revealing and documenting such microstructures. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 2 laboratories. Prerequisite: MATE 306 and MATE 341.

#### MATE 226 Physical Metallurgy (4)

Physical metallurgy of major ferrous and nonferrous alloy systems. Mineral resources and economics of metal production. Crystal structure and bonding, equilibrium diagrams, phase diagrams, phase transformations, heat treatment. Casting, working and joining of metals. 4 lectures. Prerequisite: MATE 224 or consent of instructor; MATE 246 should be taken concurrently.

#### MATE 240 Additional Materials Laboratory (1)

Special assignments undertaken by students who need or wish to acquire abilities supplementary to their required course work. Assignments must be of a laboratory nature. Work is done by the student with a minimum of faculty supervision. 1 laboratory. Prerequisite: Consent of department head.

#### MATE 246 Physical Metallurgy Laboratory (2)

Laboratory experiments designed to make the student familiar with the physical metallurgy of major ferrous and nonferrous alloy systems. Melting and casting, cold working and annealing, heat treatment, microstructures, mechanical testing, preparation of engineering reports. Miscellaneous course fee requiredsee *Class Schedule*. 2 laboratories. Prerequisite: MATE 306 and MATE 341. MATE 226 should be taken concurrently.

#### MATE 306 Materials Engineering (3)

Structure of matter. Physical and mechanical properties of materials including metals, alloys, ceramics, insulating materials, semiconductors, super semiconductors and polymers. Equilibrium diagrams. Heat treatments, material selection and corrosion phenomena. 3 lectures. Prerequisite: CHEM 121, CHEM 124 or CHEM 127.

#### MATE 341 Materials Engineering Laboratory (1)

Laboratory experiments on the heat treatment and resulting properties of steel and aluminum alloys. Effects of cold deformation of metals. Brittle-ductile fracture behavior, equilibrium phase relationships, corrosion. Mechanical behavior of polymers. Construction and behavior of semiconductor devices. 1 laboratory. Prerequisite or concurrent: MATE 306.

### MATE 400 Special Problems for Advanced Undergraduates (1-4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

#### MATE 401 Electronic Properties of Materials (3)

Basic concepts in electron theory of solids (quantum mechanics, energy band theory, Fermi energy, distribution and density of states), electrical properties and conduction in metals, semiconductors, polymers, ceramics, and superconductors, magnetic phenomena and optical properties in materials with applications in recording media. 3 lectures. Prerequisite: MATE 306, PHYS 133.

### MATE 402 Mechanical Behavior of Materials (4)

Uniaxial and complex static stress, stress-strain elastic and plastic relationships. Mechanisms of plastic deformation, dislocation theory, strengthening mechanisms. Brittle, ductile and high temperature fracture. Fatigue, creep, stress-rupture. Strain rate and environmental effects. 4 lectures. Prerequisites: MATE 306, CE 204; MATE 412 should be taken concurrently.

### MATE 403 Materials Inspection (3)

Special physical and mechanical techniques for nondestructive and destructive examination of materials, to determine their fitness for service. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 2 laboratories. Prerequisite: MATE 224.

#### MATE 404 Failure Analysis (3)

Procedures for analyzing failed materials. Actual failure analysis of a failed component by each student. Involves fracture, fatigue, corrosion, overload, using metallography, electron microscopy, energy-dispersive x-ray spectroscopy, chemical analysis and heat treatments. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 2 laboratories. Prerequisite: MATE 226, MATE 402, MATE 403 (MATE 226 may be taken concurrently.

#### MATE 412 Mechanical Behavior of Materials Laboratory (2)

Tensile, fatigue, creep and impact testing of materials. Miscellaneous course fee required-see *Class Schedule*. 2 laboratories. Prerequisite: MATE 306, CE 204. Concurrent: MATE 402.

# MATE 421, 422 Materials Thermodynamics I, II (3) (3)

Physical chemistry of metals. Thermodynamics of liquid and solid metallic systems. Material and energy balances, transport phenomena. Computer applications and simulations of thermodynamic processes. 3 lectures. Prerequisite: MATE 306, CHEM 305.

#### MATE 424 Ceramic Materials (3)

Development, utilization, and control of properties in ceramic materials (inorganic-nonmetallic solids). Parallel treatment of crystalline insulators, semiconductors, and glasses. Characteristics of ceramic solids (crystals and non-crystals). Thermal, optical, mechanical, magnetic, and electrical properties. Physical chemistry of ceramics. 3 lectures. Prerequisite: MATE 306, CHEM 306.

### MATE 425 Corrosion Engineering (4)

Galvanic corrosion, thermodynamics of corrosion, polarization curves, corrosion testing, corrosion control, cathodic protection systems. 3 lectures, 1 laboratory. Prerequisite: CHEM 125 or CHEM 128.

#### MATE 426 Fracture of Materials (3)

Stress analysis of cracks, energy analysis of fracture process, fracture toughness testing, fail safe design. Use of fracture mechanics in describing fatigue and stress corrosion cracking. 2 lectures, 1 laboratory. Prerequisite: CE 205.

#### MATE 427 Composites (3)

Molecular structures of composites. Properties, processing techniques and fabrication methods of composites, structure and property relationships. 3 lectures. Prerequisite: MATE 306, CE 204.

#### MATE 428 Polymers (3)

Molecular structures of polymers and polymer systems. Synthesis, processing techniques, properties and fabrication methods of polymeric materials. 3 lectures. Prerequisite: MATE 306.

#### MATE 429 Instrumental Analysis (3)

Basic theory and practice of current instrumentation and analytical techniques for the characterization of metallic and non-metallic materials. Laboratory experiments emphasize technique selection methods, specimen preparations for various applications and optimization of experimental parameters for data analysis. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 2 laboratory. Prerequisite: MATE 306.

### MATE 430 Microelectronic Materials Processing (3)

Introductory microelectronics materials processing, including integrated circuit fabrication, assembly and packaging. Crystal growth, epitaxial layer growth, diffusion, ion implantation, oxidation, chemical and plasma assisted etching, photolithography. 3 lectures. Prerequisite: MATE 306.

#### MATE 434 Welding Engineering 1 (3)

Principles, primary variables, and metallurgical changes associated with the welding process, concentrating on the heat affected zone. Physics of heat transfer involved in welding and welding processes. Relation between joint design, weld microstructure, and weld properties. Description of weld processes. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 2 laboratories. Prerequisite: MATE 306.

#### MATE 435 Welding Engineering II (3)

Principles, primary variables, and metallurgical changes associated with the welding process, concentrating on the weld fusion zone. Thermodynamics of welding, solidification kinetics of the weld pool. Heat and mass transfer during solidification. Fusion zone structure and morphology. Hot ductility testing, weldability. Miscellaneous course fee required-see *Class Schedule.* 1 lecture, 2 laboratories. Prerequisite: MATE 306.

#### MATE 436 Welding Engineering III (3)

Current topics in welding. Discussion of areas of intense research. Modeling and simulation of welding and weldments. Welding of Al-Li alloys. Stainless steels for cryogenic applications and substituted stainless steels. Dissimilar metal welds, diffusion and explosure bonding, welding in hostile environments. Robotics, welding automation. Solder, semiconductor packaging, welding of non-metallic materials. Miscellaneous

#### 470 MATH

course fee required-see *Class Schedule*. 1 lecture, 2 laboratories. Prerequisite: MATE 306.

#### MATE 441, 442, 443 Advanced Materials Laboratory I, II, III (1) (1) (1)

Laboratory examination of properties and microstructure-optical and SEM, of superalloys, stainless steels, titanium alloys, dual phase steels, Al-Li alloys and recently developed composite materials. MATE 441: Miscellaneous course fee required--see *Class Schedule*. 1 laboratory. Prerequisite: MATE 226.

# MATE 446 Surface Chemistry of Materials (3) (Also listed as CHEM 446)

Surface energy, capillarity, solid and liquid interface. Adsorption, surface areas of solids, contact angles and wetting. Friction, lubrication and adhesion. Relationship of surface to bulk properties of materials. Applications. 3 lectures. Prerequisite: CHEM 306.

#### MATE 461, 462 Senior Project (1) (4)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time.

### MATE 463 Undergraduate Seminar (1)

Developments, policies, practices and procedures discussed through regular seminar. 1 seminar. Prerequisite: Senior standing.

#### MATE 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 9 units. Prerequisite: Sophomore standing and consent of instructor.

#### MATE 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 9 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 adviser, or supervising faculty member.

#### MATE 562 Mechanical Behavior of Materials (4)

Complex stress analysis, dislocation theory, fracture mechanisms, introductory fracture mechanics. Fatigue, creep, brittleductile transition, environmental embrittlement. Special project assignment. 4 seminars. Prerequisite: Graduate standing.

#### MATE 564 Fracture Mechanics (3)

Stress analysis of cracks, energy analysis of fracture process, fracture toughness testing. Fail safe design. Use of fracture mechanics in describing fatigue and stress corrosion cracking. 2 lectures, 1 laboratory. Prerequisite: Graduate standing.

#### MATE 587 Cooperative Education Experience (6)

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Prerequisite: Graduate standing and consent of instructor.

#### MATE 597 Cooperative Education Experience (12)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Prerequisite: Graduate standing and consent of instructor.

# 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.

#### MATH 100 Beginning Albegra Review (3) (CR/NC)

Review of basic algebra skills at the beginning algebra level intended primarily to prepare students for MATH 104. Course open only to students who have taken the ELM examination and are not qualified for MATH 104. Not for baccalaureate credit. Credit/No Credit grading only. 3 lectures. Prerequisite: Two years of high school algebra.

#### MATH 102 Agricultural Mathematics (3) (CR/NC)

Percentage problems in soils, dairy, horticulture, poultry, feeds, discount and interest, Pearson's square, equations, formulas, dimensional analysis, linear measurements, areas, volumes and proportions. Concrete and lumber problems. Not for baccalaureate credit. Credit/No Credit grading only. 3 lectures.

#### MATH 104 Intermediate Algebra (3) (CR/NC)

Review of basic algebra skills at the intermediate algebra level intended primarily to prepare students for MATH 116. Not for baccalaureate credit. Credit/No Credit grading only. 3 lectures. Prerequisite: Two years high school algebra and appropriate score on the ELM examination, or credit in MATH 100.

#### MATH 105 Hand-Held Calculators (1)

Operation of multi-function programmable calculators including all operations and memory and stack registers. Applications of the calculator to problems in mathematics and engineering. 1 lecture.

#### MATH 112 The Nature of Modern Mathematics (3)

#### **GEB B.2.**

Contemporary mathematics and the relationship between mathematics and our cultural heritage. Intended to develop an appreciation for the role that mathematics plays in society, both past and present. 3 lectures. Prerequisite: Appropriate score on ELM examination, or an ELM exemption, or credit in MATH

**GEB B.2.** 

104, and 3 years high school math, including 2 years high school algebra, or equivalent.

#### <sup>1</sup> MATH 116, 117 Pre-Calculus Algebra I, II (3) (3) 117: GEB B.2.

Precalculus college algebra without trigonometry. Topics in algebra and coordinate geometry. Functions and applications, polynomial and rational functions, exponential and logarithmic functions, systems of equations and analytic geometry. Additional topics. MATH 116 and MATH 117 are equivalent to MATH 118. Not open to students with credit in MATH 118 or MATH 120. 3 lectures. Prerequisite for MATH 116: Appropriate score on ELM examination, or an ELM exemption, or credit in MATH 104, and 3 years of high school math including 2 years of high school algebra, or equivalent. Prerequisite for MATH 117: MATH 116.

#### MATH 118 Pre-Calculus Algebra (4)

GEB B.2.

Pre-calculus college algebra without trigonometry. Special products and factoring, exponents and radicals, partial fractions. Fractional and quadratic equations, determinants, systems of equations. Graphing, inequalities and absolute value, mathematical induction. Binomial theorem, logarithms, complex numbers. MATH 118 is equivalent to MATH 116 and MATH 117. Not open to students with credit in MATH 117 or MATH 120. 4 lectures. Prerequisite: Appropriate score on ELM examination, or an ELM exemption, and 3 years high school math including 2 years high school algebra, or equivalent.

### MATH 119 Pre-Calculus Trigonometry (3) GEB B.2.

Rectangular and polar coordinates. Trigonometric functions, fundamental identities. Inverse trigonometric functions and relations. Complex numbers. Not open to students with credit in MATH 120. 3 lectures. Prerequisite: Appropriate score on ELM examination, or an ELM exemption, and MATH 117 or MATH 118, or equivalent.

#### MATH 120 Pre-Calculus Algebra and Trigonometry (5)

GEB B.2.

An integrated review course in college algebra and trigonometry covering function concepts and symbols, rectangular coordinates, trigonometric functions, linear and quadratic functions, inequalities, analysis of trigonometric functions, inverse trigonometric functions, exponential and logarithmic functions, systems of equations and complex numbers. MATH 120 is equivalent of MATH 118 and MATH 119. Not open to students with credit in MATH 117, MATH 118, or MATH 119. 5 lectures. Prerequisite: Appropriate score on ELM examination, or an ELM exemption, and 3 years high school math including 2 years high school algebra, and trigonometry, or equivalent.

#### MATH 124 Finite Mathematics (3) G

GEB B.2.

Sets and counting problems. Probability theory including stochastic processes, probability distributions, and Markov Chains. Algebra of vectors and matrices, Gaussian elimination, and the inverse of a square matrix. Applications of matrices. 3 lectures. Prerequisite: ELM requirement and passing score on Mathematics Placement Examination, MATH 118 or equivalent.

#### <sup>1</sup> MATH 131, 132, 133 Technical Calculus (4) (4) (4) GEB B.2.

Functions, their graphs and limits; techniques and applications of differential and integral calculus; introduction to applied differential equations. Designed principally for technology students and others interested in an applied three-quarter calculus sequence. Not open to students with credit in MATH 142, MATH 143, MATH 318 (respectively) or equivalents. 4 lectures. Prerequisite: ELM requirement and passing score on Mathematics Placement Examination, MATH 118 and MATH 119 or equivalent.

#### <sup>1</sup> MATH 141, 142, 143 Calculus I, II, III (4) (4) (4)

Limits, continuity, differentiation, integration. Techniques of integration, applications to physics, transcendental functions. Infinite sequences and series, vector algebra, curves. 4 lectures. Prerequisite: ELM requirement and passing score on Mathematics Placement Examination, MATH 118 and MATH 119 or equivalent.

#### MATH 151, 152, 153 Calculus Laboratories I, II, III (1) (1) (1) (CR/NC)

Facilitated study and discussion of the theory, problems, and applications of calculus. Credit/No Credit grading only. 1 laboratory. Prerequisite: Concurrent enrollment in the associated section of MATH 141, MATH 142, or MATH 143.

# MATH 170 Theory of Equations (2)

Properties of polynomials, rational solutions, partial fractions, complex roots, symmetric functions, numerical solutions. 2 lectures. Prerequisite: MATH 142.

#### MATH 202 Orientation to the Mathematics Major (1) (CR/NC)

Career opportunities in the field of mathematics, preparing a field of study, and a survey of departmental facilities and procedures related to research, study and graduation. Credit/No Credit grading only. 1 lecture. Prerequisite: Sophomore standing or consent of instructor.

# MATH 206 Linear Algebra I (4)

**GEB B.2.** 

Matrices, inverses, linear systems, determinants, eigenvalues, eigenvectors, vector spaces, linear transformations, applications. 4 lectures. Prerequisite: MATH 142 or consent of instructor.

# MATH 221 Calculus for Business and Economics (4) GEB B.2.

Polynomial calculus for optimization and marginal analysis. Partial derivatives and elementary integration. Not open to students with credit in MATH 143, MATH 133 or equivalent. 4 lectures. Prerequisite: MATH 118 or equivalent.

#### MATH 222 Mathematical Analysis for Economics and Business (4)

GEB B.2.

**GEB B.2.** 

Multivariate calculus. Lagrange multipliers, linear algebra and determinants. Differential and difference equations. 4 lectures. Prerequisite: MATH 221 or equivalent.

# MATH 241 Calculus IV (4)

Partial derivatives, multiple integrals, introduction to vector analysis. 4 lectures. Prerequisite: MATH 143.

# MATH 242 Differential Equations (4) GEB B.2.

Ordinary differential equations: introduction with applications in engineering and science; classification of equations and their analytic solutions; study of interrelationships between differential systems, graphs, and physical problems. 4 lectures. Prerequisite: MATH 241.

<sup>1</sup> Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.

## MATH 248 Methods of Proof in Mathematics (4) GEB B.2.

Methods of proof (direct, contradiction, conditional, contraposition); valid and invalid arguments. Examples from set theory. Quantified statements and their negations. Functions, indexed sets, set functions. Proofs in number theory, algebra, geometry and analysis. Proof by induction. Equivalence and well-defined operations and functions. The axiomatic method. 4 lectures. Prerequisite: MATH 143 and MATH 170, or consent of instructor.

#### MATH 300 Microcomputers in Mathematics Education (3)

Examination of existing hardware and software designed for educational uses. Mathematical topics appropriate for computer enhancement. Special methods and techniques for educational uses of computers. Emphasis on activity learning and applications. Computer as a classroom management device. 2 lectures, 1 activity. Prerequisite: MATH 118 and CSC 110 or CSC 410.

#### MATH 304 Vector Analysis (4) GEB B.2.

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 242.

#### MATH 306 Linear Algebra II (4) GEB B.2.

Inner product spaces, bilinear and quadratic forms, diagonalization of symmetric operators, applications. 4 lectures. Prerequisite: MATH 206 and MATH 248, or consent of instructor.

#### MATH 316 Transform Engineering Methods in Discrete-Time Systems (4) GEB B.2.

Properties of linear discrete-time systems. Theory and application of z-transforms to problems found in electronic, mechanical, and industrial engineering, population dynamics, inventory control and finance. Transfer functions, stability theory, Fourier analysis, and digital filters. Not open to students with credit in EL 328. 4 lectures. Prerequisite: MATH 242.

#### MATH 317 Topics in Engineering Mathematics (4)

GEB B.2.

Fourier series, Fourier transforms and their properties. Introduction to generalized functions. Introductory probabilistic concepts encountered in data analysis and engineering. 4 lectures. Prerequisite: MATH 242.

# MATH 318 Advanced Engineering Mathematics (4) GEI

GEB B.2.

Power series solutions of differential equations and Bessel functions. Fourier series and transform; matrices. 4 lectures. Prerequisite: MATH 242.

#### <sup>1</sup> MATH 327, 328 Introduction to Modern Mathematics (4) (4) 328: GEB B.2.

Introduction to set theory, logic and proof, number theory, real numbers, geometry and trigonometry, probability and statistics. 4 lectures. Prerequisite: MATH 118.

#### MATH 329 Mathematical Applications to Elementary Teaching (3)

Mathematical concept development in elementary school mathematics. Emphasis on activity learning and problem solv-

ing. Computer applications. 2 lectures, 1 activity. Prerequisite: MATH 328.

# MATH 333 Numerical Analysis II (3) (Also listed as CSC 333)

Solution of systems of differential equations, predictorcorrector methods, stiff equations. Approximation methods: cubic splines, B-splines, Bezier curves, least squares, methods for solving boundary value problems. 3 lectures. Prerequisite: CSC 332 or equivalent.

# MATH 335 Graph Theory (3)

Finite graphs, digraphs, Eulerian and Hamiltonian paths, matrix representation of graphs, connectedness, isomorphism, planarity, matching theory, network flow, trees, applications. 3 lectures. Prerequisite: Junior standing or consent of instructor.

### MATH 336 Combinatorial Mathematics (3)

Selected topics from the field of enumerative combinatorics: permutations, combinations, generating functions, recurrence relations, inclusion and exclusion, Polya theory, block design. 3 lectures. Prerequisite: Junior standing or consent of instructor.

# MATH 341 Theory of Numbers (4) GEB B.2.

Properties of numbers. Euclid's Algorithm, greatest common divisors, diophantine equations, prime numbers, congruences, number theoretic functions, the quadratic reciprocity laws, primitive roots and indices. 4 lectures. Prerequisite: MATH 248 or consent of instructor.

### MATH 350 Mathematica (4)

Problem-solving using Mathematica in a UNIX environment. 4 lectures. Prerequisite: MATH 241.

#### MATH 370 Putnam Exam Seminar (2)

Directed group study of mathematical problem solving techniques. Open to undergraduate students only. Class members are expected to participate in the annual William Lowell Putnam Mathematical Competition. Course may be repeated up to eight units. 2 seminars. Prerequisite: Consent of instructor.

#### MATH 371 Math Modeling Seminar (2)

Directed group study of mathematical modeling techniques. Open to undergraduate students only. Class members are expected to participate in the annual Mathematical Competition in Modeling. Total credit limited to 8 units. 2 seminars. Prerequisite: Consent of instructor.

#### MATH 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

#### MATH 404 Introduction to Differential Geometry and Topology (4)

Theory of curves and surfaces in space. Topics such as curvature, gesics, Gauss map, Gauss-Bonnet Theorem, combinatorial topology, point set topology. 4 lectures. Prerequisite: MATH 206 and MATH 304.

<sup>1</sup> Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.

#### MATH 406 Linear Algebra III (4)

Spectral Theorem, Cayley-Hamilton Theorem and minimal polynomial, Jordan and rational canonical forms, applications. 4 lectures. Prerequisite: MATH 306.

# MATH 408 Functions of a Complex Variable (4)

Elementary analytic functions and mapping; Cauchy's Integral Theorem; Power series; theory of residues and evaluation of integrals; harmonic functions. 4 lectures. Prerequisite: MATH 242.

### MATH 409 Complex Analysis (4)

Further development of analytic function theory. Additional topics in calculus of residues, conformal mapping and the Poisson Integral. 4 lectures. Prerequisite: MATH 408.

# <sup>1</sup> MATH 412, 413, 414 Advanced Calculus I, II,

#### III (4) (3) (3)

Introduction to concepts and methods basic to real analysis. Topics such as real number system, continuity, uniform continuity, differentiation, the integral, uniform convergence, partial differentiation, multiple integration, implicit and inverse function theorems. MATH 412, 4 lectures; MATH 413, 414, 3 lectures. Prerequisite: MATH 248.

#### MATH 417 Introduction to Dynamical Systems (4)

Theory of dynamical systems in one and two dimensions. Topics such as bifurcation theory, chaos, attractors, limit cycles, nonlinear dynamics. 4 lectures. Prerequisite: MATH 242.

#### MATH 418 Partial Differential Equations (4)

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 318 or equivalent. Students with credit in MATH 316 or MATH 317 should obtain consent of instructor.

#### MATH 419 Introduction to History of Mathematics (3)

Evolution of mathematics from earliest to modern times. Contributions of prominent mathematicians. Development of mathematical concepts and techniques. Appropriate for prospective and in-service teachers. 3 lectures. Prerequisite: Junior standing or consent of instructor.

#### MATH 424 Organizing and Teaching Mathematics (4)

Organization, selection, presentation, application and interpretation of subject matter in mathematics. Introduction to current issues in mathematics education. For students who will be teaching in secondary schools. 4 lectures. Prerequisite: Senior standing or consent of instructor.

#### <sup>1</sup> MATH 431, 432 Mathematical Optimization I, II (3) (3)

Classical optimization. Maximum/minimum of functions, linear and nonlinear optimization problems, duality, constrained optimization. Model building and applications to various fields. 3 lectures. Prerequisite: MATH 206 or consent of instructor.

# MATH 433 Numerical Analysis III (3) (Also listed as CSC 433)

Methods for solving special systems of equations. Iterative and direct methods. Solution of partial differential equations by the finite difference method. Method of characterisitcs. Methods for finding eigenvalues and eigenvectors including the QR method. 3 lectures. Prerequisite: CSC 332 or equivalent.

#### MATH 437 Game Theory (3)

Development of the mathematical concepts, techniques, and models used to investigate optimal strategies in competitive situations; games in extensive, normal, and characteristic form. 3 lectures. Prerequisite: MATH 206 or consent of instructor.

### MATH 442 Euclidean Geometry (4)

Foundations of Euclidean geometry, finite geometries, congruence, similarities, polygonal regions, circles and spheres. Constructions, mensuration, the parallel postulate. Appropriate for prospective and in-service mathematics teachers. 4 lectures. Prerequisite: MATH 248.

#### MATH 443 Modern Geometries (4)

Non-Euclidean and projective geometries. Properties of parallels, biangles, Saccheri and Lambert quadrilaterals, angle-sum and area. Limiting curves, hyperbolic trigonometry, duality, perspectivity, quadrangles, fundamental theorems of projective geometry, conics. 4 lectures. Prerequisite: MATH 442.

#### MATH 459 Undergraduate Seminar (2)

Written and oral analysis and presentations by students on topics from mathematical modeling. 2 seminars. Prerequisite: MATH 206 and MATH 242.

#### <sup>1</sup> MATH 461, 462 Senior Project (3) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: MATH 459.

#### MATH 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

# <sup>1</sup> MATH 481, 482 Modern Algebra I, II (4) (4)

Fundamental algebraic structures and types of algebras, including operations within them and relations among them. Groups, rings and fields. 4 lectures. Prerequisite: MATH 248.

#### MATH 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

<sup>&</sup>lt;sup>1</sup> Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.

#### 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 501, 502 Methods of Applied Mathematics I, 11 (4) (4)

Introduction to advanced methods of mathematics useful in the analysis of engineering problems. Theory of vector fields, Fourier analysis, Sturm-Liouville theory, functions of a complex variable. Selected topics in asymptotic analysis, special functions, perturbation theory. Not open to students in major or master's degree program in mathematics. 4 lectures. Prerequisite: MATH 318 or equivalent, and graduate standing or consent of instructor. MATH 502: MATH 501.

#### MATH 505 Foundations of Mathematics (4)

Development of the primitive materials and concepts necessary to an understanding of the axiomatic method dealing with sets and logic. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

#### MATH 506 Topics in Modern Algebra (4)

Topics selected from group theory, ring theory, unique factorization, group representation, module theory and linear algebra. 4 seminars. Prerequisite: Satisfactory completion of the Graduate Written Examination in Algebra or consent of the Graduate Committee.

#### MATH 507 Structure of Geometry (4)

Transformations and geometries; affine, topological and analytic. Appropriate for the prospective or in-service teacher. 4 seminars. Prerequisite: Graduate standing or consent of instructor; MATH 442 recommended.

#### MATH 508 Introduction to Topology (4)

Basic ideas of general topology, metric spaces, homeomorphisms and the separation axioms. 4 seminars. Prerequisite: Satisfactory completion of the Graduate Written Examination in Analysis or consent of the Graduate Committee.

#### 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 512, 513 Partial Differential Equations of Physical Systems (4) (4)

Partial differential equations of first and second order. Laplace's equation, wave equation, diffusion equation and others. Methods for analytical solution. 4 seminars. Prerequisite: MATH 418 and graduate standing or consent of instructor.

#### MATH 515 Real Analysis (4)

Introduction to Lebesgue measure and integration, convergence theorems,  $L_1$  spaces, Radon-Nikodym theorem and Fubini's theorem. 4 seminars. Prerequisite: Satisfactory completion of the Graduate Written Examination in Analysis or consent of the Graduate Committee.

#### MATH 516 Linear Operators (4)

Linear spaces, operator theory and operational calculus. Applications to differential equations, integral equations, transforms and Fourier analysis. 4 seminars. Prerequisite: MATH 515 and graduate standing or consent of instructor.

#### MATH 518 Advanced Ordinary Differential Equations (4)

Existence, continuation and dependence on parameters of solutions. Linear systems, initial and boundary value problems. Self-adjoint eigenvalue problems. 4 seminars. Prerequisite: MATH 318 and graduate standing or consent of instructor.

#### MATH 580 Seminar (1-4)

Built around topics in advanced mathematics chosen according to the common interests and needs of the students enrolled. Each seminar will have a subtitle according to the nature of the content. Total credit limited to 12 units. 1–4 seminars. Prerequisite: Graduate standing and consent of instructor.

#### MATH 596 Thesis (3) (3)

Serious research endeavor devoted to the development, pedagogy or learning of mathematics. Prerequisite: Graduate standing and consent of instructor.

# **ME-MECHANICAL ENGINEERING**

#### ME 134 Mechanical Systems (3)

An introduction to analysis, synthesis, design, and testing of mechanical systems, their components and instruments. 2 lectures, 1 laboratory.

# ME 211 Engineering Statics (3)

Analysis of forces on engineering structures in equilibrium. Properties of forces, moments, couples, and resultants. Equilibrium conditions, friction, centroids, area moments of inertia. Introduction to mathematical modeling and problem solving. Vector mathematics where appropriate. 3 lectures. Prerequisite: MATH 241 (or concurrently), PHYS 131.

#### ME 212 Engineering Dynamics (3)

Analysis of motions of particles and rigid bodies encountered in engineering. Velocity, acceleration, relative motion, work, energy, impulse, and momentum. Further development of mathematical modeling and problem solving. Vector mathematics where appropriate. 3 lectures. Prerequisite: MATH 241, ME 211.

GEB E.2.

#### ME 221 Solar Energy (3)

Methods of utilizing solar energy. Energy concepts, collection and storage systems; greenhouse effect. Commercial and residential building applications. Solar power generation and recent technical developments. International achievements in solar energy with emphasis on solar energy application in developing countries for water purification and other life support functions. 3 lectures. Prerequisite: PHYS 121 or equivalent.

<sup>&</sup>lt;sup>1</sup> Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.

### ME 234 Philosophy of Design (3)

General approach to the meaning of engineering design. Conceptual blocks, creativity, design process, design considerations and elements. Intended for transfer students as a substitution for ME 134. 3 lectures.

#### ME 236 Thermal Systems (3)

Fundamentals of measuring temperature, pressure, and other thermal-fluid parameters. Measurement principles including error analysis. Theory and practice of writing lab reports. 2 lectures, 1 laboratory. Prerequisite: CHEM 125, ENGL 114, PHYS 132.

#### ME 240 Additional Engineering Laboratory (1) (CR/NC)

Special assignments undertaken by students who need or wish to acquire abilities supplementary to their standard pattern of courses. Assignments must be primarily of shop or laboratory nature. Work is done by the student with a minimum of faculty supervision. Credit/No Credit grading only. 1 laboratory. Prerequisite: Consent of department head.

### ME 302 Thermodynamics (3)

Properties and fundamental relations for processes involving substances and the transfer of energy. First and second laws of thermodynamics, irreversibility and availability. 3 lectures. Prerequisite: PHYS 132, ME 212, CSC 251.

#### ME 313 Heat Transfer (3)

Basic principles of heat transfer. Conduction, radiation, convection, and combined modes. 3 lectures. Prerequisite: ME 302 or CHEM 305, MATH 242, CSC 251.

# ME 318 Mechanical Vibrations (4)

Free vibration, damping, transient and steady state response to forced vibrations. Engineering methods, single and multiple degrees of freedom. Experimental studies of the dynamic behavior of structures and machines. Instrumentation methods utilized in field and laboratory. 3 lectures, 1 laboratory. Prerequisite: MATH 318, ME 326, EE 311.

#### ME 326 Intermediate Dynamics (4)

Continuation of ME 212. Additional analysis of planar motion of rigid bodies with particular attention to the kinematics of mechanisms. Rotating reference frames. Introduction to three dimensional dynamics. 4 lectures. Prerequisite: MATH 242 (or concurrent), ME 212, CSC 251.

#### ME 328 Introduction to Design (4)

Design of machine parts by stress and deflection. Effects of fluctuating stresses and stress concentration. Design of shafts and other machine parts. Modern industrial design practice using standard components and design layout drawings. 3 lectures, 1 laboratory. Prerequisite: CE 204, CE 205, ETME 143, MATE 306, CSC 251, ME 212.

#### ME 329 Intermediate Design (4)

Design of mechanical equipment and systems using various machine elements and components such as threaded fasteners, power screws, springs, gears, bearings, clutches, etc. Decision modeling based on technical and economic feasibility. 3 lectures, 1 laboratory. Prerequisite: ECON 201, ME 318 (or concurrent), ME 328.

### ME 341, 342 Fluid Mechanics (3) (3)

Fluid statics. Conservation equations of fluid dynamics. Viscous flow, boundary layer concepts, lift and drag, compressible flow, turbomachinery. ME 341: 3 lectures. Prerequisite: ME 212. ME 342: 3 lectures. Prerequisite: ME 341, CSC 251 or equivalent.

### ME 343 Thermal Science Laboratory (1)

Heat transfer and thermodynamic experiments covering combined free convection and radiation, forced convection, heat exchanger, polytropic blowdown, steam turbine, and refrigeration system. 1 laboratory. Prerequisite: ME 236, ME 313, ME 341.

### ME 344 Thermal Engineering (4)

Power and refrigeration cycles. Ideal gas mixtures, psychrometry, combustion. Convection, condensation, boiling heat transfer. 4 lectures. Prerequisite: ME 313, ME 341.

### ME 345 Fluid Mechanics Laboratory (1)

Planning, execution and reporting of fluid mechanics experiments involving flow measurement and control, conservation equations, pressure and velocity distributions, performance of turbomachines, dimensional analysis for lift and drag on airfoils or bearings. 1 laboratory. Prerequisite: ME 236, ME 342.

### ME 350 Thermal Environmental Engineering (4)

An introduction to environmental control including physiological aspects of the thermal environment, moist air properties, heat transmission in buildings, pumps, fans, and fluid distribution systems. 4 lectures. Prerequisite: ME 302.

### ME 351 Active Solar System Analysis and Design (4)

Insolation estimation. Radiation properties of materials. Solar collector analysis. Energy storage. System simulation and design. Applications to building environmental control and process heat. 4 lectures. Prerequisite: ME 313, ME 341, CSC 251.

# ME 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

#### ME 401 Stress Analysis (4)

Advanced strength of materials: behavior of disks, plates, and shells. Theory of elasticity. Energy methods. 3 lectures, 1 laboratory. Prerequisite: CE 205, CE 206, CSC 251, MATH 318.

# ME 410 Experimental Methods in Mechanical Design I (4)

Bonded resistance strain gages for static and dynamic measurements; rosettes, bridge circuits, lead wire effects, special gages. Photoelastic and moire fringe methods including birefringent coatings, shadow, and projection moire. Applications in mechanical design and metrology. 3 lectures, 1 laboratory. Prerequisite: ME 328.

#### ME 412 Composite Materials Analysis and Design (4)

Behavior of unidirectional fiber composites. Properties of short-fiber composites, and orthotropic lamina. Analysis of laminated composites. Strength and hygrothermal behavior of composite materials. Structural optimization. 3 lectures, 1 laboratory. Prerequisite: AERO 324, 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 420 Kinematics Analysis and Design (3)

Kinematic and kinetic analysis and design of two and three dimensional mechanisms including open chain types. Analysis techniques include Tensor methods, application of Newtonian and Lagrangian dynamics. Approximate techniques and utilization of large scale commercial mechanism analysis programs. 3 lectures. Prerequisite: ME 318.

#### ME 422 Mechanical Control Systems (4)

Modeling and analysis of mechanical control systems. Design of mechanical, hydraulic and fluid systems using block diagrams, root locus, Bode diagrams, and the digital computer. 3 lectures, 1 laboratory. Prerequisite: ME 318.

#### ME 423 Robotics: Fundamentals and Applications (4)

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 I (4)

Pipe specifications and pertinent codes. Valves, fittings, pumps and compressors. The transportation function of piping as related to power plants, refineries, slurry systems, pumping systems and drainage. Philosophy of system design. 3 lectures, 1 laboratory. Prerequisite: CE 205, CE 206, ME 342, CSC 251.

#### ME 425 Design of Piping Systems II (4)

Design of piping systems which must withstand elevated temperatures. Pertinent codes. Support and damping systems. Design of piping to resist earthquakes. Code philosophy about containing pipe expansion. Material specifications. 3 lectures, 1 laboratory. Prerequisite: CE 205, CE 206, MATE 306, CSC 251.

#### ME 428 Design (4)

Component and system design from global integration point of view of various design parameters, using real life problems. Techniques of brainstorming, decision making, PERT, feasibility studies. Industrial participation design program. Subsystem design involving gears, bearings, etc. 2 lectures, 2 laboratories. Prerequisite: ME 313, ME 329, ME 342, ENGL 218.

### ME 431 Mechanical Design Techniques (4)

Comprehensive study of various design methods and techniques. Techniques used to explore various structural concepts such as prestressing, shaping, sizing, etc. Simulation of systems using digital computer. Design criteria identification of design parameters and constraints. 3 lectures, 1 laboratory. Prerequisite: ME 329.

#### ME 432 Petroleum Reservoir Engineering (4)

Types of reservoirs and reservoir rocks. Measurement and interpretation of physical properties of reservoir rocks and fluids porosity, permeability, compressibility, electrical resistivity, fluid saturation, viscosity, solution gas. Introduction to flow in porous media, reserve calculations and computer applications. 3 lectures, 1 laboratory. Prerequisite: ME 341.

#### ME 434 Enhanced Oil Recovery (4)

Primary, secondary, and tertiary (enhanced) oil recovery methods. Waterflooding, gas injection, steam injection, in-situ combustion, chemical flooding, miscible flooding. Performance calculations and computer applications in EOR. 4 lectures. Prerequisite: ME 342, ME 344.

#### ME 435 Drilling Engineering (4)

Theory and practice of oilwell planning, drilling, well logging, and completion applied to the development of new oil and gas production, from onshore and offshore fields. 4 lectures. Prerequisite: ME 329, ME 342.

#### ME 436 Petroleum Production Engineering (4)

Design and operation of surface and subsurface equipment required in oil production. Processes and systems involved are well pumping, gas lifting, acidizing, hydraulic fracturing, fluid gathering and storage, separation of oil, gas, water and sediment from produced fluid. Includes equipment used in enhanced oil recovery processes. 4 lectures. Prerequisite: ME 329, ME 342.

#### ME 438 Heat Exchanger Design (4)

Theory and application of numerical, analytical, and experimental methods to selected heat transfer problems. Application of principles of conduction, convection, condensation, and boiling heat transfer, stress, and vibrations to design of heat exchange equipment. 4 lectures. Prerequisite: ME 313, ME 342.

#### ME 440 Thermal System Design (4)

Design and optimization of thermal systems. Engineering economics, thermal component sizing, steady-state simulation, and optimization techniques applied to the design and performance analysis of thermal systems. 3 lectures, 1 laboratory. Prerequisite: ME 342, ME 344.

#### ME 443 Turbomachinery (4)

Performance characteristics of various types for liquids and for gases. Criteria for proper selection of type and main dimensions. Cavitation criteria. Gas turbine cycles and performance. Two-dimensional cascades. Axial flow turbines and compressors. Centrifugal compressors and radial-inflow turbines. 4 lectures. Prerequisite: ME 342, ME 344, MATH 318.

#### ME 444 Combustion Engine Design (4)

Application of design parameters to the various engine cycles. Aspects of the combustion processes. Energy conversion including losses and cooling. Static and dynamic loading. 3 lectures, 1 laboratory. Prerequisite: ME 344.

#### ME 445 Convective Heat and Mass Transfer (4)

Forced convection in laminar and turbulent flow, free convection, diffusion, combined heat and mass transfer. 4 lectures. Prerequisite: ME 342, ME 344.

#### ME 448 Cooling of Electronic Equipment (3)

Concepts involved with designing for heat removal from electronic equipment. Thermal network method as a tool for modeling the heat transfer in electronic systems. Computer modeling of thermal networks. 3 lectures. Prerequisite: ME 313, ME 342.

#### ME 450 Solar Power Systems (4)

High and intermediate temperature systems for conversion of solar energy to mechanical power and heat. Thermal energy storage and total thermal energy system design. Recommended as a complement to ME 415. 3 lectures, 1 laboratory. Prerequisite: ME 313.

#### ME 451 Passive Solar System Analysis and Design (3)

Performance analysis of passive systems applied to building environmental control. Dynamics of massive thermal systems. Simulation and correlation techniques in system design. Use of packaged CAD programs. 3 lectures. Prerequisite: ME 351.

#### ME 452 Solar Engineering Design (2)

Project work in designing active and passive heating and cooling systems. Use of simulation and correlation tools, case studies. 1 lecture, 1 laboratory. Prerequisite: ME 451.

#### ME 455 Thermal Environmental Experimentation (2)

Experimental determination of the performance of various thermal and solar devices. Conducting experiments, analyzing experimental data, and preparation of reports. 1 lecture, 1 laboratory. Prerequisite: ME 351, ME 459.

#### ME 456, 457, 458 HVAC System Design (3) (3) (3)

Individual and team project work (including computer simulation) in designing systems, selecting equipment, estimating energy consumption and operating cost for applications in: ME 456, industrial ventilation, exhaust and pollution control; ME 457, commercial and industrial refrigeration; ME 458, commercial and industrial heating and air conditioning. 1 lecture, 2 laboratories. Prerequisite: ME 341, ME 350 or ENVE 304, EE 311.

#### ME 459 Advanced Thermal Environmental Engineering (4)

Advanced topics in environmental control including psychrometric chart construction, direct contact transfer processes, heat exchangers, and refrigeration fundamentals. 4 lectures. Prerequisite: CSC 251, ME 313, ME 350, or consent of instructor.

#### ME 461, 462 Senior Project (2) (3)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: Senior standing, ME 328, ME 344 and ME 329 (or concurrent) or ME 351 (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 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 9 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

#### ME 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

#### ME 487 Cooperative Education Experience (6)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Prerequisite: Sophomore standing and consent of instructor.

#### ME 497 Cooperative Education Experience (12)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Prerequisite: Sophomore standing and consent of instructor.

#### ME 500 Individual Study (1-3)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.

#### ME 502 Stress Analysis (4)

Approximate methods of stress analysis with emphasis on the theory of the Finite Element Method. Rayleigh-Ritz approximate energy minimizations applied to one- and two-dimensional stress fields. 3 lectures, 1 laboratory. Prerequisite: ME 401, graduate standing or consent of instructor.

#### ME 517 Advanced Vibrations (4)

Vibration of complex engineering systems. Inertia and stiffness matrices. Natural frequencies and normal modes. Approximate solutions and computer techniques. Response to transient and periodic inputs. 3 lectures, 1 laboratory. Prerequisite: ME 318, CSC 251, graduate standing or consent of instructor.

#### ME 531 Acoustics and Noise Control (3)

Description of sound using normal modes and waves. Interaction between vibrating solids and sound fields. Sound absorption in enclosed spaces. Sound transmission through barriers. Applications in acoustic enclosures, room enclosures, room acoustics. Design of quiet machinery and transducers. 3 lectures. Prerequisite: ME 318, MATH 318.

#### ME 541 Advanced Thermodynamics (4)

Selected modern applications of thermodynamics which may include topics from: 1) equilibrium and kinetics as applied to combustion and air pollution, analysis and evaluation of techniques used to predict properties of gases and liquids, and 2) improvement of modern thermodynamic cycles by second law analysis. 4 lectures. Prerequisite: ME 342, ME 344 and graduate standing or consent of instructor.

#### ME 542 Dynamics and Thermodynamics of Compressible Flow (4)

Control volume analysis of fluid-thermo equations for onedimensional, compressible flow involving area change, normal shocks, friction, and heat transfer. Two-dimensional supersonic flow including linearization, method of characteristics, and oblique shocks. One-dimensional constant area, unsteady flow, 4 lectures. Prerequisite: ME 342, ME 344, MATH 242, and graduate standing or consent of instructor.

#### ME 551 Mechanical Systems Analysis (4)

Various system modeling methods applied to mechanical systems. System stability studies and system optimization methods. 3 seminars, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

#### ME 552 Conductive Heat Transfer (3)

Theory of steady-state and transient conduction in isotropic and anisotropic media. Development of differential equations, solutions by series, transforms, Duhamel's Method, variational methods. 3 seminars. Prerequisite: ME 342, ME 344, MATH 318, and graduate standing or consent of instructor.

#### ME 553 Convective Heat Transfer (3)

Conservation of mass, momentum, and energy applied to laminar forced and free convection and turbulent flows. Differential, integral, and scale analysis solutions. 3 seminars. Prerequisite ME 342, ME 344, MATH 318, and graduate standing or consent of instructor.

# ME 554 Computational Heat Transfer (3)

Numerical solutions of classical, industrial, and experimental problems in conduction, convection, and radiation heat transfer. 3 seminars. Prerequisite: ME 552, ME 553, graduate standing or consent of instructor.

#### ME 587 Cooperative Education Experience (6)

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Prerequisite: Graduate standing and consent of instructor.

# ME 597 Cooperative Education Experience (12)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Prerequisite: Graduate standing and consent of instructor.

#### ME 599 Design Project (Thesis) (2) (2) (5)

Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis. Prerequisite: Graduate standing.

# **MGT-MANAGEMENT**

#### MGT 118 Introduction to Human Relations in Business (3)

Small group dynamics, leadership, communication, motivation, and perception. The individual in the business organization. For non-Business majors. 3 lectures.

#### MGT 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

#### MGT 201 Principles of Management (3)

Management process involving organization, decision-making, and managerial activities fundamental to all management levels and functional areas. Application to business firms, governmental agencies, hospitals, benevolent groups, and colleges. For non-Business majors. 3 lectures.

#### MGT 206 Principles of Purchasing (3)

Purchasing function applied to manufacturing, retailing, and food-service institutions. Its interdependence with other functional areas of the organization. For non-Business majors. 3 lectures.

#### MGT 301 Production and Operations Management (4)

Introduction to operations management and production systems; production models. Planning and control in manufacturing. Quantitative methods and statistical techniques used in production systems management. 3 lectures, 1 activity. Prerequisite: MATH 221, STAT 252 and junior standing.

# MGT 310 History of Management, Labor and Capitalism in the U.S. (4)

Historical development of labor-management systems and human resource management practices including case studies. Evolution of union and non-union, private and public sector workplaces. 4 lectures. Prerequisite: Junior standing.

#### MGT 311 Industrial Management (4)

Organization and functioning of management in industry. Planning, direction, and control of the business enterprise in terms of policy formation, organizational structure, finance, sales, procurement, plant location, facilities and production processes. 4 lectures. Prerequisite: Junior standing.

# MGT 312 Organization and Management Theory (4)

Examination of the structural and configurational components of formal organizations. Analysis of management theory development, concepts of organizational processes and managerial strategies. Application of organizational and management imperatives to formal organizational structures and functions. 4 lectures. Prerequisite: Junior standing. Recommended: STAT 252.

#### MGT 313 Industrial Relations (3)

Functions of personnel and labor relations as they relate to the management of the human resources in the organization. Industrial relations theory and practice. For non-Business majors only. 3 lectures. Prerequisite: Junior standing.

#### MGT 314 Human Resources Management (4)

Personnel function as it relates to the management of the human resources of the organization. Survey of employee/employer relations, the work environment, employee development and labor relations. 4 lectures. Prerequisite: Junior standing.

#### MGT 316 Labor Relations (4)

Union organizing. Negotiation and administration of collective agreements. Simulation of bargaining, grievance, and arbitration processes. 4 lectures. Prerequisite: Junior standing.

#### MGT 317 Organizational Behavior (4)

Application of behavioral science concepts to management. Motivation, perception, communications, leadership style, group dynamics. Effectiveness: individual, interpersonal, team, intergroup and organizational. 4 lectures. Prerequisite: Junior standing. Recommended: STAT 252.

#### MGT 331 Organization Design and Analysis (4)

Organizational design strategies and constructs, environmental, technological, and behavioral imperatives influencing organizational objectives and structures; design modifications to accommodate industrial, governmental, and nonprofit organizational requirements. Diagnostic analysis approaches; causation analysis; alternative formulation and analysis; design optimization criteria and techniques. 4 lectures. Prerequisite: MGT 312 or consent of instructor.

#### MGT 332 International and Cross Cultural Management (4)

Impact of culture on multinational businesses. Problem-solving framework and managerial skills for dealing with cultural differences. Case studies, simulation, and fieldwork. 4 lectures. Prerequisite: MGT 312, MGT 317 and junior standing.

#### MGT 400 Special Problems for Advanced Undergraduates (1-4)

Individual investigation, research studies, or surveys of selected problems. Total credit limited to 4 units. Prerequisite: Senior standing and consent of instructor.

#### MGT 406 Multinational Business Operations (4)

International dimensions of managerial decision-making for multinational business operations. Environmental factors which shape international business strategy. Economic, technological, functional areas of management, accounting, finance, and marketing within the business enterprise. Complexities of global management strategy. Case studies and simulation. 4 lectures. Prerequisite: Senior standing and completion of all 300-level Business core courses.

#### MGT 410 Compensation (4)

Design and management of compensation systems. Job analysis, job evaluation, wage and salary surveys, incentive systems, gainsharing, benefit administration, pay equity and legal regulation. Simulation and case study development of a wage structure, pay level and individual raise policies, administrative controls, salary and program budgets. 4 lectures. Prerequisite: MGT 314 or consent of instructor.

#### MGT 413 Labor Law (4)

Federal and state labor policy as expressed in common law, relevant statutes, and executive orders. Effects upon labor, management, minorities, and the public. Current rules analyzed

in a contemporary and historical context. Understanding important industrial relations and manpower problems. 4 lectures. Prerequisite: MGT 310 or consent of instructor.

#### MGT 414 Business Strategy and Policy Seminar (4)

Application of interdisciplinary skills to comprehensive short and long range strategy and policy formulation. Analysis of the interdependence between external environments and internal systems. Case studies from a general management point of view. Industry and company simulations. Group problem solving. Integrating course of the core curriculum. 4 seminars. Prerequisite: All 300-level Business core courses and senior standing.

#### MGT 415 Advanced Personnel Management (4)

Application of behavioral science knowledge and process skills to the major functional activities of human resource management. Analysis of cost consequences and net utility of human resource programs and innovations. Case studies integrating theoretical and applied human resource concepts, strategies and organizational practices. Application of behavioral science research methods to conduct a field audit of an existing human resource system. 4 lectures. Prerequisite: MGT 314, or consent of instructor.

#### MGT 417 Organization Development (4)

Analysis of development and trends in the field of organization development. Application of behavioral science knowledge and social technology to growth and change of organizations for the purpose of improving effectiveness. Problem diagnosis and facilitation skills. 4 seminars. Prerequisite: MGT 317 or consent of instructor.

#### MGT 430 Internship (2-8) (CR/NC)

Business internship to permit student to correlate experience and academic knowledge. Placement in a part-time, supervised work experience program in a government agency or private organization (entrepreneurship, partnership or corporation) as approved by the department head. The intern will function as an employee subject to all the duties and responsibilities of employees engaged in comparable work. 16 hours of work experience per quarter per two units of credit. Maximum of 8 units per quarter. Credit/No Credit grading only. Prerequisite: Junior standing.

#### MGT 440 Service Operations Management (4)

Principles and techniques of operations management applied to the management of service operations. Producing organizational success through offering reliable, dependable, readily available, and flexible customer service. 4 lectures. Prerequisite: MGT 301.

#### MGT 441 Operations Planning and Control (4)

Framework for operations planning and control. Management problems associated with controlling flows of material and inventory levels in manufacturing and distribution systems. 4 lectures. Prerequisite: MGT 301.

#### MGT 442 Purchasing and Materials Management (4)

Role and scope of the procurement function and concept of an integrated materials management process. Relations with functional departments. Purchasing structure and processes in business and service organizations. Global concept of international purchasing. Measuring purchasing performance. 4 lectures. Prerequisite: Junior standing.

#### MGT 445 Advanced Operations Management (4)

Advanced principles in operations management as applied to both manufacturing and service organizations. Product-service conversion systems, capacity planning and utilization, aggregate planning, scheduling and control, inventory management, and operations subsystem coordination with the organization's strategy. 4 lectures. Prerequisite: MIS 318, MIS 422, MGT 301, and senior standing.

#### MGT 461, 462 Senior Project (2) (2)

Selection and analysis of a problem under faculty supervision. Problems typical of those which graduates must solve in their fields of employment. Formal report is required. Minimum 120 hours total time. Prerequisite: MGT 461 for MGT 462.

#### MGT 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–4 lectures. Prerequisite: Consent of instructor.

#### MGT 475 Seminar in Managerial Consultation (4)

Management consulting in the private and public sectors. Analysis of substantive and process skills required to provide independent and objective advice to clients. Application of consulting knowledge and skills to real client problems and facilitation of change. 4 seminars. Prerequisite: MGT 312, MGT 314, MGT 317 or consent of instructor.

#### MGT 480 Employee Ownership, Profit Sharing and Leveraged Buyouts (4)

Applications in large and small, public and private, union and nonunion businesses. Study of ESOPs (Employee Stock Ownership Plans). Review of related theory and research including tax and financial implications and role in corporate takeovers. Impact on management, labor relations, and economic performance. 4 seminars. Prerequisite: Junior standing, MGT 314 or equivalent.

#### MGT 487 Seminar in Quality Management (4)

Principles and techniques of quality and performance management as applied to organizations in the private and public sector. Emphasis on competitive implications. Integrations of fundamental management techniques, existing improvement efforts, technical tools, and new management technologies focused on continuous organizational improvement. 4 seminars. Prerequisite: Senior standing, MGT 301.

#### MGT 488 Small Business Management (4)

Application of management knowledge and skills to the specific managerial problems involved in planning and operating the smaller company; growth strategies; the art of securing performance; changing the organization structure to match growth; recruiting and compensating new personnel. 4 seminars. Prerequisite: Senior standing.

#### MGT 489 Advanced Seminar in International Management (4)

Discussion and case analysis of integration of theoretical and applied managerial concepts, strategies, and organizational practices in: international and multinational organizations; administration of foreign operations; conflicts between domestic and international policies and practices; integration of cultural, technological, and organizational management imperatives in multinational and international operations. 4 seminars. Prerequisite: MGT 332 or consent of instructor.

#### MGT 500 Independent Study (1-4)

Advanced study planned and completed under the direction of a departmental faculty member. Open only to graduate students demonstrating ability to do independent work. Prerequisite: Formal petition with approval.

# MIS-MANAGEMENT INFORMATION SYSTEMS

#### MIS 318 Modeling Systems (4)

Model formulation and solution procedures. Structured and unstructured processes. Constructing models under uncertainty. Probabilistic processes in management planning. Tradeoffs in alternative courses of action. Deterministic and probabilistic models. Mathematical techniques in strategic planning. Game theory. Optimization and suboptimization in business models. 3 lectures, 1 laboratory. Prerequisite: Junior standing, STAT 252 or equivalent.

#### MIS 321 Management Information Systems (4)

Applications of computers in business and industry. Management information systems and integrated systems concepts. Data organizations, file processing, spreadsheets, data base management, and expert systems. Data communication and distributed data processing. System development process and information resource management. Decision support systems and the relationship of the computer to the management decision process. 3 lectures, 1 activity. Prerequisite: CSC 120 and junior standing.

#### MIS 412 Information Management and Database Systems (4)

Overview of database management and modeling. Focuses on business applications. Treats flatfile, network, relational, and object-oriented systems. Provides analysis, design and implementation for flatfile, relational and object-oriented systems. 3 lectures, 1 activity. Prerequisite: CSC 203, CSC 345, MIS 321.

#### MIS 418 Advanced Quantitative Methods and Control in Business (4)

Quantitative controls and decision support as applied to the operations of business. For the senior student who needs operational knowledge for applications in business analysis and decision support. Development of decision support system. 3 lectures, 1 activity. Prerequisite: MIS 321.

#### MIS 419 Expert Systems Applications in Business (4)

Impact of expert systems on business. Concepts and methods of logical inference using a computer. Knowledge engineering and fuzzy systems. Structure and function of an expert system. Development of business expert systems. 3 lectures, 1 activity. Prerequisite: MIS 321.

#### MIS 422 Information Systems Analysis and Design (4)

System development methodology and logical database design. Determination of management information requirements. Hardware and software selection. Computer Aided Software Engineering (CASE), software development tools. System definition project. 3 lectures, 1 activity. Prerequisite: MIS 412.

# MIS 432 Information Systems Design and Implementation (4)

Structured design techniques and database implementation. Input, process, and output control and presentation methods. Project management and control. Design and implementation of information systems. Computer Aided Software Engineering (CASE) tools and software quality and security assurance. Software implementation project. 3 lectures, 1 activity. Prerequisite: MIS 412, MIS 422.

# **MKTG-MARKETING**

### MKTG 204 Elements of Marketing (4)

Overview of the marketing institutions and function of marketing in the economic, socio-cultural and political-legal environments. Not acceptable for credit toward Business Administration degree. 4 lectures. Prerequisite: ECON 201 or ECON 221 or equivalent, or consent of instructor.

#### MKTG 301 Principles of Marketing (4)

Basic course in marketing that examines marketing's role in society and management of the product, promotion, pricing and channel strategies of the firm. Includes discussion of ethical issues in marketing. 4 lectures. Prerequisite: ECON 222, STAT 252, and junior standing.

#### MKTG 302 Marketing Research I (4)

Market planning and information systems, Bayesian decision analysis. Survey research design, secondary and primary data collection, measurement and scaling. Questionnaire design, attitude theory and measurement, statistical sampling theory and sampling design. Elementary data analysis, report writing. Miscellaneous course fee required-see *Class Schedule*. 3 lectures, 1 activity. Prerequisite: MKTG 301.

#### MKTG 303 Buyer Behavior (4)

Applied study of behavior that affects marketing decisions in both consumer and industrial markets. 4 lectures. Prerequisite: MKTG 302.

#### MKTG 305 Promotion Strategies (4)

Designing the promotion strategies of the firm, including advertising, personal selling, sales promotion, publicity and public relations. Communications media available; their uses and limitations. 4 lectures. Prerequisite: MKTG 302.

#### MKTG 401 International Marketing (4)

Marketing activities necessary to direct the flow of a company's goods and services to customers in global markets. 4 lectures. Prerequisite: MKTG 302 and senior standing.

#### MKTG 402 Marketing Research II (4)

Emphasizes market data analysis. Includes current marketing research techniques. Regression, conjoint, and multidimensional scaling analysis. Miscellaneous course fee required-see *Class Schedule*. 3 lectures, 1 activity. Prerequisite: MKTG 301 and MKTG 302 and junior standing.

#### MKTG 404 Services Marketing (4)

Service organizations such as banks, hotels, and hospitals and the distinctive approach required for marketing strategy which is unique to service companies. 4 lectures. Prerequisite: MKTG 301 and senior standing.

#### MKTG 405 Sales Management (4)

Management of the field sales force, including staffing, training, directing, evaluating and control of sales personnel. 4 lectures. Prerequisite: MKTG 302 and senior standing.

### MKTG 406 Marketing Management (4)

Policymaking and decisionmaking applications in the planning, organizing, operating, controlling and evaluating of individual products and brands. 4 lectures. Prerequisite: Senior standing and consent of instructor.

#### MKTG 412 Marketing Law (4)

Law of marketing from a comprehensive management perspective: products, channels, pricing, promotion and credit. Information on patents, copyrights and trademarks. 4 lectures including case analysis. Prerequisite: Senior or graduate standing, BUS 207 and BUS 404 recommended.

### MKTG 450 Direct Marketing (4)

Direct response marketing including the use of mail, space advertising, radio and television media in marketing products and services to consumer and industrial markets. 4 seminars. Prerequisite: MKTG 302 and senior standing.

### MKTG 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

# **MSC-MILITARY SCIENCE**

# MSC 111 Orienteering (2)

Principles of orienteering, basic map reading and compass skills; course running techniques applied in field orienteering events. Open to all students. 1 lecture, 1 activity.

# MSC 112 Survival Training-Wilderness (2) (CR/NC)

Techniques of survival in a wilderness environment. Traps and snares, building fires, preparing plant and animal food, locating water, and first aid. Open to all students. Credit/No Credit grading only. 1 lecture, 1 activity.

#### MSC 116 Basic Military Skills (2)

Conducting and evaluating individual, squad, platoon, and company drill and ceremony skills. Conducting manual of arms, evaluating physical fitness principles. Conducting and evaluating physical fitness program. Techniques of rifle marksmanship. Open to all students. 1 lecture, 1 activity.

#### MSC 211 Current Military Affairs (2)

Organization and functions of the Department of Defense. Issues related to U.S. military affairs: selective service, arms control, nuclear weapons and alliances. Purpose of ROTC, military customs, the military as a profession. Open to all students. 2 lectures.

#### MSC 212 Basic Camp (1-7)

One to seven units of credit may be granted depending upon successful completion of training. Six weeks of training, Fort Knox, Kentucky. Travel pay and salary provided through the Military Science Department. No obligation. Camp graduates eligible to enroll in ROTC Advanced Program.

#### MSC 213 Survival Training-Mountain (2) (CR/NC)

Techniques of survival in a mountainous environment. Rappelling, hot and cold weather survival, basic mountaineering, and rope bridges. Open to all students. Credit/No Credit grading only. 1 lecture, 1 activity.

### MSC 215 Leadership/Management Seminar (2)

Exploration of key, basic managerial and leadership concepts/techniques. Emphasis is on practical application with experiential learning situations demonstrating key leadership and management principles. Open to all students. 2 seminars.

#### MSC 225 Advanced Survival Techniques (2) (CR/NC)

Mastery of advanced survival skills including water survival, water crossings, expedient tools, weapons, and shelters. Signaling, weather forecasting and survival medicine. Credit/No Credit grading only. 2 lectures. Prerequisite: MSC 112, MSC 213 or consent of instructor. Must be able to swim.

#### MSC 229 Ranger Challenge (2) (CR/NC)

Selection and preparation of the Ranger Challenge Team which will represent Cal Poly in military tactical skills competition. Includes rope bridging, orienteering, weapons knowledge, hand grenade accuracy, 10K road march with equipment, first aid, marksmanship, physical fitness and tactics. Credit/No Credit grading only. 1 lecture, 1 activity.

#### MSC 311 Leadership and Management (3)

Descriptive model of platoon leadership including personnel within a platoon and tasks of platoon leaders; major theories of leadership; instruction and practice in communication, human relations, organizational structure, power and influence, and management. 3 lectures.

#### MSC 312 Leader Communication Skills (3)

Principles and usage of verbal, nonverbal, and symbolic communications. Preparing, conducting, and evaluating training. Principles and techniques of meeting management; leadership counseling techniques; proper radio procedures. 3 lectures.

#### MSC 313 Tactical Military Operations (3)

Organization of the United States and Soviet land combat forces including tactical doctrine and equipment; organization of the modern battlefield; fundamentals of small unit tactics; planning, organizing and conducting small unit operations; fundamentals of land navigation. 3 lectures.

#### MSC 314 ROTC Advanced Camp (6) (CR/NC)

Six week summer training program required to achieve an Army commission. Testing and training as functional Army officers and determination of potential for service. Travel pay, room and board, and salary are provided by the U.S. Army. Held at Fort Lewis, Washington. Credit/No Credit grading only. Prerequisite: MSC 311, MSC 312, MSC 313, and consent of instructor.

#### MSC 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of instructor.

#### MSC 411 Military Professionalism and Ethics (3)

Professional knowledge subjects including command and staff functions, personnel, training and logistics management, military correspondence and leadership counseling. Discussion of moral philosophy and values essential to the military profession. 3 lectures.

#### MSC 412 Military Justice (2)

Uniform code of military justice, including the court martial system, disciplinary measures, military crimes, search and seizure, apprehension and safeguarding evidence. Overview of the laws of war. 2 lectures.

#### MSC 413 Military Organizations and Management (2)

Planning and organizing military functions. Managing staff positions of responsibility. Cadets will be responsible for all coordination and execution of assigned projects. 2 lectures. Prerequisite: MSC 411, MSC 412 and consent of instructor.

#### MSC 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

# **MU-MUSIC**

#### MU 100 Music Fundamentals (3)

Traditional music notation. Use of treble and bass staff for pitch and rhythm, harmonization using principal triads, major and minor, and common seventh chords. Performance of simple pieces individually and in groups using common classroom instruments. 2 lectures, 1 activity.

#### MU 101 Introduction to Music Theory (3) GEB C.2.

For the non-music major. Introduction to the elements of music and their use by composers and performers. Intended for students with little or no prior musical experience in music theory. Notation of pitch and rhythm, scales, intervals and chords. 3 lectures.

#### MU 102 Acoustic Communication (3)

Exploring aspects of sound for communication, sound in our society. Effect and implications of technology on sound and contemporary music. Interrelationship of acoustic space and musical creation. 3 lectures. Prerequisite: Music major or consent of instructor.

#### MU 103 Music Theory I (3)

Structure of tonality in music of Western civilizations, four-part writing of root position and inverted triads, cadences and melodic structure, harmonic progressions, harmonization of a melody and nonharmonic tones, and seventh chords. To be taken concurrently with MU 104. 3 lectures. Prerequisite: Music major or minor or permission of instructor.

#### MU 104 Musicianship I (1)

Systematic development of skills in sight-singing and rhythm. Ear training and dictation in one and two parts. Score reading in two parts. To be taken concurrently with MU 103. 1 activity.

#### MU 105 Music Theory II (3)

Continuation of MU 103. Includes secondary dominants, nondominant seventh chord, basic modulation, change of mode. Augmented sixth chord, and Neapolitan sixth chord. To be taken concurrently with MU 106. 3 lectures. Prerequisite: MU 103.

# MU 106 Musicianship II (1)

Continuation of MU 104. Ear training in rhythm, seventh chords, augmented and Neapolitan sixth chords, dictation and score reading in two and three parts. To be taken concurrently with MU 105. 1 activity. Prerequisite: MU 104.

#### MU 120 Music Appreciation (4) GE

GEB C.2.

Exploration of the world of music with emphasis on Western tradition. Language of music, the role of music in society. The works of major composers from the Renaissance to the present. 3 lectures, 1 activity.

#### MU 150 Applied Music (1)

Individual instruction in performance with emphasis on repertoire, technical skills, style, and interpretation. Total credit limited to 3 units. *Class Schedule* will list specific instrument or voice. Prerequisite: Consent of instructor.

### MU 151 Beginning Piano (2)

Beginning piano for student with no background in keyboard instruments. Includes fundamentals of notation, keyboard techniques, tone production, sightreading and facility. 1 lecture, 1 activity.

# MU 152 Keyboard Skills I (1)

Continuation of MU 151. Piano for students with the ability to play a simple Bach or Mozart Minuet. Total credit limited to 3 units. 1 activity. Prerequisite: MU 151 or equivalent.

#### MU 153 Keyboard Skills II (1)

Continuation of MU 152. Students are expected to play at the level of the easier Clementi Sonatinas. Total credit limited to 3 units. 1 activity. Prerequisite: MU 152 or one year of piano instruction.

#### MU 154 Beginning Voice (1)

Beginning study of vocal and performance technique for the untrained singer. Total credit limited to 3 units. 1 activity.

#### MU 155 Guitar I (1)

Fundamentals of guitar technique and performance including elements of both classical and folk guitar. Designed to meet the needs of the public school teacher. No previous experience necessary. 1 activity.

#### MU 170 University Jazz Band (1)

Limited to those who have had considerable experience playing musical instruments. Students have an opportunity to play for various university functions, dances, community programs, the annual Spring Tour and the Jazz Night concert. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

#### MU 171 Instrumental Ensembles (1)

Open to qualified musicians. Rehearsal and public performances in large and small ensembles. Total credit limited to 6 units. 1 activity. Prerequisite: Consent of instructor.

#### MU 172 Band (1)

Study and public performance of music written for large wind bands (woodwinds, brass, and percussion). Limited to those students who have had experience with wind and percussion instruments. The band performs concerts on campus and makes at least one tour annually. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

# MU 173 Wind Ensemble (1)

Study and public performance of music written for wind ensembles (woodwinds, brass and percussion). Limited to those students who have had experience with wind and percussion instruments. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

# MU 174 Orchestra (1)

Preparation and performance of orchestral music including both the standard repertoire and rarely performed works. Open to all students whose technique is adequate. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

#### MU 180 Men's Chorus (1)

Study and public performance of music composed for men's voices. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

### MU 181 University Singers (1)

Study and public performance of music for mixed voices. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

### MU 182 Women's Chorus (1)

Study and public performance of music composed for women's voices. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

### MU 183 Vocal Ensemble (1)

Open to qualified singers. Rehearsal and performance of vocal music. Total credit limited to 6 units. 1 activity. Prerequisite: Consent of instructor.

### MU 184 Music Production Workshop (2)

Preparation of a musical theatre production for public presentation. Includes acting and stage management. Total credit limited to 6 units. 2 laboratories. Prerequisite: By audition or consent of instructor.

#### MU 201 Music Theory III (3)

Compositional procedures employed by composers of the Classical and Romantic periods. Chromatic third-related harmony, ninth, eleventh and thirteenth chords. Chromatic modulation. To be taken concurrently with MU 202. 3 lectures. Prerequisite: MU 105.

#### MU 202 Musicianship III (1)

Continuation of MU 106. Dictation and score reading in three and four parts. Ear training in rhythm and chromaticism. Concurrent: MU 201. 1 activity. Prerequisite: MU 106.

#### MU 203 Cultural Concepts and Structures in Music (3)

Exploration of innovative and non-Western techniques for structuring music. Compositional application of new and unusual systems of theory. 3 lectures. Prerequisite: MU 201.

#### MU 205 Music Recording Techniques I (3)

Equipment and basic techniques for recording music. Understanding recording technology. Analysis and projects in recording. 2 lectures, 1 activity. Prerequisite: MU 120 and MU 101 or MU 102 or MU 103.

#### MU 206 Jazz and Popular Music Arranging (3)

Beginning techniques for combo and big band arranging. Arrangement planning, sketch scores, full scores, transpositions, part preparation and copying included. Arrangements will be played by University groups. 3 lectures. Prerequisite: MU 105 or equivalent and consent of instructor.

#### MU 221 Jazz Styles (3)

Survey of Jazz as a significant American art form from 1917 to the present; its historical background and development in the United States. Big bands, combos, and soloists. Extensive use of recordings and live presentations. 3 lectures.

#### MU 222 History and Theory of Jazz (3)

Survey of Jazz styles. Emphasis on historical context and development of Jazz through study and analysis of scores. 3 lectures. Prerequisite: MU 201.

#### MU 250 Applied Music (1)

Individual instruction in performance with emphasis on repertoire, technical skills, style, and interpretation. Total credit limited to 3 units. *Class Schedule* will list specific instrument or voice. Prerequisite: 3 units of MU 150 and consent of instructor.

#### MU 252 Intermediate Voice (1)

Vocal and performance technique for experienced singers. Total credit limited to 3 units. 1 activity. Prerequisite: MU 154 or consent of instructor.

#### MU 253 Keyboard Skills III (1)

Intermediate level piano techniques with emphasis on style, interpretation, sightreading, basic performance practices and the solution to general musical problems. Total credit limited to 3 units. 1 activity. Prerequisite: MU 153 or consent of instructor.

#### MU 255 Guitar II (1)

Fundamentals of guitar technique and performance including elements of both classical and folk guitar. Knowledge of basic chords and/or standard note reading on guitar required. 1 activity. Prerequisite: MU 155 or permission of instructor.

#### MU 300 Contemporary Music Theory (3)

Harmonic, melodic, and rhythmic styles and trends of contemporary music. Includes modality, polytonality, quartal harmony, and serial techniques. 3 lectures. Prerequisite: MU 201.

#### MU 301 Counterpoint (3)

Counterpoint as a compositional technique. Modal, tonal, and post-tonal practices. 3 lectures. Prerequisite: MU 201.

#### MU 303 Music Form and Analysis (3)

Musical forms and processes employed by composers from the Baroque period to the present. 3 lectures. Prerequisite: MU 300.

#### MU 304 Introduction to Music Synthesis (3)

Survey of equipment and techniques for synthesizing music, and instrumental timbres. Development of basic skills in programming synthesis equipment and manipulating sonic material. 2 lectures, 1 activity. Prerequisite: MU 102 and MU 101 or MU 103.

#### MU 305 Music Recording Techniques II (4)

Advanced techniques for recording music, signal processing, and the relationship of sound spaces and the recording process. Development of practical recording methods. 2 lectures, 2 activities. Prerequisite: MU 205.

#### MU 306 Advanced Music Synthesis (3)

Compositional application of sound synthesis techniques. Exploration of current topics in music synthesis. Total credit limited to 6 units. 1 lecture, 2 activities. Prerequisite: MU 205, MU 304 and consent of instructor.

#### MU 320 Music Research and Writing (3)

Methodology for researching, analyzing, and writing about music. Exploration of investigative tools including library resources, periodicals, bibliographic tools, computerized search methods. Computer software for writing text, music notation, and music printing. Editing and formatting for music publication. 3 lectures. Prerequisite: ENGL 114, MU 120.

#### MU 321 History of Music I (3)

Survey of the history of Western music from Antiquity through the Renaissance. 3 lectures. Prerequisite: MU 120, MU 201.

#### MU 322 History of Music II (4)

Music of the Baroque, Classic and Romantic periods. 4 lectures. Prerequisite: MU 321.

#### MU 323 History of Music III (3)

Music of the 20th Century. 3 lectures. Prerequisite: MU 322.

#### MU 324 Music and Society (3) GEB C.3.

Designed for the non-music major. Exploration into the role of music in history and culture. Emphasis on appreciation and a deeper understanding of music and both its historical and cultural context. *Class Schedule* will list topics selected. Total credit limited to 9 units. 3 lectures. Prerequisite: Junior standing. MU 120 recommended.

#### MU 325 America's Music (3)

Exploration of the many styles of America's music through readings, sound recordings, and musical scores. Includes 'fine art,' 'popular,' and 'folk' traditions. How American music reflects the different cultural heritages, social contexts, and philosophies of its creators. 3 lectures. Prerequisite: MU 103, MU 120.

#### MU 340 Conducting (3)

Principles and techniques of conducting with experience in score reading. 2 lectures, 1 activity. Prerequisite: MU 201.

#### MU 341 Choral Conducting (3)

Continuation of MU 340. Emphasis on choral literature. Score reading, rehearsal techniques, and musical details associated with vocal music. 2 lectures, 1 activity. Prerequisite: MU 340.

#### MU 342 Instrumental Conducting (3)

Continuation of MU 340. Emphasis on band and orchestra literature. Score reading, rehearsal techniques, and musical details associated with instrumental music. 2 lectures, 1 activity. Prerequisite: MU 340.

#### MU 350 Applied Music (1)

Individual instruction in performance with emphasis on repertoire, technical skills, style, and interpretation. Total credit limited to 3 units. *Class Schedule* will list specific instrument or voice. Prerequisite: 3 units of MU 250 and consent of instructor.

#### MU 360 Music for Children (3)

Development of skills basic to fostering creative music experiences in the classroom. Exploration of various approaches to motivating children musically. Study of folk songs for singing, playing instruments, and learning about music as well as for their ethnic and cultural significance. 3 lectures. Prerequisite: MU 100.

#### MU 361 Instruments (1)

Fundamentals of playing and teaching woodwind, brass, string, and percussion instruments. Separate sections arranged with instructor. Total credit limited to 6 units. 1 activity. Prerequisite: Junior standing and consent of instructor.

#### MU 365 Music in the Elementary School (3)

Study and application of Orff and Kodaly. Philosophy and objectives for implementing an effective school music program. Includes fieldwork. 2 lectures, 1 activity. Prerequisite: Junior standing.

#### MU 370 University Jazz Band (1)

Limited to those who have had considerable experience playing musical instruments. Students have an opportunity to play for various university functions, dances, community programs, the annual Spring Tour and the Jazz Night concert. Total credit limited to 6 units. 1 laboratory. Prerequisite: Junior standing and consent of instructor.

#### MU 371 Instrumental Ensemble (1)

Open to qualified musicians. Rehearsal and public performance in large and small ensembles. Total credit limited to 6 units. 1 activity. Prerequisite: Junior standing and consent of instructor.

#### MU 372 Band (1)

Study and public performance of music written for large wind band (woodwinds, brass and percussion). Limited to those students who have had experience with wind and percussion instruments. The band performs concerts on campus and makes at least one tour annually. Total credit limited to 6 units. 1 laboratory. Prerequisite: Junior standing and consent of instructor.

#### MU 373 Wind Ensemble (1)

Study and public performance of music written for wind ensemble (woodwinds, brass and percussion). Limited to those students who have had experience with wind and percussion instruments. Total credit limited to 6 units. 1 laboratory. Prerequisite: Junior standing and consent of instructor.

# MU 374 Orchestra (1)

Preparation and performance of orchestral music including both the standard repertoire and rarely performed works. Open to all students whose technique is adequate. Total credit limited to 6 units. 1 laboratory. Prerequisite: Junior standing and consent of instructor.

#### MU 380 Men's Chorus (1)

Study and performance of music for men's voices. Total credit limited to 6 units. 1 laboratory. Prerequisite: Junior standing and consent of instructor.

#### MU 381 University Singers (1)

Study and public performance of music for mixed voices. Total credit limited to 6 units. 1 laboratory. Prerequisite: Junior standing and consent of instructor.

#### MU 382 Women's Chorus (1)

Study and public performance of music for women's voices. Total credit limited to 6 units. 1 laboratory. Prerequisite: Junior standing and consent of instructor.

#### MU 383 Vocal Ensemble (1)

Open to qualified singers. Rehearsal and performance of vocal music. Total credit limited to 6 units. 1 activity. Prerequisite: Junior standing and consent of instructor.

#### MU 384 Music Production Workshop (2)

Preparation of a musical theatre production for public presentation, including acting and stage management. Total credit limited to 6 units. 2 laboratories. Prerequisite: Junior standing and by audition, or consent of instructor.

#### MU 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Junior standing and consent of department head.

#### MU 402 Orchestration (3)

Scoring and arranging for various combinations of instruments. Ranges, transposition, and technical capabilities of vocal ensembles, band, and orchestra instruments. 3 lectures. Prerequisite: MU 201.

#### MU 404 Composition (3)

Independent creative projects. Exercises in compositional methods designed to increase technical facility. Total credit limited to 9 units. 3 lectures. Prerequisite: MU 300.

#### MU 420 Music History: Selected Topics (3)

Intensive study of selected topics in music history through the use of readings, recordings, and scores. *Class Schedule* will list topics selected. Total credit limited to 9 units. 3 lectures. Prerequisite: MU 323.

#### MU 450 Applied Music (1)

Individual instruction in performance with emphasis on repertoire, technical skills, style, and interpretation. Total credit limited to 3 units. *Class Schedule* will list specific instrument or voice. Prerequisite: 3 units of MU 350 and consent of instructor.

#### MU 461 Senior Project (3)

Selection and completion of a project under faculty supervision. Minimum of 90 hours total time. Results presented in a recital, creative work, formal report, or a combination of all three. Prerequisite: Senior standing and consent of department head.

#### MU 465 Choral Literature and Rehearsal Techniques (3)

Survey of choral literature especially suited for secondary schools. Philosophy and strategy for developing a school program. Musical as well as non-musical techniques for effective rehearsal. 2 seminars, 1 activity. Prerequisite: MU 341.

#### MU 466 Instrumental Literature and Rehearsal Techniques (3)

Survey of instrumental literature especially suited for secondary schools. Philosophy and strategy for developing a school program. Musical as well as non-musical techniques for effective rehearsal. 2 seminars, 1 activity. Prerequisite: MU 342.

# NRM-NATURAL RESOURCES MANAGEMENT

see FNR-Forestry and Natural Resources

# **OH-ORNAMENTAL HORTICULTURE**

# OH 100 Enterprise Project (1-4) (CR/NC)

Selection and completion of a management/production project under faculty supervision. Project participation is voluntary and subject to approval by the department head and the Cal Poly Foundation. Degree credit limited to 12 units. Credit/No Credit grading only.

# OH 101 Principles of Landscape Drafting (3)

Introduction to basic drafting skills, standards, techniques; CAD applications for the landscape contractor/designer; practical use of drafting tools; application of lines, symbols, lettering to construct typical landscape drawings. Overview of landscape history. Drafting tools required. Miscellaneous course fee required–see *Class Schedule*. 1 lecture, 2 laboratories.

#### OH 110 Orientation to Ornamental Horticulture (1) (CR/NC)

Understanding the depth and breadth of the ornamental horticulture industry, the department, and the University. Student and professional organizations. Required of all students in the major. Credit/No Credit grading only. 1 activity.

# OH 125 Commercial Floral Design Practices (3)

Theory, techniques, and skills currently practiced in the floral design industry. Construction of basic floral products for resale, cut flower processing, industry sales practices, merchandising and packaging. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 2 laboratories.

#### OH 126 Ornamental Horticulture Construction (2)

Design, construction and repair of structures and facilities using tools, equipment, power machinery, materials and methods unique to the horticulture industry. 1 lecture, 1 laboratory.

# OH 131 Fundamentals of Ornamental Horticulture I (4)

Introduction to and career potentials in the field of ornamental horticulture. Growing operations and cultural practices, soils, media and diagnosis of plant problems. Miscellaneous course fee required-see *Class Schedule*. Field trip required. 3 lectures, 1 laboratory.

#### OH 132 Fundamentals of Ornamental Horticulture II (3)

Introduction to basic equipment and techniques in floriculture and floral design. Effects of environment on plant growth and relationships to commercial applications. Miscellaneous course fee required-see *Class Schedule*. Field trip required. 2 lectures, 1 laboratory. Prerequisite: OH 131.

# OH 133 Plant Propagation Fundamentals III (4)

Introduction to commercial practices of plant propagation including seed, cuttings, grafting, layering, tissue culture. Discussion of the structures and environmental conditions utilized for plant propagation. Field trip may be required. 3 lectures, 1 laboratory. Prerequisite: OH 131, OH 132.

# OH 134 Landscape Maintenance Fundamentals IV (3)

Maintenance of trees, shrubs. Cultural requirements, irrigation, pruning, fertilizing. Turf and ground cover renovation. Repair of irrigation systems, equipment. Landscape maintenance industry. Maintenance of hand tools and power equipment. 2 lectures, 1 laboratory. Prerequisite: OH 126, OH 131 or consent of instructor.

### OH 200 Special Problems for Undergraduates (2-4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

# OH 230 Ornamental Gardening (3) GEB F.2.

Information and recommendations for the home gardener. Methods of propagation, pruning, planting, soils, fertilizers, lawn planting and maintenance, pest and weed control, home landscaping, and identification and care of house plants. For non-horticulture majors. 2 lectures, 1 laboratory.

#### OH 231, 232 Plant Materials (4) (4)

Identification, habits of growth, cultural requirements, and use of ornamental plants in landscape. 3 lectures, 1 laboratory. Prerequisite: BOT 223.

#### OH 238 Landscape Plants I (3)

Identification of woody and herbaceous ornamental plant materials selected and specified for the landscape. Landscape uses, cultural requirements and growth habits of plants used in North America. Field trips required. For non-horticulture majors. 2 lectures, 1 laboratory. Prerequisite: BOT 121.

#### OH 243 Turf Management (4)

Turf propagation, irrigation, fertilizer and pest control methods and procedures. Turf grass varieties and uses. Turf equipment. 3 lectures, 1 laboratory.

# OH 253 Stylized Western Design (3)

Techniques of western stylized line design as it is known currently. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: OH 132.

#### OH 301 Principles of Landscape Design (3)

Introduction to principles and elements of landscape design, design theory, plant composition; creative problem solving, functional and design uses of landscape materials, client and maintenance criteria, xeriscape concepts and perspective drawing. Expansion of drafting skills and development of computer-aided desgin skills. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 2 laboratories. Prerequisite: OH 101, OH 126, OH 132, OH 134, one plant materials course and AG 250 or CSC 110.

#### OH 302 Ornamental Horticulture Sales and Service (3)

Historical establishment of the retail horticulture centers. Relating basic marketing and management principles to the unique conditions found in typical ornamental horticulture sales and service establishments. Field trip required. 2 lectures, 1 activity. Prerequisite: OH 132.

# OH 308 Landscape Plants II (3)

Identification of woody and herbaceous ornamental plant materials. Cultural requirements, integration and utilization of plants used in North America. Field trip required. Not for Ornamental Horticulture majors. 2 lectures, 1 laboratory. Prerequisite: OH 238.

### OH 315 Advanced Plant Materials (4)

Identification, habits of growth, cultural requirements and use of ornamental woody and herbaceous plants used in Mediterranean climates. Incorporation of a design/use project, in addition to testing for knowledge of plants covered in required prerequisites. 3 lectures, 1 laboratory. Prerequisite: OH 101, OH 231, OH 232, BOT 223.

### OH 320 Horticultural Presentation Techniques (4)

Various media essential to horticultural presentations. Expanded applications of plan, elevation, perspective drawings. Duplication, color rendering, CAD applications for logo, letterhead, business card, brochures for horticultural business. Model construction, photography and slide-synchronization. Required field trip. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: Computer literacy course GEB F.1, OH 301.

### OH 321 Residential Landscape Design (4)

Principles of landscape design for single-family residential properties. Project involvement includes actual client contact. Application of xeriscape concepts to the residence. Computer assisted design applications emphasized. Required field trip. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: OH 301 and two plant materials courses selected from OH 231, OH 232, OH 233. Recommended: OH 320, OH 381, AE 131 or AE 237.

#### OH 324 Foliage Plant Culture (4)

Identification, propagation, production, marketing, utilization and maintenance of plants intended for interior plantscaping. 3 lectures, 1 laboratory. Prerequisite: Junior standing or consent of instructor.

#### OH 325 Floriculture Grades and Standards (3)

Grades and standards for fresh flowers, and blooming and foliage plants. Score cards in evaluating florist crops. Comparative evaluation used to develop both verbal skills and appreciation of commercially grown floriculture crops. 1 lecture, 2 laboratories. Prerequisite: OH 131, OH 132, or consent of instructor.

# OH 328 Advanced Floral Design (4)

Advanced styling of floral designs used in sympathy work. Party decorations, hospital arrangements, and solid work. Field trip required. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: OH 132.

# OH 329 Advanced Floral Design (4)

Advanced styling of floral designs to wear and carry, as practiced specifically in wedding work. Field trip required. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: OH 328.

#### OH 330 Art of Flower Arrangement (2)

Theory and practice of use of plant materials as an art medium in creating floral design. Application of universal art principles to flower and foliage decorations. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 1 laboratory. Prerequisite: Any course in GEB area B.1.

#### OH 331 Landscape Contracting (4)

Practices in supervising personnel and applying standard techniques in landscape construction. Cost finding and estimating for landscape trades. Miscellaneous course fee required-see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: OH 101, OH 126, OH 301.

### OH 332 Landscape Contracting (4)

Practices in supervising personnel and applying standard techniques in landscape construction cost finding and estimating for landscape trades. Rules, regulations, and licensing laws, set forth by the State of California, governing landscape contractors. Miscellaneous course fee required-see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: OH 331.

#### OH 333 Sport and Recreational Turf (4)

Maintenance and operation of large areas such as golf greens, athletic fields, and park areas. Systems of management and maintenance, business aspects, and turf industry. 3 lectures, 1 laboratory. Prerequisite: OH 243.

### OH 337 Park Planning and Management (4)

Overview of the management and maintenance of private and public parks and recreational areas. Field trips required. 3 lectures, 1 laboratory. Prerequisite: Junior standing or consent of instructor.

#### **OH 340** Principles of Greenhouse Environment (5)

Problems and practices affecting the contemporary commercial horticulturist. Analysis and operation of greenhouses and related equipment stressing the effect of environment on plant growth. Field trip required. 4 lectures, 1 laboratory. Prerequisite: OH 131 and OH 132, or consent of instructor.

#### OH 341 Cut Flower Production (4)

Production of cut flowers and other fresh florists' commodities in greenhouses and outdoors. Preparation and scheduling of such commodities for major markets. Field trip required. Miscellaneous course fee required-see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: OH 340 and consent of instructor.

#### OH 342 Potted Plant Production (4)

Production of major commercial flowering potted plants in greenhouses and outdoors. Preparation and scheduling of potted flowering greenhouse crops for major markets. Field trip required. 3 lectures, 1 laboratory. Prerequisite: OH 340 or consent of instructor.

#### OH 345 Specialized Techniques of Bonsai Culture (2)

Principles of bonsai techniques, including the cultural care, practices and training techniques utilized in the production and development of plant materials grown in small containers. Miscellaneous course fee required-see *Class Schedule*. 1 lecture, 1 laboratory. Prerequisite: Any course in GEB area B.1.

#### OH 381 Native Plants for California Landscapes (3)

Horticultural investigation of the California flora with emphasis on landscape use and potential. Plant recognition, identification, propagation and culture. Utilization of native plants in landscape design and habitat restoration. Field trip required. 2 lectures, 1 laboratory. Prerequisite: BOT 121, junior standing or consent of instructor.

# OH 400 Special Problems for Advanced Undergraduates (2-4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

#### OH 401 Field Studies in Ornamental Horticulture (1)

Field trips to ornamental horticulture outlets and the industry businesses that supply them. Garden centers, flower shops and garden center flower shop combinations. Foundation and display gardens with retail outlets and public educational facilities. Required field trip includes wholesalers, jobbers, display houses, advertising agency and others working with the retailers. 1 activity. Prerequisite: OH 131, OH 132.

#### OH 402 Advanced Ornamental Horticulture Sales and Services (4)

Legal aspects and economics of operating a retail horticulture business. State and county regulations, quarantines, grades and standards of nursery stock and floral design materials. Purchasing, merchandising and record keeping. Trade associations and cooperative buying. 3 lectures, 1 laboratory. Field trip required. Prerequisite: OH 302, ECON 201 or ECON 211, junior standing or consent of instructor. Recommended: MGT 201.

#### OH 421 Arboriculture (4)

Care and management of large ornamental trees. Use of ropes and other safety equipment in tree climbing. Cavity work, bracing, cabling, and pruning. 3 lectures, 1 laboratory. Prerequisite: OH 134, OH 231, OH 232, OH 315 or consent of instructor.

#### OH 422 Advanced Arboriculture (2)

Theory and practices utilized in the management of ornamental trees found in landscaped urban settings. Scheduling of cultural practices and safe usage of hand and power equipment, as specified by professional arborists, and other safety regulations. 1 lecture, 1 laboratory. Prerequiste: OH 231, OH 421 and consent of instructor.

#### OH 424 Wholesale Nursery Management (4)

Commercial nursery operations including container plant handling, growing media, fertilization, weed control, container sizing, pruning and staking, systems analysis, production and inventory control and marketing. History and overview of the nursery industry. Field trip required. 3 lectures, 1 laboratory. Prerequisite: OH 133, SS 221, senior standing, or consent of instructor.

#### OH 425 Tissue Culture Propagation I (2)

Principles of tissue culture applied to the propagation of ornamental plants. Systems applicable to commercial crops, laboratory organization, media, and current research. Miscellaneous course fee required–see *Class Schedule*. 1 lecture, 1 laboratory. Prerequisite: OH 133 and BOT 322.

#### OH 426 Tissue Culture Propagation II (1)

Current tissue culture techniques used in horticulture industry. Continuation of experiments begun in OH 425. Total credit limited to 6 units. 1 laboratory. Prerequisite: OH 425.

#### OH 427 Disease and Pest Control Systems for Ornamental Plants (5)

Recognition, prevention and control of disease, weed, insect and mite pests that impact commercial ornamental plantings. Pesticides recommended for prevention and control. Training for safe and proper pesticide applications. Miscellaneous course fee required-see *Class Schedule*. 4 lectures, 1 laboratory. Prerequisite: ENT 220 and/or CRSC 311, BOT 324 and senior standing.

#### OH 434 Landscape Management (3)

Maintenance procedures and operations. Estimating scheduling, recordkeeping and implementation of landscape maintenance projects. Interior landscape maintenance. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: OH 126, OH 134 or permission of instructor.

# OH 435 Interiorscaping (4)

Systematic presentation and critique of current aspects of interior landscaping. Elements of design, environmental influences and measurements, plant materials selection, specifications, procurement and installation, and subsequent maintenance of finished interiorscape. 3 lectures, 1 laboratory. Prerequisite: OH 301 and OH 324 or consent of instructor.

#### OH 443 Greenhouse Management (4)

Problems and practices in the management of greenhouses. Scheduling greenhouse crops, planning crop rotation, cost accounting for floricultural crops, management decisions in production costs and personnel matters. Field trips required. 3 lectures, 1 laboratory. Prerequisite: OH 342 or consent of instructor.

#### OH 454 Ornamental Horticulture Irrigation Systems (4)

Irrigation system design with emphasis on landscape, nursery and specialized systems, materials and installation. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisites: OH 301, AE 337 and senior standing.

#### OH 461 Senior Project (2)

Selection of a project under faculty adviser approval. Initial research and data gathering period for project information. Projects typical of problems which graduates must solve in their fields of study or employment. Project results are presented in a formal written report completed in OH 462. Contract drawn up with approval of adviser. Minimum 60 hours. Prerequisite: All 100–200 level courses in OH curriculum; 135 units; ENGL 114, ENGL 215 or ENGL 218.

#### OH 462 Senior Project (2)

Continuation of Senior Project development. Write-up of rough draft and formal draft of project. Completion of formal written report under adviser supervision. Minimum 60 hours. Prerequisite: Completion of OH 461 with a grade of C or better.

#### OH 463 Senior Seminar (1)

Open forum for senior students presenting information and developing skills necessary for career planning in professional horticulture. Exposure to current employment trends in the OH industry. 1 seminar. Prerequisite: OH 461.

#### OH 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

#### OH 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

#### OH 581 Graduate Seminar in Ornamental Horticulture (3)

Group study of current problems of the ornamental horticulture industry; current experimental and research findings as applied to production and to the teaching of horticulture. 3 seminars.

# **PE-PHYSICAL EDUCATION**

#### **Number Fields for Physical Education Courses**

	Coed	Men	Women
	(PE)	(PEM)	(PEW)
Basic Instructional			
Program	100–165		
Intramural activities	174		
Competitive athletics	181–199	181–199	181–199
Professional activities (PE majors or related			
only)	206-239		
Academic courses	240 up		

#### **BASIC INSTRUCTIONAL PROGRAM**

Enrollment is open to all students except for designated intramural courses. Courses carry 1 unit of credit, meet 2 hours per week, and are designed to develop skill, knowledge of rules, background and analysis of techniques, and desirable attitudes toward physical fitness and participation in physical activities.

The beginning course or its equivalent is prerequisite to the intermediate, and the intermediate to the advanced. Prerequisite may be waived by consent of the instructor.

No more than two different activity courses nor more than one section of an individual activity course may be taken for credit in any one quarter. A student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course. Any level of an activity course can be repeated only once for credit.

Students not majoring in physical education may apply a maximum of 12 units of credit earned in general and intramural activity courses toward the bachelor's degree.

All basic instructional courses (PE 100–176) are evaluated on a Credit/No Credit basis. A miscellaneous course fee may be required-see *Class Schedule*.

#### Coed

- PE 100 Adaptive Activity
- PE 101 Gymnastics
- PE 102 Tumbling and Vaulting
- PE 103 Archery
- PE 104 Badminton, Beg.
- PE 105 Badminton, Int.-Adv.
- PE 108 Basketball
- PE 109 Bowling
- PE 110 Cycling
- PE 111 Fencing
- PE 116 Aerobic Exercise
- PE 121 Golf, Beg.
- PE 122 Golf, Int.-Adv.
- PE 125 Jogging
- PE 126 Judo
- PE 129 Stretch, Flex and Relax
- PE 131 Physical Conditioning
- PE 132 Racquetball, Beg.
- PE 133 Racquetball, Int.-Adv.
- PE 135 Skin Diving
- PE 136 Scuba Diving
- PE 137 Self-Defense
- PE 138 Karate
- PE 139 Soccer
- PE 140 Ultimate Disc
- PE 142 Softball
- PE 143 Swimming for Non-Swimmers
- PE 144 Swimming, Advanced Beginner
- PE 145 Swimming, Int.
- PE 146 Swimming, Adv.
- PE 147 Swim Conditioning
- PE 148 Tennis, Beg.
- PE 149 Tennis, Int.-Adv.
- PE 151 Volleyball, Beg.
- PE 152 Volleyball, Int.-Adv.
- PE 154 Weight Training
- PE 156 Aqua-Aerobics
- PE 159 Wrestling
- PE 161 Canoeing
- PE 162 Windsurfing
- PE 174 Intramurals
- PE 176 Fitness Walking

# **COMPETITIVE ATHLETICS**

Enrollment limited to those academically qualified to compete in intercollegiate athletic programs. Consent of coach required. Total credit limited to 8 units. Courses are each 2 units and meet for a minimum of 10 hours per week. All competitive athletics courses are evaluated on a Credit/No Credit basis.

## Men

PEM 182 Baseball **PEM 183** Basketball **PEM 184** Cross Country PEM 185 Football PEM 189 Soccer PEM 191 Swimming PEM 192 Tennis PEM 193 Track and Field PEM 196 Wrestling

#### Women

PEW 183	Basketball
PEW 184	Cross Country
PEW 190	Softball
PEW 191	Swimming
PEW 192	Tennis
PEW 193	Track and Field
PEW 194	Vollevball

#### **PROFESSIONAL ACTIVITIES**

Priority for enrollment given to those students pursuing a major in Physical Education. Physical Education majors may apply a maximum of 24 units of credit earned in PE 101-239 toward the bachelor's degree. When applicable, course selection should be determined by the student after consultation with his/her adviser. All courses are one or two units and meet for two or four hours per week. All professional activities are designed to attain intermediate skills in performance and analysis and knowledge of rules and strategy. Prerequisites in the PE 101-165 series activities will be required for those students who cannot demonstrate minimum skill levels.

- PE 206 Gymnastics (2)
- PE 208 Golf (1)
- PE 209 Creative and Non-Traditional Games (1)
- PE 210 Tennis (1)
- PE 211 Softball-Baseball (1)
- PE 212 Handball/Racquetball (1)
- PE 213 Basketball (1)
- PE 214 Volleyball (1)
- PE 215 Field Sports (Soccer, Speedball, Speed-a-Way) (2)
- PE 216 Wrestling (1)
- PE 217 Flag Football/Football (1)
- PE 218 Aquatics (2)
- PE 219 Progressive Strength Training (1)
- PE 221 Combatives/Self Defense (1)
- PE 222 Archery (1)
- PE 223 Cross Country and Track Events (1)
- PE 224 Field Events (1)
- PE 225 Team Handball (1)
- PE 227 Aerobic Dance Exercise (2)
- PE 229 Badminton (1)

# ACADEMIC COURSES

Professional courses designed primarily for the student majoring in physical education. PE 250 may be used in partial satisfaction of the General Education-Breadth requirement in physical education.

#### PE 241 Understanding Fitness and Training (1)

Introduction to physiological principles and factors which provide the basis for the development and maintenance of optional physical fitness. 1 lecture. Prerequisite: Concurrent enrollment in PE 110, PE 116, PE 125, PE 131, PE 145, PE 146, PE 147, PE 154 or PE 156.

#### PE 242 Pre-WSI (1) (CR/NC)

Designed to offer certification in American Red Cross Emergency Water Safety (EWS) and Instructor Candidate Training (ICT). Teaching methods as related to American Red Cross courses; cognitive and skill acquisition relating to emergency water rescue methods. Credit/No Credit grading only. 1 activity. Prerequisite: PE 145 or equivalent.

#### PE 243 Lifeguard Training (3)

Lifeguarding theory, knowledge, techniques and skills. Students completing course will be eligible for American Red Cross Lifeguard Training Certification exam. 1 lecture, 2 activities. Prerequisite: Successful completion of Red Cross swimming skills test, consent of instructor.

#### PE 245 Adaptive Aquatics in Physical Education and Recreation (2) (Also listed as REC 245)

Adaptive techniques in working with the disabled in aquatics; physical, mental, emotional, social, and recreational involvements utilizing aquatics as the treatment modality. 1 lecture, 1 activity.

#### PE 250 Health Education (2) GEB E.2.

Introductory health course geared to bridge the gap between scientific health discoveries and one's application of these discoveries in the daily living pattern. 1 lecture, 1 recitation.

# PE 252 Introduction to Athletic Training (2)

Modern principles and practices in the prevention, treatment, rehabilitation and follow-up care of athletic injuries. Functions and limitations of the athletic trainer as an athletic paramedic. Theory and practice of adhesive strapping as related to supporting major body joints for athletic participation. 2 activities. Prerequisite: GEB B.1.b.

#### PE 270 Introduction to Physical Education (2)

Designed to acquaint the student with the concept of physical education as a profession and to orient the student to the Cal Poly program. 2 lectures.

#### PE 275 Sports Officiating (2)

Designed to provide knowledge, understanding, appreciation of officiating in general, and the development of skills in officiating. 1 lecture, 1 activity.

#### PE 280 First Aid and CPR (3)

Standard American Red Cross first aid and CPR course. Instruction and practice in the immediate and temporary care of injuries and sudden illness. 2 lectures, 1 activity.

#### PE 296 Planning Techniques in Physical Education (3)

Practical skills and techniques of teaching physical education in schools. Unit and lesson planning, class management, teaching aids. Implementation and evaluation of lessons in a laboratory setting. 2 lectures, 1 activity. Prerequisite: 4 units of professional physical education activity courses (PE 206–229).

#### PE 302 Mechanical Kinesiology (4)

Fundamental biomechanical concepts and their application to human movement activities, and analyses of exercise mechanics and skill performance. 3 lectures, 1 laboratory. Prerequisite: ZOO 237 and ZOO 340.

#### PE 303 Physiology of Exercise (4)

Application of the knowledge of human physiology to exercise situations. 3 lectures, 1 laboratory. Prerequisite: ZOO 331 and ZOO 322. Recommended: FSN 210.

#### PE 305 Drug Education (2)

Instruction on the nature and effect of the use of tobacco, alcohol, narcotics and restricted dangerous drugs. 2 lectures. Prerequisite: PE 250.

# PE 307 Adaptive Physical Education (4)

Major categories of handicapping conditions with implications for the development of physical activity programs for specific disabilities. 3 lectures, 1 laboratory. Prerequisite: ZOO 237, ZOO 331 and ZOO 332.

#### PE 310 Concepts in Physical Education (3)

Historical, physiological, mechanical, psychological, and sociological foundations of physical education. Movement as it relates to physical fitness, wellness, social development, crosscultural understanding, and self-image. 3 lectures. Prerequisite: GEB E.2. (See page 114 for GEB requirements.)

### PE 312 Coaching Aquatics (2)

Supervision of swimming pool activities. Coaching swimming, diving, and water polo. 1 lecture, 1 activity. Prerequisite: PE 218 or consent of instructor. Recommended: PE 296.

# PE 318 Measurement and Evaluation in Physical Education I (3)

Scientific basis of evaluating programs in physical education. Experimental, survey, and historical evaluative methods. Statistical design and analysis with packaged computer programs and data base management. 3 lectures. Prerequisite: STAT 130 or STAT 211 and GEB F.1. (See page 114 for GEB requirements.)

# PE 319 Measurement and Evaluation in Physical Education II (4)

Principles of test selection and administration, measurement and evaluation of characteristics and data, library research, data analysis, experimental design, questionnaire construction and sampling techniques related to physical education. 3 lectures, 1 activity. Prerequisite: PE 318.

# PE 321 Coaching Football (2)

Fundamentals and systems of offensive and defensive football. Preparation for interscholastic coaching. Rules of the game. 1 lecture, 1 activity. Prerequisite: PE 217 or consent of instructor. Recommended: PE 296.

#### PE 322 Coaching Basketball (2)

Theories of coaching, principles of organization of interscholastic basketball. 1 lecture, 1 activity. Prerequisite: PE 213 or consent of instructor. Recommended: PE 296.

#### PE 323 Coaching Baseball (2)

Fundamentals of baseball with emphasis on strategy, selection of players, officiating, interpretation of rules, scoring, and administration of interschool games. 1 lecture, 1 activity. Prerequisite: PE 211 or consent of instructor. Recommended: PE 296.

#### PE 325 Coaching Softball (2)

Fundamentals of softball with emphasis on strategy, selection of players, officiating, interpretation of rules, scoring, and administration of interschool games. Slow pitch as well as fast pitch techniques will be emphasized. 1 lecture, 1 activity. Recommended prerequisite: PE 296.

# PE 327 Coaching Wrestling (2)

Coaching techniques of wrestling. Theories of coaching principles and organization of interscholastic wrestling. 1 lecture, 1 activity. Prerequisite: PE 216 or consent of instructor. Recommended: PE 296.

## PE 344 Coaching Volleyball (2)

Techniques and theories of individual fundamentals, game strategies, and problems of coaching secondary and collegiate level athletes. 1 lecture, 1 activity. Prerequisite: PE 214 or consent of instructor. Recommended: PE 296.

# PE 350 Computer Applications in Teaching Physical Education (3)

Practical experience with educational applications of microcomputers and software designed to aid the physical education teacher. 1 lecture, 2 activities. Prerequisite: CSC 110, CSC 111, CSC 112, CSC 118, CSC 120, CSC 410, CSC 416 or consent of instructor.

### PE 354 School Health Programs (2)

Introduction to school health services, environment, and instruction within the public and private school system. Health instruction and curriculum. Identification and control of children's communicable diseases and special problems within the classroom. 2 lectures. Prerequisite: PE 250.

### PE 356 Teaching Gymnastics (2)

Techniques and problems in teaching gymnastics along with practical experience. Emphasis on teaching progressions, class organization, spotting, and safety. 2 activities. Prerequisite: PE 206, PE 296, or consent of instructor.

#### PE 379 Coaching Track and Field and Cross Country (2)

Techniques and problems in teaching track and field and cross country. 1 lecture, 1 activity. Prerequisite: PE 223, PE 224, or consent of instructor. Recommended: PE 296.

# PE 384 Water Safety Instructor (3)

Analyzing swimming strokes and techniques with emphasis on teaching methods for beginning, intermediate, and advanced skills. Teaching infant and pre-school children. Teaching basic water safety and emergency water safety skills. Curriculum requirements can be satisfied without WSI card requirements. 2 lectures, 1 activity. Prerequisite: Pass skill and written pre-test, possess a current ARC Emergency Water Safety or Lifeguard Training Certificate.

#### PE 385 Lifeguard Instructor (2)

Analyzing lifeguard skills with emphasis on techniques and methods for teaching advanced aquatic rescue skills. Upon successful completion of this course, American Red Cross Lifeguard Instructor certification will be issued. 1 lecture, 1 activity. Prerequisite: PE 242 and PE 243 or equivalent certifications.

### PE 400 Special Problems for Advanced Undergraduates (1-3)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Senior standing or consent of instructor.

#### PE 401 Administration of Physical Education and Health/Fitness Programs (3)

Underlying philosophy, principles, policies, and procedures of administration and management as applied to physical education and health/fitness in various settings such as schools and commercial and corporation fitness enterprises. 3 lectures. Prerequisite: Junior standing (preference given to PE majors).

#### PE 402 Motor Learning and Control (4)

Variables which control sensory-motor integration. Analysis of factors which affect the acquisition of motor skills as related to the learning process and the learning environment. 3 lectures, 1 activity. Prerequisite: Senior standing.

#### PE 404 Motor Development (3)

Motor development of individuals from birth to maturity. Emphasis on interrelationship between motor and cognitive characteristics and affective needs and interests. 3 lectures. Prerequisite: Two physical education Basic Instructional Program courses (PE 101-165) and senior standing.

#### PE 405 Administration of Health Education (2)

Current procedures and policies in the development and basic administration of public and school health education programs. 2 lectures. Prerequisite: PE 354.

#### PE 407 Programming and Adaptive Techniques in Therapeutic Recreation (4) (Also listed as REC 407)

Description, etiology, and nature of specific disabilities, with an emphasis on the development of individualized therapeutic recreation programs for the physically handicapped, the developmentally disabled, and the emotionally troubled individual. 3 lectures, 1 laboratory. Prerequisite: PE 307 or REC 252 or consent of instructor.

#### PE 408 Exercise and Health Promotion for Senior Adults (3)

Special fitness, exercise, and health needs of the senior population. Theories of aging and age-related changes. Health promotion, exercise needs and activity programs for senior adults. 3 lectures. Prerequisite: PE 250, senior standing or consent of instructor.

#### PE 410 Psychology of Coaching (3)

Psychological considerations of the coach-athlete relationship and mental preparation of teams and individuals for competition and practice. Special emphasis on the male and female adolescent with regard to the psychological implications of sports participation. 3 lectures. Prerequisite: PSY 201 or PSY 202.

#### PE 411 The Human Element in Sport (3)

Principles of sport psychology and sport sociology. The effect of sport on individuals and groups in American society. 3 lectures. Prerequisite: GEB D.4.a. and PSY 201 or PSY 202.

#### PE 412 Contemporary Issues in Sport (3)

Selected topics dealing with sports as a social phenomenon in American life. *Class Schedule* will list topic selected. Total credit limited to 6 units. 3 lectures.

#### PE 416 Physical Education/Recreation Facilities (3) (Also listed as REC 416)

Management, clientele considerations, facilities and outdoor areas planning and operations, personnel, finance and equipment as related to physical education and recreation areas and facilities. Consideration of architectural and environmental barriers. Field visits required. Miscellaneous course fee required-see *Class Schedule*. 3 lectures. Prerequisite: Upper division standing and consent of instructor for non-PE/REC majors.

#### PE 420 Administration of Aquatic Programs (3)

Preparation for national certification as a pool operator. Health and sanitation in swimming facilities; state swimming codes; pool chemistry; filtration systems; safety; liability; instructional programming; facility design; and equipment. 3 lectures. Prerequisite: PE 384 or consent of instructor.

#### PE 422 Teaching Elementary Physical Education (4)

Content and process required to implement a developmental physical education program for elementary school children. 2 lectures, 2 activities. Prerequisite: PE 296. Recommended: PSY 201 or PSY 202, PE 206, and DANC 311.

#### PE 423 Teaching Secondary Physical Education (4)

Techniques of teaching physical education in junior and senior high school. Emphasis on class organization, lesson plan development and evaluation, class management and control and understanding the secondary school setting. 2 lectures, 2 activities. Prerequisite: PE 296. Recommended: PE 422.

#### PE 424 Organizing and Teaching Physical Education (4)

Organization, selection, presentation, strategy, application, and interpretation of K-12 subject matter in physical education. 4 seminars. Prerequisite: PE 296 and PE 422 or PE 423.

#### PE 432 Athletic Training and Rehabilitation (2)

Modern principles and practices in conditioning and care of athletes. Theory and practice in the scientific manipulation of the muscles as related to therapeutic exercise. 2 activities. Prerequisite: PE 241 and PE 252 for non-PE majors; PE 252 and senior standing for PE majors.

# PE 434 Design and Implementation of Health and Fitness Programs (3)

Application of training physiology to development of health and fitness programs. Role of exercise in health promotion, Evaluation of current practice in health and fitness program design and implementation in various commercial and corporate settings. Review of knowledge and skills of health and fitness professionals. 3 lectures. Prerequisite: PE 252, PE 302, PE 303.

#### PE 437 Directed Fieldwork (1-3) (CR/NC)

Practical work experience in related phases of physical education under qualified supervision. Total credit limited to 9 units. Credit/No Credit grading only. Minimum of 2 laboratory hours per week per unit. Prerequisite: Senior standing or consent of adviser.

# PE 438 Adaptive Physical Education Fieldwork (1-3) (CR/NC)

Practical experience in physical education for special populations. Students plan and conduct physical activity programs for subjects who have special needs. Total credit limited to 6 units. Credit/No Credit grading only. Prerequisite: PE 307, consent of instructor.

#### PE 439 Commercial/Corporate Fitness Internship (3)

Practical experience at approved site which provides fitness and wellness programs. Students participate in program administration under direct supervision of on-site coordinator. Prerequisite: Senior standing and successful completion of all undergraduate requirements except PE 439.

#### PE 440 Physical Education Practicum (1)

Supervised experience involving organizational and instructional responsibilities in activity, lecture and/or laboratory classes as determined by curricular concentration or certificate program. Total credit limited to 3 units. Prerequisite: PE 423 or consent of instructor.

#### PE 445 Electrocardiography (3)

Basic principles of electrocardiography, including practical skills of the ECG technician. Recognition of normal ECG patterns and abnormal changes related to rhythm disturbances, conduction defects, and myocardial ischemia/infarction. 2 lectures, 1 laboratory. Prerequisite: CHEM 328, PE 303, ZOO 237, ZOO 331, ZOO 332, or consent of instructor.

#### PE 450 Lifestyle Management in the Workplace (3)

Designed to acquaint students with those events, situations and relationships leading to healthy lifestyles in fitness and occupational settings. Emphasis on stress and time management, exercise, nutrition and relaxation techniques. Design and implementation of workplace health promotion programs. 3 lectures. Prerequisite: Senior standing. Non-majors: Consent of instructor.

#### PE 451 Nutrition for Fitness and Sport (3)

Application of nutritional facts to selected aspects of physical training, degenerative disease, obesity and weight control, diet manipulation and modification in sport, nutrition supplementation and special dietary considerations for the young and old, male and female athletes. 3 lectures. Prerequisite: HE 210/FSN 210 and PE 303.

#### PE 452 Testing and Exercise Prescription for Fitness Specialists (3)

Selected areas of health/fitness screening and evaluation. Application of components relevant to the development and administration of exercise programs for persons regardless of sex, age, functional capacity and presence or absence of CHD or CHD risk factors. 1 seminar, 2 laboratories. Prerequisite: HE 210/FSN 210, PE 303, PE 445 or consent of instructor.

#### PE 461, 462 Senior Project (3) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: Senior standing.

#### PE 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

#### PE 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

#### PE 474 History and Philosophy of Physical Education (3)

History of physical education including philosophical, institutional, and personal influences. Application of education principles to physical education. 3 lectures. Prerequisite: PE 270.

#### PE 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

#### PE 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

#### PE 500 Individual Study (1-3)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Only 6 units may be applied to degree requirements. Prerequisite: PE 517 and consent of department head, graduate adviser, and supervising faculty member.

#### PE 501 Administration of Adapted Physical Education Programs (3)

Principles, policies, and procedures of administration as applied to the adaptive physical education program for the elementary and secondary school levels. Legal aspects involving city, county, state and national agencies. Assessment of program effectiveness. 3 seminars. Prerequisites: PE 406, PE 407.

# PE 502 Current Trends and Issues in Physical Education (3)

Practical problems in physical education and their solution in terms of desired objectives in this field. 3 seminars. Prerequisite: Graduate standing.

#### PE 503 Seminar in Adult Wellness (3)

Advanced seminar investigating topics relating to wellness in adults. Cardiovascular, respiratory, and stress related diseases as well as health issues in the later years. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

#### PE 504 Cardiopulmonary Physiology, Pathology, and Exercise (3)

Selected cardiovascular and pulmonary disease problems, their etiology, symptoms, diagnosis, physical limitations, and physiology as affected by exercise in therapy and rehabilitation. 3 seminars. Prerequisite: ZOO 331, ZOO 332, PE 303.

# PE 511 Administration of Physical Education and Athletics (3)

Principles and techniques of administration of physical education and athletics on the elementary and secondary school levels. 3 seminars. Prerequisite: Graduate standing.

#### PE 512 Critical Health Issues (3)

Selected topics dealing with health and wellness appraisal, planning and management. *Class Schedule* will list topics

selected. Total credit limited to 9 units. 3 seminars. Prerequisite: Graduate standing.

#### PE 517 Research Methods in Physical Education (3)

Experimental, descriptive, historical, philosophical, and action research in physical education. Selection of adequate problems for investigation; various sampling techniques and analyses; use of library facilities; manuscript requirements for the thesis. 3 seminars. Prerequisite: PE 319 or consent of instructor.

#### PE 519 Evaluation of Current Studies (3)

Analysis and evaluation of published studies in physical education, health education and recreation. 3 seminars. Prerequisite: PE 517.

# PE 522 Biomechanics (3)

Advanced biomechanical concepts applied to human movement, examination of research, and biomechanical analyses of movement activities. 2 seminars, 1 laboratory. Prerequisite: PE 302 or equivalent.

#### PE 525 Human Performance and Learning (3)

Analysis of research principles and concepts and variables related to human motor performance and learning with emphasis on the information processing approach for evaluating performance. 3 seminars. Prerequisite: Graduate standing.

#### PE 526 Sport in American Society (3)

Understanding the role of sport in American society as viewed from sociological and psychological perspectives. Effect of success and failure in competitive sport situations. 3 seminars. Prerequisite: Graduate standing.

#### PE 530 Advanced Physiology of Exercise (4)

Physiological determinants of physical work capacity and sports performance. 3 seminars, 1 laboratory. Prerequisite: PE 303.

#### PE 536 Advanced Electrocardiography (4)

Theory and application of electrocardiography and other techniques for cardiovascular assessment and treatment of cardiac disease and other abnormalities. 3 seminars, 1 .aboratory. Prerequisite: PE 445 or equivalent.

#### PE 537 Internship (3-12) (CR/NC)

Supervised work experience in an approved wellness/fitness clinical facility, school, or other faculty approved setting. Total credit limited to 12 units. Maximum of 6 units may be applied toward Master of Science in Physical Education. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor. Student must be advanced to candidacy.

#### PE 581 Graduate Seminar in Physical Education (1-3)

Directed group study of selected topics for advanced students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 seminars. Prerequisite: Graduate standing or consent of instructor.

### PE 585 Cooperative Education Experience (6) (CR/NC)

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

#### PE 599 Thesis or Project (3) (3)

Completion of a thesis or project pertinent to the field of physical education. Independent research under the guidance of the faculty. Prerequisite: PE 519, consent of graduate committee and supervising faculty member.

# PHIL-PHILOSOPHY

#### PHIL 125 Critical Thinking (3) (Also listed as ENGL 125 and SPC 125) GEB A.2.

Nature of critical thinking. Analysis of inductive and deductive arguments. Practice in the criticism and composing of arguments in English. 3 lectures. Prerequisite: ENGL 114.

#### PHIL 170 Problems of Philosophy (3)

Main problems and basic concepts of philosophy. Methods of philosophical analysis and argumentation. Oral and written expression of philosophical ideas using a case mode presentation. 3 lectures. Prerequisite: PHIL 125 or ENGL 125 or SPC 125.

#### PHIL 225 Symbolic Logic I (3)

Methods of proof in propositional and predicate logic including conditional and indirect proof procedures. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

### PHIL 230 Philosophical Classics (3) GEB C.1.

Readings of various philosophic classics with focus on the identification and evaluation of the central metaphysical and epistemological themes. Various major arguments through a case mode presentation. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

#### PHIL 231 Philosophical Classics (3)

Readings with focus on the identification and evaluation of the central themes of ethics, social and political philosophy. Various major arguments through a case mode presentation. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

#### PHIL 305 Judeo-Christian Religions (3) GEB C.3.

Origins, beliefs, practices and philosophies of Judaism and Christianity, and of the ancient Middle Eastern religions which led to their development. Influence of these religions and the logic of their religious claims. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

# PHIL 306 Asian Religions (3)

GEB C.3.

GEB C.3.

GEB C.1.

Origins, beliefs, practices and philosophies of the religions of the Hindu, Buddhist, Taoist, Confucian and Shinto and other faiths common to India and the Far East. Influence of these religions on the world and the logic of their religious claims. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

#### PHIL 308 Islamic Religion (3)

Beliefs, ethics and religious practices of Islam. Historical development of the Islamic tradition from the Prophet Muhammad. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

# PHIL 311 History of Greek Philosophy (3) GEB C.3.

Beginnings of Western philosophy and science. Presocratics, Socrates, Plato, and Aristotle. Greek philosophies in the Roman world. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

GEB C.3.

GEB C.3.

#### PHIL 312 History of Medieval Philosophy (3) GEB C.3.

Development of Western philosophy from Augustine to Ockham, including the philosophies of Anselm, Abelard, Roger Bacon, Bonaventure, Aquinas and Duns Scotus. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

# PHIL 313 Continental Philosophy: Montaigne to Leibnitz (3) GEB C.3.

Development of Western philosophy from the Renaissance through Leibnitz with special emphasis upon the philosophies of the Continental Rationalists. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

#### PHIL 314 British Philosophy: Bacon to Mill (3) GE

GEB C.3.

Development of Western philosophy from the Renaissance through Mill with special emphasis upon the philosophies of the British Empiricists. Prerequisite: PHIL 230 or PHIL 231.

# PHIL 315 German Philosophy: Kant to Nietzsche (3)

GEB C.3.

Primary issues and concepts found in German philosophy from 1780 to 1900, with emphasis on Kant, Hegel, and Nietzsche. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

### PHIL 316 Contemporary European Philosophy (3) GEB C.3.

Recent movements within the Continental tradition, including French and German existentialism, phenomenology, and postmetaphysical philosophy. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

### PHIL 317 Contemporary British and American Philosophy (3) GEB C.3.

Distinctly Anglo-American philosophical movements of the twentieth century including pragmatism, realism, relativism, positivism, and various schools of analytic philosophy. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

# PHIL 321 Philosophy of Science (3) GEB C.3.

Methods of physics, biology, psychology and other schected sciences, with reference to their presuppositions and general findings. Relations between the sciences and implications of scientific methods for other fields of inquiry. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

# PHIL 322 Philosophy of Cognitive Science (3)

Systematic study of the problems and issues of the self and consciousness, of mental states and events and of human action; and of the relation of the philosophy of mind to such areas as psychology, linguistics and computer science. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

# PHIL 327 Inductive Reasoning (3)

Introduction to inductive reasoning. The traditional problem of induction. Mill's methods for discovering causes. Induction and the concept of probability. 3 lectures. Prerequisite: PHIL 125 or ENGL 125 or SPC 125.

# PHIL 331 Ethics (3)

GEB C.3.

Inquiry into the problems of the principles of right action and justice, of moral character and motivation, and of the good life. Examination of traditional and contemporary answers to these problems and the implications of those answers. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

# PHIL 332 History of Ethics (3) GEB C.3.

History of ethics from the Greeks to the 20th Century. 3 lectures. Prerequisite: PHIL 125 or ENGL 125 or SPC 125.

# PHIL 333 Political Philosophy (3) GEB C.3.

Philosophic foundations of political ideologies. Freedom, state, law, obligation, sanction, and their relation to metaphysics, theory of knowledge, and ethics. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

# PHIL 334 Jurisprudence (3) (Also listed as POLS 334)

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. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

#### PHIL 335 Social Ethics (3)

Ethical theory and critical analysis applied to the resolution of such public policy issues as abortion, euthanasia, children's rights, family law, racial and sexual discrimination, government regulation of business, technology and ecology. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

# PHIL 337 Professional Ethics (3) GEB C.3.

Critical examination of ethical problems arising in the professions. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

# PHIL 339 Biomedical Ethics (3) GEB C.3.

Critical examination of ethical problems arising in biology, biotechnology and medicine. Concepts of health and disease, ethical issues of human experimentation, informed consent, behavior control, genetic intervention, new birth technologies. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

# PHIL 341 Philosophy of Art (3)

GEB C.3.

Theories about the nature and evaluation of artistic and literary phenomena. Relationship of art and literature to ethics, metaphysics, religion, political philosophy and epistemology. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

# PHIL 342 Philosophy of Religion (3) GEB C.3.

Inquiry into the nature of religious experience and claims, naturalism and supernaturalism, arguments for the existence of God, the problem of evil, miracles, revelation, faith, human nature and destiny, verification and refutation of religious claims. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

#### PHIL 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

# PHIL 411 Metaphysics (3) GEB C.3.

Traditional and current ideas and arguments about substance, the relation of universals to particulars, space and time, events, causation and necessity, the self and free will. 3 lectures. Prerequisite: PHIL 230.

# PHIL 412 Epistemology (3)

Traditional and current ideas and arguments about the possibility of knowledge, the limits and powers of perception, reason and memory as ways of knowing, and the nature of necessary and contingent truth. 3 lectures. Prerequisite: PHIL 230.

### PHIL 460 Senior Project Seminar (3)

Discussion and selection of topics suitable for preparation and presentation as a senior project thesis. Sources, bibliographies, and other tools of philosophical research. 3 seminars. Prerequisite: Prior consent of instructor.

#### PHIL 461 Senior Project (3)

Selection and completion of a thesis under faculty supervision. Minimum of 90 hours total time. Prerequisite: Prior consent of instructor.

#### PHIL 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. *Class Schedule* will list topics selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

# **PHYS-PHYSICS**

#### PHYS 104 Introductory Physics (4) GEB B.1.a.

Fundamental principles of mechanics, heat, light and electricity. Not to be taken by students who have taken a college course in physics. 4 lectures. Prerequisite: MATH 103, MATH 117, MATH 118 or MATH 120.

### PHYS 121 College Physics (4)

#### GEB B.1.a.

An introductory course in mechanics emphasizing motion, force, and energy. Not open for credit to students having a grade of C- or better in PHYS 131. 3 lectures, 1 laboratory. Prerequisite: MATH 117 and high school trigonometry or, MATH 119, or MATH 120.

#### PHYS 122 College Physics (4)

GEB B.1.a.

Continuation of PHYS 121. Topics include properties of materials, fluids, waves and vibrations, sound, heat, light and optics. Not open for credit to students having a grade of C- or better in PHYS 132. 3 lectures, 1 laboratory. Prerequisite: PHYS 121.

PHYS 123 College Physics (4)

# GEB B.1.a.

Continuation of PHYS 121 and 122. Electrostatics, electric current, magnetic fields and induction. Elements of 1. odern physics, Not open for credit to students having a grade of C- or better in PHYS 133. 3 lectures, 1 laboratory. Prerequisite: PHYS 121. Recommended: PHYS 122.

# PHYS 131 General Physics (4)

GEB B.1.a.

Fundamental principles of mechanics. Vectors, particle kinematics, statics and dynamics. Equilibrium of a rigid body. Work and energy, linear momentum, rotational kinematics and dynamics. Primarily for physical science, engineering, and architecture students. 3 lectures, 1 laboratory. Prerequisite: MATH 131 or concurrent enrollment in MATH 142. High school physics recommended.

#### PHYS 132 General Physics (4)

#### GEB B.1.a.

**GEB B.1.a.** 

Oscillations, waves in elastic media, sound waves. Temperature, heat and the first law of thermodynamics. Kinetic theory of matter, second law of thermodynamics. Geometrical and physical optics. 3 lectures, 1 laboratory. Prerequisite: PHYS 131.

# PHYS 133 General Physics (4)

Charge and matter, electric field, electric potential, dielectrics, capacitance, current and resistance, electromotive force and circuits, magnetic fields, magnetic field of a moving charge,

induced emf. 3 lectures, 1 laboratory. Prerequisite: PHYS 131, MATH 132 or MATH 142.

#### PHYS 137 General Physics: Applied Physics for Architects (4)

Applied physics problems related to architecture. Damped, forced, and coupled oscillations in mechanical structures and electric circuits. Earthquakes and structures. Elementary electric circuit and wiring concepts. Energy transport, and efficient use of energy and passive solar energy in buildings. For School of Architecture and Environmental Design majors. 3 lectures, 1 laboratory. Prerequisite: PHYS 132, MATH 142.

# PHYS 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

# PHYS 201 Learning Center Tutor (1) (CR/NC)

Act as a tutor in the Physics Learning Center. Help students with problem solving techniques and introductory physics course material. Total credit limited to 3 units, with a maximum of 1 unit per quarter. Credit/No Credit grading only. Prerequisite: PHYS 133 and consent of instructor.

### PHYS 202 Physics and the Computer (3)

Introduction to microcomputer tools for physics. Graphics, plotting, use of spreadsheets, integration, differential equations, simulations, statistical techniques, non-linear equations. Applications to problems in physics. 3 lectures. Prerequisite: PHYS 133, GEB F.1. elective, and concurrent enrollment in MATH 242.

# PHYS 206 Instrumentation in Experimental Physics (3)

L-R-C circuits and electronic circuit elements emphasizing the applications of analog and digital electronics to instrumentation in modern physics. 3 lectures. Prerequisite: PHYS 133, MATH 143, GEB F.1. elective, and concurrent enrollment in PHYS 256.

# PHYS 211 Modern Physics I (4) GEB B.1.a.

Special relativity, fundamental principles of quantum mechanics, emphasizing the modern description of atomic phenomena. Kinetic theory, wave particle duality, Bohr theory, Schroedinger equation, elementary atomic structure. 4 lectures. Prerequisite: PHYS 123 or PHYS 133, and MATH 133 or MATH 241.

# PHYS 212 Modern Physics II (3) GEB B.1.a.

Applications of quantum physics to atoms, nuclei, and elementary particles. Nuclear reactions, radioactivity, nuclear energy. 3 lectures. Prerequisite: PHYS 211.

PHYS 215 Physics of Sound and Music (3) GEB B.1.a.

Wave nature of sound. Musical instruments and production of sound, overtones and tone quality, musical scales, decibels and noise hazards. Speech and hearing. Recording and reproduction of sound. Electronic instruments and synthesizers. Room acoustics. 3 lectures. Prerequisite: PHYS 104 or PHYS 122 or PHYS 132 or PSC 101 or consent of instructor.

#### PHYS 243 Introductory Modern Physics Laboratory (1) GEB B.1.a.

Experiments in modern physics, including atoms and techniques of nuclear radiation detection. Properties of alpha, beta

and gamma radiation. 1 laboratory. Prerequisite or concurrent: PHYS 212, PHYS 256 or equivalent.

#### PHYS 256 Electrical Measurements Laboratory (1)

Experimental studies of circuit analysis and electronics; introduction to digital techniques; instrumentation. 1 laboratory. Prerequisite: PHYS 133, MATH 143, and concurrent PHYS 206.

#### PHYS 301 Thermal Physics I (3) GEB B.1.a.

Thermodynamics and statistical mechanics. Entropy, temperature, chemical potential, free energy. Selected applications including paramagnetism, ideal gas, Fermi-Dirac distribution. 3 lectures. Prerequisite: PHYS 132, PHYS 211, MATH 241.

#### PHYS 302 Analytical Mechanics (3) GEB B.1.a.

Vector analysis, laws of motion, kinematics and dynamics of a particle. Work and energy, Oscillatory motion (damped and forced oscillation). Center of mass. Linear and angular momentum. 3 lectures. Prerequisite: PHYS 131, MATH 242.

#### PHYS 303 Analytical Mechanics (3) **GEB B.1.a.**

Dynamics of a rigid body. Three-dimensional motion of a rigid body. Introduction to Lagrange's and Hamilton's equations. 3 lectures. Prerequisite: PHYS 302. Concurrent: MATH 304.

#### PHYS 310 Physics of Energy (3) GEB B.1.a.

Physics and mathematics applied to broad energy topics. Efficient useage, transportation, solar energy, nuclear fission and fusion. Plasma, hydrogen economy, fuel cells, wind wave, tidal, and geothermal energy. Transmission, storage, fossils. National planning, and energy economics. 3 lectures. Prerequisite: PHYS 133.

#### PHYS 313 Introduction to Atmospheric Physics (3)

GEB B.1.a.

Properties of the atmosphere, atmospheric motions, solar and terrestrial radiation. Atmospheric optics and cloud physics. 3 lectures. Prerequisite: PHYS 132 or PHYS 122 and MATH 143 or MATH 133 or equivalent.

#### PHYS 315 Introduction to Lasers and Laser Applications (3) GEB B.1.a.

Interaction of radiation with matter, theory of laser action, characteristics and modification of laser output, types of lasers. Holography and other applications. 3 lectures. Prerequisite: PHYS 133, or PHYS 123 with MATH 133 or MATH 143.

#### PHYS 317 Special Theory of Relativity (3) GEB B.1.a.

Fundamental experiments and basic postulates of special relativity. Simultaneity, length and time measurements. Lorentz transformations. Four-Vectors. Space-time diagrams. Relativistic mechanics and electromagnetism. 3 lectures. Prerequisite: PHYS 211.

# PHYS 323 Optics (4)

#### GEB B.1.a.

Maxwell's electromagnetic equations, light as an electromagnetic wave, refraction and geometrical optics, lenses and lens systems, polarization, interference, diffraction. 3 lectures, 1 laboratory. Prerequisite: PHYS 133, MATH 241.

#### PHYS 341, 342 Quantum Physics GEB B.1.a. Laboratory (1) (2)

Experimental studies of particles and radiation, their quantum properties and interactions with atoms and nuclei. 1 laboratory, 2 laboratories. Prerequisite: PHYS 243.

#### PHYS 357 Advanced Instrumentation in Experimental Physics (3)

Advanced analog and digital electronics, computer interfacing to experiments, robotics, 2 lectures, 1 laboratory, Prerequisite; PHYS 206 and PHYS 256.

#### PHYS 363 Undergraduate Seminar (2)

Study and oral presentation of physics topics of interest to students and faculty. Discussion of projects and research by students and faculty. 2 seminars.

#### PHYS 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigations, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

#### PHYS 401 Thermal Physics II (3)

Additional topics in thermodynamics and statistical physics. including chemical equilibrium, phase transitions, transport processes, and cryogenics. 3 lectures. Prerequisite: PHYS 301.

#### PHYS 403 Nuclear 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 (3)

Wave nature of matter and the basic postulates of quantum mechanics. The wave function, operators, and their interpretation. Schroedinger's equation and its solutions for one dimensional problems. 3 lectures. Prerequisite: PHYS 211, MATH 242. Recommended: PHYS 212, MATH 304.

#### PHYS 406 Quantum Mechanics (3)

Angular momentum operators and problems in three dimensions including the hydrogen atom. The elements of matrix mechanics and spin wave functions. Perturbation theory. 3 lectures. Prerequisite: PHYS 405.

#### PHYS 408, 409 Electromagnetic Fields and Waves (4) (3)

Electric and magnetic field theory using vector analysis. Electric fields, dielectric materials, magnetic fields, induced emf's, magnetic materials, Maxwell's equations, wave equations, plane electromagnetic waves. Dipole radiation, radiation from an accelerated charge. 4 lectures, 3 lectures. Prerequisite: MATH 304, PHYS 206 or consent of instructor.

#### PHYS 410 Physics of the Solid Earth (3)

Gravity and the figure of the Earth. Body wave seismology, structure and composition of the Earth, heat flow and heat sources, Earth tides, rotational dynamics, the geomagnetic field and its source, paleomagnetism, 3 lectures, Prerequisite: PHYS 133 and MATH 242 or equivalent.

#### PHYS 412 Solid State Physics (3)

Basic quantum mechanics. Application to atomic structure and bonding. Crystal structures and their determination. Elementary treatments of Fermi statistics, free electron theory and band theory of solids, bulk properties of metals and semiconductors.

Application to optical properties of solids and to selected current topics of interest (lasers, superconductivity, etc.). 3 lectures. Prereduisite: PHYS 211, MATH 242.

#### PHYS 413 Advanced Topics in Solid State Physics (3)

Semiconductor statistics and devices. Fermi surfaces in metals, superconductivity, magnetism in solids. 3 lectures. Prerequisite: PHYS 412.

### PHYS 416 Theoretical Acoustics (3)

Mathematics-based theoretical treatment of vibrations and normal modes; wave equation and solutions; radiation from vibrating sources, resonators and filters; impedance; decibel scale; speech, hearing and psychological acoustics. 3 lectures. Prerequisite PHYS 132 and MATH 318.

#### PHYS 423 Advanced Optics (4)

Lens aberrations, interference and diffraction, Fourier optics, quantum optics, image formation and holography, non-linear optics. Miscellaneous course fee required-see *Class Schedule*. 3 lectures, 1 activity. Prerequisite: PHYS 323.

#### PHYS 424 Theoretical Physics (3)

Contour integration in the complex plane, properties of the delta function, properties of some common functions of theoretical physics, Green's function techniques for solving differential equations. 3 lectures. Prerequisite: PHYS 133, MATH 304, MATH 318.

# PHYS 452 Solid State Physics Laboratory (1)

Selected experiments on the solid state of matter using electrical, optical, and x-ray methods. 1 laboratory. Prerequisite or concurrent: PHYS 412.

#### PHYS 461, 462 Senior Project (2) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

#### PHYS 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

#### PHYS 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

#### PHYS 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

#### PHYS 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

# **PI-POULTRY INDUSTRY**

# PI 100 Enterprise Project (1-4) (CR/NC)

Selection and completion of a management/production project under faculty supervision. Project participation is voluntary and subject to approval by the department head and the Cal Poly Foundation. Degree credit limited to 12 units. Credit/No Credit grading only.

### PI 121 Poultry Industry Development (4)

Development, scope and importance of the poultry industry as a part of agriculture in California and the U.S. Organization of the commerical poultry industry, employment opportunities, sources of information and development of poultry related skills. 3 lectures, 1 laboratory.

#### PI 122 Replacement Programs and Broiler Production (4)

Organization and planning of layer replacement programs and broiler production enterprises. Current brooding and rearing practices and management techniques as applied to commerical poultry operations. 3 lectures, 1 laboratory.

#### PI 133 Poultry Incubation (3)

Fundamentals of avian embryology. Application of artificial incubation practices and management of the commercial poultry hatchery. Genetic and environmental factors affecting the hatch. 2 lectures, 1 laboratory.

#### PI 200 Special Problems for Undergraduates (2-3)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 3 units per quarter. Prerequisite: Consent of department head.

### Pl 221 Poultry Selection and Egg Production (3)

Current management techniques and practices as applied to the commercial egg production flock. Selection of egg production stock and environmental factors affecting egg numbers and quality. 2 lectures, 1 laboratory.

#### PI 222 Poultry Products, Processing and Marketing (3)

Processing, quality determination, distribution and merchandising of poultry meat and eggs. Governmental regulations applicable to the processing and marketing of poultry products. Development and promotion of consumer products. 2 lectures, 1 laboratory.

#### Pl 230 General Poultry Production (3)

Survey of modern poultry production including breeding, reproduction, nutrition and flock health. Organization of the commercial industry and marketing of poultry products. Not open to Poultry Industry majors. 2 lectures, 1 laboratory.

#### Pl 231 Poultry Anatomy and Physiology (3)

Structure and function of the principal organ systems of domestic poultry. 2 lectures, 1 laboratory. Prerequisite: ZOO 131.

#### PI 233 Poultry Plant Design and Equipment (2)

Planning a modern commercial poultry production operation. Application of current technology to the design of poultry housing. Coordination of buildings, equipment and operational procedures for maximum plant efficiency. 1 lecture, 1 laboratory.

#### PI 305 Game Bird Propagation and Management (3)

Habitat needs, management and propagation of North American game bird species in the wild and in captivity. Reproduction, nutrition and maintenance of flock health as practiced by commercial game bird operations. 3 lectures. Prerequisite: One quarter college mathematics, one quarter animal biology.

#### PI 322 Poultry Business Organization (4)

Organization and management of commercial poultry operations. Recruiting, training and supervising personnel. Managing the finance, public relations, production scheduling, product distribution and sales of a commercial poultry enterprise. 3 lectures, 1 laboratory. Prerequisite: Consent of instructor.

#### PI 323 Poultry Diseases and Hygiene (4)

Prevention and control of poultry diseases and parasites. Planning and management of poultry flock health maintenance programs. 3 lectures, 1 laboratory. Prerequisite: BACT 221, Pl 231.

#### PI 331 Turkey Industry (3)

Coordination and operation of commercial egg-hatching and turkey-meat production enterprises. Application of current techniques and practices as related to turkey reproduction, nutrition, disease control and flock management. Planning and supervising the specialized phases of a turkey production enterprise. 2 lectures, 1 laboratory. Prerequisite: Consent of instructor.

#### PI 333 Applied Poultry Feeding and Nutrition (4)

Nutritional requirements, feeding principles and current feeding practices as applied to commercial poultry flocks. Least-cost ration formulation and feed manufacture for various ages and classes of poultry. 3 lectures, 1 laboratory. Prerequisite: ASCI 202, CHEM 326 or consent of instructor.

#### PI 400 Special Problems for Advanced Undergraduates (2-4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

#### PI 422 Advanced Poultry Enterprise Supervision (3)

Coordination and supervision of the modern commercial poultry enterprise. Analysis and application of operational procedures, efficiency practices, cost and quality control techniques. Relationship of business practices to the success of the commercial enterprise. 3 lectures. Prerequisite: Consent of instructor.

# PI 431 Applied Poultry Breeding (4)

Application of genetics and breeding techniques to the improvement of economic traits in commercial poultry stocks. Developing selection and breeding programs for genetic progress. 3 lectures, 1 laboratory. Prerequisite: BIO 303.

#### PI 461, 462 Senior Project (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.

#### PI 463 Undergraduate Seminar (2)

Preparing and presenting in an organized manner reports on new trends, special problems, research developments related to the poultry industry. Group discussion of industry special problems. 2 seminars.

#### PI 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

#### PI 581 Graduate Seminar in Poultry (3)

Current trends and characteristics of the poultry industry enterprise. Group discussion of skills, techniques and practices to improve teaching of vocational agriculture as it applies to poultry. 3 seminars.

# POLS-POLITICAL SCIENCE

#### POLS 100 Political Inquiry (4)

Introduction to the scope, language, concepts and approaches employed in political science and the social sciences. Includes emphasis on basic methodological and research strategies for assessing political issues, events, and the dynamics of political change. 4 lectures.

### POLS 105 Introduction to International Relations (4)

Introduction to the evolution, dynamics and substance of the international system; consideration of such subjects of conflict and accommodation, power and weakness, perception and reality, prosperity and poverty, and war and peace in international relations. 4 lectures.

#### POLS 200 Special Problems for Undergraduates (1-4)

Individual investigation, research, study, or survey of selected problems under faculty supervision. Total credit limited to 4 units. Prerequisite: Consent of department head.

#### POLS 204 Basic Concepts of Political Thought (4)

Introduction to such concepts as: law, justice, community, right, citizen, and constitution, which are fundamental to political discourse, as developed in the works of Plato, Aristotle, Augustine, Thomas Aquinas, Machiavelli, and other illustrious thinkers from classic to modern times. 4 lectures. Prerequisite: POLS 210.

#### POLS 210 American and California Government (3)

#### GEB D.1.

Origin, nature, and distribution of political power. Declaration of Independence. Constitution of the United States. Function and current problems of national, state and local government. Completion of POLS 210 will satisfy the California state requirements in the United States Constitution, state and local government. 3 lectures.

#### POLS 250 Model United Nations (2)

Preparation for participation in the campus Model United Nations. Procedure, MUN rules of debate, preparation of country positions, area papers, and policy statements suitable for use in mock United Nations sessions. Total credit limited to 6 units. 2 lectures. Prerequisite: One course in POLS or consent of instructor.

#### POLS 301 California State and Local Politics (3)

Political culture, processes, behavior, institutions, public policy and distribution of power in California state and substate governments. 3 lectures. Prerequisite: POLS 210.

#### POLS 303 Minority Group Politics (3)

Analysis of political factors affecting minority groups in America. Involvement, organization and role of minority groups in the political process. Emphasis on the political behavior of black and chicano minorities. 3 lectures. Prerequisite: POLS 210.

#### POLS 304 Politics of Global Survival (4)

Consideration of global survival from east-west, north-south and global perspectives. Arms race, development, and the political dimensions of energy, environment, food and population. 4 lectures. Prerequisite: POLS 105 or junior standing.

#### POLS 305 Political Analysis (4)

Introduction to methodology research design and quantitative methods used in survey research and political analysis. Bivariate inferential statistics and SPSS statistical computer programs will be used to analyze political phenomena. 3 lectures, 1 activity. Prerequisite: POLS 100 and STAT 211.

#### POLS 306 Modern Political Thought (3)

Theories of political participation and the relationship between man and the state as developed in the works of influential thinkers such as Locke, Rousseau, Mill and Marx. 3 lectures. Prerequisite: POLS 204.

#### POLS 307 American Political Thought (3)

Central political ideas of America's leading thinkers from Thomas Paine to the present. 3 lectures. Prerequisite: POLS 204.

#### POLS 308 Revolutions and Collective Violence (3) (Also listed as SOC 308)

Causes, methods, outcomes of and authority responses to collective violence and revolutionary movements. Contemporary events including terrorist and other forms of collective violence in industrialized and developing nations. 3 lectures. Prerequisite: One course in sociology or political science, or consent of instructor.

#### POLS 311 Inter-American Relations (3)

Inter-American affairs. Political, economic, and social problems; forces motivating cultural behavior, industrial development, trade techniques, agriculture methods. Finding and evaluating authoritative source materials on Latin American affairs. 3 lectures. Prerequisite: POLS 105, or junior standing.

#### POLS 312 International Politics (3)

International political processes and problems. Foreign policies and politics in relations between states. Conflicts and adjustments. Analyses of selected problems. 3 lectures. Prerequisite: POLS 105, or junior standing.

# POLS 313 National Security Policy (3)

Theoretical approaches to the study of war and peace and the evolution of contemporary defenses and strategies, especially those pertaining to the United States. Impact of national strategy on both national and international politics. 3 lectures. Prerequisite: POLS 105 or POLS 210.

#### POLS 314 Public Administration (4)

Development of the management functions in government. Survey of administrative concepts and cases. Attention given to national, state and local administrative systems. Case studies and simulations. 4 lectures. Prerequisite: POLS 210.

# POLS 321 American Constitutional Law (3)

Basic principles of American constitutional law. Role of the Supreme Court as arbiter of separation of powers and federalism. 3 lectures. Prerequisite: POLS 210.

### POLS 322 Civil Liberties (3)

Role of Supreme Court as interpreter of Constitutional rights and liberties, freedom of expression, search and seizure, due process of law. 3 lectures. Prerequisite: POLS 210.

#### POLS 323 Civil Rights in America (4)

Case-based examination of race, ethnic and gender discrimination in the United States. The course emphasizes the response of the Supreme Court to issues of equality including affirmative action and abortion. 4 lectures. Prerequisite: POLS 210.

#### POLS 331 Political Parties and Interest Groups (3)

Makeup and major functions of political parties. Role of political parties and interest groups in a democracy. Degree of consensus and conflict between present day political parties and interest groups in their attempts to influence public policy. 3 lectures. Prerequisite: POLS 210.

#### POLS 332 Public Opinion and Political Participation (3)

Origins and dimensions of public opinion. Focus on contemporary political campaigns and elections in the U.S. Impact of political ideology, mass media, high technology, pressure groups on electoral outcomes. Voting behavior and other forms of political participation in the U.S. 3 lectures. Prerequisite: POLS 210.

#### POLS 334 Jurisprudence (3) (Also listed as PHIL 334)

# GEB C.3.

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, liberty and justice. 3 lectures. Prerequisite: PHIL 230 or PHIL 231.

# POLS 335 Legislative Process (4)

Theory and practice of representative government in the United States and other selected political systems. Organization and procedures in Congress, state legislatures and local legislative bodies. Use of simulations will be encouraged. 4 lectures. Prerequisite: POLS 210.

# POLS 336 Judicial Process (4)

Examines legal processes, emphasizing political influences on law. Topics may include: types of law, legal culture, state and

federal courts, criminal trials, the role of police, judges, attorneys in the legal system. 4 lectures. Prerequisite: POLS 100.

#### POLS 340 Government Internship (2-12) (CR/NC)

Supervised work experience in a government or related public agency as approved by the school dean. Intern will function as an employee subject to all the duties and responsibilites of employees engaged in comparable work. 30 hours of work experience per unit of credit. Credit/No Credit grading. Recommended preparation: Junior standing with a minimum 2.5 GPA.

### POLS 342 The American Presidency (3)

Nature and problems of contemporary presidential leadership emphasizing the impact of bureaucracy, Congress, public opinion, the courts, interest groups, and the party system upon the presidency and national policy making. 3 lectures. Prerequisite: POLS 210.

## POLS 350 Advanced Model United Nations (2)

Participation in the campus Model United Nations. Procedure, MUN rules of debate, preparation of country positions, area papers, and policy statement for use in mock United Nations sessions. Total credit limited to 6 units. 2 lectures. Prerequisite: POLS 250 or consent of instructor.

# POLS 370 Contemporary Global Political Issues (3) GEB D.4.b.

Coverage of current international political issues. Directed toward making students more aware of issues, problems, tensions in the international arena, relationship of the western and nonwestern countries to these issues, emphasizing both causes and effects. 3 lectures. Prerequisite: POLS 210.

# POLS 371 World Food Politics (3)

GEB D.4.b.

Self-reliant, food-first politics of the hungry poor in the lessdeveloped countries; political support of food policies in the U.S. and other developed nations. Moral, ecological and commodity politics of food in a variety of cultural settings which direct food production, consumption and distribution and reduce food demand through population stabilization. 3 lectures. Prerequisite: POLS 105 or junior standing.

## POLS 380 Political Behavior (4)

Political behavior of individuals and groups examined in light of biological, economic, psychological and social-psychological theories and research, including emphasis on the relationship between attitudes and behavior. 4 lectures. Prerequisite: POLS 210.

#### POLS 382 Comparative Politics (4)

Comparative study of the government of the United Kingdom and other selected Western European and non-Western countries. Emphasis given to comparison of democratic and nondemocratic models and traditions. Case studies. 4 lectures. Prerequisite: POLS 105 or POLS 210.

#### POLS 384 Politics of Developing Areas (3)

Process of political development in the Third World with appropriate examples taken from particular areas and countries. 3 lectures. Prerequisite: POLS 105 or junior standing.

#### POLS 400 Special Problems for Advanced Undergraduates (1-4)

Individual investigation, research, study, or survey of selected problems. Total credit limited to 4 units. Prerequisite: Consent of department head.

# POLS 401 State and Local Government (4)

Theoretical approaches to and structure, function and problems of state, county and local governments, including case studies, simulations and/or computer research exercises. 4 lectures. Prerequisite: POLS 210.

#### POLS 403 Municipal Government (4)

Concepts, policies and politics in urban governments and organization and power-structure issues of modern American municipalities. Inter-governmental relations, finance, and planning problems in city government. 4 lectures. Prerequisite: POLS 210.

#### POLS 404 Science, Technology and Public Policy (4)

Techniques for performing technical assessment and impact analysis in communication, transportation, health technologies, aerospace, electronics and other new technologies. Case studies on contemporary problems stemming from the relationship of technology and politics. 4 lectures. Prerequisite: POLS 210.

# POLS 405 Politics of Finance and Planning (3)

Economic and political factors affecting federal, state and local governments. Intergovernmental relations and policy considerations in finance, debt management and tax administration. Appropriations and audits in government departments, commissions and agencies. 3 lectures. Prerequisite: POLS 210.

# POLS 411 Contemporary U.S. Foreign Policy (3)

Formulation and conduct of U.S. foreign policy. Analysis of the theory and elements of U.S. strategy; diplomacy, propaganda, economic operations, psychological warfare, and military strategies. 3 lectures. Prerequisite: POLS 105 or POLS 210.

#### POLS 415 Politics in Britain (4)

Politics and processes of government in Britain, the operation of parliamentary government, the responses of the political system to the issues and problems in contemporary Britain and the Commonwealth. 4 lectures. Prerequisite: POLS 105 or junior standing.

#### POLS 417 Asian Politics (3)

Analysis of political, economic, and social institutions and conditions in selected Asian nations. 3 lectures. Prerequisite: POLS 105 or junior standing.

#### POLS 418 Soviet Politics (3)

Analysis of political, economic, and social institutions and conditions of the U.S.S.R. 3 lectures. Prerequisite: POLS 105 or junior standing.

#### POLS 425 Public Policy Analysis (4)

Methods of analyzing the intent and action of government. Techniques for evaluating the outputs and impacts of governmental policies. Case studies on various domestic issue areas such as transportation, education, housing, welfare, and law enforcement. 4 lectures. Prerequisite: POLS 210.

#### POLS 441 Administrative Theory and Behavior (4)

Theories, concepts and case studies related to organizations and to the individuals and groups that work in them. Application of concepts to public and non-profit organizations. Research paper required. 4 lectures. Prerequisite: POLS 210 and POLS 314.

#### POLS 442 Public Personnel Administration (4)

Concepts, techniques, and issues related to human resource administration. Techniques and concepts for public and nonprofit organizations. Case studies utilized to illustrate issues in the bureaucracy. Research papers on legislation, application, litigation, and other aspects of personnel administration required. 4 lectures. Prerequisite: POLS 210 and POLS 314.

#### POLS 450 Community Research Seminar (2)

Participation in small groups performing action research requested by one or more community agencies. May include surveys, interviewing, on-site evaluations and computer data analysis. Total credit limited to 6 units. 1 seminar, 1 activity. Prerequisite: POLS 210, junior standing and consent of instructor.

#### POLS 461, 462 Senior Project (2) (2)

Selection and completion of a project under faculty supervision. Project results presented in a formal paper. Prerequisite: Senior standing (completion of 135 quarter hours), completion of required core courses and concentration. May not be taken CR/NC.

#### POLS 463 Undergraduate Seminar (3)

Preparation and presentation of current developments in the field of political science. 3 seminars. Prerequisite: POLS 461, POLS 462.

#### POLS 465 Middle Eastern Politics (4)

Analysis of political, economic, and social institutions of the Middle East and North Africa. Turkey, Iran, Egypt and Isreal are used as case studies to illustrate the mosaic of nationalisms that have developed in that region. 4 lectures. Prerequisite: POLS 105 or junior standing.

#### POLS 468 African Politics (4)

Analysis of indigenous institutions, Western influences, and nationalism in Africa south of the Sahara. Emphasis on postindependence with selective case studies including South Africa. Impact of outside powers on Africa. 4 lectures. Prerequisite: POLS 105 or junior standing.

#### POLS 470 Selected Advanced Topics (1–3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: POLS 210, junior standing.

#### POLS 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

#### POLS 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

#### POLS 510 Administration in Developing Nations (4)

Processes of administration with reference to the differing cultural, political, and economic environments of the developing areas of the world. Impact of technological developments in emerging nations. 4 seminars. Prerequisite: Graduate standing.

#### POLS 590 Seminar in Political Science (3)

Special problems in selected areas of Political Science. Each seminar will have a subtitle describing its nature and content. 3 seminars. Maximum of 6 units may be earned. Prerequisite: Graduate standing.

# **PSC-PHYSICAL SCIENCE**

## PSC 101 The Physical Environment: Matter and Energy (4) GEB B.1.a.

Introduction to the basic principles of physical science and application of these principles in modern society. Objects at rest and in motion, energy and power, fluids, heat, light, and sound. 3 lectures, 1 laboratory.

#### PSC 102 The Physical Environment: Atoms and Molecules (4) GEB B.1.a.

Introduction to the basic principles of the atomic, molecular, and sub-atomic behavior of matter, and applications of these principles in modern society. Electricity and magnetism, electrical nature of matter, organic and inorganic chemistry, modern physics, the nucleus. 3 lectures, 1 recitation. Prerequisite: PSC 101.

#### PSC 103 The Physical Environment: Earth and the Universe (4) GEB B.1.a.

Introduction to the basic principles of the Earth sciences and astronomy, and applications of these principles in modern society. Structure and formation of the Earth, earthquakes, weather, oceanography, Solar System, stars, and cosmology. 3 lectures, 1 recitation. Prerequisite: PSC 101.

#### PSC 110 Energy for the Present and the Future (3) GEB B.1.a.

Detailed qualitative presentation of current and future energy sources along with the associated environmental problems. Energy production, energy consumption, efficient use of energy, fossil fuels, nuclear fission and alternative sources such as solar, geothermal and fusion energy. 3 lectures.

#### PSC 171 Nuclear Arms Race (3) GEB B.1.a.

Science and technology of fission/fusion weapons, offensive and defensive systems. Effects of nuclear war, proliferation technologies, verification and their effect on arms control treaties. 3 lectures.
## PSC 201 Introduction to Physical Oceanography (3)

#### GEB B.1.a.

Origin, extent of oceans. Nature of sea bottom, sediments. Causes, effects of ocean circulation, tides and waves. Physical properties of sea water. Interaction with atmosphere and influence on our climate. Shorelines and shoreline processes. Marine environments. Possible field trips. 3 lectures.

## PSC 205 Traces Through Time (3) (Also listed as BIO 205) GEB B.1.a. or B.1.b.

Survey of evidence supporting evolution including origin of the universe, radiometric dating, structure of Earth and plate tectonics. Evolutionary evidence from chemistry, biology, fossils, and the geographical distribution of life. Fundamental differences between science and creationism will be explored. 3 lectures.

## PSC 304 Applications of Physical Science (4)

Serious problems faced by technological societies worldwide, such as the destruction of ozone, runaway greenhouse effect, smog, acid rain, water pollution, nuclear radiation hazards, and the depletion of fossil fuels. 3 lectures, 1 activity. Prerequisite: PSC 101, PSC 102, PSC 103 or equivalent.

# PSC 424 Organizing and Teaching of Physical Sciences (3)

Techniques, aims and objectives in the teaching of physical sciences and general sciences at the secondary level. Selection and organization of teaching material. Evaluation of results. 3 lectures. Prerequisite: Evidence of satisfactory preparation in physics and chemistry.

## **PSC 461** Senior Project (2)

Selection and completion of a project under faculty supervision. Project results are presented in a formal report. Minimum of 60 hours total time.

# **PSY-PSYCHOLOGY**

## PSY 104 Effective Study Techniques (2) (CR/NC)

Designed to acquaint students with basic aims and objectives of attending college. Provides adequate instruction and practice in specific study skills such as effective study methods, notetaking, time-planning, memory, concentration, reading and test taking. Credit/No Credit grading only. 2 lectures.

## PSY 200 Special Problems for Undergraduates (1-3)

Individual investigation, research, study or survey of selected problems in consultation and with prior approval of instructor. Written report required. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: PSY 201 or PSY 202 and consent of department head.

#### PSY 201 General Psychology (3) GEB E.1.

Introduction to the psychological study of human beings; applications of research in psychobiology, perception, learning, motivation, consciousness, cognition, personality, emotion, development, psychologial assessment, social behavior, psychopathology, and psychotherapy. A student may enroll for credit in either PSY 201 or PSY 202, but not both. 3 lectures.

#### PSY 202 General Psychology (3) GEB E.1.

GED E.

Introduction to the psychological study of human beings. Applications of research in psychobiology, perception, learning, motivation, consciousness, cognition, personality, emotion, development, psychological assessment, social behavior, psychopathology, and psychotherapy. A student may enroll for credit in either PSY 202 or PSY 201, but not both. 2 lectures, 1 recitation.

### PSY 205 Human Sexuality (3) (CR/NC)

Understanding development of personal sexuality. Sexual identity, biological aspects of sexuality, homosexuality, intimate relationships, communication, sexually transmitted diseases, sexual dysfunction, family planning, abortion. Emphasis on maintaining psychological and physical wellness. Credit/No Credit grading only. 3 lectures.

# PSY 212 Interpersonal Communication (4) (Also listed as SPC 212)

Introduction to the interaction process in two-person (dyadic) communication settings. Emphasis on the functions of varying messages in the initiation, development, maintenance and termination of personal and professional relationships. 4 lectures.

## PSY 251 Laboratory in Group Activities (1-3) (CR/NC)

Skills and techniques of solving problems in large and small groups. Conducting and reporting meetings. Analyses of leadership dynamics in campus organizations. Credit/No Credit grading only. Total credit limited to 6 units. 1–3 activities.

## PSY 301 Psychology of Personal Development (3)

Approaches to self-exploration and self-modification. Conceptions of human potential. Evaluation and development of personal effectiveness. 3 lectures. Prerequisite: PSY 201 or PSY 202.

## PSY 302 Behavior in Organizations (3)

Characteristics of functioning organizations and their effects on individuals. Psychological issues relevant to the maintenance of the organization. Motivation, leadership, group phenomena, communication, decision-making, attitudes, personnel selection and organizational change. 3 lectures. Prerequisite: PSY 201 or PSY 202.

## PSY 304 Physiological Psychology (3) GEB E.2.

Relationship between physiological and behavioral processes. Learning, motivation, emotion, perception, individual differences, social and abnormal behaviors as a function of the nervous and endocrine systems, sensory structures, genetic factors, effects of drugs. 3 lectures. Prerequisite: PSY 201 or PSY 202.

## PSY 307 Abnormal Psychology (3)

Abnormal behavior of individuals. Dynamics, etiology, symptoms, treatment and prevention of the more severe personality and behavior disorders. Includes organic mental disorders; substance abuse; psychoses; affective, anxiety, psychosexual, psychosomatic and personality disorders. 3 lectures. Prerequisite: PSY 201 or PSY 202.

## PSY 309 Psychology of Consciousness (3)

Characteristics and functions of selected, qualitatively unique patterns of consciousness such as hypnosis, meditation, dreaming, drug experiences and parapsychological phenomena, with particular emphasis on adaptive and maladaptive expressions of these states of consciousness. 3 lectures. Prerequisite: PSY 201 or PSY 202.

## PSY 310 Death, Dying and Bereavement (3)

Scientific and experiential investigations of dying and bereavement. Cross-cultural, historical, medical, legal, and developmental perspectives. Demography, care of the dying, grieving, funerals, search for immortality, megadeath, suicide, euthanasia. Meaning of life in the context of death. 3 lectures. Prerequisite: PSY 201 or PSY 202.

## PSY 311 Environmental Psychology (3)

Interrelationship between behavior and the built and natural environments. Evaluating and understanding environments, environmental stress, and the human apects of environmental problems. 3 lectures. Prerequisite: PSY 201 or PSY 202.

## PSY 314 Psychology of Women (3)

Central issues in feminine psychology including stereotypes, gender differences, sex-roles, sex-typing, female sexuality, pregnancy and childbirth, women as victims, mental and emotional disorders of women, and aging. 3 lectures. Prerequisite: PSY 201 or PSY 202.

## PSY 315 Psychology of Men (3)

Central issues in male psychology including stereotypes, gender differences, sex-roles and their development, sex and role typing, male sexuality and models of masculinity. Health, mental and emotional disorders of men, and aging. 3 lectures. Prerequisite: PSY 201 or PSY 202.

## PSY 317 Psychology of Stress (3)

Examines the present status of research in psychology on the relationship between stress and psychological and physical well-being. Psychological factors influencing stress. Description and critical evaluation of methods of stress reduction. Miscellaneous course fee required-see *Class Schedule.* 3 lectures. Prerequisite: PSY 201 or PSY 202.

## PSY 318 Psychology of Aging (3)

Psychological and physiological aging in the context of the culture. Theories and research relating to positive and negative changes in perception, learning, memory, intelligence, personality, identity, motivation, sexuality, family relationships, career. Disorders, institutionalization, death and bereavement, coping strategies. 3 lectures. Prerequisite: PSY 201 or PSY 202.

#### **PSY 319** Motivation (3)

Physiological, sociobiological, behavioral, humanistic and cognitive theories of motivation. Practical applications of each theory to personal and societal behaviors. Research evaluating each theory. 3 lectures. Prerequisite: PSY 201 or PSY 202 and junior standing.

# PSY 320 Nonverbal Communication (4) (Also listed as SPC 320)

Influence of kinesic, proxemic, artifactual, olfactory, paralinguistic and environmental factors in human communication. Theory, research and practice in nonverbal communication. 4 lectures. Prerequisite: SPC 212 or consent of instructor.

#### PSY 323 The Helping Relationship (4)

Basic skills and approaches common to helping relationships with children, adults, and families. Examines theoretical, empirical, and practical applications of helping. Differentiation between professional, paraprofessional, and nonprofessional helping relationships. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: Junior standing, ETHS 114 or ETHS 210, HD 102, HD 130, or consent of instructor.

# PSY 327 Leisure Counseling (3) (Also listed as REC 327)

Philosophical, psychological, educational and practical aspects of leisure counseling. Therapeutic recreation intervention processes and procedures. Historical foundations and leisure counseling models. 3 lectures. Prerequisite: REC 252 or consent of instructor.

# PSY 329 Research Methods in Psychology and Human Development (3)

Introduction to research design methods and research literature in psychology and human development. Topics include experimental and correlational research design, basic statistical analysis, survey, observation, structured situation methods, and library search procedures. 2 lectures, 1 activity. Prerequisite: PSY 201 or PSY 202, STAT 211 or STAT 130, HD 102, or consent of instructor.

## PSY 330 Behavioral Effects of Psychoactive Drugs (3)

Behavioral effects of the major categories of drugs. Factors influencing a person's choice to use and abuse drugs; personal and social consequences of abuse of alchohol and other drugs. 3 lectures. Prerequisite: PSY 201 or PSY 202.

## PSY 350 Social Psychology (3)

Human behavior as it is influenced by other people and social situations. Socialization processes, attitude formation and change, aggression, behavior in groups, impression formation and factors involved in attraction, love and prejudice. 3 lectures. Prerequisite: PSY 201 or PSY 202.

## PSY 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 323 and PSY 350.

#### 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 400 Special Problems for Advanced Undergraduates (1-3)

Individual investigation, research, study or survey of selected problems in consultation and with prior approval of instructor. Written report required. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: PSY 201 or PSY 202 and consent of department head.

#### **PSY 422** Lifespan Sexuality (3)

Sexual interest, activity, and functioning from birth through the late adult years. Influence of sexual roles, attitudes, and adaptation during the life span. Sexual practices in our society. Therapies for enhancing a comfortable sexuality. 3 lectures. Prerequisite: PSY 201 or PSY 202, or PSY 205, and junior standing.

## PSY 429 Experimental Psychology (4)

Research methodology and experimental design. Application of descriptive and inferential statistics to data from various content areas including development, animal and human learning, memory, cognition, and psychophysical processes. 3 lectures, 1 laboratory. Prerequisite: PSY 329, junior standing or consent of instructor.

## PSY 432 Psychological Testing (3)

Principles and procedures of selection, administration, scoring, and interpretation of achievement tests, aptitude tests including scholastic aptitude, interest inventories, and personality inventories. 3 lectures. Prerequisite: PSY 201 or PSY 202, junior standing.

## PSY 452 Personality (3)

Personality theories and research. Human motivation and emotions, description and development of personality characteristics. Adjustment and self-actualization. 3 seminars. Prerequisite: PSY 201 or PSY 202, junior standing.

# PSY 453, 454 Supervised Fieldwork (6) (6) (Also listed as HD 453, 454) (CR/NC)

Supervised fieldwork experience in various community, governmental, and educational settings. Applied psychological, developmental, or educational experiences determined by participating institution, supervising faculty member, and student. Maximum of 6 units per quarter. Credit/No Credit grading only. Prerequisite: PSY 323, HD majors, junior standing and consent of instructor.

## PSY 456 Behavioral Disorders in Children (3)

Applications of psychological principles to childhood behavioral disorders. Aggression, delinquency, stress reactions, motivational, perceptual-attentional deficiencies, psychoses, anxiety disorders, biological dysfunctions, and retarded social and cognitive development. 3 seminars. Prerequisite: PSY 201 or PSY 202, junior standing.

## PSY 458 Learning and Memory (3)

Principles of conditioning, motivation, verbal learning, observational learning, concept formation, language development, short-term and long-term memory; applications to problems such as behavior disorders, learning disabilities, mental retardation, drug abuse, aggression and prejudice. 3 seminars. Prerequisite: PSY 201 or PSY 202, junior standing.

## PSY 459 Lifespan Theories (3)

Comparative study of theories that attempt to explain life span development. Controversial issues, evaluations and applications of theories. Emphasis on biological, psychological, and social aspects of life span development. 3 seminars. Prerequisite: PSY 201 or PSY 202, HD 299 or consent of instructor, senior standing.

## PSY 460 Child Abuse and Neglect (3)

Issues in child maltreatment, including definitions and forms, causes, consequences, assessment, reporting, treatment, and prevention. Possible links among research, intervention, and public policy will be emphasized. 3 seminars. Prerequisite: PSY 201 or PSY 202 and junior standing.

## PSY 465 Cross-Cultural Issues in Psychology (3)

Psychological, biological and ecological influences on human development in different cultural settings. Focuses on:

1) cognitive development/teaching and learning; 2) attitudes and belief; 3) health and growth; and 4) social and psychological aspects of cultural patterns. Course will have a focal cultural area for each quarter. 3 seminars. Prerequisite: PSY 201 or PSY 202 and junior standing.

## PSY 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

## PSY 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

## PSY 494 Psychology of Technological Change (3)

Examines the impact of technological change on the psychological and social characteristics of people and organizations. Identifies personal, social and organizational factors which provide obstacles and opportunities for technological change. Survey of methods of reducing the negative impact of change. 3 seminars. Prerequisite: PSY 201 or PSY 202 and senior standing.

## PSY 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

## PSY 496 Applied Social Psychology (4)

Survey of methods of applied social psychology and applications to education, business and industry, environmental problems, health systems, law, mass communication, politics, and international relations. Oral and written reports of student investigation and analysis of social and organizational problems. 4 seminars. Prerequisite: PSY 302, PSY 329, PSY 350.

## PSY 500 Individual Study (1-6)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Only 6 units may be applied to degree requirements. Prerequisite: Consent of department head, graduate major adviser and supervising faculty member.

## PSY 504 Psychoneurology and Pharmacology (3)

Advanced study of neuropsychological and pharmacological concepts including neuroanatomical systems, neurochemical processes, brain dysfunctions, basic neurological assessment, alcohol and psychoactive substance abuse, antidepressants, antianxiety agents, antipsychotics. Current theoretical perspectives and research findings will be reviewed. 3 seminars. Prerequisite: PSY 304, PSY 330, graduate standing or consent of instructor.

# PSY 555 Counseling and Communication (4) (Also listed as EDUC 555)

Overview of the counseling profession, history, philosophy, theory, and ethics. Emphasis on developing interviewing, assessment and communication skills. Required practicum. 3 seminars, 1 activity. Prerequisite: Graduate standing or consent of instructor.

# PSY 557 Career Development (4) (Also listed as EDUC 557)

Counselor role in career decision making to include career choice theory, appraisal instruments, community referral resources, occupational information, computerized retrieval systems, and person/social data and required activities. 3 seminars; 1 activity. Prerequisite: Graduate standing.

# PSY 560 Counseling Theories and Assessment (4) (Also listed as EDUC 560)

Counseling theories and concepts applied to individuals. Develop skills in interviewing, assessment, intervention selection, termination and crisis intervention. Ethics and law included. 3 seminars, 1 activity. Prerequisite: EDUC 555 or PSY 555, PSY 452 or consent of instructor.

# PSY 561 Group Counseling (3) (Also listed as EDUC 561)

Theory and practice of group counseling, client selection, group structure, process and termination. Application of theories to specific developmental groups. Communication and facilitation skills emphasized with relevant ethics and law. 2 seminars, 1 activity. Prerequisite: EDUC 555 or PSY 555 or consent of instructor.

## PSY 564 Ethics and the Law: MFC Counseling (3)

Ethics, client rights, and laws related to individual, child, family and group therapy counseling. 3 seminars. Prerequisite: EDUC/PSY 560, EDUC/PSY 561, HD 450 or consent of instructor.

## PSY 565 Diagnosis and Treatment: Psychopathology (3)

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 307, PSY 432, or consent of instructor.

## PSY 566 Group Therapy (3)

Group therapy theory, leadership and research applied to client assessment, screening, treatment selection, evaluation and termination. Ethics, law included. 2 seminars, 1 activity. Prerequisite: EDUC/PSY 560, EDUC /PSY 561 or consent of instructor.

## PSY 567 Counseling the Elderly and Their Families (3)

Dynamics of aging and family transitions as applied to counseling. Application of medical, psychological, DSM III, physiological, crisis and ethnic concerns with a required practicum. 2 seminars, 1 activity. Prerequisite: EDUC/PSY 555, HD 421 or PSY 459 or consent of instructor.

## PSY 568 Cognitive Behavioral Counseling (3)

Theory and application of cognitive restructuring approaches in counseling and therapy. Includes social and cognitive learning

approaches, coping, problem solving and decision making skills. 3 lectures. Prerequisite: EDUC/PSY 560 or consent of instructor.

## PSY 569 Counseling Clinic Practicum (6)

Applied experience and instruction in assessment, diagnosis, treatment planning and treatment of individuals, couples, families and children under direct supervision of faculty in Cal Poly's Counseling Clinic. Ethical and legal practices included. Weekly meetings. Total credit limited to 18 units. A maximum of 12 units may be applied to the Master of Science in Counseling. Prerequisite: EDUC/PSY 560, HD 450, PSY 307, PSY 459, or consent of instructor.

## PSY 570 Selected Topics in Psychology and Human Development (3)

Directed group study of selected topics for advanced students. Open to graduate students and selected seniors. *Class Schedule* will list topic selected. Total credit limited to 6 units. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

## PSY 571 Advanced Marital and Family Therapy (4)

Theory and application of process, structural and systems approaches to family and couple therapy. Assessment, diagnosis, treatment and follow-up of family and couple therapy with required supervised activities. Ethics and law related to family therapy. 3 seminars, 1 activity. Prerequisite: HD 450, EDUC/PSY 555 or consent of instructor.

## PSY 572 Child Therapy (4)

Assessment, diagnosis, treatment planning and therapeutic modalities appropriate for children and adolescents. Seven hours of instruction in abuse and neglect of children with relevant ethics and law. Effective parenting approaches and integration of family treatment. 3 seminars, 1 activity. Prerequisite: EDUC/PSY 560, EDUC/PSY 561, PSY 307, PSY 456 or consent of instructor.

# PSY 573 Field Experience: Counseling (6) (Also listed as EDUC 573)

Practical application of guidance services and counseling in public schools, colleges and community settings. Weekly seminars with university staff included. Total credit limited to 24 units. Maximum of 12 units may be applied toward Master of Science in Counseling. Maximum of 6 units may be applied toward Master of Arts in Education. Prerequisite: EDUC/PSY 555, EDUC/PSY 557 and consent of Counseling Coordinator Committee.

## PSY 574 Applied Psychological Testing (3)

Commonly used psychological tests, report writing and communication of test results to clients and other professionals. Administering, scoring, and interpreting self-report inventories used in public and private agencies for marriage and family counseling. 3 seminars. Prerequisite: PSY 432 and STAT 512.

## PSY 575 Sexual Dysfunction Therapy (3)

Analysis of physiological, social, and psychological antecedents to sex role identity. Sexual behavior, disease, sexual dysfunction. Assessment, diagnosis, and treatment of sexual dysfunction. Ethics. 3 seminars. Prerequisite: EDUC/PSY 560 and HD 450.

## PSY 576 Field Experience: Marital and Family Counseling (6)

Supervised practicum in applied psychotherapeutic techniques, assessment, diagnosis, prognosis and treatment of pre-marital, marital, family and child relationships dysfunctions with licensed supervisor. Total credit limited to 24 units. Maximum of 12 units may be applied toward Master of Science in Counseling; maximum of 6 units may be applied toward the Master of Arts in Education. Weekly seminar with on-site and university supervisors. 30 hours work experience per unit of credit. Prerequisite: PSY 569, consent of instructor and Counseling Coordinating Committee.

# PSY 585 Research Methods for Counseling Psychology (4)

Research methods relevant to practitioners in counseling psychology and human services. Develop the ability to design, carry out and evaluate pertinent psychological research. Basic understanding of descriptive and inferential statistics and the use of computers in the analysis of data. 2 seminars, 2 activities. Prerequisite: PSY 573 or PSY 576 or consent of instructor.

## PSY 586 Cooperative Education Experience (6) (CR/NC)

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

## PSY 590 Research Applications in Psychology and Human Services (4)

Application of research techniques to problems in psychology and human services. Emphasis on the design of data collection instruments, data collection and data analysis in an applied research project. 2 seminars, 2 activities. Prerequisite: PSY 585.

## PSY 596 Cooperative Education Experience (12) (CR/NC)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

## PSY 599 Thesis or Project (3)

Completion of a thesis or research project pertinent to the fields of psychology and human services. Supervision. Prerequisite: PSY 590.

# **REC-RECREATION ADMINISTRATION**

## REC 100 Leisure Education and Lifestyle Managment (2)

Exploration of the impact of work, play, and leisure upon society. Analysis of theoretical views of play and the relationship of positive leisure values upon the development of a well-integrated lifestyle. Foundations for understanding and assessment of personal leisure well-being. 1 lecture, 1 recitation.

GEB E.2.

## REC 101 Introduction to Recreation and Leisure Services (3)

History, philosophy, theory, and community organization of recreation. Various agencies providing recreation and leisure services. Emphasis upon functions, areas, facilities, clientele, and career opportunities. Field visits required. 3 lectures.

## **REC 102** Backcountry Ethics and Safety (3)

Generalized outdoor course designed to prepare students for participation in the Outdoor Recreation Skill sequence. Wilderness and backcountry characteristics are reviewed in terms of natural hazards, safety procedures and potential impact of various activities on the environment. Emphasis on knowledge and appreciation of the natural environment. 3 lectures.

## **REC 105** Recreation Leadership (3)

Recreation leadership with small and large groups. Emphasis upon leadership skill development, appropriate theories and techniques for specific clientele. 2 lectures, 1 laboratory.

## **REC 210** Programming for Leisure (4)

Methods of program planning, organization, implementation and evaluation in public and private settings. Interrelationship of needs and interests of people, physical settings, and activity content. Emphasis on program construction and scheduling in social recreation, cultural arts, health and fitness and sport-/games areas. 2 lectures, 2 activities. Prerequisite: REC 101, REC 105 or consent of instructor.

## REC 245 Adaptive Aquatics in Physical Education and Recreation (2) (Also listed as PE 245)

Adaptive techniques in working with the disabled in aquatics; physical, mental, emotional, social, and recreational involvements utilizing aquatics as the treatment modality. 1 lecture, 1 activity.

## **REC 252** Introduction to Therapeutic Recreation (4)

Adaptation of recreation and leisure services for persons with special needs. Role of institutions and community agencies. Specialized leadership techniques. Modification requirements for programs, areas, facilities, equipment, and supplies. Field visits required. 3 lectures, 1 activity. Prerequisite: REC 210 or consent of instructor.

## **REC 260** Intramural and Recreational Sports (3)

Philosophy, foundations, policy and techniques underlying intramurals and recreational sport programs in schools, public, private and commercial settings. 2 lectures, 1 activity. Prerequisite: REC 210 or consent of instructor.

## **REC 301** Outdoor Recreation Education (3)

Seasonally selected outdoor leadership and skill development activities as specified by subtitle. Land, snow, and water based outdoor curriculum. Total credit limited to 9 units. Passing a basic proficiency test may be required. Field trips required. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 1 activity. Prerequisite: REC 102 or consent of instructor.

## **REC 302** Outdoor Experiential Education (3)

Experiential education and techniques to apply to outdoors. Experiential learning cycle, focusing, feedback, support, processing, and effective communication techniques. Educational strategies include individual, competitive, and cooperative learning. 2 lectures, 1 activity. Prerequisite: REC 102.

## **REC 310** Program Administration in Leisure Services (3)

Management of a full service program delivery system in a variety of settings. Needs assessment, program selections, program evaluation, grant and proposal writing, long range planning. Field visits required. 3 lectures. Prerequisite: REC 210.

## **REC 312** Employee Services and Recreation (3)

Administrative patterns, financing, programming, personnel, and legal concerns in programs designed to utilize leisure for employee motivation and productivity. Analysis of military, corporate, agency programs. Field visits required. 3 lectures. Prerequisite: REC 210.

# **REC 314** Travel and Tourism–Implications for Leisure (3)

Trends of travel and tourism with specific emphasis on the Western United States and the international market. Travel motivations, settings involved in tourism development, travel research, and careers in tourism. Field visits required. 3 lectures. Prerequisite: Junior standing and consent of instructor.

## **REC 316** Commercial Recreation Entrepreneurship (1)

Management, finance, personnel considerations in commercial recreation business. Qualities and problems of the leisure entreprenuer specific to recreation business pursuits. 1 seminar. Prerequisite: BUS 101, or consent of instructor.

# **REC 320** Processes and Techniques in Therapeutic Recreation (4)

Philosophy, principles, and techniques in the utilization of recreation as a treatment modality in rehabilitating people with illness or disability. Sociological foundations of recreation and leisure in the community and implications for the exceptional individual. Role of recreation in total rehabilitation process of various agencies and institutions. Field visits required. 3 lectures, 1 laboratory. Prerequisite: REC 252 or consent of instructor.

### REC 323 Supervisory Roles in Recreation Administration (3)

Analysis of the supervisory roles in public, private, commercial and voluntary agencies offering organized leisure services. Methods, techniques, and evaluation systems. Emphasis upon development of a personal philosophy, ethics and interpersonal skills. Field visits required. 3 lectures. Prerequisite: REC 210.

## REC 324 Legal and Managerial Patterns in Recreation Administration (3)

Scope, levels, concepts, structure, and legal aspects of public, private, commercial, and non-profit recreation and leisure services agencies. Risk management and ethics. Emphasis on the development of a professional philosophy. Field visits required. 3 lectures. Prerequisite: BUS 101, REC 210.

## REC 325 Recreation Therapy in a Physical Rehabilitation Setting (4)

Therapeutic recreation for people who are physically disabled. Emphasis on the nature of and adapted techniques and equipment for spinal cord injury, head trauma, and stroke. Treatment planning, behavior management, leisure education, sports classification by degree of injury, and mainstreaming. 4 seminars. Prerequisite: REC 252 or consent of instructor.

# REC 327 Leisure Counseling (3) (Also listed as PSY 327)

Philosophical, psychological, educational and practical aspects of leisure counseling. Therapeutic recreation intervention processes and procedures. Historical foundations and leisure counseling models. 3 lectures. Prerequisite: REC 252 or consent of instructor.

## REC 328 Aging and Leisure (3)

Analysis of the psycho-social aspects of aging as related to leisure and recreation; physiological responses to leisure activity; special precautions and activity adaptations. Field visits required. 2 lectures, 1 activity. Prerequisite: REC 252 or consent of instructor.

### REC 329 Team Procedures and Processes for Recreation Therapists (4)

Clinical principles, procedures and processes for the recreation therapist in working in an interdisciplinary milieu. Treatment strategies for maximizing the effectiveness of therapeutic recreation services. Cooperative and coordinative assessment, program design, and documentation. Philosophical, ethical and legal considerations in therapeutic recreation. Field visits required. 3 lectures, 1 activity. Prerequisite: REC 252 or consent of instructor.

## REC 330 Directed Field Experience (3) (CR/NC)

Practical work experience in related phases of recreation administration in organization or agency under qualified supervision. Minimum of nine hours per week. Credit/No Credit grading only. Total credit limited to 9 units. Prerequisite: REC 210 and consent of instructor.

#### REC 364 Commercial Recreation and Leisure Services (3)

Analysis of the types of commercial and private-for-profit enterprises. Public-private cooperative ventures. Marketing leisure services. Probable trends and directions. Requirements and procedures for planning and organizing commercial recreation services. Field visits required. 2 lectures, 1 activity. Prerequisite: BUS 101, REC 210.

#### REC 400 Special Problems For Advanced Undergraduates (1-3)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Consent of curriculum coordinator.

#### REC 407 Programming and Adaptive Techniques in Therapeutic Recreation (4) (Also listed as PE 407)

Description, etiology, and nature of specific disabilities, with an emphasis on the development of individualized therapeutic recreation programs for the physically disabled, the developmentally disabled, and the emotionally troubled individual. 3 lectures, 1 laboratory. Prerequisite: REC 252 or PE 306 or consent of instructor.

### REC 416 Physical Education and Recreation Facilities (3) (Also listed as PE 416)

Management, clientele considerations, facilities and outdoor areas planning and operations, personnel, finance, and equipment as related to physical education and recreation areas and facilities. Consideration of architectural and environmental barriers. Field visits required. Miscellaneous course fee required-see *Class Schedule*. 3 lectures. Prerequisite: Upper division standing and consent of instructor for non-PE/REC majors.

## **REC 424** Financing Recreation and Leisure Services (4)

Financing leisure products and services in public, private, commercial and voluntary settings. Emphasis on sources and methods of financing; grant development; property management; operational/financial cost analysis; forecasting, budgeting, pricing and fiscal master planning through use of computer technology. 2 lectures, 2 laboratories. Prerequisite: ACTG 211, CSC 120, ECON 211, REC 323, REC 324, REC 416.

# REC 430, 431 Therapeutic Recreation Internship (6) (3) (CR/NC)

600 (400/200) hours of full-time T R Concentration-specific practical work experience over fifteen contiguous weeks in one CBRPC-approved site under the supervision of an RTR with CBRPC, and a TRS with NCTRC. Out-of-State placement permitted only under supervision of TRS with NCTRC, in agency program which meets CBRPC and NCTRC standards. Open to T R Concentration students only. Comprehensive involvement in agency program. Students must meet CBRPC and NCTRC Internship eligibility requirements and enroll in and complete REC 430 and then, in the following, contiguous quarter, enroll in and complete REC 431. Credit/No Credit grading only. Prerequisite: Minimum GPA of 2.0; 1,000 verified hours of adviser-approved paid and/or volunteer experience subsequent to high school; completion of all university coursework other than Internship; approval of Curriculum Coordinator.

## **REC 432** Internship (6) (CR/NC)

400 hours of full-time concentration-specific practical work experience over a ten-week period in an approved agency. Comprehensive involvement in agency program. Not open to T R Concentration students. Credit/No Credit grading only. Prerequisite: Minimum GPA of 2.0; 1,000 verified hours of adviser-approved paid and/or volunteer experience subsequent to high school; completion of all university coursework other than Internship; approval of Curriculum Coordinator.

## **REC 460** Research in Recreation Administration (4)

Research design, questionnaire and interview schedule construction, sampling methods, data array and analysis, and computer applications. Selection and preliminary investigation of senior project topic. 4 seminars. Prerequisite: CSC 120 or CSC 444, SOC 333, STAT 211.

## **REC 461, 462** Senior Project (3) (2)

Selection and completion, under faculty supervision, of an investigative project typical of problems which graduates must solve in their fields of employment. Required minimum of 150 hours. Analytical, formal report is required. Prerequisite: Senior standing and completion of REC 369.

## REC 464 Delivery of Commercial Recreational Services (3)

Requirements and procedures for opening, operating, and evaluating public and commercial recreation enterprises. Feasibility analysis process applied to specific case scenarios. 2 lectures, 1 laboratory. Prerequisite: REC 364.

## REC 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

## REC 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to graduate and undergraduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

## 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.

# SCM–SCHOOL OF SCIENCE AND MATHEMATICS

## SCM 100 Orientation to the School of Science and Mathematics (2) (CR/NC)

Application of learning strategies, problem-solving methodologies, academic planning and career selection for students in the science and mathematics disciplines. Concurrent enrollment in specific orientation or content course is desirable. Credit-No Credit grading only. 1 lecture, 1 activity.

## SCM 300 Early Field Experience, Science/ Mathematics (2) (CR/NC)

A minimum of 20 hours of supervised observation of secondary school science or mathematics classes. These observations will be discussed and evaluated during weekly meetings. Credit/No Credit grading only. 2 lectures.

# **SOC-SOCIOLOGY**

## SOC 105 Introduction to Sociology (3) GEB D.4.a.

Orientation to the nature of the study of society. Survey of approaches to social analysis. Emphasis upon primary concepts describing environment, social structure, and social change for increased understanding of human relations. An overview of the systems of social relationships. 3 lectures.

## SOC 106 Social Problems (3)

Appraisal of various factors from which the social problems of contemporary American society emerge and alternative procedures for dealing with such problems. 3 lectures.

## SOC 301 Social Work in the U.S.A. (3)

Introduction to the field of social welfare. Development of American social work. Scope and diversity of specific programs designed to meet welfare problems in contemporary society. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

## SOC 302 Social Welfare Institutions (3)

Development of public welfare services; current problems and policy issues; analysis of current programs of social insurance, public assistance programs; interagency relationships. 3 lectures. Prerequisite: SOC 301 or consent of instructor.

## SOC 305 Sociology of Social Movements (3)

Analysis of the causes and impact of social movements, with a focus on the contemporary world. Included are events ranging from riots, lynchings and panics to political, religious and racial social movements. 3 lectures. Prerequisite: 3 units of sociology or consent of instructor.

## SOC 306 Sociology of the Family (3)

Analysis of basic concepts of family structure. Types of families, marriages, conjugal relations and kinship in contemporary society. Emphasis on the dynamic nature of family interaction and its correlates. Social class, communication patterns, family size, and conflict. 3 lectures. Prerequisite: SOC 105 or consent of instructor.

# SOC 308 Revolutions and Collective Violence (3) (Also listed as POLS 308)

Focus on the causes, methods, outcomes of, and authority responses to collective violence and revolutionary movements. Contemporary events including terrorist and other forms of political violence in industrialized and developing nations. 3 lectures. Prerequisite: One course in sociology or political science, or consent of instructor.

## SOC 309 World System and Its Problems (3) GEB D.4.b

Analysis of the world system, its structure, its effects upon developed and developing nations, and the relations among the nations. 3 lectures. Prerequisite: Junior standing or consent of instructor.

# SOC 310 Socialization: Self, Organizations and Society (3)

Analysis of social interaction relating to development of self. Reciprocal influences between individuals, organizations and society. Development of social roles and the symbolic nature of interaction. 3 lectures. Prerequisite: One course in sociology, or consent of instructor.

## SOC 311 Sociology of Sex Roles (3)

Description and analysis of sex roles in modern society. Special attention given to the learning process and how sex stereotypes affect individuals' life chances and the social structure. Exploration of the sociobiological bases of sex role differentiation in societies. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

## SOC 313 Urban Sociology (3)

Structure of social relationships in the community. Physical structure of communities, patterns of community cooperation and conflict. Changing patterns of urban community life. Social class and political influence on the community level. 3 lectures. Prerequisite: One sociology course or consent of instructor.

## SOC 315 Race Relations (3)

GEB D.4.b.

Diverse structures of unequal relationships among racial and ethnic groups in several countries. Theories about sources of economic and social discrimination. Evaluation of methods to restructure race and ethnic relations. International case histories. 3 lectures. Prerequisite: Junior standing.

## SOC 316 American Minorities (3)

Dynamics of minority relations in the U.S. ethnic conflict, pluralism, assimilation. Dynamics of intergroup relations. Sources and manifestation of economic and social discrimination patterns and how they affect the individual's life chances. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

## SOC 323 Social Stratification (3)

Social class and the distribution of status and power in society, with emphasis on contemporary United States; social mobility; relationships of stratification to mental illness, race, family systems, crime and delinquency, etc. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

## SOC 326 Sociology of Aging (3)

Age as a social phenomenon. Roles of the elderly in industrial societies. Changes in social structures and people as the shift occurs from middle to older age. Sociological theories about aging. Implications of an aging population. Public policies and aging. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

## SOC 330 Social Change (3)

Description and analysis of social change in contemporary American society as it relates to major revolutionary changes in this century; variables alleged to affect social change; impact of social change upon traditional societies; prospects for future social change. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

## SOC 333 Social Research Methods I (3)

Survey research experimentation, field research and content analysis as research techniques. Relationship between theory and research conceptualization and operationalization. Basic sampling techniques. Approaches to interviewing. 3 lectures. Prerequisite: Two sociology courses and STAT 211 with a grade of C- or better, or consent of instructor.

## SOC 334 Social Research Methods II (3)

Univariate and multivariate data analysis using packaged statistical computer programs. Scale and index development. Causal analysis. 2 lectures, 1 laboratory. Prerequisite: SOC 333.

### SOC 344 Sociology of Poverty (3)

Variable indicators of poverty in modern society. Chief features of the subculture of the poor. Analysis of different explanations for the persistence of poverty. Survey of proposals for reducing poverty. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

#### SOC 350 Social Organization of Modern Japan (3)

Social and cultural features of modern Japan. Japanese group processes. Investigation of contemporary Japanese institutions: family, education, mass media, industry, politics, including an overview of popular culture. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

## SOC 351 Women in East Asia (3)

Traditional roles and status of women in Chinese, Japanese and Korean societies. Changes due to industrialization, the impact of Western ideas and their implications for today's women. 3 lectures. Prerequisite: One sociology course at the 100/200 level or consent of instructor.

## SOC 395 Sociology of Complex Organizations (3)

Bureaucracies and informal organizations from a sociological perspective. Organizational networks within and between organizations, relationship between organizations and their environment, and organizational socialization and career patterns. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

## SOC 402 Crime and Delinquency (3)

Theories of delinquent and criminal behavior; analysis of institutional and other approaches to rehabilitation of criminals and delinquents. 3 lectures. Prerequisite: Junior standing.

## SOC 412 Treatment of Criminals and Delinquents (3)

Approaches to the control and rehabilitation of adult and juvenile offenders; philosophy of treatment strategies; history and analysis of probation, imprisonment, parole and preventive programs. 3 lectures. Prerequisite: SOC 402.

## SOC 413 Methods of Social Work (3)

Theories, concepts, values stressed in social work. Social casework. Principles and practices used by social workers serving individuals and families in correctional, public assistance, medical, psychiatric youth services, and other settings. Discussion of case material and available literature. 3 seminars. Prerequisite: SOC 302.

## SOC 421 Social Theory (3)

Concepts and theories in sociology, anthropology and geography. Modern and classical perspectives. Usefulness of theories for understanding present social problems. 3 lectures. Prerequisite: Two sociology courses or consent of instructor.

## SOC 431 Population Problems (3)

Description and analysis of population variables and their sociological consequences. 3 lectures. Prerequisite: One sociology course and STAT 211 or consent of instructor.

## SOC 470 Selected Advanced Topics in Sociology (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

# **SOCS-SOCIAL SCIENCES**

## SOCS 200 Special Problems for Undergraduates (1-3)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 3 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

# SOCS 366 Research and Writing Seminar in Social Sciences (3)

Development of research and bibliographic skills in the process of composing a major research paper in Social Sciences. Thesis formation, development or organizational and analytic skills, and utilization of social science data and formats. 3 seminars. Prerequisite: ENGL 215 or ENGL 218 or consent of instructor.

### SOCS 400 Special Problems for Advanced Undergraduates (1-3)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Consent of department head.

## SOCS 424 Organizing and Teaching Social Sciences (3)

Organization, selection, presentation, application, and interpretation of social sciences subject matter for teaching at the secondary level. 3 lectures. Prerequisite: Senior standing and/or consent of instructor.

## SOCS 440 Supervised Fieldwork (3-6)

Supervised observation, research and work in community organizations, public agencies, etc., with attention to the barrio and ghetto. Total credit limited to 18 units. Prerequisite: Senior standing and/or consent of instructor.

## SOCS 461, 462 Senior Project (2) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time. Prerequisite: SOCS 366, senior standing or consent of instructor.

## SOCS 463 Undergraduate Seminar (3)

Intensive study of selected social problems with application of techniques for analysis. 3 seminars. Prerequisite: Senior standing or consent of instructor.

## SOCS 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

## SOCS 487 Cooperative Education Experience (6)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Prerequisite: Sophomore standing and consent of instructor.

## SOCS 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

## SOCS 497 Cooperative Education Experience (12)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Prerequisite: Sophomore standing and consent of instructor.

# SPAN-SPANISH

## SPAN 101, 102, 103 Elementary Spanish (4) (4) (4)

For beginners. Class practice and assigned outside work in pronunciation, sentence structure, reading, writing, and basic conversation. Laboratory drill required. Language taught in its cultural context. Credit not available for students who have completed SPAN 104. To be taken in numerical sequence. 3 lectures, 1 activity.

## SPAN 104 Intensive Elementary Spanish (12)

Class practice in pronunciation, syntax, reading, writing, and conversation. Offered in summer only. Not open to students with credit in SPAN 101, 102, 103. Laboratory drill required. 9 lectures, 3 activities.

## SPAN 111, 112, 113 Elementary Hispanic Language and Culture (4) (4) (4)

Inductive Spanish grammar with special focus on vocabulary and culture from American agribusiness and the Hispanic cultures of the United States and Latin America. Open to all students with little or no knowledge of Spanish. 3 lectures, 1 activity. To be taken in numerical sequence.

## SPAN 201, 202 Intermediate Spanish (4) (4)

Review of Spanish grammar and practice in writing and oral expression based on social and cultural values. 3 lectures, 1 activity. Prerequisite: SPAN 103 or consent of instructor.

## SPAN 204 Intensive Intermediate Spanish (8)

Review of grammar and practice in written and oral expression based on social and cultural values. 6 lectures, 2 activities. Prerequisite: SPAN 103 or SPAN 104 or permission of instructor.

## SPAN 233 Critical Reading in Hispanic Literature (4) GEB C.1.

Selected readings from major Hispanic authors that show the Hispanic literary tradition from the Middle Ages to the present in both Spain and Latin America. Includes works by such Medieval, Renaissance, Colonial, Realistic, and 20th century authors as Juan Ruiz, Cervantes, Lope de Vega, Sor Juana Inés de la Cruz, Martí, Unamuno, Lorca, Neruda, and Borges. 4 lectures. Prerequisite: SPAN 202 or equivalent.

## SPAN 301 Advanced Spanish Composition and Grammar (4)

Oral and written development of structural grammar, syntax, and complex components of Spanish. Vocabulary expansion and idiomatic construction. Written composition. Translations to examine linguistic and semantic differences. 4 lectures. Prerequisite: SPAN 202, or equivalent, or consent of instructor.

## SPAN 305 Significant Writers in Spanish (4) GEB C.3.

Critical analysis and oral discussion of poetry, essays, novels and plays by selected Hispanic writers. *Class Schedule* will list topic selected. Total credit limited to 12 units. 4 lectures. Prerequisite: SPAN 233 or equivalent.

## SPAN 330 Spanish for Bilingual Speakers (4)

For students with a high degree of oral proficiency in Spanish. Review of Spanish grammar and practice in written expression. Social and cultural realities of Chicanos in the United States. 3 lectures, 1 activity. Prerequisite: SPAN 202 or consent of instructor.

## SPAN 405 Hispanic Literature in English Translation (4)

Selected works to be read by students in the original or in English translation. Critical analysis, interpretation, and comparison of individual works by outstanding Hispanic writers. Lecture in English. *Class Schedule* will list topics selected. Total credit limited to 8 units. 4 lectures. Prerequisite: One literature

## SPAN 470 Selected Advanced Topics (1-4)

course or consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

# SPC-SPEECH COMMUNICATION

# SPC 101 Introduction to Speech Communication (1) (CR/NC)

Theory and practice of interpersonal, group, organizational and public communication. Fundamentals of scholarship; professional and trade journals in the discipline. No final exam. Credit/No Credit grading only. 1 lecture.

## SPC 125 Critical Thinking (3) (Also listed as ENGL 125 and PHIL 125) GEB A.2.

Nature of critical thinking. Analysis of inductive and deductive arguments. Practice in the criticism and composing of arguments in English. 3 lectures. Prerequisite: ENGL 114.

## SPC 201 Public Speaking (3)

GEB A.3.

GEB C.3.

Introduction to the principles and types of public speaking. Practical experience in the development, presentation, and critical analysis of speeches to inform, to persuade, and to actuate. Not open to students with credit in SPC 202. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

### SPC 202 Principles of Speech Communication (3)

GEB A.3.

Introduction to the fundamentals and principles which underlie effective speech communication. Practical experience in various types of speaking situations: informative speaking, persuasive speaking, and panel discussion. Not open to students with credit in SPC 201. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

# SPC 212 Interpersonal Communication (4) (Also listed as PSY 212)

Introduction to the interaction process in two-person (dyadic) communication settings. Emphasis on the functions of varying messages in the initiation, development, maintenance and termination of personal and professional relationships. 4 lectures. Prerequisite: SPC 201 or SPC 202.

## SPC 213 Organizational Communication (4)

Introduction to communication within the organization and between the organization and its environment. Effects of networks, superior/subordinate message patterns, team building, climate, message flow patterns and distortion on organizational effectiveness. 4 lectures. Prerequisite: SPC 201 or SPC 202.

## SPC 217 Small Group Communication (4)

Basic principles and techniques of discussion. Survey of the importance of discussion in contemporary society, including study of and practice in informal group discussion, panel discussion, symposium, and forum. 4 lectures. Prerequisite: SPC 201 or SPC 202.

# SPC 250 Forensic Activity (1)

Lower division participation in intercollegiate forensic activities. Any student who wishes to receive academic credit for participation in such activities during the quarter should enroll. Specific assignments will be determined by instructor. Total credit limited to 6 units. 1 activity. Prerequisite: SPC 201 or SPC 202.

# SPC 300 Voice and Phonetics (4)

Physiology of normal speech. The basis of speech sounds in American English, their development, symbolization and production using International Phonetic Alphabet. Assessment and improvement of student's vocal and articulation practices to enhance oral skills. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

# SPC 301 Business and Professional Communication (4)

Communication skills and functions for all levels of organizational employees. Interviewing, oral briefings, motivational and conference speaking. 4 lectures. Prerequisite: SPC 201 or SPC 202.

## SPC 302 Introduction to Communicative Disorders (4)

Survey of speech, language, and hearing disorders emphasizing causes, symptoms, and treatment. Role of the speech therapist in the community and in public schools. Role of the classroom teacher in speech improvement. 4 lectures. Prerequisite: SPC 201 or SPC 202.

## SPC 303 Development of Speech and Language (3)

Development of speech and language from birth to adolescence. Physical and psychological processes contributing to the emergence, practice, and mastery of speech and language. 3 lectures. Prerequisite: SPC 300, SPC 302.

# SPC 305 Performance of Literature (4)

Poetry, prose, nonfiction and dramatic literature performed to communicate the levels of meaning within each work to the audience. 4 lectures. Prerequisite: SPC 201 or SPC 202, 3 units of literature.

# SPC 310 Performing Literature in the Classroom (4)

Techniques for performing literature in primary and secondary teaching situations. Selection, preparation and presentation of literature for an audience; literature exercises to enhance the reading experience for students. Poetry, storytelling, oral reading and research paper. 4 lectures. Prerequisite: SPC 201 or SPC 202.

## SPC 312 Communication Theory (4)

Concepts and theories of the human communication process. Psycho-sociological aspects of attitude change. Interpersonal relations in an informational-behavioral context. 4 lectures. Prerequisite. PSY 201 or PSY 202, SPC 212, consent of instructor.

## SPC 316 Intercultural Communication (4)

Examination and clarification of cultural aspects and communication problems within and between ethnic groups. 4 lectures. Prerequisite: SPC 201 or SPC 202.

# SPC 320 Nonverbal Communication (4) (Also listed as PSY 320)

Influence of kinesic, proxemic, artifactual, olfactory, paralinguistic and environmental factors in human communication. Theory, research and practice in nonverbal communication. 4 lectures. Prerequisite: SPC 212.

## SPC 321 Intermediate Public Speaking (4)

Further consideration of the principles of public address. Advanced practice in manuscript, extemporaneous, and impromptu speaking. 4 lectures. Prerequisite: SPC 201 or SPC 202.

## SPC 322 Persuasion (4)

Persuasive theory including methods of attention, suggestion, motivation, and adaptation employed to influence feelings, attitude, change and action. Analysis of persuasive discourse and the application of persuasive methods in speaking. 4 lectures. Prerequisite: SPC 201 or SPC 202.

# SPC 325 Argumentation (4)

Techniques of argumentation, logic and reasoning. Fallacies of reasoning. Experience in various forms of formal argument, and evaluation systems. 4 lectures. Prerequisite: SPC 201 or SPC 202.

# SPC 330 Classical Rhetorical Theory (4) GEB C.3.

Early development of rhetorical theory in Greco-Roman civilization. Analysis of the canons of rhetoric. Rhetorical thought of Sophists, Isocrates, Plato, Aristotle, Cicero and Quintilian. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

# SPC 331 Political Advocacy and Contemporary Rhetoric (4)

Rhetoric's role in contemporary culture. Issues: political advocacy; science, technology and mass persuasion; ethics and rhetoric. Representative theorists: Burke, Weaver, Richards, Toulmin and McLuhan. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

## SPC 350 Advanced Forensic Activity (2)

Upper division participation in intercollegiate forensics. Administration and operation of tournaments held annually on campus and in the community. Total credit limited to 6 units. 2 activities. Prerequisite: SPC 250.

## SPC 370 Gender and Communication (4)

Examination of gender in a variety of communication contexts. Concepts presented will help students understand the theory and practice of communication with members of the same and opposite sex. 4 lectures. Prerequisite: SPC 201/202.

## SPC 380 Media Effects (4)

Analysis of theoretical assumptions and methodologies of mass media effects research. Influence of media on specific audiences. 4 lectures. Prerequisite: SPC 201 or SPC 202.

# SPC 385 Mass Media Criticism (4) (Also listed as ENGL 385 and JOUR 385)

Examines mass media (especially broadcasting) from a rhetorical/critical perspective. Aims to expand students' understanding of media issues, media's role as critic, and the role of criticism. 4 lectures. Prerequisite: SPC 201 or SPC 202.

## SPC 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of instructor, junior standing.

## SPC 405 Group Performance of Literature (4)

Examination and experience in the various modes of group performance of literature. Readers Theatre, Chamber Theatre, Story Theatre. Scripting, directing, performing and critiquing of group performance of literature. 4 lectures. Prerequisite: SPC 305 or SPC 310, junior standing.

## SPC 411 Communication Research (4)

Exploration of communication research strategies and methodologies. Basic methods of designing research in empirical communication studies. 4 lectures. Prerequisite: STAT 211, SPC 312, junior standing. For majors only.

## SPC 413 Advanced Organizational Communication (4)

Describing and measuring the organization's human message system. Planning and implementing communication training and development for the organization. New functions, careers and opportunities for the communication professional. 4 lectures. Prerequisites: Junior standing, SPC 213 and SPC 301.

## SPC 424 Classroom Communication (4)

Exploration of communication development, preschool and elementary school children. Construction, presentation, and evaluation of appropriate instructional experiences. Studentteacher-parent interaction. Communication style, environmental stimuli, dialectal differences and bilingualism, measurement of communication competence. 4 lectures. Prerequisite: Junior standing, ENGL 215 or ENGL 218.

## SPC 430 Rhetorical Criticism (4)

Theory and method used in the analysis and evaluation of rhetorical discourse. Study of critical essays. Practice in interpreting and evaluating persuasive discourse. 4 lectures. Prerequisite: Junior standing, SPC 330.

## SPC 435 Great Speeches (4)

Selected speakers and speeches from the Greco-Roman era to the present. Analysis and discussion of oratory's role in the shaping of historical events and the development of civilization. 4 lectures. Prerequisite: Junior standing, SPC 430.

#### SPC 450 Internship: Speech Communication (2–4) (CR/NC)

Supervised practicum and application of principles and theories of communication in organizational settings. Total credit limited to 8 units. Credit/No Credit grading only. Prerequisite: Junior standing, 2.5 GPA, and consent of instructor.

## SPC 460 Undergraduate Seminar (1)

Discussion and design of individual projects, oral reports on material in current professional writings. 1 seminar. Prerequisite: Junior standing. For majors only.

## SPC 461 Senior Project (3)

Completion of approved project under faculty supervision. Project results are presented in a formal written report. Minimum 90 hours total time. Prerequisite: SPC 460. For majors only.

## SPC 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 8 units. 1–4 lectures. Prerequisite: Junior standing, ENGL 215 or ENGL 218.

# **SS-SOIL SCIENCE**

## SS 100 Enterprise Project (1-4) (CR/NC)

Selection and completion of a management/production project under faculty supervision. Project participation is voluntary and subject to approval by the department head and the Cal Poly Foundation. Degree credit limited to 12 units. Credit/No Credit grading only.

## SS 110 Orientation in Soil Science (1)

Understanding the depth and breadth of soils as a science. Examine potential career opportunities. Introduction to both student and professional organizations. 1 activity.

## SS 121 Introductory Soil Science (4) GEB F.2.

Biological, chemical, physical and genetic soil properties. Interpretation of soils information for agricultural management and production. Proper land use and conservation, soil and water management. 3 lectures, 1 laboratory.

## SS 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

## SS 202 Soil and Water Conservation (3)

Climate, topography, soils and land use in relation to soil and water losses. Evaluation of soil and water conservation programs and practices. Miscellaneous course fee required-see *Class Schedule*. 3 lectures. Prerequisite: SS 121 or consent of instructor.

#### SS 221 Fertilizers and Plant Nutrition (4)

Plant nutrient requirements. Composition, value, and use of fertilizer materials, conditioners and agricultural minerals. Methods of manufacturing, distributing, and applying fertilizers. 3 lectures, 1 laboratory. Prerequisite: SS 121.

## SS 223 Rocks and Minerals (4)

Origin, composition, identification and weathering of rocks, minerals, and clays important in the development of soils. Parent materials as related to the nature and properties of soils. 3 lectures, 1 laboratory. Prerequisite: SS 121, CHEM 122 or CHEM 128.

#### SS 310 Urban Soils (3)

Manipulation, creation, and management of soils in urban environments. Measurement and interpretation of physical and chemical properties. Selection of soil materials for interior and exterior plantings. 2 lectures, 1 laboratory. Prerequisite: SS 121.

## SS 312 Agricultural Climatology (3)

Influence of climate, climatic factors and the plant canopy microclimate on plant growth, and yield. Managing climatic factors for improving crop production. 2 lectures, 1 activity. Prerequisite: SS 121 and junior standing, or consent of instructor.

## SS 321 Soil Morphology (4)

Identification of soil horizons and morphological properties. Correlation of soil physical and chemical properties with landscapes and land use. Techniques of interpretations for agriculture, forest, range and urban development. Miscellaneous course fee required-see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: SS 121.

## SS 322 Soil Fertility (3)

Investigation and evaluation of the nutrient supplying ability of soils. Examination of the conditions and transformations involved in the transfer of mineral nutrients from the soil to the plant. Effects of cultural treatments on soil fertility. 3 lectures. Prerequisite: SS 221, CHEM 122 or CHEM 128.

## SS 323 Soil Fertility Laboratory (1)

Interpretation of data integrating soils, applied fertilizers and plant growth. Diagnostic techniques in soil and plant analysis. 1 laboratory. Prerequisite: Concurrent enrollment in SS 322.

# SS 350 Computer Software Applications in Agronomy (2)

Computer software aprelications for soil science and agriculture including word processing, data storage and manipulation, statistical analysis of data, graphics preparation and presentations. 1 lecture, 1 laboratory. Prerequisite: AG 250 or CSC 110 or consent of instructor.

## SS 400 Special Problems for Advanced Undergraduates (2-4)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

## SS 422 Soil Microbiology (3)

Biochemical activities of soil organisms. Effect of soil organisms on the formation, characteristics, and productivity of soils. Methods of studying soil organisms. 2 lectures, 1 laboratory. Prerequisite: SS 221, BACT 221 or BACT 224, CHEM 328 or CHEM 317, or consent of instructor.

## SS 423 Soil and Water Chemistry (4)

Application of concepts in chemistry and clay mineralogy to the management, use and understanding of soils and water. Quantitative approach to understanding and altering the chemical environment in saline, sodic and acidic soils for optimizing their use. 3 lectures. 1 laboratory. Prerequisite: SS 322, CHEM 129, CHEM 326 or CHEM 316, MATH 118 or MATH 131.

## SS 431 Soil Resource Inventory (3)

Development and production of soil surveys for interpretive purposes. Use of soil taxonomy and land classification systems to evaluate land for best management practices. 1 lecture, 2 laboratories. Prerequisite: SS 321.

## SS 432 Soil Physics (4)

Fundamentals of soil physical properties. Structure, texture, water, air and temperature and their application to agricultural and engineering practices. 2 lectures, 2 laboratories. Prerequisite: SS 121, PHYS 121 or PHYS 131, CHEM 122 or CHEM 128, MATH 118 or MATH 131, or consent of instructor.

## SS 433 Land Use Planning (3)

Development of plans and practices for management of agricultural, recreational and urban land use by evaluating the soil capabilities through the use of Soil Survey Reports. 2 lectures, 1 laboratory. Prerequisite: SS 121.

## SS 440 Forest and Range Soils (4)

Ecosystem approach to the chemical, biological, physical and mechanical properties of forest and range soils. Interpretation of specific research findings and their applications to management problems. Preparation of soil management reports similar to those required by various land management organizations. Overnight field trips. Miscellaneous course fee required-see *Class Schedule.* 3 lectures, 1 laboratory. Prerequisite: SS 121.

## SS 442 Soil Vadose Zone Remediation (3)

Water movement in the vadose zone. Monitoring and predicting management effects on water quality. Strategies for selecting the best remediation. Case histories which demonstrate handling of different monitoring problems. 3 lectures. Prerequisite: CHEM 326, GEOL 201, SS 121.

## SS 444 Soil Judging (2)

Morphological description of soils in the field. Taxonomic determination of classifications and interpretive properties from soil descriptions. Participation in collegiate soil judging contests. Total credit limited to 12 units. 1 lecture, 1 laboratory. Prerequisite: SS 321 or consent of instructor.

## SS 453 Tropical Soils (4)

Nature and properties of soils occurring in the tropics, their origin, morphology, classification, fertility, management and conservation. Examine social implications in international agriculture. 3 lectures, 1 laboratory. Prerequisite: SS 121, CHEM 122 or CHEM 128.

## SS 461 Soils Senior Project (1)

Senior project topic selection and contract development with project adviser. Statement of problems, subproblems, assumptions, objectives, hypothesis, methods of analysis and statistial design. Development of literature review and budget of time and finances. Proper format and presentation of tabular and graphic information. 1 activity. Prerequisite: MATH 118 or MATH 131, STAT 211 or STAT 321 or CRSC 411.

## SS 462 Soils Senior Project (3)

Implementation of materials and methods. Collection, analysis and interpretation of data. Completion of formal written report under adviser supervision. Minimum 90 hours. Prerequisite: SS 461.

## SS 463 Undergraduate Soils Seminar (2)

Review of current research, experiments, and problems related to the student's major field of interest. Preparation and presentation of reports on problems or research activities. 2 seminars.

## SS 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

### SS 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

## SS 501 Research Planning (3)

Problem solving and research planning for agriculture, natural resources and related sciences. Preparation of study plans which identify problems, review appropriate literature, formulate objectives, develop methods and provide for presentation and interpretation of results. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

## SS 508 Landscape Management for Erosion Control (3)

Techniques for the development of soil erosion control and the dispersal of surface runoff water on urban, industrial, recreational and dwelling sites. Land grading ordinances and their limitations. Miscellaneous course fee required-see *Class Schedule*. 3 lectures. Prerequisite: Introductory soils course and graduate standing, or consent of instructor.

### SS 522 Advanced Soil Fertility (3)

Current research frontiers in soil fertility. Evaluating soil testing philosophy, theories and interpretation. Optimizing soil conditions for maximizing crop production. Consequences of environmental pollution, trace elements and organic amendments. Chemical reactions including solubility and chelate equilibria, adsorption phenomena, nutrient mobility, soil mineralogy and weathering. Use of foliar fertilization. Radioisotopes in soil fertility. 3 lectures. Prerequisite: SS 322, graduate standing or consent of instructor.

#### SS 581 Graduate Seminar in Soils (3)

Current research, experiments and problems related to soil science. 3 seminars.

#### 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 orginality, clarity, critical and independent thinking, proper analysis of data, appropriate organization and format, and accurate and thorough documentation. Six units required for the M.S. degree. Prerequisite: Graduate standing and consent of instructor.

# STAT-STATISTICS

## STAT 130 Introduction to Statistical Reasoning (3)

GEB B.2.

Survey of statistical ideas and philosophy. Emphasis on concepts rather than in-depth coverage of statistical methods. Topics include sampling, experimentation, data exploration, chance phenomena, and methods of statistical inference. Credit not allowed for students with previous Statistics course. 3 lectures. Prerequisite: Intermediate algebra or equivalent.

### STAT 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

### STAT 211 Elementary Probability and Statistics (3)

**GEB B.2.** 

Classification of statistical data. Calculation and uses of various averages, measures of variability, elementary probability. Binomial and normal distributions. Random sampling, confidence intervals. Introduction to hypothesis testing. 3 lectures. Prerequisite: Intermediate algebra or equivalent.

## STAT 212 Statistical Methods (3) GEB B.2.

Tests of hypotheses, and confidence intervals on common parameters. Linear regression and correlation, multiple regression. Analysis of variance and enumerative data. Nonparametric methods. 3 lectures. Prerequisite: STAT 211.

## STAT 251 Statistical Inference for Management I (4)

GEB B.2.

Descriptive statistics. Probability distributions. Point and interval estimation of common population parameters. Hypothesis tests of population means, proportions, and variances. Chisquare analysis. Nonparametric tests. Survey sampling. 4 lectures. Prerequisite: MATH 124.

#### STAT 252 Statistical Inference for Management II (4)

**GEB B.2.** 

Regression, correlation, multiple regression, time series, and forecasting. Single factor analysis of variance. Statistical quality control. Experience with statistical computer packages in analyzing data sets. Use of computers assumed throughout course. 4 lectures. Prerequisite: STAT 251 and CSC 120 or one course in computer programming.

## STAT 312 Statistical Methods for Engineers (3) GEB B.2.

Survey of statistical methods. Descriptive statistics. Graphical methods. Discrete and continuous random variables. One and two sample confidence intervals and hypothesis tests. Single factor analysis of variance. Chi-square tests. Use of computer for solving statistical problems. 3 lectures. Prerequisite: MATH 142.

## STAT 313 Applied Experimental Design and Regression Models (3) GEB B.2.

Applications of statistics for students not majoring in statistics or mathematics. Analysis of variance including the one-way classification, randomized blocks, Latin squares, and factorial designs. Introduction to multiple regression and to analysis of covariance. Use of computer software in the solution of statistical problems. 3 lectures. Prerequisite: STAT 212.

## STAT 321, 322 Statistical Analysis (3) (4) GEB B.2.

Probability and probability distributions for statistical procedures. Statistical techniques based on sampling from normally distributed populations. Regression and correlation. One and two factor analysis of variance. Chi-square tests. Statistical quality control. Use of statistical computer packages. 3 (4) lectures. Prerequisite: MATH 132 or MATH 142.

## STAT 323 Analysis of Variance (3)

Single and two factor analyses of variance, fixed and random effects, Latin square and other special designs, nested designs, factorial designs and analysis of 2<sup>n</sup> factorial experiments, analysis of covariance. 3 lectures. Prerequisite: STAT 322.

# STAT 324 Applied Regression Analysis (3) GEB B.2.

Simple linear regression, aptness of model, special topics in simple linear regression, multiple linear regression, indicator variables, selection of "best subset," and introduction to nonlinear regression models. 3 lectures. Prerequisite: STAT 212 or STAT 252 or STAT 322.

# STAT 330 Statistical Uses of Computers (3)

Techniques available to the statistician for efficient use of a digital computer to perform statistical computations and to handle large amounts of data. Use of special languages. Analysis of computer software used in the solution of statistical problems. 3 lectures. Prerequisite: STAT 212 or STAT 252 or STAT 322, and one course in computer programming.

## STAT 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

# STAT 415 Nonparametric Methods in Statistics (3)

Hypothesis testing when form of parent population is unknown. Tests based on Binomial Distribution. Measures of dependence. Contingency tables, tests based on ranks. Kolmogorov-Smirnov-type tests. 3 lectures. Prerequisite: STAT 212 or STAT 322.

# STAT 416 Statistical Analysis of Time Series (3)

Descriptive smoothing methods, regression models for time series data, forecasting via exponential smoothing, methods for seasonal data, ARIMA models and Box-Jenkins methods, frequency domain analysis, filtering. 3 lectures. Prerequisite: STAT 252 or STAT 322.

# STAT 418 Analysis of Cross-Classified Data (3)

Discrete multivariate statistics, including analysis of crossclassified data, log-linear models for multidimensional contingency tables, goodness of fit statistics, measures of association, model selection, and hypothesis testing. 3 lectures. Prererequisite: Two courses in statistics and MATH 204 or consent of instructor.

# STAT 419 Applied Multivariate Statistics (3)

Continuous multivariate statistics. Multivariate linear model, principal components and factor analysis, discriminant analysis, clustering, and canonical correlation. 3 lectures. Prerequisite: Two courses in statistics and MATH 204 or consent of instructor.

# STAT 421 Sampling Techniques (3)

Planning, execution, and analysis of sampling from finite populations. Sampling designs and estimation procedures. Nonsampling errors. Questionnaire analysis. Case studies. 3 lectures. Prerequisite: STAT 212, STAT 252, or STAT 322.

# STAT 423 Linear Models (3)

General linear model-a unified approach to various applied methods. Regression, t-test, analysis of variance and covari-

ance. Programming statistical problems. Advanced topics in statistical designs. Split plot design, confounding, fractional factorial, response surfaces. 3 lectures. Prerequisite: STAT 323, MATH 204.

# STAT 425 Probability Theory and Applications I (3)

Basic probability theory, conditional and marginal probability, stochastic independence, probability models for random phenomena, probability distributions, mathematical expectation and transformation. 3 lectures. Prerequisite: STAT 321, MATH 241.

# STAT 426 Probability Theory and Applications II (3)

Multivariate normal distribution, sampling distributions, theory of estimation and hypothesis testing. 3 lectures. Prerequisite: STAT 425.

# STAT 427 Mathematical Statistics (3)

Investigation of statistical theory, including the topics of Bayesian inference, regression and linear hypotheses, and sequential analyses. 3 lectures. Prerequisite: STAT 426.

## STAT 461, 462 Senior Project (2) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

## STAT 463 Undergraduate Seminar (2) (CR/NC)

Reports and discussions by students through seminar methods, based on topics of interest to persons preparing for a career in statistics. Offered only on a Credit/No Credit basis. 2 seminars.

## STAT 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

## STAT 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 (3)

Statistical methods in research for graduate students not majoring in mathematical sciences. Probability distributions, confidence intervals, hypothesis testing, contingency tables, linear regression and correlation. Application of statistics in the student's major field. 3 seminars. Prerequisite: Intermediate algebra or equivalent.

# TH-THEATRE

### TH 210 Introduction to Theatre (3) GEB C.2.

Play production process and approach to the theatre including theatrical terminology, methods, dramatic literature, aesthetics and technology. 3 lectures.

## TH 327, 328 Theatre History and Literature (3) (3) GEB C.3.

History of theatre in the Western world and representative plays from the Greeks through the French Seventeenth Century, and from Eighteenth Century England to the present. 3 lectures. Prerequisite: TH 210 or consent of instructor.

#### TH 330 Stagecraft (3)

Sound, costume construction, stage lighting, make-up, and construction and painting of stage scenery. Total credit limited to 9 units. Prerequisite: Consent of instructor.

## TH 340 Acting (3)

Basic acting techniques, improvisation, characterization, pantomime and movement. 2 lectures, 1 activity. Prerequisite: Consent of instructor.

## TH 342 Directing (3)

Script analysis, motivation and blocking of action, preparation of the prompt book. Direction of one-act plays. 1 lecture, 2 activites. Prerequisite: Junior standing and consent of instructor.

## TH 345 Rehearsal and Performance (3)

Preparation of a play for public presentation, including acting, stage management, publicity and house management. Admission to course by audition only. Total credit limited to 9 units. 3 laboratories.

#### TH 350 Advanced Playwriting (3)

Examines dramatic structure, techniques of dialogue, and means of characterization in variety of plays. Relates dramatic writing to technical, design, directorial and acting demands. Composition of monologues, scenes and one-act play; works read and critiqued in class. 3 seminars. Prerequisite: TH 210, ENGL 114 and ENGL 215 or ENGL 218.

## TH 380 Children's Drama (3)

Role-playing, group dramatization, and related activities. For students preparing to teach. 1 seminar, 2 activities. Prerequisite: Any GEB Area C.2 or C.3 course and sophomore standing.

# TH 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, or project centering around theatre. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

#### TH 430 Introduction to Stage Design: Scenery (3)

Theories and contemporary practices in stage scenic design. Script analysis and production concept through shop plans, renderings and models, property plots. Drafting and design projects. 1 seminar, 2 activities. Prerequisite: Consent of instructor.

### TH 432 Introduction to Stage Design: Costume (3)

Adapting historic and contemporary fashion for the stage. Script analysis for costume detail. Contemporary professional practices. Design projects. 1 seminar, 2 activities. Prerequisite: Consent of instructor.

# TH 434 Introduction to Stage Design: Lighting and Sound (3)

Lighting and sound design for the stage, dance concerts and exhibitions. From script analysis, exhibition proposal, through the rendering of production lighting and sound plots. Light and color. Contemporary instrumentation and controls. Production analysis. Practical execution in performance situations. 1 seminar, 2 activities. Prerequisite: Consent of instructor.

## TH 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

## TH 471 Selected Advanced Laboratory (1–3)

Directed group laboratory study of selected topics for theatre students. *Class Schedule* will list topics selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

# **VGSC-VEGETABLE SCIENCE**

## VGSC 100 Enterprise Project (1-4) (CR/NC)

Selection and completion of a management/production project under faculty supervision. Project participation is subject to approval by the department head and the Cal Poly Foundation. Degree credit limited to 12 units. Credit/No Credit grading only.

## VGSC 230 General Vegetable Crops (4) GEB F.2.

Principles involved in production, harvesting, packaging, and marketing of major California vegetable crops. Survey of the vegetable industry for other than crop science majors. Field trip required. Not open to students with credit in VGSC 232. Miscellaneous course fee required-see *Class Schedule*. 3 lectures, 1 laboratory.

## VGSC 232 Vegetable Crops Production (4)

Production, adaptation, utilization of vegetable crops such as cole crops, beans, celery, peppers, squash, melons, cucumbers, lettuce, carrots, spinach, sweet potatoes. Field trip to a major California vegetable production area required. Not open to students with credit in VGSC 230. Miscellaneous course fee may be required–see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: CRSC 133.

#### VGSC 250 Home Vegetable Production (2)

Practical aspects of growing vegetable crops in the home garden. Seedbed preparation, seeding, transplanting, fertilizing, mulching, composting, irrigation, trellising, pest control, harvest and storage. Organic and conventional cultural practices presented. 1 lecture, 1 laboratory.

### VGSC 421 Postharvest Technology of Horticultural Crops (4) (Also listed as FRSC 421)

Harvesting methods and procedures. Current handling and packaging techniques. Containers, precooling, refrigerated and controlled atmosphere storage. Postharvest physiology of fresh market commodities. Field trip to major California production areas required plus local grower visits. Miscellaneous course fee may be required–see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: One production class in either fruits, vegetables or ornamentals, or consent of instructor.

## VGSC 423 Advanced Vegetable Production (4)

Advanced studies of recent developments and problems of vegetable production. Cultural practices associated with mechanization. Field trip to a major California vegetable production area required. Miscellaneous course fee may be required–see *Class Schedule.* 3 lectures, 1 laboratory. Prerequisite: VGSC 232.

## VGSC 424 Vegetable Crop Management (4)

Organization, management, and operation of commercial vegetable production considering the varied aspects of the entire commercial vegetable industry. Field trip to a major California vegetable production area required. Miscellaneous course fee may be required-see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: VGSC 232 or consent of instructor.

## VGSC 521 Advanced Crop Production (4) (Also listed as CRSC 521)

Production and management of crops under intensive and extensive cultural systems and low-input agriculture. Interaction between growth factors at various levels of production and interaction of cultural practices and plant requirements. Miscellaneous course fee may be required-see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: Graduate standing and consent of instructor.

# **VS-VETERINARY SCIENCE**

## VS 123 Anatomy and Physiology (3)

Structural aspects and the normal functions of the principal systems of the various farm animals. 2 lectures, 1 laboratory. Prerequisite: ZOO 131.

#### VS 200 Special Problems for Undergraduates (2-3)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 3 units per quarter. Prerequisite: Consent of department head.

## VS 203 Animal Parasitology (3)

Identification, life cycles, prevention and control of the common external and internal parasites causing economic loss in livestock. 3 lectures. Prerequisite: ZOO 131.

## VS 241 Veterinary Technology (2)

Application of paraprofessional knowledge and skills including medical terminology, pharmacological metrology, and animal identification, behavior, and restraint. 2 activities.

### VS 302 Animal Hygiene (3)

Basic disease concepts, transmission of infectious diseases, fundamentals of immunology. Infectious disease preventive principles. Livestock producer's role and responsibilities in governmental farm animal disease control programs. 3 lectures. Prerequisite: BACT 221.

## VS 310 Zoonosis (2)

Significant public health diseases transmissible to man through domestic and wild animals, vectors, and food resources. 2 lectures. Prerequisite: ZOO 131 or BIO 101.

## VS 341 Veterinary Technology-Advanced (2)

Application of advanced paraprofessional knowledge involving principles of asepsis, anesthesia, veterinary instrumentation and radiology. Supportive techniques in anesthesia, surgical preparation, and veterinary hematology. 2 activities. Prerequisite: VS 241.

### VS 400 Special Problems for Advanced Undergraduates (2-4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

## VS 438 Systemic Animal Physiology (4)

Homeostatic relationships of organ systems. Cardiovascular, respiratory, urogenital and neuro-endocrinological functions. 3 lectures, 1 laboratory. Prerequisite: VS 123, CHEM 328.

# WS-WOMEN'S STUDIES

## WS 301 Introduction to Women's Studies (3)

Introduction to women's contributions to various areas of human life and to women's place in history and society. Students will increase their understanding of women as a principal category of scholarly investigation. 3 lectures. Prerequisite: ENGL 114, ENGL 125 or PHIL 125 or SPC 125, upper division standing.

## WS 401 Seminar in Women's Studies (3)

Opportunity to explore scholarly works on women's contributions to various areas of human life. Discussion and reports on library research will be incorporated into the course. Field research or service is required. 3 seminars. Prerequisite: WS 301, upper division standing.

## WS 411 Women, Race and Class (3)

Interactive roles of ethnicity, gender and class on the lives of individual women, and society as a whole. Examination of social conditions faced by different groups of contemporary women and the diverse ethnic and class heritages with which they shape their lives. 3 lectures. Prerequisite: WS 301, one course in SOC or WS, upper division standing.

# ZOO-ZOOLOGY

## ZOO 131 General Zoology (4)

Cells, tissues, and organ systems of vertebrates. Emphasis on man and domestic animals. 2 lectures, 2 laboratories.

#### ZOO 237 Human Anatomy (3)

Structure of the human body as the basis of function. Supplemented with demonstrations of human cadavers. Not open for Anatomy and Physiology Concentration credit to students who have completed ZOO 326. 2 lectures, 1 laboratory. Prerequisite: ZOO 131 or BIO 153.

#### ZOO 303 Vertebrate Embryology (3) GEB B.1.b.

Developmental processes from the egg to the formation of the body and the establishment of the principal organs and systems. 3 lectures. Prerequisite: BIO 153.

## ZOO 304 Vertebrate Embryology Laboratory (2)

#### GEB B.1.b.

GEB B.1.b.

Developmental anatomy of selected stages of the frog, chicken and pig. 2 laboratories. Prerequisite or concurrent: ZOO 303.

## ZOO 321 Mammalogy (4)

GEB B.1.b.

Biology and economic importance of mammals. Classification and identification of mammals, with emphasis on California species. 2 lectures, 2 laboratories. Prerequisite: BIO 153.

## ZOO 322 Ichthyology (4)

GEB B.1.b.

Phylogeny, anatomy, functional morphology, physiology, and ecology of marine and freshwater fishes. Special reference to local and economically important species. Laboratory emphasis on taxonomy of California species, especially marine groups. 2 lectures, 2 laboratories. Prerequisite: BIO 153.

## ZOO 323 Ornithology (4)

GEB B.1.b.

Classification and identification of birds, with emphasis on California species. Anatomy, physiology, ecology and behavior. Saturday field trips required. 2 lectures, 2 laboratories. Prereguisite: BIO 153.

## ZOO 324 Zoo Biology (3)

GEB B.1.b.

Wild animals in captivity. Principles and problems of maintaining them for recreational, educational and scientific purposes. 3 lectures. Prerequisite: One course in biology or zoology.

#### ZOO 326 Comparative Anatomy of the Chordates (5) GEB B.1.b.

Comparative structure of chordate organ systems. Laboratory emphasis on dissection techniques. 3 lectures, 2 laboratories. Prerequisite: BIO 153.

#### ZOO 329 Vertebrate Field Zoology (4) GEB B.1.b.

Identification and natural history of terrestrial vertebrates, with emphasis on field studies and local species. 2 lectures, 2 laboratories. Prerequisite: BIO 153.

# ZOO 331, 332 Human Physiology I, II (3) (3) GEB B.1.b.

Function of various human organ systems with appropriate laboratory experiments. Credit not allowed for students in the Anatomy and Physiology Concentration who have completed ZOO 432 or ZOO 433. 2 lectures, 1 laboratory. Prerequisite: ZOO 331: ZOO 237 and CHEM 121 or CHEM 124 or CHEM 127. ZOO 332: ZOO 331.

#### ZOO 336 Invertebrate Zoology (4) GEB B.1.b.

Invertebrate groups of animals with emphasis on taxonomy. morphology, distribution and economic importance, 2 lectures. 2 laboratories, and fieldwork. Prerequisite: BIO 153 or consent of instructor.

## ZOO 340 Human Muscle Anatomy (2)

Muscles of a human cadaver. 1 lecture, 1 laboratory. Prerequisite or concurrent: ZOO 237.

#### GEB B.1.b. ZOO 341 Herpetology (4)

Living and extinct reptiles and amphibians; an adaptive approach to their diversity, biology, and classification. 2 lectures, 2 laboratories. Prerequisite: BIO 153.

## ZOO 356 Neurobiology (3)

GEB B.1.b.

Survey of the nervous system with emphasis on functional anatomy of the human brain. Motor and sensory systems. Neural control mechanisms, including neurotransmitters and neuromodulators. Development, aging, and common disorders. 3 lectures. Prerequisite: BIO 153.

## ZOO 422 Functional Histology (4)

Functional microscopic anatomy of principal tissues and organs of vertebrates. Structural studies to determine mechanisms underlying physiological processes. 2 lectures, 2 laboratories. Prerequisite: BIO 153.

# ZOO 425 Parasitology (4)

External and internal parasites of man and animals. Life history. Parasite-host relationships. Control and recognition of species of clinical importance. 2 lectures, 2 laboratories. Prerequisite: BIO 153 and BACT 221 or BACT 226.

## ZOO 426 Serology and Immunology (4)

Nature of beneficial and harmful immune reactions. Theory and techniques of serological methods in diagnosing disease. Designed for preparing laboratory technologists. 2 lectures, 2 laboratories. Prerequisite: Consent of instructor.

## ZOO 428 Hematology (4)

Formation, composition, function and destruction of blood in health and disease. Methods for examination of blood. Designed for preparing laboratory technologists. 2 lectures, 2 laboratories. Prerequisite: BIO 153 or ZOO 131, and consent of instructor. Recommended: ZOO 426.

## ZOO 432 Physiology II: Comparative Systems (4)

Physiological mechanisms involved in osmotic and ionic regulations, digestion, circulation, respiratory energetics and thermal acclimation. Laboratory experiments in physiological processes and their ecological importance. 2 lectures, 2 laboratories. Prerequisite: BIO 431.

## ZOO 433 Physiology III: Endocrine and **Reproductive** (4)

Introduction to the endocrine and reproductive systems of vertebrate animals. Includes not only classical actions of hormones but also mechanisms of hormone action, relationship between nervous and endocrine systems, hormone bioassay, and selected clinical aspects of endocrinology. 3 lectures, 1 laboratory. Prerequisite: BIO 431.

## ZOO 436 Functional Invertebrate Zoology (4)

Comparative study of the functions of organ systems of the invertebrate groups of organisms. Emphasis on strategies utilized in accomplishing the function of the organ systems in adapting to different environmental demands. 2 lectures, 2 laboratories. Prerequisite: ZOO 336 or consent of instructor.

## ZOO 437 Animal Behavior (4)

Behavioral adaptations of animals to their environment and way of life. Analysis of behavior patterns, use of patterns in clarifying evolutionary and ecological relationships. 3 lectures. 1 laboratory. Prerequisite: BIO 153. Recommended: BIO 325.

## ZOO 530 Behavioral Ecology (3)

Function and evolution of behavioral phenomena as they relate to ecological phenomena. Topics include habitat selection, spacing mechanisms, reproductive strategies, feeding strategies, agonistic, parasitic, and altruistic behavior; migration, and comparative social systems, 3 seminars, Prerequisite: Graduate standing, BIO 325 or BOT 326, ZOO 437. Recommended: BIO 414.





# UNIVERSITY ADMINISTRATION

## **OFFICE OF THE PRESIDENT**

President	Warren J. Baker
Presidential Aide	Gerry K. Mueller
Executive Assistant to the President	Howard West
Affirmative Action Director	Anna J. McDonald

# ACADEMIC AFFAIRS

# **Schools and Departments**

### SCHOOL OF

AGRICULTURE	Interim Dean, Joseph E. Sabol
A	ssociate Dean, Larry P. Rathbun
Associate D	Pean, Steven Kaminaka (Interim)
Agribusiness	M. LeRoy Davis
Agricultural Education	Glen R. Casey
Agricultural Engineering	Edgar J. Carnegie
Animal Sciences and Industry	John W. Algeo
Crop Science	George G. Gowgani
Dairy Science	Edwin H. Jaster
Food Science and Nutrition	Joseph Montecalvo
Natural Resources Manageme	entNorman H. Pillsbury
Ornamental Horticulture	Stephen F. Angley (Interim)
Soil Science	Terry L. Smith

#### SCHOOL OF ARCHITECTURE AND DOMINICAL DECICAL

School of Allenneeroke /	
ENVIRONMENTAL DESIGN	Dean, Paul R. Neel
Associa	te Dean, K. Richard Zweifel
Architectural Engineering	Mark Berrio
Architecture	James R. Bagnall (Interim)
City and Regional Planning	Linda Dalton
Construction Management	James A. Rodger
Landscape Architecture	Gerald L. Smith

SCHOOL OF BUSINESS Associate De	Dean, William Boyes an, Mary Beth Armstrong
Accounting Business Administration Economics Management	James Anderson John C. Rogers Artemis Papakyriazis David A. Peach
SCHOOL OF ENGINEERING	Dean, Peter Y. Lee
Asso Associat Aeronautical Engineering Civil Engineering and	ciate Dean, J. Kent Butler e Dean, Daniel W. Walsh Doral Sandlin
Environmental Engineering Computer Science Electronic and Electrical Engineering Engineering Technology Industrial Engineering Materials Engineering	Stephen Hockaday Roger C. Camp Martin E. Kaliski Kim Davis (Interim) H. JoAnne Freeman Robert H. Heidersbach Ronald L. Mussulman
	Doon Sidnov Piboou
Associa Director, Ethn Art and Design English Foreign Languages and Literatures History Journalism Liberal Studies, Coordinator Music Philosophy	ate Dean, Harry Share, Jr. ic Studies, Robert F. Gish Charles W. Jennings Brent H. Keetch William T. Little Robert E. Burton Nishan R. Havandjian Margaret J. Glaser Clifton E. Swanson Diane P. Michelfelder
Political Science Psychology and Human Developme Social Sciences Speech Communication Theatre and Dance	Dianne N. Long ntLaura A. Freberg Warren DeLey Raymond F. Zeuschner Michael R. Malkin
SCHOOL OF PROFESSIONAL	Ioan Harry I Russelon Ir

STUDIES	Dean, Harry J. Busselen, Jr.
Graphic Communication	Harvey R. Levenson
Home Economics	Barbara P. Weber
Industrial Technology	Gerald E. Cunico
Military Science	Lt. Col. Stephen E. Hack
Physical Education and Recreation	n
Ádministration	Dwayne G. Head

## SCHOOL OF SCIENCE AND

MATHEMATICS	Dean, Philip S. Bailey
	Associate Dean, Harry L. Fierstine
Biological Sciences	V.L. Holland
Chemistry	Norman Eatough
Mathematics	Thomas E. Hale
Physics	Robert H. Dickerson
Statistics	Roxy L. Peck

## UNIVERSITY CENTER FOR

TEACHER EDUCATION ......Director, Susan Roper

## **BUSINESS AFFAIRS**

Interim Vice President, Business Affairs.....Frank T. Lebens Associate Vice President, Business Affairs .... Position Vacant

Business Affairs Associate	Vicki Stover
Director, Budget Planning	
and Administration	Richard R. Ramirez
Director, Environmental	
and Emergency Services	Joseph C. Risser
Interim Director, Facilities Planning	W. Mike Martin
Director, Fiscal Services	Robert Dignan
Director, Plant Operations	Edward M. Naretto
Director, Support Services	Ray Macias

# **INFORMATION SYSTEMS**

Vice President for Information'Systems .....Arthur S. Gloster, II Director, Academic Computing Services....Robert C. Clover Director, Administrative Systems......Jeffrey T. Williams Director, Communication Services......Norman E. Johnson Interim Director, Instructional Computing and Operations ......Arthur J. Chapman Director, Computing Center.....David J. Yang

# PERSONNEL AND EMPLOYEE RELATIONS

Director	Janet L. Pieper
Associate Director	Michael H. Suess
Human Resource Manager	Barbara Melvin
Personnel Programs Manager	loan Lund
Staff Personnel Officer	Robert M. Negranti

# **STUDENT AFFAIRS**

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# UNIVERSITY RELATIONS AND DEVELOPMENT

Vice President, University Relations ......Position Vacant Executive Director, University Relations

and Development.....Charles R. Allen

Associate Vice President,	
University Relations	Larry R. Voss
Director, Alumni Relations	Steven B. Shockley
Director, Annual Giving	Susan Childers-Kraft
Director, Communications and	
Special Events	Darlene Slack
Communications Officer	C. Robert Anderson
Publications Editor	Ginny Monteen
Director, Endowment Developmen	t and
University Development Services	Larry R. Voss
Director, Gift Planning	Ronald D. Nordeen

# **AUXILIARY ORGANIZATIONS**

## Associated Students, Inc.

Executive Director,	Roger Conway
Associate Director, Procurement	<b>o</b>
and Contracts	Stephen H. Adams

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Associate Director, Program ManagementRod Neubert
Galerie DirectorJeanne LaBarbera

## Foundation

Executive Director	Alfred W. Amaral
Associate Executive Director	Robert E. Griffin
Director, Campus Dining	Nancy Williams
Director, El Corral Bookstore	C. Court Warren
Director, Financial Services	Don Shemenske
Personnel Manager	Tom Estrada
Sponsored Programs Administrator	Don Prout
Director, Vocational Education Proc	ductionPatrick Smith

# CAL POLY CHIEF EXECUTIVE OFFICERS

Cal Poly has been guided by the following chief executive officers:

Leroy Anderson	1902	to	1908
Leroy Burns Smith	1908	to	1914
Robert W. Ryder	1914	to	1921
Nicholas Ricciardi	1921	to	1924
Margaret Chase (acting)			1924
Benjamin Ray Crandall	1924	to	1933
Julian A. McPhee	1933	to	1966
Dale W. Andrews (acting)	1966	to	1967
Robert E. Kennedy	1967	to	1979
Dale W. Andrews (acting)			1979
Warren J. Baker		19	79 to

# **FACULTY EMERITI**

(Dates indicate period of service)

Robert E. Kennedy (1940-1979)	President Emeritus
J. Phil Adams, Jr. (1970-1990)	Economics
Robert W. Adamson (1953-1983)	Aeronautical and
Mee	chanical Engineering
William Alexander (1958–1988)	Political Science
John K. Allen (1952–1970)	Veterinary Science
Ray R. Allen (1955–1986)Eng	ineering Technology
Anthony J. Amato (1955–1982)Orna	amental Horticulture
Olive M. Andersen (1957-1972)	Mathematics
Elizabeth B. Anderson (1958–1980)	English
Marshall L. Anderson (1975-1991)	Civil and
Enviro	nmental Engineering
Richard A. Anderson (1947–1983)	Physical Education

David W. Cook (1941–1977)	
Frank C Cover (1965, 1982)	Academic Analis
Frank G. Coyes (1965–1963)	Agricultural Engineering
Franklin S. Crane (1958–1985)	Mechanical Engineering
A. Norman Cruikshanks (1947–19	71)Social Sciences
James T. Culbertson (1953–1977)	Philosophy
Carl C. Cummins (1958–1983)	Dean of Human
	Development and Education
William D. Curtis (1961-1989)	Psychology and
	Human Development
Max Darnielle (1967–1989)	Fnglish
Charles P. Davis (1959, 1982)	Civil and
Charles F. Davis (1930–1903)	Facility and the factor of the
A Likk D (1040, 1002)	environmental engineering
Arnold M. Dean (1949–1982)	Soll Science
Richard Dickey (1956–1986)	Electronic and
	Electrical Engineering
Bruce A. Dickson (1952-1978)	Soil Science
Charles E. Dills (1963-1988)	Chemistry
Robert Dourson (1967-1987)	Computer Science
John F. Dunn Sr. (1961–1981)	Agricultural Engineering
$W_{eclev} = Dunn (1959-1974)$	Craphic Communications
Remard M/ Dural: (1935–1974)	Art and Dasies
Bernard W. Dusek (1965–1989)	An and Design
Walter E. Elliott (1965–1983)	Physics
Charles A. Elston (1947–1973)	Mathematics
James Emmel (1967–1988)	Speech Communication
Jon M. Ericson (1970-1991)	Speech Communication
Edward J. Ernatt (1958–1983)	Education
Warren S. Farrell (1967–1981)	Agricultural Management
M. Dale Federer (1963–1987)	Psychology
	and Human Development
Harry C Einch (1962–1980)	Biological Sciences
Millard   Fotter (1954–1976)	Industrial Engineering
Appa C. Fowler (1965, 1982)	Social Science
Frank Fox (1967, 1989)	Animal Science and Industry
Fight FOX $(1957-1900)$	Orgamental Lightiguiture
Winton H. Frey, Jr. (1963–1990).	
Artnur H. Frietzsche (1965–1987)	English
Clara B. Froggatt (1964–1980)	Counseiing and Testing
Robert H. Frost (1953–1983)	Physics
George S. Furimsky (1955–1973)	Engineering lechnology
Timothy A. Gaskin (1970–1991).	Ornamental Horticulture
Vincent J. Gates (1958–1977)	Journalism
Curtis F. Gerald (1964–1980)	Computer Science
	and Statistics
William R. Gibford (1955–1979)	Animal Science
J. Cordner Gibson (1949-1976)	Agricultural Education
	and Dean of Agriculture
	and Natural Resources
Marcus Gold (1947–1952 and 19	54-1980)Audiovisual
lames R Golden (1967–1983)	Industrial Engineering
David M. Grant (1950–1980)	nglish and Academic Affairs
Rufus I Graves Ir (1951-1954 a	nd
1957-1982)	Architecture
Theodoro C. Crayes (1947-1984)	Engineering Technology
C Hereld Createry (1950–1970)	Printing Technology and
C. Herold Gregory (1950–1970).	Printing rectificitogy and
Lastan MI Custoface (1047 1071)	Management
Lester W. Gustatson $(1947-1971)$	Aeronautical Engineering
Kenneth L. Haggard (1967–1986)	Architecture
KICHARD E. Hall (1946–19//)	Engineering Lechnology
Barbara M. Hallman (1973–1992)	History
Charles J. Hanks (1954–1983)	Mathematics
Reino Hannula (1962–1981)	Computer Science and
	Statistics
Phyllis J. Hansen (1963–1990)	Library

Dov E Andorron (1040-1070)	
KOV E. /ADUEISON (1949-1970)	Business
Russell K Anderson (1955–1991)	Animal Sciences
	and Industry
	and industry
Warren R. Anderson (1946–1979)	Electronic and
	Electrical Engineering
Robert L. Andreini (1954-1983)	Speech Communication
Alfred F. Andreoli (1963-1990)	Aeronautical Engineering
Dil M( Andrew (1959–1990)	E i i Vi i Di i li i
Dale W. Andrews (1950–1983)	Executive vice President
John H. Applegarth (1952–1972)	Biological Sciences
William W. Armentrout (1953-1980	))Education
Robert F. Asbury, Ir. (1964-1988).	Architecture
Charles R Atles $Ir$ (1969–1900).	Crop Scionco
Charles D. Allee, Jr. (1969–1990)	Crop science
James H. Babb (1959–1982)	Graphic Communications
Paraschos Babos (1972–1991)	Biological Sciences
Roger S. Bailey (1962-1979)	Art
Allan S. Baillie (1978-1991)	Management
Stanlay I. Barry (1070-1090)	English
Stanley L. Darr (1959–1960)	English
George C. Beatie (1959–1980)	Music
Joy G. Berghell (1956-1975)	Library
Fllard W. Betz (1947–1976)	Engineering Technology
Charles P. Boymer (1966, 1990)	
Chanes R. Deymer (1900–1990)	
Richard Birkett (1955–1988)Ai	nimal Science and Industry
Chester O. Bishop (1957–1973)	Mechanical Engineering
Charles R. Black (1973-1989)	Mechanical Engineering
Emmett A Bloom (1946–1974)	Animal Science
Envice P. Pongio (1049, 1070)	Engineering Technology
Enrico P. Bongio (1940–1979)	Engineering Technology
James S. Booth (1972–1988)	Biological Sciences
Woodford E. Bowls (1937–1973)	Physics
William M. Boyce (1962-1978)	Management
L Philip Bromley (1947–1973)	Agricultural Management
Howard C Brown $(1943-1983)$	Ornamental Horticulture
110Ward C. Drown (1945-1965)	Omamental i forticulture
	Industrial Technology
William L. Bruckart (1969–1984)	Industrial Technology
Athol J. D. Brunk (1957–1980)	Industrial Technology
Athol J. D. Brunk (1969–1984) Richard A. Bucich (1963–1988)	Industrial Technology Physics Electronic and
Athol J. D. Brunk (1969–1984) Richard A. Bucich (1963–1988)	Industrial Technology Physics Electronic and Electrical Engineering
Athol J. D. Brunk (1969–1984) Richard A. Bucich (1963–1988)	Industrial Technology PhysicsElectronic and Electrical Engineering Animal Science
<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>L. LaVerne Bucy (1955–1978)</li> <li>H. H. Burlingham (1948–1972)</li> </ul>	Industrial Technology Physics Electronic and Electrical Engineering Animal Science
<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>L. LaVerne Bucy (1955–1978)</li> <li>H. H. Burlingham (1948–1972)</li> <li>Wallaco Burt (1968–1986)</li> </ul>	Industrial Technology Physics Electronic and Electrical Engineering Animal Science
<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>L. LaVerne Bucy (1955–1978)</li> <li>H. Burlingham (1948–1972)</li> <li>Wallace Burt (1968–1986)</li> <li>William Q. Burchersen (1955–1978)</li> </ul>	Industrial Technology Physics Electronic and Electrical Engineering Animal Science Agricultural Education
William L. Bruckart (1969–1984)         Athol J. D. Brunk (1957–1980)         Richard A. Bucich (1963–1988)         L. LaVerne Bucy (1955–1978)         H. H. Burlingham (1948–1972)         Wallace Burt (1968–1986)         William O. Buschman (1956–1980)	Industrial Technology Physics Electronic and Electrical Engineering Animal Science Agricultural Education Computer Science
<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>L. LaVerne Bucy (1955–1978)</li> <li>H. H. Burlingham (1948–1972)</li> <li>Wallace Burt (1968–1986)</li> <li>William O. Buschman (1956–1980)</li> </ul>	Industrial Technology Physics Physics Agricultural Education Agricultural Education Accounting Computer Science and Statistics
<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>L. LaVerne Bucy (1955–1978)</li> <li>H. H. Burlingham (1948–1972)</li> <li>Wallace Burt (1968–1986)</li> <li>William O. Buschman (1956–1980)</li> <li>Arthur G. Butzbach (1950–1970)</li> </ul>	Industrial Technology Physics Physics Agricultural Education Agricultural Education Accounting Computer Science and Statistics Education
<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>L. LaVerne Bucy (1955–1978)</li> <li>H. H. Burlingham (1948–1972)</li> <li>Wallace Burt (1968–1986)</li> <li>William O. Buschman (1956–1980)</li> <li>Arthur G. Butzbach (1950–1970)</li> <li>Edward A. Cairns (1969–1991)</li> </ul>	Industrial Technology Physics Electronic and Electrical Engineering Animal Science Agricultural Education Computer Science and Statistics Education English
<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>L. LaVerne Bucy (1955–1978)</li> <li>H. H. Burlingham (1948–1972)</li> <li>Wallace Burt (1968–1986)</li> <li>William O. Buschman (1956–1980)</li> <li>Arthur G. Butzbach (1950–1970)</li> <li>Edward A. Cairns (1969–1991)</li> <li>Tracey G. Call (1962–1980)</li> </ul>	Industrial Technology Physics Electronic and Electrical Engineering Animal Science Agricultural Education Computer Science and Statistics Education English
<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>L. LaVerne Bucy (1955–1978)</li> <li>H. H. Burlingham (1948–1972)</li> <li>Wallace Burt (1968–1986)</li> <li>William O. Buschman (1956–1980)</li> <li>Arthur G. Butzbach (1950–1970)</li> <li>Edward A. Cairns (1969–1991)</li> <li>Tracey G. Call (1962–1980)</li> <li>Laurence H. Carr (1962–1980)</li> </ul>	Industrial Technology Physics Electronic and Electrical Engineering Agricultural Education Accounting Computer Science and Statistics Education English Biological Sciences Engineering Technology
<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>L. LaVerne Bucy (1955–1978)</li> <li>H. H. Burlingham (1948–1972)</li> <li>Wallace Burt (1968–1986)</li> <li>William O. Buschman (1956–1980)</li> <li>Arthur G. Butzbach (1950–1970)</li> <li>Edward A. Cairns (1969–1991)</li> <li>Tracey G. Call (1962–1980)</li> <li>Laurence H. Carr (1963–1980)</li> </ul>	Industrial Technology Physics Electronic and Electrical Engineering Agricultural Education Agricultural Education Computer Science and Statistics Education English Biological Sciences Engineering Technology
William L. Bruckart (1969–1984)         Athol J. D. Brunk (1957–1980)         Richard A. Bucich (1963–1988)         L. LaVerne Bucy (1955–1978)         H. H. Burlingham (1948–1972)         Wallace Burt (1968–1986)         William O. Buschman (1956–1980)         Arthur G. Butzbach (1950–1970)         Edward A. Cairns (1969–1991)         Tracey G. Call (1962–1980)         Laurence H. Carr (1963–1980)         Majorie Cass (1957–1974)	Industrial Technology Physics Physics Electronic and Electrical Engineering Agricultural Education Agricultural Education Accounting Computer Science and Statistics Education 
William L. Bruckart (1969–1984)         Athol J. D. Brunk (1957–1980)         Richard A. Bucich (1963–1988)         L. LaVerne Bucy (1955–1978)         H. H. Burlingham (1948–1972)         Wallace Burt (1968–1986)         William O. Buschman (1956–1980)         Arthur G. Butzbach (1950–1970)         Edward A. Cairns (1969–1991)         Tracey G. Call (1962–1980)         Marjorie Cass (1957–1974)         Everett M. Chandler (1951–1977)	Industrial Technology Physics Physics Physics Agricultural Education Agricultural Education Agricultural Education Accounting Computer Science and Statistics Education Education Biological Sciences Engineering Technology Education 
<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>L. LaVerne Bucy (1955–1978)</li> <li>H. H. Burlingham (1948–1972)</li> <li>Wallace Burt (1968–1986)</li> <li>William O. Buschman (1956–1980)</li> <li>Arthur G. Butzbach (1950–1970)</li> <li>Edward A. Cairns (1969–1991)</li> <li>Tracey G. Call (1962–1980)</li> <li>Laurence H. Carr (1963–1980)</li> <li>Marjorie Cass (1957–1974)</li> <li>Everett M. Chandler (1951–1977)</li> <li>Daniel C. Chase (1954–1979)</li> </ul>	Industrial Technology Physics Physics Physics Agricultural Education Agricultural Education Agricultural Education Accounting Computer Science and Statistics Education English Engineering Technology Engineering Technology Engineering Technology Education Education Engineering Technology Engineering Technology 
<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>L. LaVerne Bucy (1955–1978)</li> <li>H. H. Burlingham (1948–1972)</li> <li>Wallace Burt (1968–1986)</li> <li>William O. Buschman (1956–1980)</li> <li>Arthur G. Butzbach (1950–1970)</li> <li>Edward A. Cairns (1969–1991)</li> <li>Tracey G. Call (1962–1980)</li> <li>Laurence H. Carr (1963–1980)</li> <li>Marjorie Cass (1957–1974)</li> <li>Everett M. Chandler (1951–1977)</li> <li>Daniel C. Chase (1954–1979)</li> <li>F. Stuart Chestnut (1963–1990)</li> </ul>	Industrial Technology Physics Physics Physics Agricultural Education Agricultural Education Agricultural Education Computer Science and Statistics Education English English Engineering Technology Education Engineering Technology Education 
<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>L. LaVerne Bucy (1955–1978)</li> <li>H. H. Burlingham (1948–1972)</li> <li>Wallace Burt (1968–1986)</li> <li>William O. Buschman (1956–1980)</li> <li>Arthur G. Butzbach (1950–1970)</li> <li>Edward A. Cairns (1969–1991)</li> <li>Laurence H. Carr (1963–1980)</li> <li>Marjorie Cass (1957–1974)</li> <li>Everett M. Chandler (1951–1977)</li> <li>Daniel C. Chase (1954–1979)</li> <li>F. Stuart Chestnut (1963–1990)</li> </ul>	Industrial Technology Physics Physics Physics Agricultural Education Agricultural Education Computer Science and Statistics Education English Education Engineering Technology Education Student Affairs Agricultural Management Physical Education and Recreation Administration
<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>L. LaVerne Bucy (1955–1978)</li> <li>H. H. Burlingham (1948–1972)</li> <li>Wallace Burt (1968–1986)</li> <li>William O. Buschman (1956–1980)</li> <li>Arthur G. Butzbach (1950–1970)</li> <li>Edward A. Cairns (1969–1991)</li> <li>Laurence H. Carr (1963–1980)</li> <li>Marjorie Cass (1957–1974)</li> <li>Everett M. Chandler (1951–1977)</li> <li>Daniel C. Chase (1954–1979)</li> <li>F. Stuart Chestnut (1963–1980)</li> <li>Gaylord Chizek (1958–1989)</li> </ul>	Industrial Technology Physics Physics Physics Agricultural Education Agricultural Education Accounting Computer Science and Statistics Education Education English Biological Sciences Engineering Technology Education Education Engineering Technology Education Education Engineering Technology 
<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>L. LaVerne Bucy (1955–1978)</li> <li>H. H. Burlingham (1948–1972)</li> <li>Wallace Burt (1968–1986)</li> <li>William O. Buschman (1956–1980)</li> <li>Arthur G. Butzbach (1950–1970)</li> <li>Edward A. Cairns (1969–1991)</li> <li>Tracey G. Call (1962–1980)</li> <li>Laurence H. Carr (1963–1980)</li> <li>Marjorie Cass (1957–1974)</li> <li>Everett M. Chandler (1951–1977)</li> <li>Daniel C. Chase (1954–1979)</li> <li>Gaylord Chizek (1958–1989)</li> </ul>	Industrial Technology Physics Physics Electronic and Electrical Engineering Agricultural Education Agricultural Education Accounting Computer Science and Statistics Education English Biological Sciences Engineering Technology Education Student Affairs Agricultural Management Physical Education and Recreation Administration Agricultural Management
<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>L. LaVerne Bucy (1955–1978)</li> <li>H. H. Burlingham (1948–1972)</li> <li>Wallace Burt (1968–1986)</li> <li>William O. Buschman (1956–1980)</li> <li>Arthur G. Butzbach (1950–1970)</li> <li>Edward A. Cairns (1969–1991)</li> <li>Tracey G. Call (1962–1980)</li> <li>Marjorie Cass (1957–1974)</li> <li>Everett M. Chandler (1951–1977)</li> <li>Daniel C. Chase (1954–1979)</li> <li>Gaylord Chizek (1958–1989)</li> <li>Thomas T. L. Chou (1961–1986)</li> </ul>	Industrial Technology Physics Physics Physics Agricultural Education Agricultural Education Agricultural Education Accounting Computer Science and Statistics Education Education 
<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>L. LaVerne Bucy (1955–1978)</li> <li>H. H. Burlingham (1948–1972)</li> <li>Wallace Burt (1968–1986)</li> <li>William O. Buschman (1956–1980)</li> <li>Arthur G. Butzbach (1950–1970)</li> <li>Edward A. Cairns (1969–1991)</li> <li>Tracey G. Call (1962–1980)</li> <li>Laurence H. Carr (1963–1980)</li> <li>Marjorie Cass (1957–1974)</li> <li>Everett M. Chandler (1951–1977)</li> <li>Daniel C. Chase (1954–1979)</li> <li>Gaylord Chizek (1958–1989)</li> <li>Thomas T. L. Chou (1961–1986)</li> </ul>	Industrial Technology Physics Physics Physics Agricultural Education Agricultural Education Accounting Computer Science and Statistics Education English Biological Sciences Engineering Technology Engineering Technology Education Student Affairs Agricultural Management Physical Education and Recreation Administration Agricultural Management Physical Education and Recreation Administration Agricultural Management Physical Education and Recreation Administration 
<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>L. LaVerne Bucy (1955–1978)</li> <li>H. H. Burlingham (1948–1972)</li> <li>Wallace Burt (1968–1986)</li> <li>William O. Buschman (1956–1980)</li> <li>Arthur G. Butzbach (1950–1970)</li> <li>Edward A. Cairns (1969–1991)</li> <li>Tracey G. Call (1962–1980)</li> <li>Laurence H. Carr (1963–1980)</li> <li>Marjorie Cass (1957–1974)</li> <li>Daniel C. Chase (1954–1977)</li> <li>Gaylord Chizek (1958–1989)</li> <li>Robert L. Cleath (1965 and</li> </ul>	Industrial Technology Physics Electronic and Electrical Engineering Animal Science Agricultural Education Computer Science and Statistics Education Education Biological Sciences Education Student Affairs Agricultural Management Agricultural Management Agricultural Management Electronic and Electrical Engineering
<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>L. LaVerne Bucy (1955–1978)</li> <li>H. H. Burlingham (1948–1972)</li> <li>Wallace Burt (1968–1986)</li> <li>William O. Buschman (1956–1980)</li> <li>Arthur G. Butzbach (1950–1970)</li> <li>Edward A. Cairns (1969–1991)</li> <li>Laurence H. Carr (1963–1980)</li> <li>Marjorie Cass (1957–1974)</li> <li>Everett M. Chandler (1951–1977)</li> <li>Daniel C. Chase (1954–1979)</li> <li>Gaylord Chizek (1958–1989)</li> <li>Robert L. Cleath (1965 and 1968–1980)</li> </ul>	Industrial Technology Physics Physics Electronic and Electrical Engineering Agricultural Education Accounting Computer Science and Statistics Education Education Engineering Technology Education Student Affairs Agricultural Management Physical Education and Recreation Administration Agricultural Management Physical Education and Electrical Engineering Speech Communication
<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>L. LaVerne Bucy (1955–1978)</li> <li>H. H. Burlingham (1948–1972)</li> <li>Wallace Burt (1968–1986)</li> <li>William O. Buschman (1956–1980)</li> <li>Arthur G. Butzbach (1950–1970)</li> <li>Edward A. Cairns (1969–1991)</li> <li>Laurence H. Carr (1963–1980)</li> <li>Marjorie Cass (1957–1974)</li> <li>Everett M. Chandler (1951–1977)</li> <li>Daniel C. Chase (1954–1979)</li> <li>F. Stuart Chestnut (1963–1980)</li> <li>Gaylord Chizek (1958–1989)</li> <li>Robert L. Cleath (1965 and 1968–1980)</li> <li>Edward Clerkin (1964–1987)</li> </ul>	Industrial Technology Physics Physics Electronic and Electrical Engineering Agricultural Education Accounting Computer Science and Statistics Education Education Education Biological Sciences Engineering Technology Education Education Education Education Education Education 
<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>L. LaVerne Bucy (1955–1978)</li> <li>H. H. Burlingham (1948–1972)</li> <li>Wallace Burt (1968–1986)</li> <li>William O. Buschman (1956–1980)</li> <li>Arthur G. Butzbach (1950–1970)</li> <li>Edward A. Cairns (1969–1991)</li> <li>Laurence H. Carr (1963–1980)</li> <li>Marjorie Cass (1957–1974)</li> <li>Everett M. Chandler (1951–1977)</li> <li>Daniel C. Chase (1954–1979)</li> <li>F. Stuart Chestnut (1963–1980)</li> <li>Gaylord Chizek (1958–1989)</li> <li>Robert L. Cleath (1965 and 1968–1980)</li> <li>Edward Clerkin (1964–1987)</li> </ul>	Industrial Technology Physics Physics Electronic and Electrical Engineering Agricultural Education Agricultural Education Accounting Computer Science and Statistics English Education Engineering Technology Engineering Technology Education Engineering Technology Education Engineering Technology Education 
<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>L. LaVerne Bucy (1955–1978)</li> <li>H. H. Burlingham (1948–1972)</li> <li>Wallace Burt (1968–1986)</li> <li>William O. Buschman (1956–1980)</li> <li>Arthur G. Butzbach (1950–1970)</li> <li>Edward A. Cairns (1969–1991)</li> <li>Tracey G. Call (1962–1980)</li> <li>Laurence H. Carr (1963–1980)</li> <li>Marjorie Cass (1957–1974)</li> <li>Everett M. Chandler (1951–1977)</li> <li>Daniel C. Chase (1954–1979)</li> <li>F. Stuart Chestnut (1963–1980)</li> <li>Gaylord Chizek (1958–1989)</li> <li>Robert L. Cleath (1965 and 1968–1980)</li> <li>Edward Clerkin (1964–1987)</li> <li>Clifford B. Cloonan (1957, 1990)</li> </ul>	Industrial Technology Physics Physics Physics Agricultural Education Agricultural Education Agricultural Education Accounting Computer Science and Statistics Education English Biological Sciences Engineering Technology Education Student Affairs Agricultural Management Physical Education and Recreation Administration Agricultural Management Agricultural Management Agricultural Management Speech Communication Electronic and Electrical Engineering Electronic and
<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>L. LaVerne Bucy (1955–1978)</li> <li>H. H. Burlingham (1948–1972)</li> <li>Wallace Burt (1968–1986)</li> <li>William O. Buschman (1956–1980)</li> <li>Arthur G. Butzbach (1950–1970)</li> <li>Edward A. Cairns (1969–1991)</li> <li>Tracey G. Call (1962–1980)</li> <li>Laurence H. Carr (1963–1980)</li> <li>Everett M. Chandler (1951–1977)</li> <li>Daniel C. Chase (1954–1979)</li> <li>F. Stuart Chestnut (1963–1980)</li> <li>Gaylord Chizek (1958–1989)</li> <li>Robert L. Cleath (1965 and 1968–1980)</li> <li>Edward Clerkin (1964–1987)</li> <li>Clifford B. Cloonan (1957–1990)</li> </ul>	Industrial Technology Physics Physics Electronic and Electrical Engineering Agricultural Education Accounting Computer Science and Statistics Education English Biological Sciences Engineering Technology Education Student Affairs Agricultural Management Physical Education and Recreation Administration Agricultural Management Physical Education and Recreation Administration Electronic and Electrical Engineering 
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<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>L. LaVerne Bucy (1955–1978)</li> <li>H. H. Burlingham (1948–1972)</li> <li>Wallace Burt (1968–1986)</li> <li>William O. Buschman (1956–1980)</li> <li>Arthur G. Butzbach (1950–1970)</li> <li>Edward A. Cairns (1969–1991)</li> <li>Laurence H. Carr (1963–1980)</li> <li>Marjorie Cass (1957–1974)</li> <li>Everett M. Chandler (1951–1977)</li> <li>Daniel C. Chase (1954–1979)</li> <li>F. Stuart Chestnut (1963–1980)</li> <li>Gaylord Chizek (1958–1989)</li> <li>Robert L. Cleath (1965 and 1968–1980)</li> <li>Edward Clerkin (1964–1987)</li> <li>Clifford B. Cloonan (1957–1990)</li> <li>George Clucas (1968–1982)</li> </ul>	Industrial Technology Physics Physics Electronic and Electrical Engineering Agricultural Education Accounting Computer Science and Statistics English Education English Engineering Technology Education Student Affairs Agricultural Management Physical Education and Recreation Administration Electronic and Electrical Engineering Speech Communication Electronic and Electrical Engineering Electronic and Electrical Engineering Electronic and Electrical Engineering 
<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>L. LaVerne Bucy (1955–1978)</li> <li>H. H. Burlingham (1948–1972)</li> <li>Wallace Burt (1968–1986)</li> <li>William O. Buschman (1956–1980)</li> <li>Arthur G. Butzbach (1950–1970)</li> <li>Edward A. Cairns (1969–1991)</li> <li>Laurence H. Carr (1963–1980)</li> <li>Marjorie Cass (1957–1974)</li> <li>Everett M. Chandler (1951–1977)</li> <li>Daniel C. Chase (1954–1979)</li> <li>F. Stuart Chestnut (1963–1980)</li> <li>Gaylord Chizek (1958–1989)</li> <li>Robert L. Cleath (1965 and 1968–1980)</li> <li>Edward Clerkin (1964–1987)</li> <li>Clifford B. Cloonan (1957–1990)</li> <li>George Clucas (1968–1982)</li> <li>Donald M. Coats (1964–1988)</li> </ul>	Industrial Technology Physics Physics Electronic and Electrical Engineering Agricultural Education Accounting Computer Science and Statistics Education Education Education Education Education Education Education Education Education Education Education Education Education Education Education Education Education Education Education 
<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>H. H. Burlingham (1948–1972)</li> <li>Wallace Burt (1968–1986)</li> <li>William O. Buschman (1956–1980)</li> <li>Arthur G. Butzbach (1950–1970)</li> <li>Edward A. Cairns (1969–1991)</li> <li>Laurence H. Carr (1963–1980)</li> <li>Marjorie Cass (1957–1974)</li> <li>Everett M. Chandler (1951–1977)</li> <li>Daniel C. Chase (1954–1979)</li> <li>F. Stuart Chestnut (1963–1980)</li> <li>Gaylord Chizek (1958–1989)</li> <li>Robert L. Cleath (1965 and 1968–1980)</li> <li>Edward Clerkin (1964–1987)</li> <li>Clifford B. Cloonan (1957–1990)</li> <li>George Clucas (1968–1982)</li> <li>Ralph C. Collins (1955–1974)</li> </ul>	Industrial Technology Physics Electronic and Electrical Engineering Agricultural Education Accounting Computer Science and Statistics Education Education Education Biological Sciences Engineering Technology Education Student Affairs Agricultural Management Physical Education and Recreation Administration Agricultural Management Physical Education and Electrical Engineering Speech Communication Electronic and Electrical Engineering Electronic and Electrical Engineering Electronic and Electrical Engineering 
<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>H. H. Burlingham (1948–1972)</li> <li>Wallace Burt (1968–1986)</li> <li>William O. Buschman (1956–1970)</li> <li>Edward A. Cairns (1969–1991)</li> <li>Edward A. Cairns (1969–1991)</li> <li>Laurence H. Carr (1963–1980)</li> <li>Marjorie Cass (1957–1974)</li> <li>Everett M. Chandler (1951–1977)</li> <li>Daniel C. Chase (1954–1979)</li> <li>F. Stuart Chestnut (1963–1980)</li> <li>Gaylord Chizek (1958–1989)</li> <li>Robert L. Cleath (1965 and 1968–1980)</li> <li>Edward Clerkin (1964–1987)</li> <li>Clifford B. Cloonan (1957–1990)</li> <li>George Clucas (1968–1982)</li> <li>Ralph C. Collins (1955–1974)</li> <li>Spelman B. Collins (1940–1968)</li> </ul>	Industrial Technology Physics Physics Electronic and Electrical Engineering Agricultural Education Accounting Computer Science and Statistics Education English Biological Sciences Engineering Technology Education Student Affairs Agricultural Management Student Affairs Agricultural Management Agricultural Management Speech Communication Electronic and Electrical Engineering Speech Communication Electronic and Electrical Engineering Electronic and Electrical Engineering Electronic and Electrical Engineering 
<ul> <li>William L. Bruckart (1969–1984)</li> <li>Athol J. D. Brunk (1957–1980)</li> <li>Richard A. Bucich (1963–1988)</li> <li>L. LaVerne Bucy (1955–1978)</li> <li>H. H. Burlingham (1948–1972)</li> <li>Wallace Burt (1968–1986)</li> <li>William O. Buschman (1956–1980)</li> <li>Arthur G. Butzbach (1950–1970)</li> <li>Edward A. Cairns (1969–1991)</li> <li>Tracey G. Call (1962–1980)</li> <li>Laurence H. Carr (1963–1980)</li> <li>Marjorie Cass (1957–1974)</li> <li>Everett M. Chandler (1951–1977)</li> <li>Daniel C. Chase (1954–1979)</li> <li>Gaylord Chizek (1958–1989)</li> <li>Robert L. Cleath (1965 and 1968–1980)</li> <li>Robert L. Cleath (1965 and 1968–1980)</li> <li>Clifford B. Cloonan (1957–1990)</li> <li>George Clucas (1968–1982)</li> <li>Donald M. Coats (1964–1988)</li> <li>Ralph C. Collins (1940–1968)</li> <li>F. Wesley Conner (1963–1984)</li> </ul>	Industrial Technology Physics Physics Electronic and Electrical Engineering Agricultural Education Accounting Computer Science and Statistics Education English Biological Sciences Engineering Technology Education Student Affairs Agricultural Management Physical Education and Recreation Administration Agricultural Management Physical Education and Recreation Administration Agricultural Management Physical Education and Electrical Engineering Speech Communication Electronic and Electrical Engineering Electronic and Electrical Engineering 

Alexander N. Landyshev (1956–19	
riexander in Eanaysher (1990 is	72)Electronic and
	Electrical Engineering
James A. Langford (1955-1976)	Education
David C. Langiold (1955–1970)	
Paul S. Lansman (1964-1979)	Viatnematics
Thomas Lee (1952–1988)	Physical Education and
	Recreation Administration
Vance D. Lewis (1946–1972)	Physics and
Valice D. Lettis (1910-1972)	f Science and Mathematics
Charles II. Linderson et (1050, 1070	
Charles H. Lindamood (1958–1975	)English
Willard H. Loper (1955–1983)	Agricultural Engineering
Bernice B. Loughran (1958–1980).	Art
lohn J. Lowry (1962–1987)	Mathematics
Thomas M. Lukes (1962–1985)	Food Science
Coorgo P. Mach (1952 1963)	Mathomatics
George K. Mach (1994–1991)	Anglita stural Engineering
Hans Mager (1949–1985)	Architectural Engineering
Leon W. Magur (1958–1983)	Physics
Ena L. Marston (1946–1970)	English
Angelina Martinez (1966-1991)	University Library
Scott   Maughan (1965–1980)	History
John W/ McCombs (1960-1900)	Electronic and
John W. McCombs (1900–1991)	Electrical Engineering
	Electrical Engineering
Robert F. McDonnell (1975–1991)	English
Willard L. McGonagill (1967–1989	)Architecture
lames M. McGrath (1946-1975)	Engineering Technology
Malcolm McLeod (1973–1988)	Biological Sciences
Ceorge H. McMeen (1960-1977)	Mathematics
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Mac Mickobble (1962–1979)	industrial Technology
John L. Merriam (1958–1978)	Agricultural Engineering
Thomas O. Meyer (1955-1979)	Food Science
Allen D. Miller (1960–1983)	Mathematics
Ernest C. Miller (1968–1987)	Management
Harold R. Miller (1968–1991)	Accounting
Dragoslav M. Misic (1900–1991)	
	Chuland
	Civil and
	Environmental Engineering
Karen Moerman (1969–1989)	Environmental Engineering
Karen Moerman (1969–1989) David H. Montgomery (1956–198)	Environmental Engineering Biological Sciences
Karen Moerman (1969–1989) David H. Montgomery (1956–1988) Sixto E. Moreira (1972–1991)	Environmental Engineering Home Economics 5)Biological Sciences Architecture
Karen Moerman (1969–1989) David H. Montgomery (1956–1989 Sixto E. Moreira (1972–1991) Donald Morgan (1968–1988)	Environmental Engineering Biological Sciences Architecture
Karen Moerman (1969–1989) David H. Montgomery (1956–198) Sixto E. Moreira (1972–1991) Donald Morgan (1968–1988)	Environmental Engineering Home Economics 5)Biological Sciences Architecture Industrial Engineering
Karen Moerman (1969–1989) David H. Montgomery (1956–198) Sixto E. Moreira (1972–1991) Donald Morgan (1968–1988) John H. Mott (1967–1983)	Environmental Engineering Home Economics 5)Biological Sciences Architecture Industrial Engineering English
Karen Moerman (1969–1989) David H. Montgomery (1956–1980 Sixto E. Moreira (1972–1991) Donald Morgan (1968–1988) John H. Mott (1967–1983) Billy W. Mounts (1956–1977)	Environmental Engineering Home Economics 5)Biological Sciences Architecture Industrial Engineering English Health Center Physician
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Karen Moerman (1969–1989) David H. Montgomery (1956–1989) Sixto E. Moreira (1972–1991) Donald Morgan (1968–1988) John H. Mott (1967–1983) Billy W. Mounts (1956–1977) Carl F. Moy (1968–1984)	Environmental Engineering Home Economics 5)Biological Sciences Architecture Industrial Engineering English Health Center Physician and Surgeon Dairy Science
Karen Moerman (1969–1989)         David H. Montgomery (1956–1981)         David E. Moreira (1972–1991)         Donald Morgan (1968–1988)         John H. Mott (1967–1983)         Billy W. Mounts (1956–1977)         Carl F. Moy (1968–1984)         Richard F. Nelson (1960–1989)	Environmental Engineering Home Economics 5)Biological Sciences Architecture Industrial Engineering English Health Center Physician and Surgeon Dairy Science Biological Sciences
Karen Moerman (1969–1989) David H. Montgomery (1956–198) Sixto E. Moreira (1972–1991) Donald Morgan (1968–1988) John H. Mott (1967–1983) Billy W. Mounts (1956–1977) Carl F. Moy (1968–1984) Richard F. Nelson (1960–1989) Loren L. Nicholson (1956–1979)	Environmental Engineering Environmental Engineering Biological Sciences Architecture Industrial Engineering English Health Center Physician and Surgeon Dairy Science Biological Sciences
Karen Moerman (1969–1989) David H. Montgomery (1956–1989) Sixto E. Moreira (1972–1991) Donald Morgan (1968–1988) John H. Mott (1967–1983) Billy W. Mounts (1956–1977) Carl F. Moy (1968–1984) Richard F. Nelson (1960–1989) Loren L. Nicholson (1956–1979) Dell O. Nickell (1964–1980)	Environmental Engineering 
Karen Moerman (1969–1989) David H. Montgomery (1956–198) Sixto E. Moreira (1972–1991) Donald Morgan (1968–1988) John H. Mott (1967–1983) Billy W. Mounts (1956–1977) Carl F. Moy (1968–1984) Richard F. Nelson (1960–1989) Loren L. Nicholson (1956–1979) Dell O. Nickell (1964–1980)	Environmental Engineering 
Karen Moerman (1969–1989)         David H. Montgomery (1956–198)         Sixto E. Moreira (1972–1991)         Donald Morgan (1968–1988)         John H. Mott (1967–1983)         John H. Mott (1967–1983)         Garl F. Moy (1968–1984)         Richard F. Nelson (1960–1989)         Loren L. Nicholson (1956–1979)         Dell O. Nickell (1964–1980)         Keith E. Nielsen (1959–1991)	Environmental Engineering Home Economics 5)Biological Sciences Architecture Industrial Engineering English Health Center Physician and Surgeon Dairy Science Biological Sciences Journalism Architectural Engineering Speech Communication
Karen Moerman (1969–1989)         David H. Montgomery (1956–1981)         David E. Moreira (1972–1991)         Donald Morgan (1968–1988)         John H. Mott (1967–1983)         John H. Mott (1967–1983)         Billy W. Mounts (1956–1977)         Carl F. Moy (1968–1984)         Richard F. Nelson (1960–1989)         Loren L. Nicholson (1956–1979)         Dell O. Nickell (1964–1980)         Keith E. Nielsen (1959–1991)         Glenn A. Noble (1947–1973)	Environmental Engineering Home Economics 5)Biological Sciences Architecture Industrial Engineering English Health Center Physician and Surgeon Dairy Science Biological Sciences Journalism Architectural Engineering Speech Communication Biological Sciences
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Karen Moerman (1969–1989)         David H. Montgomery (1956–1981)         David E. Moreira (1972–1991)         Donald Morgan (1968–1988)         John H. Mott (1967–1983)         John H. Mott (1967–1983)         Billy W. Mounts (1956–1977)         Carl F. Moy (1968–1984)         Richard F. Nelson (1960–1989)         Loren L. Nicholson (1956–1979)         Dell O. Nickell (1964–1980)         Keith E. Nielsen (1959–1991)         Glenn A. Noble (1947–1973)         Thomas F. Nolan (1949–1974)         Raymond E. Nordquist (1965–199)	Environmental Engineering 
Karen Moerman (1969–1989)         David H. Montgomery (1956–198)         Sixto E. Moreira (1972–1991)         Donald Morgan (1968–1988)         John H. Mott (1967–1983)         John H. Mott (1967–1983)         Billy W. Mounts (1956–1977)         Carl F. Moy (1968–1984)         Richard F. Nelson (1960–1989)         Loren L. Nicholson (1956–1979)         Dell O. Nickell (1964–1980)         Keith E. Nielsen (1959–1991)         Glenn A. Noble (1947–1973)         Thomas F. Nolan (1949–1974)         Raymond E. Nordquist (1965–1991)	
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Karen Moerman (1969–1989)         David H. Montgomery (1956–1981)         David H. Montgomery (1956–1981)         Sixto E. Moreira (1972–1991)         Donald Morgan (1968–1988)         John H. Mott (1967–1983)         John H. Mott (1967–1983)         Billy W. Mounts (1956–1977)         Carl F. Moy (1968–1984)         Richard F. Nelson (1960–1989)         Loren L. Nicholson (1956–1979)         Dell O. Nickell (1964–1980)         Keith E. Nielsen (1959–1991)         Glenn A. Noble (1947–1973)         Thomas F. Nolan (1949–1974)         Raymond E. Nordquist (1965–199)         Eugene L. O'Connor (1964–1991)         Howard R. O'Daniels (1938–1971)         Michael J. O'Leary (1951–1982)         Barton C. Olsen (1968–1990)         Leon F. Osteyee (1957–1983)         Philip H. Overmeyer (1958–1972)         Gordon J. Paul (1969–1983)         Evolve L. Pellatop (1966–1993)	
Karen Moerman (1969–1989)         David H. Montgomery (1956–1981)         David H. Montgomery (1956–1981)         Sixto E. Moreira (1972–1991)         Donald Morgan (1968–1988)         John H. Mott (1967–1983)         Billy W. Mounts (1956–1977)         Carl F. Moy (1968–1984)         Richard F. Nelson (1960–1989)         Loren L. Nicholson (1956–1977)         Dell O. Nickell (1964–1980)         Keith E. Nielsen (1959–1991)         Glenn A. Noble (1947–1973)         Thomas F. Nolan (1949–1974)         Raymond E. Nordquist (1965–1997)         Eugene L. O'Connor (1964–1991)         Howard R. O'Daniels (1938–1971)         Michael J. O'Leary (1951–1982)         Barton C. Olsen (1968–1990)         Leon F. Osteyee (1957–1983)         Philip H. Overmeyer (1958–1972)         Gordon J. Paul (1969–1983)         Evelyn I. Pellaton (1966–1982)	Environmental Engineering 
Karen Moerman (1969–1989)         David H. Montgomery (1956–1981)         David H. Montgomery (1956–1981)         Donald Morgan (1968–1988)         John H. Mott (1967–1983)         John H. Mott (1967–1983)         Billy W. Mounts (1956–1977)         Carl F. Moy (1968–1984)         Richard F. Nelson (1960–1989)         Loren L. Nicholson (1956–1977)         Dell O. Nickell (1964–1980)         Keith E. Nielsen (1959–1991)         Glenn A. Noble (1947–1973)         Thomas F. Nolan (1949–1974)         Raymond E. Nordquist (1965–1997)         Eugene L. O'Connor (1964–1991)         Howard R. O'Daniels (1938–1971)         Michael J. O'Leary (1951–1982)         Barton C. Olsen (1968–1990)         Leon F. Osteyee (1957–1983)         Philip H. Overmeyer (1958–1972)         Gordon J. Paul (1969–1983)         Evelyn I. Pellaton (1966–1982)         Dominic Perello (1954–1987)	
Karen Moerman (1969–1989)         David H. Montgomery (1956–1981)         David H. Montgomery (1956–1981)         Donald Morgan (1968–1988)         John H. Mott (1967–1983)         John H. Mott (1967–1983)         Billy W. Mounts (1956–1977)         Carl F. Moy (1968–1984)         Richard F. Nelson (1960–1989)         Loren L. Nicholson (1956–1977)         Dell O. Nickell (1964–1980)         Keith E. Nielsen (1959–1991)         Glenn A. Noble (1947–1973)         Thomas F. Nolan (1949–1974)         Raymond E. Nordquist (1965–1997)         Eugene L. O'Connor (1964–1991)         Howard R. O'Daniels (1938–1971)         Michael J. O'Leary (1951–1982)         Barton C. Olsen (1968–1990)         Leon F. Osteyee (1957–1983)         Philip H. Overmeyer (1958–1972)         Gordon J. Paul (1969–1983)         Evelyn I. Pellaton (1966–1982)         Dominic Perello (1954–1987)         James M. Peters (1958–1980)	
Karen Moerman (1969–1989)         David H. Montgomery (1956–198)         Sixto E. Moreira (1972–1991)         Donald Morgan (1968–1988)         John H. Mott (1967–1983)         John H. Mott (1967–1983)         Billy W. Mounts (1956–1977)         Carl F. Moy (1968–1984)         Richard F. Nelson (1960–1989)         Loren L. Nicholson (1956–1977)         Dell O. Nickell (1964–1980)         Keith E. Nielsen (1959–1991)         Glenn A. Noble (1947–1973)         Thomas F. Nolan (1949–1974)         Raymond E. Nordquist (1965–199)         Eugene L. O'Connor (1964–1991)         Howard R. O'Daniels (1938–1971)         Michael J. O'Leary (1951–1982)         Barton C. Olsen (1968–1990)         Leon F. Osteyee (1957–1983)         Philip H. Overmeyer (1958–1972)         Gordon J. Paul (1969–1983)         Evelyn I. Pellaton (1966–1982)         Dominic Perello (1954–1987)         James M. Peters (1958–1980)         James J. Peterson (1964–1984)	
Karen Moerman (1969–1989)         David H. Montgomery (1956–198)         Sixto E. Moreira (1972–1991)         Donald Morgan (1968–1988)         John H. Mott (1967–1983)         John H. Mott (1967–1983)         Billy W. Mounts (1956–1977)         Carl F. Moy (1968–1984)         Richard F. Nelson (1960–1989)         Loren L. Nicholson (1956–1979)         Dell O. Nickell (1964–1980)         Keith E. Nielsen (1959–1991)         Glenn A. Noble (1947–1973)         Thomas F. Nolan (1949–1974)         Raymond E. Nordquist (1965–199)         Eugene L. O'Connor (1964–1991)         Howard R. O'Daniels (1938–1971)         Michael J. O'Leary (1951–1982)         Barton C. Olsen (1968–1990)         Leon F. Osteyee (1957–1983)         Philip H. Overmeyer (1958–1972)         Gordon J. Paul (1969–1983)         Evelyn I. Pellaton (1966–1982)         Dominic Perello (1954–1987)         James M. Peters (1958–1980)         James J. Peterson (1964–1984)         William J. Phaklides (1963–1984)	
Karen Moerman (1969–1989)         David H. Montgomery (1956–198)         Sixto E. Moreira (1972–1991)         Donald Morgan (1968–1988)         John H. Mott (1967–1983)         John H. Mott (1967–1983)         Billy W. Mounts (1956–1977)         Carl F. Moy (1968–1984)         Richard F. Nelson (1960–1989)         Loren L. Nicholson (1956–1979)         Dell O. Nickell (1964–1980)         Keith E. Nielsen (1959–1991)         Glenn A. Noble (1947–1973)         Thomas F. Nolan (1949–1974)         Raymond E. Nordquist (1965–1997)         Eugene L. O'Connor (1964–1991)         Howard R. O'Daniels (1938–1971)         Michael J. O'Leary (1951–1982)         Barton C. Olsen (1968–1990)         Leon F. Osteyee (1957–1983)         Evelyn I. Pellaton (1966–1982)         Dominic Perello (1954–1987)         James M. Peters (1958–1980)         James J. Peterson (1964–1984)         William J. Phaklides (1963–1984)         William Phillips (1957–1987)	
Karen Moerman (1969–1989)         David H. Montgomery (1956–1981)         David H. Montgomery (1956–1981)         Sixto E. Moreira (1972–1991)         Donald Morgan (1968–1988)         John H. Mott (1967–1983)         Billy W. Mounts (1956–1977)         Carl F. Moy (1968–1984)         Richard F. Nelson (1960–1989)         Loren L. Nicholson (1956–1979)         Dell O. Nickell (1964–1980)         Keith E. Nielsen (1959–1991)         Glenn A. Noble (1947–1973)         Thomas F. Nolan (1949–1974)         Raymond E. Nordquist (1965–1997)         Eugene L. O'Connor (1964–1991)         Howard R. O'Daniels (1938–1971)         Michael J. O'Leary (1951–1982)         Barton C. Olsen (1968–1990)         Leon F. Osteyee (1957–1983)         Philip H. Overmeyer (1958–1972)         Gordon J. Paul (1969–1983)         Evelyn I. Pellaton (1966–1982)         James M. Peters (1958–1980)         James M. Peters (1958–1980)         James J. Phaklides (1963–1984)         William J. Phaklides (1963–1984)         William Phillips (1957–1987)	Environmental Engineering 

F. Sheldon Harden (1948–1987)	Physical Education
Leroy M. Harris (1954–1986)	Animal Sciences and
Charles [Jackel] (10(2, 1000)	Industry
Charles Haskell (1963–1988)	
Harry Hazebrook (1968–1990)	Electrical Engineering
John R. Healey (1947–1980)	lournalism
Anatol Helman (1957–1974)	Architecture
Frank I. Hendel (1967–1984)	Aeronautical Engineering
Harold I. Hendriks (1952–1978)	Electronic and
	Electrical Engineering
Donald W. Hensel (1960–1990)	History
Charles A Herald (1958–1975)	Electropic and
	Electrical Engineering
Farl R. Hesch (1956–1983)	Engineering Technology
William R. Hicks (1957–1983)	Physical Education
Robert Hill (1976–1991)	Accounting
George F. Hoffman $(1956-1979)$	Industrial Engineering
Wilbur C. Hogan (1959–1973)	Philosophy
Roy B. Hollstien (1973–1988)	Computer Science
Ray   Holt (1955–1978)	Physics
Walter F. Holtz (1954–1966 and	
1968_1982)	Environmental Engineering
Cilbert L. Homfeld (1960–1976)	Mathematics
Harry Honegger (1961–1986)	Metallurgical Engineering
Robert Hooks (1966–1988) A	nimal Science and Industry
H Clyde Hostetter (1958–1983)	lournalism
A L Houk (1946-1972)	Chemistry
Ernest P. Houston (1957–1983)	Ornamental Horticulture
LoPov R. Hughos (1950–1903)	Physical Education
Pobert I. Huot (1963-1986)	English
Edgar A Hyper $(1951-1981)$	Agricultural Management
C Doppis Hypes $(1951-1901)$	Riological Sciences
C. Dennis Types (1937–1990)	English
Starr lonking (1961-1988)	English
Boyd W/ Johnson (1969, 1991)	Mathematics
Corwin M. Johnson (1967–1997)	Cron Science
Mood P. Johnson (1956–1987).	English
Miles B. Johnson (1957–1983)	English
Richard F. Johnson (1950–1963)	Animal Sciences and
Renard 1. Jonnson (1990–1900)	Industry
Robert M. Johnston (1946-1954 at	ad
1956–1974)	Engineering Technology
Thomas V. Johnston (1967-1985).	Art and Associate Dean
of Commun	icative Arts and Humanities
Jack B. Jones (1969–1991)	University Center for
	Teacher Education
Edward J. Jorgensen (1947–1976)	Physical Education
William B. Judd (1956-1981)	Mathematics
John J. Kane (1969–1984)	Aeronautical and
	Mechanical Engineering
Thomas D. Kay (1958–1991)	Engineering Technology
Roger A. Keech (1965–1983)	Aeronautical and
	Mechanical Engineering
Rodney Keit (1960–1988)	Mechanical Engineering
Helen P. Kelley (1966–1985)	Art
Piebord T. Kombriely (1056, 1000)	Business Administration
RICHARD I. KOMPTINK (1956–1980)	Electronic and
Russell Korsineyer (1958–1978)	Electrical Engineering
Hove H Lamouria (1965-1997)	Agricultural Engineering
LIOYU IT. Lamouria (1965–1987)	Agricultural Engineering

Robert G. Valpey (1972–1983)	Dean of Engineering
	and Technology
Gordon L. Van de Vanter (1968	-86)Crop Science
Herman C. Voeltz (1965–1983)	History
Ralph M. Vorhies (1946-1980)	Crop Science
Evelyn K. Voros (1955-1974)	Speech
William B. Wahl (1966-1985)	English
Howard D. Walker (1957-1991)	Chemistry
Isaac N. Walker (1967-1983)	English
Edward John Ward (1970-1989)	City and Regional Planning
James Webster, Jr. (1965-1987).	Agricultural Engineering
John West (1968-1988)	School of Agriculture
Marvin J. Whalls (1968-1989)	Biological Sciences
Omer K. Whipple (1956-1976).	Chemistry
Mary Lou White (1961-1979)	Physical Education
Francis F. Whiting (1946-1970).	Engineering Technology
Milo E. Whitson (1947-1974)	Mathematics
H. Glenn Wight (1952-1990)	Chemistry
J. Barron Wiley (1956-1978)	Education
Richard C. Wiley (1946-1983)	Metallurgical and
	Welding Engineering
Maurice L. Wilks (1966-1983)	Architecture
Graydon J. Williams (1970-1991	)Music
Irwin A. Willson (1958-1975)	Education
Harold O. Wilson (1936 and	
1946–1974)	Administrative Vice President
Malcolm W. Wilson (1968-1989	)Academic Affairs
	Vice President
C. Paul Winner (1940-1971)	Agricultural Mechanics
Victor F. Wolcott (1962-1983)	Business Administration
John A. Woodworth (1949-1974	)Mathematics
John Wordeman (1973-1988)	Graphic Communication
Lloyd J. Work (1958-1978)	Physics
Marshall S. Wright, Jr. (1969-19	88)Chemistry
Raymond A. Wysock (1967-199	1)Industrial Technology
	07

## **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 subsequent recommendations of the nominees are based upon an in-depth review by the committee, including classroom visitations. Recipients of the Distinguished Teacher Awards and their departments since the inception of the program are listed below.

1963-64	Robert E. Holmquist, Physics
	John L. Merriam, Agricultural Engineering
1964-65	Joy O. Richardson, Mechanical Engineering
	Milo E. Whitson, Mathematics
1965–66	A. Norman Cruikshanks, Social Sciences
	Richard F. Johnson, Animal Husbandry
	George R. Mach, Mathematics
196667	Robert W. Adamson, Mechanical Engineering
	Kenneth G. Fuller, Mathematics
	William D. Curtis, Psychology
1967–68	Rodney G. Keif, Environmental Engineering
	David M. Grant, English
	Wesley S. Ward, Architecture
1069 60	Pohert M. Johnson Machanical Engineering

1968–69 Robert M. Johnson, Mechanical Engineering Bruce Kennelly, Chemistry Alice E. Roberts, Education

Curtis Piper (1964-1988)	Soil Science
Clifford I. Price (1956–1974)	Aeronautical Engineering
Derek Price (1957–1989)	Mechanical Engineering
Peter Rabe (1967-1986)	Psychology and
Teter Rabe (190/=1900)	
Evolup D. Bongon (104) 1048 and	Human Development
Everyn D. Reagan (1946–1948 and	1 1954–1977)Library
R. HOWEII REECE (1946–1964)	Mechanical Engineering
Ronald D. Regan (1977–1991)	Ornamental Horticulture
R. Wallace Reynolds (1953–1979)	Engineering Technology
Howard Rhoads (1956–1983)	Crop Science
Glenn W. Rich (1953–1979)	Agricultural Engineering
Carlos C. Richards (1946-1971)	Engineering Technology
Herman E. Rickard (1959-1990)	Dairy Science
Rolla W. Rider, Jr. (1960-1982)	Business Administration
Eugene A. Rittenhouse (1949-1976	6)Economics and
-	Placement
Arvan I. Roest (1955–1990)	Biological Sciences
David Rollings (1968-1987)	Fnglish
Robert L. Rosenberg (1970–1985)	History
Mildred Roske (1967–1988)	Home Economics
Glenn W Salo (1955–1990)	Agricultural Engineering
Leo F. Sankoff (1942 and	
1946_1980)	Agricultural Education
$H_{2}$ Harry $H_{2}$ Scales (1959, 1976)	Agricultural coucation
Paul E. Schoffer (1064, 1092)	Industrial Engineering
Faul E. Schener (1904-1903)	industrial Engineering
Melhan D. Cabusaday (1057, 1000)	Construction Management
Waiter P. Schroeder (1957–1980).	Education
Kenneth E. Schwartz (1952–1988)	Architecture
Marcel E. Sedletzky (1974–1991)	Architecture
	Engineering Technology
Glenn E. Seeber (1954–1979)	crigineering rechnology
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983)	
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986)	
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980)	
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980)	
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983)	Management Physics Metallurgical and Welding Engineering Economics
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981)	Management Metallurgical and Welding Engineering Economics
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) M. Eugene Smith (1946–1974)	Management Management Metallurgical and Welding Engineering Economics Metallurgical and Welding Engineering History
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) M. Eugene Smith (1946–1974) Warren T. Smith (1952–1973)	Management Management Metallurgical and Welding Engineering Economics Speech Communication History
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) M. Eugene Smith (1946–1974) Warren T. Smith (1952–1973) L. Robert Sorensen (1966–1983)	Management Management Metallurgical and Welding Engineering Economics Speech Communication History Dean of Agriculture Psychology
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) M. Eugene Smith (1946–1974) Warren T. Smith (1952–1973) L. Robert Sorensen (1966–1983) Shirley R. Sparling (1963–1991)	Management Management Metallurgical and Welding Engineering Economics Metallurgical sciences Biological Sciences
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) M. Eugene Smith (1946–1974) Warren T. Smith (1952–1973) L. Robert Sorensen (1966–1983) Shirley R. Sparling (1963–1991) Ruth G. Spencer (1967–1982)	Management Metallurgical and Welding Engineering Economics Metallurgical and Welding Engineering Leconomics Mistory Dean of Agriculture Sychology Biological Sciences
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) M. Eugene Smith (1946–1974) Warren T. Smith (1952–1973) L. Robert Sorensen (1966–1983) Shirley R. Sparling (1963–1991) Ruth G. Spencer (1967–1982)	Management Management Metallurgical and Welding Engineering Economics Metallurgical and Welding Engineering Leconomics Metallurgical and Kerting Metallurgical and Metallurgical Sciences Metallurgical and Metallurgical and Metall
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) M. Eugene Smith (1946–1974) Warren T. Smith (1952–1973) L. Robert Sorensen (1966–1983) Shirley R. Sparling (1963–1991) Ruth G. Spencer (1967–1982) Verlan Stahl (1968–1987)	Management Management Metallurgical and Welding Engineering Economics Metallurgical and Welding Engineering Leconomics Mistory Dean of Agriculture Speech Communication History Metallurgical Sciences Library Foreign Languages
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) M. Eugene Smith (1946–1974) Warren T. Smith (1952–1973) L. Robert Sorensen (1966–1983) Shirley R. Sparling (1963–1991) Ruth G. Spencer (1967–1982) Eugene E. Starkey (1978–1991) Uohn Stechman (1960–1989)	Management Management Metallurgical and Welding Engineering Economics Metallurgical and Welding Engineering Economics Mistory Dean of Agriculture Psychology Biological Sciences Library Foreign Languages Dairy Science
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) M. Eugene Smith (1946–1974) Warren T. Smith (1952–1973) L. Robert Sorensen (1966–1983) Shirley R. Sparling (1963–1991) Ruth G. Spencer (1967–1982) Verlan Stahl (1968–1987) Eugene E. Starkey (1978–1991) John Stechman (1960–1989)Ar	Management Metallurgical and Welding Engineering Metallurgical and Welding Engineering Economics Speech Communication History Dean of Agriculture Psychology Biological Sciences Library Foreign Languages Dairy Science himal Sciences and Industry
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) M. Eugene Smith (1946–1974) Warren T. Smith (1952–1973) L. Robert Sorensen (1966–1983) Shirley R. Sparling (1963–1991) Ruth G. Spencer (1967–1982) Verlan Stahl (1968–1987) Eugene E. Starkey (1978–1991) John Stechman (1960–1989)Ar Howard Steinberg (1970–1991)	Management Metallurgical and Welding Engineering Metallurgical and Welding Engineering Economics Economics Mistory Dean of Agriculture Psychology Biological Sciences Library Foreign Languages Dairy Science Sciences and Industry Mathematics
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) M. Eugene Smith (1946–1974) Warren T. Smith (1952–1973) L. Robert Sorensen (1966–1983) Shirley R. Sparling (1963–1991) Ruth G. Spencer (1967–1982) Eugene E. Starkey (1978–1991) John Stechman (1960–1989)Ar Howard Steinberg (1970–1991) Fred H. Steuck (1947–1978)	Management Management Metallurgical and Welding Engineering Economics Metallurgical and Welding Engineering Economics Metallurgical and Welding Engineering Economics Metallurgical and History Metallurgical and Psychology Biological Sciences Library Mathematics Mathematics
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) M. Eugene Smith (1946–1974) Warren T. Smith (1952–1973) L. Robert Sorensen (1966–1983) Shirley R. Sparling (1963–1991) Shirley R. Sparling (1963–1991) Eugene E. Starkey (1978–1991) John Stechman (1960–1989)Ar Howard Steinberg (1970–1991) Fred H. Steuck (1947–1978)	Management Metallurgical and Welding Engineering Metallurgical and Welding Engineering Economics Speech Communication History Dean of Agriculture Psychology Biological Sciences Library Foreign Languages Dairy Science nimal Sciences and Industry Mathematics Electronic and Electronic and
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) M. Eugene Smith (1946–1974) Warren T. Smith (1952–1973) L. Robert Sorensen (1966–1983) Shirley R. Sparling (1963–1991) Ruth G. Spencer (1967–1982) Verlan Stahl (1968–1987) Eugene E. Starkey (1978–1991) John Stechman (1960–1989)Ar Howard Steinberg (1970–1991) Fred H. Steuck (1947–1978)	Management Management Management Metallurgical and Welding Engineering Economics Speech Communication Mistory Dean of Agriculture Psychology Biological Sciences Library Foreign Languages Dairy Science nimal Sciences and Industry Mathematics Electronic and Electrical Engineering Mechanical Engineering
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) M. Eugene Smith (1946–1974) Warren T. Smith (1952–1973) L. Robert Sorensen (1966–1983) Shirley R. Sparling (1963–1991) Ruth G. Spencer (1967–1982) Verlan Stahl (1968–1987) Eugene E. Starkey (1978–1991) John Stechman (1960–1989)Ar Howard Steinberg (1970–1991) Fred H. Steuck (1947–1978)	Management Management Management Metallurgical and Welding Engineering Economics Metallurgical and Welding Engineering Economics Metallurgical Sciences Metallurgical Sciences Speech Communication Horeign Languages Metallurgical Sciences Mathematics Metallurgical Engineering Mechanical Engineering Metallurgical Sciences
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) M. Eugene Smith (1946–1974) Warren T. Smith (1952–1973) L. Robert Sorensen (1966–1983) Shirley R. Sparling (1963–1991) Ruth G. Spencer (1967–1982) Eugene E. Starkey (1978–1991) John Stechman (1960–1989)Ar Howard Steinberg (1970–1991) Fred H. Steuck (1947–1978) Edward O. Stoffel (1957–1988) Ellen T. Stookey (1961–1978) J. Edward Strasser (1960–1984)	Management Management Management Metallurgical and Welding Engineering Economics Metallurgical and Welding Engineering Economics Metallurgical Sciences Metallurgical Sciences Library Foreign Languages Dairy Science Mathematics Electronic and Electrical Engineering Mechanical Engineering Mechanical Engineering Mechanical Engineering Mechanical Engineering
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) Warren T. Smith (1952–1973) U. Robert Sorensen (1966–1983) Shirley R. Sparling (1963–1991) Ruth G. Spencer (1967–1982) Eugene E. Starkey (1978–1991) Fugene E. Starkey (1978–1991) Howard Steinberg (1970–1991) Edward O. Stoffel (1957–1988) Ellen T. Stookey (1961–1978) J. Edward Strasser (1960–1984)	Management Management Metallurgical and Welding Engineering Economics Metallurgical and Welding Engineering Metallurgical and Foreign Languages Dairy Sciences Mathematics Electronic and Electrical Engineering Mechanical Engineering
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Ordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) Warren T. Smith (1946–1974) Warren T. Smith (1952–1973) L. Robert Sorensen (1966–1983) Shirley R. Sparling (1963–1991) Ruth G. Spencer (1967–1982) Verlan Stahl (1968–1987) John Stechman (1960–1989) Fred H. Steuck (1947–1978) Edward O. Stoffel (1957–1988) Ellen T. Stookey (1961–1978) J. Edward Strasser (1960–1984) J. Edward Strasser (1960–1984) J. Harry Strauss (1961–1976)	Management Management Metallurgical and Welding Engineering Economics Metallurgical and Welding Engineering Metallurgical and Foreign Languages Dairy Sciences Mathematics Electronic and Electrical Engineering Mechanical Engineering
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Ordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) M. Eugene Smith (1946–1974) Warren T. Smith (1952–1973) L. Robert Sorensen (1966–1983) Shirley R. Sparling (1963–1991) Puth G. Spencer (1967–1982) Uverlan Stahl (1968–1987) Eugene E. Starkey (1978–1991) John Stechman (1960–1989)Ar Howard Steinberg (1970–1991) Fred H. Steuck (1947–1978) Ellen T. Stookey (1961–1978) J. Edward Strasser (1960–1984) J. Harry Strauss (1961–1976) John S. Stuart (1964–1983)	Management Management Metallurgical and Welding Engineering Leconomics Metallurgical and Welding Engineering Leconomics Metallurgical Sciences Metallurgical Sciences Library Foreign Languages Dairy Science Nathematics Electronic and Electrical Engineering Mechanical Engineering
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) M. Eugene Smith (1946–1974) Warren T. Smith (1952–1973) L. Robert Sorensen (1966–1983) Shirley R. Sparling (1963–1991) Ruth G. Spencer (1967–1982) Verlan Stahl (1968–1987) John Stechman (1960–1989)Ar Howard Steinberg (1970–1991) Fred H. Steuck (1947–1978) Edward O. Stoffel (1957–1988) Ellen T. Stookey (1961–1978) J. Edward Strasser (1960–1984) J. Edward Strasser (1960–1984) John S. Stuart (1964–1983) John S. Stuart (1964–1983)	Management Management Metallurgical and Welding Engineering Metallurgical and Welding Engineering Metallurgical sciences Metallurgical Sciences Metallurgical Sciences Library Foreign Languages Dairy Science Nathematics Electronic and Electrical Engineering Mechanical Engineering
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) M. Eugene Smith (1946–1974) Warren T. Smith (1952–1973) L. Robert Sorensen (1966–1983) Shirley R. Sparling (1963–1991) Ruth G. Spencer (1967–1982) John Stechman (1960–1987) Fugene E. Starkey (1978–1991) John Stechman (1960–1989)Ar Howard Steinberg (1970–1991) Edward O. Stoffel (1957–1988) Ellen T. Stookey (1961–1978) J. Edward Strasser (1960–1984) L. Harry Strauss (1961–1976) John S. Stuart (1964–1983) Laurence F. Talbott (1966–1987) Fuad H. Tellew (1960–1991)	Management Management Metallurgical and Welding Engineering Metallurgical and Welding Engineering Metallurgical and Welding Engineering Metallurgical and Metallurgical and Foreign Languages Dairy Sciences Mathematics Electronic and Electrical Engineering Mechanical Engineering
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) M. Eugene Smith (1946–1974) Warren T. Smith (1952–1973) L. Robert Sorensen (1966–1983) Shirley R. Sparling (1963–1991) Ruth G. Spencer (1967–1982) Yerlan Stahl (1968–1987) John Stechman (1960–1989)Ar Howard Steinberg (1970–1991) Edward O. Stoffel (1957–1988) Ellen T. Stookey (1961–1978) J. Edward Strasser (1960–1984) J. Edward Strasser (1960–1984) L. Harry Strauss (1961–1976) John S. Stuart (1964–1983) John S. Stuart (1964–1983) Jead H. Tellew (1960–1991)	Management Management Metallurgical and Welding Engineering Metallurgical and Welding Engineering Metallurgical and Welding Engineering Metallurgical Sciences Mathematics Mathematics Electronic and Electrical Engineering Mechanical Mechanical Engineering M
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) M. Eugene Smith (1946–1974) Warren T. Smith (1952–1973) L. Robert Sorensen (1966–1983) Shirley R. Sparling (1963–1991) Ruth G. Spencer (1967–1982) Verlan Stahl (1968–1987) John Stechman (1960–1989) Floward Steinberg (1970–1991) Fedward O. Stoffel (1957–1988) Ellen T. Stookey (1961–1978) J. Edward Strasser (1960–1988) J. Edward Strasser (1960–1984) L. Harry Strauss (1961–1976) John S. Stuart (1964–1983) John S. Stuart (1964–1983) J. Edward P. Talbott (1966–1987) Fuad H. Tellew (1960–1991) Fuad H. Thomson (1946–1979) Frank P. Thrasher (1963–1980)	Management Management Metallurgical and Welding Engineering Metallurgical and Welding Engineering Metallurgical and Welding Engineering Metallurgical Sciences Mathematics Mathematics Electronic and Electrical Engineering Mechanical Mechanical Engineering M
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) M. Eugene Smith (1946–1974) Warren T. Smith (1952–1973) L. Robert Sorensen (1966–1983) Shirley R. Sparling (1963–1991) Ruth G. Spencer (1967–1982) Verlan Stahl (1968–1987) Eugene E. Starkey (1978–1991) John Stechman (1960–1989)Ar Howard Steinberg (1970–1991) Edward O. Stoffel (1957–1988) Ellen T. Stookey (1961–1978) J. Edward Strasser (1960–1984) J. Edward Strasser (1960–1984) J. Harry Strauss (1961–1976) John S. Stuart (1964–1983) Vern Swansen (1969–1989) Fuad H. Tellew (1960–1991) Fuad H. Thomson (1946–1979) Fuak P. Thrasher (1963–1980)	Management Management Metallurgical and Welding Engineering Metallurgical and Welding Engineering Metallurgical and Welding Engineering Metallurgical Sciences Metallurgical Sciences Metallurgical Sciences Mathematics Methematics Methanical Engineering Mechanical Engineering Metallurgital Technology Metallurgital Technology Metallur
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) M. Eugene Smith (1946–1974) Warren T. Smith (1952–1973) L. Robert Sorensen (1966–1983) Shirley R. Sparling (1963–1991) Ruth G. Spencer (1967–1982) Verlan Stahl (1968–1987) Eugene E. Starkey (1978–1991) John Stechman (1960–1989)Ar Howard Steinberg (1970–1991) Edward O. Stoffel (1957–1988) Ellen T. Stookey (1961–1978) J. Edward Strasser (1960–1984) J. Edward Strasser (1960–1984) John S. Stuart (1964–1983) Vern Swansen (1969–1989) Laurence F. Talbott (1966–1987) Fuad H. Tellew (1960–1991) Fuad H. Themson (1946–1978) William Thurmond (1951–1988) William Thurmond (1951–1989)	Management Management Metallurgical and Welding Engineering Economics Speech Communication History Dean of Agriculture Psychology Biological Sciences Library Foreign Languages Dairy Science nimal Sciences and Industry Mathematics Electronic and Electrical Engineering Mechanical Engineering Mechanical Engineering Library Library Mathematics Library Mathematics Library Mathematics Mechanical Engineering Mechanical Engineering Mechanical Engineering Mechanical Engineering Biological Sciences Biological Sciences Dairy and Poultry Science
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) M. Eugene Smith (1946–1974) Warren T. Smith (1952–1973) L. Robert Sorensen (1966–1983) Shirley R. Sparling (1963–1991) Purth G. Spencer (1967–1982) Verlan Stahl (1968–1987) Eugene E. Starkey (1978–1991) John Stechman (1960–1989)Ar Howard Steinberg (1970–1991) Edward O. Stoffel (1957–1988) Ellen T. Stookey (1961–1978) J. Edward Strasser (1960–1984) J. Edward Strasser (1960–1984) Jethward Steinberg (1970–1991) Frad H. Tellew (1960–1987) Laurence F. Talbott (1966–1987) Fuad H. Tellew (1960–1991) Fuad H. Thomson (1946–1976) William Thurmond (1951–1988) William Thurmond (1951–1988) Harmon B. Toone (1952–1977) Neal R. Townsend (1965–1991)	Management Management Metallurgical and Welding Engineering Economics Speech Communication History Dean of Agriculture Psychology Biological Sciences Library Foreign Languages Dairy Science nimal Sciences and Industry Mathematics Electronic and Electrical Engineering Mechanical Engineering Home Economics Industrial Technology Library Architecture Architecture Mathematics Electronic and Electrical Engineering Mechanical Engineering Mechanical Engineering Biological Sciences Biological Sciences Biological Sciences Dairy and Poultry Science Mathematics
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) M. Eugene Smith (1946–1974) Warren T. Smith (1952–1973) L. Robert Sorensen (1966–1983) Shirley R. Sparling (1963–1991) Pugene E. Starkey (1963–1991) Eugene E. Starkey (1978–1991) Howard Steinberg (1970–1981) Fred H. Steuck (1947–1978) Edward O. Stoffel (1957–1988) Ellen T. Stookey (1961–1978) J. Edward Strasser (1960–1984) L. Harry Strauss (1961–1976) John S. Stuart (1964–1983) Frad H. Tellew (1960–1991) Frank P. Thrasher (1963–1980) Frank P. Thrasher (1963–1980) William Thurmond (1951–1988) William Thurmond (1951–1976) William Thurmond (1952–1977) Neal R. Townsend (1965–1997) Harmon B. Toone (1952–1977) Neal R. Townsend (1965–1991)	Management Management Management Metallurgical and Welding Engineering Economics Speech Communication History Dean of Agriculture Psychology Biological Sciences Library Foreign Languages Dairy Science Nathematics Lectrical Engineering Mechanical Engineering Biological Sciences Biological Sciences Dairy and Poultry Science Mathematics Counseling and Testing
Glenn E. Seeber (1954–1979) Owen L. Servatius (1947–1983) Gordon A. Silver 1964–1986) Orien W. Simmons (1961–1980) Howard F. Smith (1968–1983) J. Murray Smith (1960–1981) M. Eugene Smith (1946–1974) Warren T. Smith (1952–1973) L. Robert Sorensen (1966–1983) Shirley R. Sparling (1963–1991) Ruth G. Spencer (1967–1982) Verlan Stahl (1968–1987) Eugene E. Starkey (1978–1991) Howard Steinberg (1970–1991) Fred H. Steuck (1947–1978) Edward O. Stoffel (1957–1988) Ellen T. Stookey (1961–1978) J. Edward Strasser (1960–1984) L. Harry Strauss (1961–1976) John S. Stuart (1964–1983) Vern Swansen (1969–1989) Harron G. Toone (1952–1977) Frank P. Thrasher (1963–1980) William Thurmond (1951–1976) William Thurmond (1951–1976) William R. Troutner (1942–1976)	Management Management Management Metallurgical and Welding Engineering Economics Metallurgical and Welding Engineering Economics Metallurgical Sciences Metallurgical Sciences Metallurgical Sciences Metallurgical Sciences Metallurgical Engineering Mechanical Engineering Mecha
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1969–70	Donald W. Hensel, History
	David H. Montgomery, Biological Sciences
	Philip H. Overmeyer, Business Administration
	Willard M. Pederson, English
	Omer K. Whipple, Chemistry
1970–71	Robert L. Cleath, Speech
	Kenneth E. Schwartz, Architecture
	Hewitt G. Wight, Chemistry
1971-72	Stuart F. Larsen, Aeronautical Engineering
	Barton C Olsen History
	Ronald L. Ritschard, Biological Sciences
	Ioseph N. Weatherby, Political Science, (Social
	Scioncos)
1072 73	Lylo C. McNool Animal Science
1972-75	Charles M. Quinlan Architecture
	Lamos E. Simmons, English
1072 74	James L. Simmons, English
19/3-/4	william J. Phakildes, Engineering Technology
	Louis D. Pippin, Education
	Duane O. Seaberg, Agricultural Management
1974–75	Peter Jankay, Biological Sciences
	Josephine S. Stearns, Child Development
	George J. Suchand, Social Sciences
1975–76	James Hayes, Journalism
	William V. Johnson, Music
	Erna Knapp, Art
197677	Harry L. Fierstine, Biological Sciences
	Grant D. Venerable II, Chemistry
	Ralph M. Warten, Mathematics
1977–78	Timothy M. Barnes, History
	Donald P. Grant, Architecture and Environmental
	Decign
	DCSIGIT
	John C. Syer, Political Science
1978–79	John C. Syer, Political Science Pat Pendse, Biological Sciences
1978–79	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry
1978–79	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics
1978–79 1979–80	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David L. Keil, Biological Sciences
1978–79 1979–80	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David J. Keil, Biological Sciences Thomas Ruebr, Soil Science
1978–79 1979–80	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein Mathematics
1978–79 1979–80	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein, Mathematics Michael D. Zohns, Ornamental Horticulture
1978–79 1979–80	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein, Mathematics Michael D. Zohns, Ornamental Horticulture Sarah F. Burroughs, Ecod Science and Nutrition
1978–79 1979–80 1980–81	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein, Mathematics Michael D. Zohns, Ornamental Horticulture Sarah E. Burroughs, Food Science and Nutrition (Child Davidepment and Home Economics)
1978–79 1979–80 1980–81	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein, Mathematics Michael D. Zohns, Ornamental Horticulture Sarah E. Burroughs, Food Science and Nutrition (Child Development and Home Economics)
1978–79 1979–80 1980–81	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein, Mathematics Michael D. Zohns, Ornamental Horticulture Sarah E. Burroughs, Food Science and Nutrition (Child Development and Home Economics) Christina Orr-Cahall, Art
1978–79 1979–80 1980–81	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein, Mathematics Michael D. Zohns, Ornamental Horticulture Sarah E. Burroughs, Food Science and Nutrition (Child Development and Home Economics) Christina Orr-Cahall, Art Kendrick W. Walker, Philosophy
1978–79 1979–80 1980–81 1981–82	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein, Mathematics Michael D. Zohns, Ornamental Horticulture Sarah E. Burroughs, Food Science and Nutrition (Child Development and Home Economics) Christina Orr-Cahall, Art Kendrick W. Walker, Philosophy Christina A. Bailey, Chemistry
1978–79 1979–80 1980–81 1981–82	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein, Mathematics Michael D. Zohns, Ornamental Horticulture Sarah E. Burroughs, Food Science and Nutrition (Child Development and Home Economics) Christina Orr-Cahall, Art Kendrick W. Walker, Philosophy Christina A. Bailey, Chemistry Kenneth E. Ozawa, Physics
1978–79 1979–80 1980–81 1981–82	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein, Mathematics Michael D. Zohns, Ornamental Horticulture Sarah E. Burroughs, Food Science and Nutrition (Child Development and Home Economics) Christina Orr-Cahall, Art Kendrick W. Walker, Philosophy Christina A. Bailey, Chemistry Kenneth E. Ozawa, Physics Thomas L. Richards, Biological Sciences
1978–79 1979–80 1980–81 1981–82 1982–83	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein, Mathematics Michael D. Zohns, Ornamental Horticulture Sarah E. Burroughs, Food Science and Nutrition (Child Development and Home Economics) Christina Orr-Cahall, Art Kendrick W. Walker, Philosophy Christina A. Bailey, Chemistry Kenneth E. Ozawa, Physics Thomas L. Richards, Biological Sciences James Bermann, Agricultural Engineering
1978–79 1979–80 1980–81 1981–82 1982–83	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein, Mathematics Michael D. Zohns, Ornamental Horticulture Sarah E. Burroughs, Food Science and Nutrition (Child Development and Home Economics) Christina Orr-Cahall, Art Kendrick W. Walker, Philosophy Christina A. Bailey, Chemistry Kenneth E. Ozawa, Physics Thomas L. Richards, Biological Sciences James Bermann, Agricultural Engineering Donald J. Koberg, Architecture
1978–79 1979–80 1980–81 1981–82 1982–83	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein, Mathematics Michael D. Zohns, Ornamental Horticulture Sarah E. Burroughs, Food Science and Nutrition (Child Development and Home Economics) Christina Orr-Cahall, Art Kendrick W. Walker, Philosophy Christina A. Bailey, Chemistry Kenneth E. Ozawa, Physics Thomas L. Richards, Biological Sciences James Bermann, Agricultural Engineering Donald J. Koberg, Architecture Jack D. Wilson, Aeronautical and Mechanical
1978–79 1979–80 1980–81 1981–82 1982–83	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein, Mathematics Michael D. Zohns, Ornamental Horticulture Sarah E. Burroughs, Food Science and Nutrition (Child Development and Home Economics) Christina Orr-Cahall, Art Kendrick W. Walker, Philosophy Christina A. Bailey, Chemistry Kenneth E. Ozawa, Physics Thomas L. Richards, Biological Sciences James Bermann, Agricultural Engineering Donald J. Koberg, Architecture Jack D. Wilson, Aeronautical and Mechanical Engineering
1978–79 1979–80 1980–81 1981–82 1982–83	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein, Mathematics Michael D. Zohns, Ornamental Horticulture Sarah E. Burroughs, Food Science and Nutrition (Child Development and Home Economics) Christina Orr-Cahall, Art Kendrick W. Walker, Philosophy Christina A. Bailey, Chemistry Kenneth E. Ozawa, Physics Thomas L. Richards, Biological Sciences James Bermann, Agricultural Engineering Donald J. Koberg, Architecture Jack D. Wilson, Aeronautical and Mechanical Engineering Euel W. Kennedy, Mathematics
1978–79 1979–80 1980–81 1981–82 1982–83 1983–84	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein, Mathematics Michael D. Zohns, Ornamental Horticulture Sarah E. Burroughs, Food Science and Nutrition (Child Development and Home Economics) Christina Orr-Cahall, Art Kendrick W. Walker, Philosophy Christina A. Bailey, Chemistry Kenneth E. Ozawa, Physics Thomas L. Richards, Biological Sciences James Bermann, Agricultural Engineering Donald J. Koberg, Architecture Jack D. Wilson, Aeronautical and Mechanical Engineering Euel W. Kennedy, Mathematics William L. Preston, Social Sciences
1978–79 1979–80 1980–81 1981–82 1982–83 1983–84	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein, Mathematics Michael D. Zohns, Ornamental Horticulture Sarah E. Burroughs, Food Science and Nutrition (Child Development and Home Economics) Christina Orr-Cahall, Art Kendrick W. Walker, Philosophy Christina A. Bailey, Chemistry Kenneth E. Ozawa, Physics Thomas L. Richards, Biological Sciences James Bermann, Agricultural Engineering Donald J. Koberg, Architecture Jack D. Wilson, Aeronautical and Mechanical Engineering Euel W. Kennedy, Mathematics William L. Preston, Social Sciences Michael J. Wenzl, English Decket G. Cicherenting
1978–79 1979–80 1980–81 1981–82 1982–83 1983–84	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein, Mathematics Michael D. Zohns, Ornamental Horticulture Sarah E. Burroughs, Food Science and Nutrition (Child Development and Home Economics) Christina Orr-Cahall, Art Kendrick W. Walker, Philosophy Christina A. Bailey, Chemistry Kenneth E. Ozawa, Physics Thomas L. Richards, Biological Sciences James Bermann, Agricultural Engineering Donald J. Koberg, Architecture Jack D. Wilson, Aeronautical and Mechanical Engineering Euel W. Kennedy, Mathematics William L. Preston, Social Sciences Michael J. Wenzl, English Robert S. Cichowski, Chemistry
1978–79 1979–80 1980–81 1981–82 1982–83 1983–84 1984–85	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein, Mathematics Michael D. Zohns, Ornamental Horticulture Sarah E. Burroughs, Food Science and Nutrition (Child Development and Home Economics) Christina Orr-Cahall, Art Kendrick W. Walker, Philosophy Christina A. Bailey, Chemistry Kenneth E. Ozawa, Physics Thomas L. Richards, Biological Sciences James Bermann, Agricultural Engineering Donald J. Koberg, Architecture Jack D. Wilson, Aeronautical and Mechanical Engineering Euel W. Kennedy, Mathematics William L. Preston, Social Sciences Michael J. Wenzl, English Robert S. Cichowski, Chemistry Harvey C. Greenwald, Mathematics
1978–79 1979–80 1980–81 1981–82 1982–83 1983–84 1984–85	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein, Mathematics Michael D. Zohns, Ornamental Horticulture Sarah E. Burroughs, Food Science and Nutrition (Child Development and Home Economics) Christina Orr-Cahall, Art Kendrick W. Walker, Philosophy Christina A. Bailey, Chemistry Kenneth E. Ozawa, Physics Thomas L. Richards, Biological Sciences James Bermann, Agricultural Engineering Donald J. Koberg, Architecture Jack D. Wilson, Aeronautical and Mechanical Engineering Euel W. Kennedy, Mathematics William L. Preston, Social Sciences Michael J. Wenzl, English Robert S. Cichowski, Chemistry Harvey C. Greenwald, Mathematics Max E. Riedlsperger, History
1978–79 1979–80 1980–81 1981–82 1982–83 1983–84 1984–85	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein, Mathematics Michael D. Zohns, Ornamental Horticulture Sarah E. Burroughs, Food Science and Nutrition (Child Development and Home Economics) Christina Orr-Cahall, Art Kendrick W. Walker, Philosophy Christina A. Bailey, Chemistry Kenneth E. Ozawa, Physics Thomas L. Richards, Biological Sciences James Bermann, Agricultural Engineering Donald J. Koberg, Architecture Jack D. Wilson, Aeronautical and Mechanical Engineering Euel W. Kennedy, Mathematics William L. Preston, Social Sciences Michael J. Wenzl, English Robert S. Cichowski, Chemistry Harvey C. Greenwald, Mathematics Max E. Riedlsperger, History Edward H. Baker, Mechanical Engineering Sup McReido, Education
1978–79 1979–80 1980–81 1981–82 1982–83 1983–84 1984–85 1985–86	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein, Mathematics Michael D. Zohns, Ornamental Horticulture Sarah E. Burroughs, Food Science and Nutrition (Child Development and Home Economics) Christina Orr-Cahall, Art Kendrick W. Walker, Philosophy Christina A. Bailey, Chemistry Kenneth E. Ozawa, Physics Thomas L. Richards, Biological Sciences James Bermann, Agricultural Engineering Donald J. Koberg, Architecture Jack D. Wilson, Aeronautical and Mechanical Engineering Euel W. Kennedy, Mathematics William L. Preston, Social Sciences Michael J. Wenzl, English Robert S. Cichowski, Chemistry Harvey C. Greenwald, Mathematics Max E. Riedlsperger, History Edward H. Baker, Mechanical Engineering Sue McBride, Education Phillin K. Burgley, Craphic Communication
1978–79 1979–80 1980–81 1981–82 1982–83 1983–84 1984–85 1985–86	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein, Mathematics Michael D. Zohns, Ornamental Horticulture Sarah E. Burroughs, Food Science and Nutrition (Child Development and Home Economics) Christina Orr-Cahall, Art Kendrick W. Walker, Philosophy Christina A. Bailey, Chemistry Kenneth E. Ozawa, Physics Thomas L. Richards, Biological Sciences James Bermann, Agricultural Engineering Donald J. Koberg, Architecture Jack D. Wilson, Aeronautical and Mechanical Engineering Euel W. Kennedy, Mathematics William L. Preston, Social Sciences Michael J. Wenzl, English Robert S. Cichowski, Chemistry Harvey C. Greenwald, Mathematics Max E. Riedlsperger, History Edward H. Baker, Mechanical Engineering Sue McBride, Education Phillip K. Ruggles, Graphic Communication Boyd W. Joheron. Mathematics
1978–79 1979–80 1980–81 1981–82 1982–83 1983–84 1984–85 1985–86	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein, Mathematics Michael D. Zohns, Ornamental Horticulture Sarah E. Burroughs, Food Science and Nutrition (Child Development and Home Economics) Christina Orr-Cahall, Art Kendrick W. Walker, Philosophy Christina A. Bailey, Chemistry Kenneth E. Ozawa, Physics Thomas L. Richards, Biological Sciences James Bermann, Agricultural Engineering Donald J. Koberg, Architecture Jack D. Wilson, Aeronautical and Mechanical Engineering Euel W. Kennedy, Mathematics William L. Preston, Social Sciences Michael J. Wenzl, English Robert S. Cichowski, Chemistry Harvey C. Greenwald, Mathematics Max E. Riedlsperger, History Edward H. Baker, Mechanical Engineering Sue McBride, Education Phillip K. Ruggles, Graphic Communication Boyd W. Johnson, Mathematics
1978–79 1979–80 1980–81 1981–82 1982–83 1983–84 1984–85 1985–86 1986–87	John C. Syer, Political Science Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein, Mathematics Michael D. Zohns, Ornamental Horticulture Sarah E. Burroughs, Food Science and Nutrition (Child Development and Home Economics) Christina Orr-Cahall, Art Kendrick W. Walker, Philosophy Christina A. Bailey, Chemistry Kenneth E. Ozawa, Physics Thomas L. Richards, Biological Sciences James Bermann, Agricultural Engineering Donald J. Koberg, Architecture Jack D. Wilson, Aeronautical and Mechanical Engineering Euel W. Kennedy, Mathematics William L. Preston, Social Sciences Michael J. Wenzl, English Robert S. Cichowski, Chemistry Harvey C. Greenwald, Mathematics Max E. Riedlsperger, History Edward H. Baker, Mechanical Engineering Sue McBride, Education Phillip K. Ruggles, Graphic Communication Boyd W. Johnson, Mathematics

1987-88	James R. Mueller, Mathematics
	Ronald S. Mullisen, Mechanical Engineering
	Robert G. Reynolds, Art and Design
1988-89	Stephen W. Ball, Philosophy
	George B. Cotkin, History
	Abraham B. Shani, Management
1989–90	Lloyd N. Beecher, History
	Talmage E. Scriven, Philosophy
	Jan W. Simek, Chemistry
1990-91	Jay L. Devore, Statistics
	Linda H. Halisky, English
	Ann Morgan, Psychology
	James L. Webb, Physical Education and Recreation

# **STAFF EMERITI**

(Dates indicate period of service)

Administration

Vic Allen (1951-1976)	Custodial Services
Edna Anderson (1964-1986)	Foundation
Grace Arvidson (1951-1991)	President's Office
Mary L. Bachino (1968-1991)	Alumni Relations
Shirley Backer (1968-1988)	
Fern Ballard (1954–1974)	Foundation
Patricia Barker (1964–1988)	Foundation
loe C Baze $(1962-1980)$	Plant Operations
Gertrude F Beck (1968–1983)	Activities Planning
lames P. Becker (1962–1980)	Plant Operations
Dolores Bennett (1971–1988)	Evaluations
Alva E Ringham (1961 1985)	Eood Sorvicos
Alva F. Dingitalii (1901–1903)	Education
Dorothy Wi. Dishop $(1962-1960)$ .	East Cardina
Dons Bodine (1961–1978)	Food Services
Leona M. Boerman (1944–1967).	President's Office
Charles Boling (1968–1988)	Athletics
Robert V. Bonds, Jr. (1972–1991)	Learning Center
Phyllis Breckan (1973–1990)	Academic Programs
Jerold L. Budoff (1957–1988)	Residence Hall Services
Elinor Bullock (1970–1986)	General Office
Harold A. Burnett (1962-1977)	Agriculture and
	Natural Resources
Carma Burns (1966-1990)	Electronic and
	Electrical Engineering
William K. Butts (1965-1980)	Plant Operations
Rosemary Cameron (1964–1989)	University Library
lames Capetillo (1969-1991)	Plant Operations
Noel Carmack (1974-1989)	Public Safety
Orlan Casey (1957–1983)	Plant Operations
Fred Casillas (1964–1989)	Plant Operations
Robert Clark (1975–1990)	Plant Operations
George W. Cockriel (1957–1977)	University Police
Lorotta I. Costen (1953–1977)	Engineering and Technology
Bornard P. Cov. (1968, 1988)	Aoronautical Engineering
Donald I. Curtia (1960–1960)	Aeronautical Engineering
Donald J. Curlis $(1960-1976)$	
Koy E. Darr (1953–19/1)	Plant Operations
Yonne Dengler (1967–1991)	Ineatre and Dance
Elizabeth D. Dickens (1961–1980)	Architecture and
	Environmental Design
Lloyd G. Dietrich (1953–1973)	University Police
Paul S. Dillon (1947–1971)	Foundation
Everette Dorrough (1953–1987)	Foundation Food Services
Colier Duncan (1955–1977)	Plant Operations
John Dyer (1963-1979)	Plant Operations
Lilly Ellsworth (1969–1989)	Housing and
	Conference Services

Merriam J. Erickson (1962–1980) Wilbur T. Erpenbach (1967–1982)	Plant Operations
Depart A Freehade (10(0, 1005)	Electrical Engineering
Robert A. Escobedo (1969–1965)	Plant Operations
Juanita Faye Esmon (19/2–1991)	Plant Operations
Lloyd R. Evans (1959–1978)	Grounds
Mary Eyler (1961–1980)	Financial Aid
James Farrar (1968–1989)	Facilities Administration
Patricia A. Eilers Farrow (1957–1972)	Health Center
Leroy Fauset (1966-1983)	El Corral Bookstore
Albert Felis (1951-1991)	Plant Operations
James Fiscalini (1966-1982)	Farm Shop
Bernard J. Fitzgerald (1958-1980)	Mail Room
David Focht (1969-1991)	Ornamental Horticulture
Alice Fov (1962–1987)	Indation Business Office
Juanita A Fredericks (1954–1974)	El Corral Bookstore
Altha Freeman (1967–1988)	Evaluations
Robert   Fritte (1965–1985)	Plant Operations
Lack Ervor (1969, 1984)	Eoundation Personnel
Doppo D Copg (1069, 1001)	Student Health Services
Dollia D. Galig (1960–1991)	
Helen K. Garing (1966–1983)	Crop Science
Gerard Gentilucci (19/3–1991)	Plant Operations
E. Douglas Gerard (1952–1991)	Hacilities Administration
Roy Gersten (1967–1984)/	Associated Students, Inc.
Lena Gianolini (1949–1972)	Business Affairs
Ruth Gran (1957–1975)	Health Center
Josephine R. Graves (1964-1982)	Health Center
Margaret Green (1960-1977)	Food Services
Mary Lee Green (1948-1976)	El Corral Bookstore
Michael C. Grom (1968–1986)	
Leonard Hall (1968–1991)	Plant Operations
Earlin Halsey (1963–1991)	Farm Operations
losenh (1903 + 1957)	Foundation
Richard Harrison (1969–1988)	Art and Design
Rill Hart (1960-1901)	Plant Operations
Doro L. Hartor $(1069, 1092)$	arning Assistance Contor
Elemented L. Hauge $(10(2, 102))$	
Fiorence I. mauge (1962–1963)	Ornore antal Linutioution
Eugene Haugh (1966–1966)	Ornamental Horticulture
Walter Herner (1965–1983)	Computer Center
Jonn A. Heinz (1953–1986)	Audiovisual Services
Norma Henderson (1949–1983)	Academic Affairs
Ferdinand Herriman (1966-1987)	Plant Operations
Jarilyn H. Hobberlin (1968–1987)	Payroll Services
F. Jerald Holley (1961–1983)A	dmissions, Records, and
	Evaluations
Alicemae Hollings (1966–1982)	Foundation
Lillian R. Hooks (1964–1980)	Library
Catherine S. Hoover (1945–1946)	
(1962–1983)S	cience and Mathematics
Irene R. Horvath (1950-1983)	Communicative Arts and
	Humanities
Lorraine H. Howard (1964–1991)	Psychological Services
Margaret Hovt (1948–1981)	El Corral Bookstore
Clara Huffman (1959–1974)	El Corral Bookstore
Hazel   Hunter (1965–1980)	Evaluations
Esther Iglosize (1972–1988)	Philosophy
Pohort Invino (1975, 1991)	Plant Operations
Note: $M$ (1975–1991)	
Twiane Williams Janons (1964–1977) Elmor P. Johnson (1964–1993)	
EIIDEL K. JOHNSON (1966–1962)	A doministrative Affect
Viary L. Jonnson (1950–1976)	Administrative Affairs
Iommie L. Jones (1964–1980)	Business Attairs
Connie Jonte (1961–1983)	Alumni Services
Jack Kirchner (1969–1990)	Plant Operations
Edwin Koch (1961–1976)	Foundation Custodial

Edna J. Kuhnes (1969-1984)	Library
Zoilo Lagunday (1977-1991)	Plant Operations
George Lancaster (1962-1979)	Plant Operations
James R. Landreth (1956-1991)	Business Affairs
Ronald I. Larsen (1968-1983)	Public Safety
Lois L. Larson (1962–1978)	Health Center
Marianne Lefebyre (1968–1984)	Financial Operations
Envir A Lombeko $(1962, 1980)$	Plant Operations
Alfons D. Lorno (1965, 1992)	Plant Operations
Anons F. Lenio (1965–1965)	Developerations
Francisco Limon (1961–1991)	Physical Education
and	Recreation Administration
Wayne Lindsey (1953–1983)	Farm Shop
Joe A. Lipe (1965–1980)	Plant Operations
Irene Lund (1961–1984)	Foundation
Ruth Lundquist (1960–1979)	Business Affairs
Josephine E. Maddalena (1965-1980	0)Physical Education
James Mapes (1961-1977)	University Police
Anne B. Marcell (1961–1982)	Evaluations
Salvador R. Mares (1974-1991)	Physical Education
and	Recreation Administration
Anna M. Martinez (1974–1991)	Fiscal Operations
K Ion Mayoda (1954–1982)	Plant Operations
Rarbara A McCalob (1975-1991)	Ornamontal Horticulture
Danald L. McCaleb (1975-1991)	Onamental Horiculture
Donald L. MCCaleb (1962-1991)	Communications and
	Special Events
Marion McCoy (1973-1990)	Foundation Food Services
Daniel H. McCready, Jr. (1961–198	3)Plant Operations
Jackie McDaniel (1970–1990)	Warehouse
Dorothy J. McDonald (1963–1985)	Telecommunications
John McGrath (1970–1988)	Warehouse
Florence H. Mesler (1962–1983)	Health Center
Julius F. Metz (1968–1983)	Plant Operations
Lionel Middlecamp (1942–1976)	Head Farmer
Viola E. Hughes Milburn (1956–197	8)Health Center
Robert J. Miller (1960–1980)	Business Affairs
Peggy Milburn (1966–1988)	Foundation
A. Teresa Mounier (1970–1986)	Purchasing
Nancy Muir (1962–1991)	Psychological Services
George Mulder (1968-1991)	Counseling Services
Robert Myers (1967-1988)	Architecture
Valdora Myers (1960-1978)	Health Center
Harold A. Nash (1947-1974)	Power Plant
James H. Nash (1977-1991)	Student Health Services
James Neal (1954-1990)	Foundation
James G. Neelands (1957-1991)	School of Science
	and Mathematics
Margaret Nelson (1959-1977)	Housing
Avice I. Nolan (1960-1980)	Audiovisual
Edward L. Nolan (1953-1979)	Mechanical Engineering
Jack O'Dell (1953-1986)	Foundation
Lee Owen (1946-1978)	Plant Operations
L. Ruth Palmer (1971-1987)F	oundation Business Office
Kathryn Patterson (1960-1982)	Procurement and
	Support Services
Alfred J. Pelucca (1956–1971)	Custodial Services
loseph C. Pereira (1970–1985)	
Bernita Persall (1964–1990)	Relations with Schools
Wilma Pierce (1971–1988)	
Donna Porter (1962–1986)	Student Health Services
lune Powell (1947–1991)	
John Rankin (1974–1991)	Plant Operations
Ioan Roberts (1958–1980)	
,	Foundation
Gerolamo Salmina (1969-1991)	Foundation

Rafael Sanchez (1970-1991)	Plant Operations
Al Sanders (1964-1979)	Grounds
Aldora Santos (1972-1988)	Physical Education
Edmond L. Schellenger (1966-1983	)Plant Operations
Byrle Schoenf (1973–1991)	Plant Operations
Ralph Schurtz (1949–1973)	Custodial Services
Many E. Scrivpor (1966, 1982)	Academic Programs
Dauling Chaffer (1960–1963)	Eoundation Food Somicos
Pauline Snatter (1969–1989)	Foundation Food Services
Mary Smith (1960–1988)	Personnel and
David LL Caudea (1070, 1980)	Envoltment Support
David H. Snyder (19/0-1989)	Enroliment Support
	Services/Admissions
F. Yvonne Southgate (1963–1980).	Mechanical Engineering
Ethel Spry (1962–1985)	Associated Students, Inc.
James Stacy (1970–1988)	Audio Visual Services
Jean Steck (1960–1975)	Industrial Engineering
Marcie Steger (1962-1979)	Food Services
Valerie Steinmann (1968-1990)	Fiscal Operations
Walter Stier (1970-1991)	School of Architecture
	and Environmental Design
Mary Jo Summers (1962-1980)	Health Center
Frank Y.Sweeney (1963-1983)	Plant Operations
Alfred Tartaglia (1970-1991)	Plant Operations
Harold S. Tartaglia (1969-1986)	
Richard A. Tartaglia (1959–1989).	
Arthur A. Thorn (1962–1979)	Business Affairs
Sondra M. Tuttle (1975–1991)	Industrial Technology
Merlin Ward (1946–1974)	Plant Operations
Thomas Ward (1969–1989)	Civil and
momus ward (1969-1969)	Environmental Engineering
Edith Welter (1963-1988)	Business Affairs
Boyd Wettlaufer (1960–1976)	Audiovisual
Corold Whiteford (1960–1983)	Fl Corral Bookstore
Alfred T. Milcov (1960-1965)	Custodial Services
Alled T. WICOX (1900–1973)	Eoundation
Junii Wilcux (1965–1966)	Borconnol and
Smiley E. Wilkins (1974–1969)	Employee Relations
Margaret Wilmot (1952–1979)	Library
Lawrence   W/olf (1970-1990)	Financial Aid
Lawrence W/right (1976-1991)	Plant Operations
Patricia Wright (1978_1991)	Library
Eranly H W/vman (1956_197)	Plant Operations
Arthur L Voung (1059-1972)	Plant Operations
Arthur J. Tourig (1930-1903)	Diant Operations
Howard Zaugg (1966–1963)	

# OUTSTANDING STAFF EMPLOYEE AWARD RECIPIENTS

The 1972-73 academic year saw the inception of the Outstanding Staff Employee Award. This honor is bestowed upon permanent, full-time employees of the university, Foundation, or Associated Students, Inc. who are in at least their third year of employment at Cal Poly. In order to be considered for this award, an employee should be truly dedicated and loyal; exhibit expertise in job performance; demonstrate a willingness to assist others enthusiastically; take initiative in making his or her department more efficient and productive; maintain an excellent relationship with co-workers, faculty, and students; and make contributions to both the university and the community. Nominations are solicited from staff employees, faculty members, and department or division heads. Selection of the awardees is made by a committee of former recipients of the award. Outstanding Staff Employees Award recipients are listed below.

#### 1972-73

Everette Dorrough

## 1973-74

Vic Allen Florence Hauge Lionel Middlecamp Jim Neelands

## 1974-1975

Robert Baldridge John Lee Gerry Wagner Arthur Young

## 1975-1976

Merriam Erickson Viola Hughes Mary Johnson Boyd Wettlaufer

1976-77

Trudy Beck Stella Nuncio

#### 1977-78

Luther Bertrando Pauline Shaffer Joanna DeRosier

## 1978-79

Harold Miller Doris Anderson Richard Tartaglia Frank Lebens

#### 1979-80

Dale Lackore Steven Riddell Joan Roberts

## 1980-81

Joan Cirone Farlin Halsey Irene Lund

## 1981-82

James Neal Connie Jonte Frank Kassak

## 1982-83

Barbara Lund Larry Grimes Norman Johnson

## 1983--84

Jerald (Louie) Budoff Walter Clark Gail Simmons

## 1984-85

Alfred W. Amaral Ethel Spry Kathleen Lamoree

## 1985-86

James Landreth Geraldine Montgomery Vicki Stover

#### 1986-87

Lee Brown Gary Ketcham French Morgan

## 1987--88

Lynette Klooster Judi Pinkerton Nancy Raetz

#### 1988-89

Debbie Arseneau June Powell Jacquie Rossi

#### 1989-1990

Grace Arvidson Janet Carlstrom Ronald Christensen

#### 1990-1991

Barbara Ciesielski Harriet Clendenen Harriet Ross

# FACULTY AND STAFF

(Number in parentheses indicates year of appointment)

#### Listed as of March, 1992

- ABITIA, FRED (1969) ...... .....Industrial Technology B.A., San Jose State College, 1964; M.A., 1966; Ed.D., Washington State University, 1971. Professor.
- ABSHIRE, FRANKLIN P. (1977) ......Engineering Technology B.S., Arizona State University, 1969; M.S., 1974. Professor. Registered Professional Engineer, Arizona, Ohio.
- ACETO, JEANNE C. (1981) ..... .....School of Engineering B.A., Whittier College, 1965; M.A., Stanford University, 1966. Director, Women's Engineering Program.
- ACORD, DORIS (PAT) (1980) .....Physical Education and
- Recreation Administration B.A., Morehead State, 1961; M.A., Ball State University, 1965; M.A., Southern Illinois University, 1975; Ph.D., 1977. Professor.
- ADALIAN, PAUL T., IR. (1978) ..... .....University Library B.A., Stanislaus State College, 1966; M.A., Loyola University of Los Angeles, 1968; M.L.S., Syracuse University, 1971. Librarian.
- ADAMS, STEPHEN H. (1974) ......Associated Students, Inc./ University Union B.S., Southern Illinois University, Edwardsville, 1969; M.S., Kansas State
- University, 1973. Associate Director, Procurement and Contracts.
- AGBO, SAMUEL O. (1991) .....Electronic and Electrical Engineering B.Sc., University of Nigeria, 1975; M.S.E., University of Michigan, 1978; Ph.D., University of Houston, 1984. Associate 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.
- AIKEN, IAMES L. (1976) ..... .. Psychological Services B.A., University of Florida, 1964; M.Ed., 1965; Ph.D., Missouri University, 1970. Diplomate in Counseling Psychology of American Board of Professional Psychology. Associate Director.
- ALEXANDER, ZOE (1991) .... .. Psychological Services B.A., Stanford University, 1965; M.A., University of Michigan, 1967; Ph.D., Ohio State University, 1970; Ph.D., California Graduate School, San Rafael, 1987. Counselor.
- ALGEO, JOHN W. (1985) ..... ...Animal Sciences and Industry B.S., State College of Washington, 1948; M.S., 1949. Professor and Department Head. Registered Professional Animal Scientist.
- AL-HADAD, SABAH (1965) Mathematics B.S., Texas Technological College, 1960; M.A., California State Polytechnic College, 1962; Ed.D., Arizona State University, 1972. Associate Professor.
- ALLEN, CHARLES R. (1986) ......University Relations and Development B.A., Kansas Wesleyan University, 1957; M.Ed., Xavier University, 1958. Executive Director, University Relations and Development.
- AMANZIO, JOSEPH C. (1971) ..... .....Architecture B.Arch., University of Florida, 1967; M.Arch., Washington University, 1974. Professor. Registered Architect, California.
- AMARAL, ALFRED W. (1967) ..... ......University Foundation B.S., California State Polytechnic College, 1964; M.B.A., Golden Gate College, 1970. Executive Director.
- AMEDEE, GASTON (1976) ..... .....Soil Science B.S., University of Haiti, 1963; M.S., University of Connecticut, 1971; Ph.D., Cornell University, 1974. Professor.
- AMSPACHER, WILLIAM H. (1985) ..... .....Agribusiness B.S., Clemson University, 1978; M.S., 1980; Ph.D. University of California, Davis, 1988. Associate Professor.
- ANDERSON, C. ROBERT (1982) .....University Relations and Development B.A., Duke University, 1965; M.A., University of Missouri, 1973. Communications Officer.

- ANDERSON, JAMES A. (1987) .....
- ....Accounting B.A., DePauw University, 1968; Ph.D., Washington University, 1973. Professor.
- ANDERSON, SARAH J. (1984) ..... .....Financial Aid B.A., University of California, Santa Barbara, 1970. Assistant Director.
- ANDERSON, YVONNE M. (1980) ......Health Services A.B., University of Kansas, 1951; Medical Technology Internship, 1952. Clinical Laboratory Technologist. California Licensed Clinical Laboratory Technologist, American Association of Bioanalysts Supervisor Certified.
- ANDOLI, FREDERICK P. (1968) .....Biological Sciences B.A., Upsala College, 1963; M.S., Utah State University, 1968; D.A., Idaho State University, 1974. Professor.
- ANDRE, BARBARA R. (1973) .....Student Life and Activities B.A., Humboldt State College, 1969; M.A., California State Polytechnic College, 1971; Ed.D., University of San Francisco, 1986. Coordinator, International Student Programs.
- ANDRESEN, JAMES G. (1956) ......Mechanical Engineering B.S., California State Polytechnic College, 1956; M.Engr., 1979. Associate Professor.
- ANDREWS, CHARLES T. (1972) ..... Accounting B.S., Eastern Illinois University, 1960; M.B.A., Bowling Green State University, 1963; D.B.A., Indiana University, 1968. Professor. Certified Public Accountant.
- ANGLEY, STEPHEN F. (1982) .....Ornamental Horticulture B.S., Berea College, 1969; M.S., Clemson University. Professor and Interim Department Head.
- APFELBERG, HERSCHEL L. (1971) .....Graphic Communication B.S., Rochester Institute of Technology, 1965; M.A., California Polytechnic State University, San Luis Obispo, 1973, Professor,
- ARMSTRONG, GENE A. (1970) ......Animal Sciences and Industry B.S., California Polytechnic State University, San Luis Obispo, 1972. Professor.
- ARMSTRONG, MARY BETH (1984).....School of Business B.S., University of Nevada, Reno, 1968; M.B.A., California State Polytechnic University, Pomona, 1976; Ph.D., University of Southern California, 1984. Professor, Certified Public Accountant, Associate Dean,
- B.S., California Polytechnic State University, San Luis Obispo, 1987. Outreach Associate
- ASCOLI, RICHARD V. (1986) ......Health Services B.S., College of William and Mary, 1965; M.D., Medical College of Virginia, 1974; Internship and Residency in Emergency Medicine, University of Southern California-Los Angeles County General Hospital, 1982. Physician.
- ASSAL, AMR F. (1986) ......Electronic and Electrical Engineering B.Sc., Cairo University, Egypt, 1977; M.Sc., 1979; Ph.D., University of California, Santa Barbara, 1986. Associate Professor.
- ATRÉ, SHARAD D. (1974) ..... .....Architecture B.Arch., University of Baroda, India, 1963; B.Arch., Washington University, 1965; M.Arch., University of Colorado, 1973. Professor. Registered Architect: California and India.
- ATTALA, EMILE E. (1970) ..... ......Computer Science B.S., Cairo University, Egypt, 1958; M.S., University of California, Berkeley, 1964; Ph.D., University of California, Santa Barbara, 1974. Professor
- ATWOOD, LINDA (1974) ..... ...Chemistry B.A., Bard College, 1968; M.A., Wesleyan University, 1973; Ph.D., 1974. Professor.
- AVEY, RENNY J. (1973) ..... .....Agribusiness B.S., California State Polytechnic College, 1969; M.S., Oregon State University, 1972; Ph.D., University of Hawaii, 1974. Professor.
- AVILES, BRIAN A. (1989) ..... .....Landscape Architecture B.L.A., University of Arizona, Tucson, 1983; M.L.A., Harvard University, 1989. Assistant Professor. Registered Landscape Architect, California.
- AXELROTH, ELIE (1984) .....Psychological Services B.A., State University of New York, Albany, 1976; M.A., University of Maryland, 1978; Psy.D., University of Denver, 1983. Counselor.

- BACHMANN, JOHN E., CPT. (1987) ......Military Science B.S., Bernard M. Baruch College, C.U.N.Y., 1977; M.S., University of Louisville, 1986.
- BAGNALL, JAMES R. (1969) ......Architecture B.A., Occidental College, 1957; M.Arch., University of California, Berkeley, 1974. Professor.
- BAILEY, CHRISTINA ANNE (1978) ......Chemistry B.S., College of Saint Elizabeth, New Jersey, 1964; Ph.D., Purdue University, 1970. Professor.
- BAILEY, PHILIP S. (1969) ......School of Science and Mathematics B.S., University of Texas, 1964; Ph.D., Purdue University, 1969. Professor and Dean.
- BAKER, WARREN J. (1979) .....President B.S., University of Notre Dame, 1960; M.S., 1962; Ph.D., University of New Mexico, 1966. President.
- BALASUBRAMANIAN, K. N. (1987) ......Industrial Engineering B.E., University of Madras, India, 1965; M.E., 1968; M.S., Ohio University, 1973; Ph.D., 1976. Associate Professor. Certified in M.T.M., and Production and Inventory Management (C.P.I.M.).
- BALDWIN, MARYLUD (1982) ......University Center for Teacher Education A.B., Wilson College, 1967; M.Ed., Virginia Commonwealth University, 1973; Ph.D., University of California, Berkeley and San Francisco State University, 1983. Professor.
- BALGLEY, KATHLEEN A. (1989) .....English B.A., University of Illinois, 1974; M.A., University of California, San Diego, 1980; Ph.D., 1986. Assistant Professor.
- BALL, STEPHEN W. (1983) ......Philosophy B.A., Purdue University, 1972; M.A., University of Michigan, 1973; Ph.D., 1978. Professor.
- BALLEW, THOMAS J. (1975) .....Architectural Engineering B.S., University of Oklahoma, 1954; M.A., Arizona State University, 1972. Professor. Registered Civil Engineer, California; Registered Architect, California.
- BALTHASER, LAWRENCE H. (1969) ......Physics B.A., Rutgers University, 1960; M.A., Indiana University, 1963; Ph.D., 1969. Professor.
- BARATA, ANTONIO G. (1985) ......Music
   B.A., Towson State University, 1977; M.M., Northwestern University, 1979;
   D.M.A., University of Illinois, 1985. Associate Professor.
- BARCLAY, KENNETH B. (1979) ......Student Life and Activities B.A., Bowling Green State University, 1967; M.A., University of Massachusetts, 1969; Ph.D., Kent State University, 1975. Director.
- BARNES, TIMOTHY M. (1969) ......History B.A., University of New Mexico, 1965; M.A., 1966; Ph.D., 1970. Professor.
- BARTHELS, KATHARINE M. (1978) ......Physical Education and Recreation Administration B.S., University of California, Los Angeles, 1961; M.S., University of California,
- 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. Assistant Professor.
- BATTERSON, RONALD E. (1971).....Architecture B.S., University of Cincinnati, 1964; M.Arch., University of Washington, 1970; graduate study, Danish Royal Academy of Arts. Professor. George C. Marshall fellowship grant. Registered Architect, Ohio.

- BAUR, LAWRENCE E., JR. (1965)......Accounting B.B.A., University of Michigan, 1954; M.B.A., 1957. Associate Professor. Certified Public Accountant.
- BEARDSLEY, GEORGE L., JR. (1975) .....Economics B.A., University of California, Berkeley, 1971; M.A., University of Pennsylvania, 1973; Ph.D., 1974. Professor.
- BEASON, STEVE B. (1985) ......Intercollegiate Athletics B.S., Emporia State University, 1979; M.S., 1985. Head Coach.
- BEECHER, LLOYD N. (1969) ......History B.A., California State College, Fullerton, 1965; MA., 1966; Ph.D., University of Georgia, 1970. Professor.
- BENEDICT, WILLIAM R. (1990) .....Architecture B.Arch., Kansas State University, 1967; M.Arch., University of Texas at Austin, 1989. Assistant Professor.
- BENNETT, DARRELL F. (1971) ......Health Services B.S., University of Arizona, 1965. Pharmacist.
- BERG, LORRAINE M. (1983) ......Health Services R.N., Cuesta College, 1975; N.P. Family Planning, San Jose State University, 1982. Nurse Practitioner.
- BERMANN, JAMES (1964) ......Agricultural Engineering B.S., California State Polytechnic College, 1959, 1961; M.S., Michigan State University, 1971; Ed.D., Brigham Young University, 1979. Professor.
- BERRIO, MARGARET M. (1989) .....Psychology and Human Development B.Mus., Oberlin College, 1964; M.A., Southern Illinois University, 1967; M.S., Tufts University, 1972; Ph.D., Indiana University, 1974. Assistant Professor.
- BERRIO, MARK (1986) .....Architectural Engineering B.S., University of El Salvador, 1955; B.S., University of Guatemala, 1963; M.S., University of Michigan, 1965; Ph.D., Michigan State University, 1971. Professor and Department Head. Registered Engineer, Guatemala.
- BERTOZZI, DAN, JR. (1974) .....Business Administration A.B., University of California, Berkeley, 1966; M.B.A., 1969; J.D., 1971. Professor.
- BETHEL, A. C. W. (1968) ......Philosophy B.A., University of California, Santa Barbara, 1964; M.A., 1968; Ph.D., 1974. Professor.
- BEUG, JAMES L. (1973) ......Computer Science B.A., Northwestern University, 1962; Sc.M., Ohio State University, 1971; Ph.D., 1974. Professor.
- BEYER, EDGAR H. (1981) .....Crop Science B.S., University of Illinois, 1958; M.S., Purdue University, 1963; Ph.D., 1964. Professor.
- BIEZAD, DANIEL J. (1990) ......Aeronautical Engineering B.S., Illinois Institute of Technology, 1966; M.S., Air Force Institute of Technology, 1972; Ph.D., Purdue University, 1984. Associate Professor.
- BIGGS, JOSEPH R. (1988) ......Management B.S.B.A., Ohio State University, 1968; M.B.A., University of Missouri, Kansas City, 1971; Ph.D., Ohio State University, 1975. Professor.
- BLOCK, DANIEL W. (1983) ......Agribusiness B.S., California Polytechnic State University, San Luis Obispo, 1977; M.S., 1987. Associate Professor.
- BLODGET, ROBERT L. (1974) .....Psychology and Human Development B.A., Willamette University, 1965; Ed.D., University of Massachusetts, 1973. Associate Professor.
- BLUM, MICHAEL L. (1981) (1984) ......Graphic Communication B.A., University of California, Los Angeles, 1971; M.S., Rochester Institute of Technology, 1979. Professor.
- BOCHE, RAYMOND E. (1969) ......Computer Science B.S., California State Polytechnic College, 1958; M.S., San Jose State College, 1966; Ph.D., Texas Tech University, 1971. Professor.
- BOONE, JOSEPH C. (1968) ......Physics B.A., Earlham College, 1962; M.A., University of Wisconsin, 1967; Ph.D., 1970. Professor.
- BORIN, NORM. A. (1992) ......Business Administration B.S., University of California, Davis, 1981; M.B.A., California State University, Sacramento, 1987; Ph.D., University of Virginia, Charlottesville, 1992. Associate Professor.

BOSTROM, ROBERT M. (1956) ......Housing B.S., California State Polytechnic College, 1956; M.A., 1970. Director.

BOTWIN, MICHAEL (1981).....Architectural Engineering B.S., University of Miami, 1962; M.S., Rensselaer Polytechnic Institute, 1964; Ph.D., 1968. Professor.

BOVILL, CARL H. (1990) ......Architecture B.S., University of California, Santa Barbara, 1969; M.S., University of California, Berkeley, 1970; M.Arch., University of Hawaii, 1976. Associate Professor. Registered Architect, Hawaii and Tennessee. ASHRAE.

BOWKER, LESLIE S. (1974) ......Biological Sciences B.S., University of Massachusetts, 1963; M.S., Rutgers University, 1965; Ph.D., Washington State University, 1974. Professor.

BOYER, LISA (1986) .....Intercollegiate Athletics B.Journalism, Creighton University, 1983; M.A., Idaho State, 1988. Head Coach.

BOYES, WILLIAM J. (1991).....School of Business B.S., Idaho State University, 1969; Ph.D., Claremont Graduate School, 1974. Dean.

BOYNTON, WILLIAM C. (1985) ......Accounting B.S., Northeastern University, 1967; M.B.A., Michigan State University, 1968; Ph.D., 1976. Professor. Certified Public Accountant.

BRADY, LOIS (1988) ......Computer Science B.A., Wagner College, 1958; M.S., University of Iowa, 1960; M.S., University of Wisconsin, 1984; Ph.D., 1988. Professor.

BRADY, MARY L. (1968) ......University Library B.A., Mundelein College, 1960; M.A.L.S., Rosary College, 1966; M.A., California Polytechnic State University, San Luis Obispo, 1978. Librarian.

BRAUNINGER, ANDREA L. (1986)......Health Servies A.B., San Jose State College, 1966; M.D., University of Southern California, 1971; Medical Internship, University of Florida, 1972. Physician.

BRECKENRIDGE, PATRICIA HAMER (1975) ......Ornamental Horticulture B.S., California State Polytechnic College, 1970; M.L.A., California State Polytechnic University, Pomona, 1979. Additional graduate study, California Polytechnic State University, San Luis Obispo. Professor.

BREITENBACH, JEROME R. (1986) .....Electronic and Electrical Engineering B.S., California State Polytechnic University, Pomona, 1977; M.S., California Institute of Technology, 1978; Ph.D., University of California, Los Angeles, 1983. Professor.

BREITENBACH, STACEY M. (1981) ......School of Engineering B.S., California Polytechnic State University, San Luis Obispo, 1989. 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.

BRODIE, DAVID A. (1970) .....Architecture B.Arch., University of Capetown, South Africa, 1953; M.Arch., University of California, Berkeley, 1964. Professor.

BROWN, C. ANDREA (1987).....Physical Education and Recreation Administration Specialist Certificate, University of Birmingham, England, 1968; M.S., Washington State University, 1978; M.A., 1979; Ph.D., University of Idaho, 1984. Associate Professor.

BROWN, CARL R.V. (1982).....English B.A., Arizona State University, 1971; M.A., 1972; Ph.D., Stanford University, 1977. Professor.

BROWN, J. WYATT (1990).....Crop Science B.S., Louisiana State University, 1978; M.S., 1985; Ph.D., Cornell University, 1990. Assistant Professor.

BROWN, JOHANNA B. (1969–1973) (1974) ......University Library B.A., Saint Mary's College, 1966; M.L.S., State University of New York at Geneseo, 1967. Associate Librarian. BROWN, KENNETH J. (1991) .....English B.A., Xavier University of Louisiana, 1971; M.A., University of Iowa, 1975; Ph.D., 1987. Associate Professor.

BROWN, KENNETH L. (1980) ......Industrial Engineering B.V.E., California Polytechnic State University, San Luis Obispo, 1979; M.A., 1980; Ph.D., Colorado State University, 1988. Associate Professor.

BROWN, ROBERT J. (1969) ......Biological Sciences B.S., California State College, Los Angeles, 1964; M.S., Arizona State University, 1967; Ph.D., University of Toronto, Canada, 1972. Professor.

BROWN, RONALD F. (1974) ......Physics B.A., University of California, Riverside, 1962; M.A., 1964; Ph.D., 1968. Professor.

BROWN, WILLIAM H. (1957) .....Architecture B.Arch., University of Florida, 1954; M.Arch., 1968; additional graduate study, University of Sydney. Professor. Registered Architect, California.

BRUMLEY, RICHARD L. (1981) ......University Library B.S., Utah State University, 1963; M.S., 1965; M.L.S., University of California, Berkeley, 1975. Associate Librarian.

BUCCOLA, VICTOR A. (1962) ......Physical Education and Recreation Administration B.S., California State Polytechnic College, 1956; M.A., 1957; Ed.D., Arizona State University, 1972. Professor.

BUCKALEW, W. CHRIS (1990) ......Computer Science B.S., North Texas State University, 1980; M.S., 1984; Ph.D., 1990. Assistant Professor.

BUFFA, ANTHONY J. (1970) ......Physics B.S., Rensselaer Polytechnic Institute, 1964; M.S., University of Illinois, 1966; Ph.D., 1969. Professor.

BURGUNDER, LEE B. (1983) .....Business Administration B.A., Dartmouth College, 1977; M.B.A., Stanford University, 1981; J.D., 1981. Professor.

BURN, SHAWN (1990) ......Psychology and Human Development B.S., Virginia Commonwealth University, 1982; M.A., The Claremont Graduate School, 1984; Ph.D., 1988. Assistant Professor.

BURNS, CHARLOTTE B. (1974) .....Ornamental Horticulture B.A., University of California, Los Angeles, 1951; M.A., 1978, California Polytechnic State University, San Luis Obispo; graduate study, University of Hawaii; University of California, Berkeley and Irvine. Professor.

BURRELL, SHEL A. (1973) ......Career Services B.A., University of California, San Diego, 1971; M.A., California Polytechnic State University, San Luis Obispo, 1981. Associate Director.

BURROUGHS, SARAH E. (1967) .....Food Science and Nutrition B.S. and Certificate in Medical Technology, University of Michigan, 1956; Ph.D., University of California, 1967. Professor.

BURT, CHARLES M. (1978) ......Agricultural Engineering B.S., California Polytechnic State University, San Luis Obispo, 1973; M.S., Utah State University, 1975; Ph.D., 1983. Professor. Registered Civil Engineer and Agricultural Engineer, California. Registered Professional Engineer, Utah.

BURTON, ROBERT E. (1968) .....History A.B., San Diego State College, 1962; M.A., University of Oregon, 1964; Ph.D., 1969. Professor and Department Chair.

BUSSELEN, HARRY J., JR. (1975) .....School of Professional Studies B.S., California State College, Sacramento, 1959; M.S., 1962; Ph.D., Florida State University, 1970; additional graduate study, University of Oregon. Professor and Dean.

BUTLER, J. KENT (1977) ......School of Engineering B.S., Arizona State University, 1961; M.S., 1963; Ph.D., 1971. Professor and Associate Dean.

BUXBAUM, JAMES M. (1978) .....Business Administration B.A., Harvard College, 1949; J.D., Columbia University Law School, 1955; M.A., Claremont Graduate School, 1976: Ph.D., 1978; additional study, University of Paris, Hague Academy of International Law. Professor.

BYARS, NAN A. (1985) .....Engineering Technology B.S., Clemson University, 1978; M.S., West Virginia University, 1981. Professor. Registered Professional Engineer, South Carolina.

CAMP, ROGER C. (1984).....Computer Science B.S., Oklahoma State University, 1955; M.S., Iowa State University, 1957; Ph.D., 1962. Professor and Department Chair.

- CANO, RAUL J. (1974) ......Biological Sciences B.S., Eastern Washington State College, 1970; M.S., 1972; Ph.D., University of Montana, 1974. Professor.
- CANTU, R. DAVID (1980) ......Student Academic Services B.S., California State Polytechnic College, 1969; M.S., 1974; M.A., 1975. Director, Minority Engineering Program.
- CARDOZA, MARGARET (1981) .....Graduate Studies and Research B.A., California State University, Sacramento, 1972. Director of Grants Development.
- CARNEGIE, E. J. (1963–64) (1965) ......Agricultural Engineering B.S., California State Polytechnic College, 1962; M.Engr., University of California, Davis, 1963. Professor and Department Head. Registered Mechanical Engineer, California.
- CARPENTER, THOMAS W. (1968) ......Mechanical Engineering B.S., Virginia Polytechnic Institute, 1961; M.S., 1964; Ph.D., Purdue University, 1969. Professor.
- CARR, JANICE L. (1983) ......Accounting B.S., California State University, Northridge, 1971; M.S., 1975; Ph.D., Arizona State University, 1985. Associate Professor. Certified Public Accountant.
- CARTER, CLAY (1991) .....Journalism M.J., Carleton University, Canada, 1990. Associate Professor.
- CARTER, LARK P. (1981) .....Crop Science B.S., Iowa State University, 1953; M.S., 1956; Ph.D., 1960. Professor.
- CARY, ARTHUR S. (1974) ......Physics B.A., Fisk University, 1949; M.A., 1951; Ph.D., University of California, Riverside, 1969. Professor.
- CASEY, GLEN R. (1982) ......Agricultural Education B.S., Chico State College, 1966; M.S., California Polytechnic State University, San Luis Obispo, 1979; Ed.D, Oklahoma State University, Stillwater, 1987. Associate Professor and Department Head.
- CASTELLANO-GIRÓN, HERNÁN (1986) ......Foreign Languages B.A., University of Chile, 1960; M.A., University of Rome, 1981; Ph.D., Wayne State University, 1986. Assistant Professor.
- CAVALETTO, RICHARD A. (1990) ......Agricultural Engineering B.S., California Polytechnic State University, San Luis Obispo, 1981; M.S., University of California, Davis, 1983; Ph.D., 1987. Associate Professor.
- CENSULLO, ALBERT C. (1974) ......Chemistry B.S., Villanova University, 1969; Ph.D., Pennsylvania State University, 1975. Professor.
- CHAMBERS, WILLIAM C. (1985) ......Industrial Technology B.S., United States Naval Academy, 1953; M.S., Air Force Institute of Technology, 1959. Associate Professor. Registered Professional Engineer, Ohio.
- CHAPMAN, ARTHUR J. (1972) .....Architecture, Information Systems B.S., B.Arch., California State Polytechnic College, 1970; M.S., Pennsylvania State University, 1971; additional graduate study, University of California, Los Angeles. Professor and Interim Director, Instructional Computing and Operations.
- CHEDA, ARCHIE D. (1980) ......Industrial Engineering B.S., California State Polytechnic College, 1969; M.S., University of Minnesota, 1978.; M.S., University of California, Santa Barbara, 1988. Professor. Registered Professional Engineer, California.
- CHEEK, DONALD K. (1973) .......University Center for Teacher Education B.S., Seton Hall University, 1953; M.S.W., Fordham School of Social Service, 1955; Ph.D., Temple University, 1971. Professor.
- CHEP, KENNETH (1990) .....Student Academic Services B.S., Madison College, Virginia, 1976; M.Ed., George Mason University, Virginia, 1981; Ed.S., James Madison University, Virginia, 1985. Learning Disabilities Specialist, Disabled Student Services.
- CHEW, MARIE (1976) ......Health 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) .....University Relations and Development B.S., California Polytechnic State University, San Luis Obispo, 1976; M.A., Mills College, 1978. Director, Annual Giving.

- 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.
- CHIVENS, DONALD R. (1988) ......Mechanical Engineering B.S., California Institute of Technology, 1965; M.S., 1966; Ph.D., Arizona State University, 1974. Associate Professor.
- CHRISTENSEN, MARGARET M., MAJ. (1989)......Military Science B.A., Concordia College, 1969; M.A., University of Utah, 1973.
- CHRISTENSON, ROBERT A. (1970) ......Psychology and Human Development B.S., University of Utah, 1963; M.S., Brigham Young University, 1968; Ph.D., 1970, Professor
- CIANO, DAVID A. (1973) ......Financial Aid B.A., University of Redlands, 1966; J.D., University of California, Los Angeles, 1972. Counselor.
- CICHOWSKI, ROBERT S. (1971) .....Chemistry B.S., Purdue University, 1964; Ph.D., Alfred University, 1968. Professor.
- CIESIELSKI, BARBARA F. (1962) .....Information Systems B.A., Fresno State University, 1962. Telephone Administration Coordinator, Communications Services.
- CIRONE, JOAN M. (1971) ......Health Services R.N., Cuesta College, 1971; Nurse Practitioner, University of California, Los Angeles, 1974; B.S.N., California State College, Bakersfield, 1979; M.A., California Polytechnic State University, San Luis Obispo, 1983; M.P.A., University of San Francisco, 1983. Head, Nursing Services.
- CIROVIC, MICHAEL M. (1968) .....Electronic and Electrical Engineering B.E., New York University, 1965; M.S., 1968. Professor.
- CLARK, KEVIN (1988).....English B.A., University of Florida, 1972; M.A., 1979; Ph.D., University of California, Davis, 1986. Assistant Professor.
- CLARK, NANCY L. (1989) ......History B.A., University of California, Los Angeles, 1972; M.A., 1974; M.A., Yale University, 1982; M.Phil., 1983; Ph.D., 1988. Assistant Professor.
- CLARK, NEILL V. (1985) ......Engineering Technology B.S.E.E., California State Polytechnic College, Pomona, 1968; M.S.E.E., University of California, Santa Barbara, 1973. Professor. Registered Professional Engineer, California.
- CLARK, WILLIAM E. (1977)......Mechanical Engineering B.M.E., University of Minnesota, 1964; M.S., 1966; Ph.D., 1972. Professor. Registered Professional Engineer, California.
- CLAUSE, ODILE M. (1976) ......Foreign Languages B.A., University of Wyoming, 1967; M.A., 1968; Ph.D., University of Colorado, 1975. Professor.
- CLIFFORD, CAROL F. (1981) .....Business Affairs B.S., University of Washington, 1972. Payroll Officer.
- CLENDENEN, HARRIET (1977) .....Student Academic Services B.A., Central Michigan State University, 1953; M.A., California Polytechnic State University, San Luis Obispo, 1979. Coordinator, Disabled Student Services.
- CLOGSTON, FRED L. (1960) .....Biological Sciences B.A., B.S., Western Washington College, 1950; M.S., University of Washington, 1956; Ph.D., 1965. Professor.
- CLOVER, ROBERT C. (1990) ......Information Systems B.A., University of California, Berkeley, 1967; M.A., Chico State College, 1969; Ph.D., Oregon State University, 1974. Director, Academic Computing Services.
- COCHRAN, BURT, JR. (1976) ......Health Services M.D., University of Southern California Medical School, 1949. Certified American Board of Internal Medicine, 1957. Physician. Head, Medical Services.
- COCHRAN, KERRY (1990) ......Agribusiness B.S., California State University, Chico, 1976; M.I.M., American Graduate School of International Management, 1986. Associate Professor.
- COCHRANE, MONA (1970)......Health Services R.N., Knapp College of Nursing, Santa Barbara, 1953. N.P., California Polytechnic State University, San Luis Obispo, 1976. Nurse Practitioner.

- COLEMAN, JAMES W. (1973) ......Social Sciences B.A., California State University, Northridge, 1969; M.A., University of California, Santa Barbara, 1971; Ph.D., 1975. Professor.
- COLEMAN, WILLI M. (1980)......Center for Women and Ethnic Issues B.A., San Francisco State College, 1966; M.S.W., University of California, Berkeley, 1971; Ph.D., University of California, Irvine, 1982. Coordinator.
- COLOMÉ, JAIME S. (1972) .....Biological Sciences B.A., University of California, Santa Barbara, 1966; M.A., 1973; Ph.D., 1974. Professor.
- COLVIN, MICHAEL R. (1979) .......Mathematics B.A., University of Houston, 1968; M.A., 1970; Ph.D., 1976. 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.
- CONWAY, JAMES R. (1969) ......Speech Communication B.A., California State College, Los Angeles, 1966; M.A., 1968; Ph.D., University of Southern California, 1977. Professor.
- CONWAY, ROGER (1984)......Associate Students, Inc./University Union A.B., Rutgers University, 1966; M.A., University of Rhode Island, 1969; P.S.O.D., National Training Labs, Alexandria, Virginia, 1975. Executive Director.
- COOK, BARBARA E. (1972) ......Social Sciences A.B., Duke University, 1965; M.A., Stanford University, 1967; Ph.D., 1974. Associate Professor.
- COOK, GAYLE (1991) ......Physics B.Sc., Imperial College, London, 1973; M.S., University of Colorado, 1977; Ph.D., 1982. Associate Professor.
- COOKE, SCOTT (1980) ......Business Affairs B.S., California Polytechnic State University, San Luis Obispo, 1985. Assistant Director, Financial Reporting.
- COOMBS, LEE C. (1969) .....Chemistry B.A., San Diego State College, 1963; M.S., 1965; Ph.D., Purdue University, 1970. Professor.
- COOPER, ALAN F. (1970) ......Biological Sciences B.S., California State Polytechnic College, Pomona, 1964; Ph.D., University of California, Riverside, 1969. Professor.
- COOPER, ALLAN R. (1975)......Architecture B.A., Rice University, 1967; B.Arch., 1968; M.Arch., Cornell University, 1971. Professor. Registered Architect, California.
- COOPER, MARK A. (1978) ......Industrial Engineering B.S., California State Polytechnic College, 1968; M.S., Arizona State University, 1978. Professor.
- COOPER, MARY P. (POLLY) (1974).....Architecture B.A., Wellesley College, 1963; M.Ed., Harvard University, 1964; M.Arch., University of California, Berkeley, 1971; M.L.A., 1974. Professor. Registered Architect, California.
- COTA, HAROLD M. (1966) .....Civil and Environmental Engineering B.S., University of California, 1959; M.S., Northwestern University, 1960; Ph.D., Oklahoma University, 1966. Professor. Registered Professional Engineer, California; Diplomat of the Academy of Environmental Engineers.
- COTKIN, GEORGE B. (1980) ......History B.A., Brooklyn College (C.U.N.Y.), 1972; M.A., Ohio State University, 1974; Ph.D., 1978. Professor.
- COWELL, LENNIS (1985) ......Intercollegiate Athletics B.Sc., California Polytechnic State University, San Luis Obispo, 1971; M.A., 1972. Head Coach.
- CRABB, A. CHARLES (1978) ......Academic Affairs B.S., University of California, Davis, 1973; M.S., Bowling Green State University, 1974; Ph.D., University of California, Davis, 1991. Professor and Interim Associate Vice President for Academic Resources.
- CROSS, RAYMOND (1990) .....Business Administration A.B., Stanford University, 1970; J.D., Yale Law School, 1973; M.P.A., Harvard University, 1989. Associate Professor.
- CRUIKSHANKS, RANDAL L. (1972)......Political Science B.A., University of California, Berkeley, 1963; M.A., University of Oregon, 1965; Ph.D., 1968; additional graduate study, University of Michigan. Professor.
- CULVER, JOHN H. (1975) ......Political Science B.S., University of Oregon, 1968; M.S., 1970; Ph.D., University of New Mexico, 1975. Professor.

- CUMMINGS, CRAIG (1983).....Intercollegiate Athletics B.Sc., California Polytechnic State University, San Luis Obispo, 1981; M.A., 1987. Head Coach.
- CUMMINGS, RUSSELL M. (1986).....Aeronautical Engineering B.S., California Polytechnic State University, San Luis Obispo, 1977; M.Engr., 1985; Ph.D., University of Southern California, 1988. Professor.
- CUNICO, GERALD E. (1988) ......Industrial Technology B.S., University of New Mexico, 1964; M.S., 1968; Ed.D., Utah State University, 1973. Professor and Department Head.
- CURRIER, BETH (1981) .....Student Academic Services B.A., University of California, Los Angeles, 1966; M.A., California Polytechnic State University, San Luis Obispo, 1980. Assistant Coordinator, Disabled Student Services.
- CURRIER, SUSAN (1980) .....English B.A., Mount Holyoke College, 1969; M.A., University of Massachusetts, 1970; Ph.D., 1979. Professor.
- D'ALBRO, JAMES A. (1969) .....Ornamental Horticulture B.S., Cornell University, 1966; M.S., University of California, Davis, 1969; Ph.D., Michigan State University, 1980. Professor.
- DALTON, LINDA C. (1983) ......City and Regional Planning A.B., Radcliffe/Harvard, 1967; M.U.P., University of Washington, 1974; Ph.D., 1978. Professor and Department Head.
- DALY, JAMES C. (1972) ......Statistics B.S., Gonzaga University, 1966; Ph.D., Oregon State University, 1973. Professor.
- DANA, CHARLES H. (1982) ......Computer Science B.A., University of California, Santa Barbara, 1972; M.S., 1974; Ph.D., 1981. Professor.
- DANES, JEFFREY E. (1986) ......Business Administration B.A., San Jose State University, 1972; M.A., 1974; Ph.D., Michigan State University, 1976. Professor.
- DATTA, SAMIR KUMAR (1968) ......Electronic and Electrical Engineering B.E.E., Jadavpur University, Calcutta, India, 1958; M.S., University of Manchester, England, 1963; Ph.D., 1966. Professor.
- DAUGHERTY, M. STEVEN (1988).....Animal Sciences and Industry B.S., New Mexico State University, 1977; M.S., Colorado State University, 1979; Ph.D., New Mexico State University, 1984. Assistant Professor.
- DAVIDMAN, LEONARD (1977)......University Center for Teacher Education B.A., Brooklyn College, 1966; M.A., 1972; Ph.D., Stanford University, 1976. 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. Associate Professor.
- DAVIS, DONNA (1984).....Career Services B.A., California Polytechnic State University, San Luis Obispo, 1976; M.A. 1977. Career Counselor.
- DAVIS, KIM (1979) ......Engineering Technology B.E.E.T., Southern Technical Institute, 1977; M.S., Rochester Institute of Technology, 1978. Professor. Professional Engineer, California.
- DAVIS, M. LeROY (1976) ......Agribusiness B.S., California State Polytechnic College, 1966; M.S., Iowa State University, 1968; Ph.D., Colorado State University, 1973. Professor and Department Head.
- DAVIS, STEVEN C. (1987) ......Physical Education and Recreation Administration B.S., University of California, Davis, 1979; M.S., San Diego State University,
- B.S., Seattle Pacific College, 1965; Ph.D., Washington State University, 1972. Professor.

- DeKLEINE, GLORIA J. (1983) ......Health Services B.A., Western Michigan University, 1964; School of Medical Technology, Borgess Hospital, 1965. M.T., A.S.C.P., California Licensed Clinical Laboratory Technologist. Clinical Laboratory Technologist.

- DeLEY, WARREN W. (1971) ......Social Sciences A.B., Stanford University, 1956; M.A., 1957; M.A., University of California, Los Angeles, 1963; C. Phil., 1968; Ph.D., 1970. Professor and Department Chair.
- DeMERS, GERALD (1989).....Physical Education and Recreation Administration
- B.S., Mankato State College, 1971; M.S., 1972; Ph.D., University of Utah, 1979. Assistant Professor.
- DeNATALE, JAY S. (1988) .....Civil and Environmental Engineering B.S., University of California, Davis, 1977; M.S., 1979; Ph.D., 1983. Associate Professor.
- DENEL, M. BILGI (1981) ......Architecture B.S.C.E., Robert College, Istanbul, 1959; M.F.A., Princeton University, 1963; Ph.D., Technical University of Istanbul, 1981. Professor. Registered Civil Engineer and Architect, Turkey.
- DENEL, SERIM (1983).....Architecture B.Arch., Middle East Technical University, Turkey, 1962; M.Arch., 1963; M.S., Pratt Institute, 1964; Ph.D., Istanbul Technical University, 1982. Associate Professor. Registered Architect, Turkey.
- DENSHAM, ROBERT S. (1980) ......Art and Design B.A., California State College, Long Beach, 1967; M.F.A., California State University, Long Beach, 1980. Professor.
- DETTLOFF, ERLAND G. (1967) ......University Center for Teacher Education B.S., Minot State College, 1956; M.A., University of Wyoming, 1962; Ed.D., 1963. Professor.
- DEVORE, JAY L. (1977) ......Statistics B.S., University of California, Berkeley, 1966; M.S., Stanford University, 1968; Ph.D., 1971; additional graduate study, Sheffield University, England. Professor.
- DIAZ, JOE V. (1976) ......Psychological Services B.A., University of Arizona, 1970; M.Ed., 1971; Ph.D., 1976. Counselor.
- DICKERSON, ROBERT H. (1970) ......Physics B.S., University of Arizona, 1959; M.S., 1963; Ph.D., 1964. Professor and Department Chair.
- DIGNAN, ROBERT J. (1974) ......Business Affairs B.S., Northeastern University, 1966; M.B.A., Golden Gate College, 1970. Director of Fiscal Services.
- DILLS, KEITH W. (1983) ......Art and Design B.A., State University of Iowa, 1961; M.A., San Francisco State College, 1969; Ph.D., University of California, Berkeley, 1981. Professor.
- DIMMITT, LAURA SAENZ (1575) ......Financial Aid B.A., University of California, Santa Barbara, 1971; M.A., California Polytechnic State University, San Luis Obispo, 1980. Scholarship Program Manager.
- DING, G. DAY (1984) .....Architecture B.Arch., University of Auckland, New Zealand, 1952; B.E. University of Canterbury, New Zealand, 1958; M.Eng.Sc., University of New South Wales, Australia, 1960. Professor. FASCE. LFRAIA.
- DINGUS, DELMAR D. (1973) ......Soil Science B.S., Berea College, 1966; M.S., West Virginia University, 1968; Ph.D., Oregon State University, 1973. Professor.
- DIRKES, LOIS M. (1973) ......Psychological Services B.S., University of California, Los Angeles, 1958; M.S., University of Maryland, 1963; Ph.D., 1973. Professor and Counselor.
- DOBSON, JOHN (1990).....Business Administration B.A., University of Lancaster, England, 1979; M.A., University of South Carolina, 1981; Ph.D., 1988. Associate Professor.
- DOMINGUES, ANTHONY (1985) .....University Outreach B.S., California Polytechnic State University, San Luis Obispo, 1979. Outreach Associate.

- DOMPKE, JOANNE (1982) ......Health Services R.N., Cuesta College, 1976; N.P., University of California, Davis, 1986. Nurse Practitioner.
- DONALDSON, DOUGLAS D. (1968) ......Biological Sciences A.B., University of California, Berkeley, 1962; M.A., California State College, Los Angeles, 1964; Ph.D., Oklahoma State University, 1969. Professor.
- DOUB, PHILIP M. (1985) ......Agribusiness B.S., California State Polytechnic College, 1966; M.B.A., College of William and Mary, 1971. Professor.
- DOYLE, ELAINE M. RAMOS (1972–73) (1976) ......Institutional Studies B.S., California Polytechnic State University, San Luis Obispo, 1981. Associate Director.
- DRUCKER, HOWARD (1980) ......University Center for Teacher Education B.A., Hunter College of the City of New York, 1957; M.A., 1961; Ph.D., Florida State University, 1972. Professor.
- DUARTE, ARTHUR C. (1965) ......Agribusiness B.S., California State Polytechnic College, 1964; M.S., Oregon State University, 1965; Ph.D., Washington State University, 1975. Professor.
- DUBBINK, DAVID T. (1989) .....City and Regional Planning B.F.A., University of Illinois, Urbana-Champaign, 1960; M.C.P., University of California, Berkeley, 1965; Ph.D., University of California, Los Angeles, 1983. Associate Professor.
- DUERK, DONNA (1981).....Architecture B.Arch., North Carolina State University, 1971; B.A., Massachusetts Institute of Technology, 1972; M.Arch.A.S., 1980. Professor. Registered Architect, Texas.
- DUFFY, BERNARD K. (1988) ......Speech Communication B.A., San Jose State College, 1970; M.A., 1971; Ph.D., University of Pittsburgh, 1976, Professor.
- DUFFY, D. JAN (1980) .....Business Administration B.A., Stanford University, 1972; J.D., Case Western Reserve University, 1976. Professor.
- DUFFY, SUSAN (1988)......Speech Communication B.A., Seton Hill College, 1973; M.A., University of Pittsburgh, 1974; Ph.D., 1979. Associate Professor.
- DUNDON, STANISLAUS J. (1970) ......Philosophy B.A., Mt. Carmel College, 1962; M.A., St. John's University, 1965; Ph.D., 1972. 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.
- EARLY, MARK M., MAJ. (1987) ......Military Science B.A., Trinity University, 1975; M.A., Webster University, 1987.
- EASTHAM, GEORGE M. (1966) .....Economics B.A., Chico State College, 1961; M.A., University of California, Santa Barbara, 1965; Ph.D., Claremont Graduate School, 1978. Professor.
- EATOUGH, NORMAN L. (1968).....Chemistry B.S., Brigham Young University, 1957; B.E.S., 1958; M.S., 1959; M.S.Ch.E., University of Washington, 1960; Ph.D., Brigham Young University, 1968. Professor and Department Chair.
- EDMISTEN, JOHN W. (1968) ......Architectural Engineering B.S., California State Polytechnic College, 1965; M.Engr., University of California, Berkeley, 1967. Professor. Registered Civil Engineer, California; Registered Architect, California.
- EHRENBERG, JAMES R. (1977) .....Engineering Technology B.S., Gonzaga University, 1960; M.S., Seattle University, 1969; Ed.D., Brigham Young University, 1982. Professor. Registered Professional Engineer, California.
- ELFRINK, T. LEIGH (1980) .....Business Affairs B.A., California Polytechnic State University, San Luis Obispo, 1978. Manager, Administrative Services.
- ELIJAH, MATHEWS M. (1980) ......Business Affairs B.S., California Polytechnic State University, San Luis Obispo, 1984; M.S., 1990. Supervising Custodian.
- ELIMIMIAN, ISAAC (1992) .....English B.A., Lagos University, 1969; M.A., Texas Christian University, 1974; Ph.D., Howard University, 1978. Assistant Professor.
- ELLIS, REBECCA (1987) ......Management B.A., University of Wisconsin, Madison, 1969; M.A., 1971; M.S., 1981; Ph.D. 1984. Associate Professor.

- ELTZROTH, THOMAS E. (1967).....Ornamental Horticulture B.S., Ohio State University, 1965; M.S., 1966. Professor.
- ENDRES, LELAND S. (1969) ......Chemistry A.B., Middlebury College, 1958; M.A., University of Oregon, 1963; Ph.D., University of Arizona, 1966. Professor.
- ENGLE, PATRICE L. (1980) ......Psychology and Human Development B.A. Wellesley College, 1966; Ph.D., Stanford University, 1971. Professor.
- ENGLUND, DAVID L. (1973)......Psychology and Human Development B.A., Ohio State University, 1956; M.A., University of Hawaii, 1965; Ph.D., University of Wisconsin, 1969. Professor.
- EQUINOA, RICHARD M. (1973) .....Career Services B.S., California State Polytechnic College, San Luis Obispo, 1967; M.S., 1970. Director.
- ESTES, ANGELA M. (1987) .....English B.A., Washington State University, 1973; M.A., University of Oregon, 1978; Ph.D., 1985. Assistant Professor.
- ESTRADA, TOM (1990).....University Foundation B.S., California State University, Los Angeles, 1976. Personnel Manager.

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B.S., Missouri School of Mines, Rolla, 1956; M.S., 1958; D.Sc., Newark College of Engineering, New Jersey, 1968. Professor.

- FAHS, MICHAEL L. (1983) ......Speech Communication A.B., California State College, Long Beach, 1972; M.A., University of Southern California, 1974; Ph.D., 1976. Associate Professor.
- FARKYE, NANA Y. (1990)......Dairy Science B.Sc., University of Ghana, 1980; M.S., Utah State University, 1985; Ph.D., 1986. Research Scientist.
- FARRELL, GERALD P. (1970) ......Mathematics A.B., San Diego State College, 1961; M.S., 1963; Ph.D., University of California, Los Angeles, 1968. Professor.
- FARUQUE, OMAR (1989) ......Landscape Architecture B.S.L.A., Texas A & M University, 1971; M. Arch., 1972. Professor. Registered Architect and Landscape Architect.
- FELDMAN, JACOB (1971) .....Architectural Engineering B.S., University of Delaware, 1961; M.S., 1968. Professor. Registered Civil Engineer, California.
- FETZER, PHILIP L. (1988)......Political Science A.B., Princeton University, 1965; M.A.T., Reed College, 1970; Ph.D., University of Oregon, 1981. Associate Professor.
- FIELD, GARY G. (1984) ......Graphic Communication Certificate of Printing, Melbourne College of Printing and Graphic Arts, Australia, 1966; Diploma in Printing Technology, Trent Polytechnic, England, 1970; M.B.A., University of Pittsburgh, 1975. Professor.
- FIERSTINE, HARRY L. (1966) ......School of Science and Mathematics B.S., Long Beach State College, 1957; M.A., University of California, Los Angeles, 1961; Ph.D., 1965. Professor and Associate Dean.
- FIORITO, BASIL A. (1977) ......Psychology and Human Development B.A., Marist College, 1968; M.S., New York University, 1970; M.A., 1975; Ph.D., Syracuse University, 1977. Professor.
- FIRMAN, RICHARD (1987) .....Intercollegiate Athletics B.Sc., California State College, Bakersfield, 1986. Head Coach.
- FISHER, GENE (1991).....Computer Science B.S., University of California, Irvine, 1973; Ph.D., 1985. Associate Professor.
- FITZPATRICK, MICHAEL JOHN (1975) ......Electronic and Electrical Engineering B.S., California State Polytechnic College, 1962; M.S., Ph.D., University of California, Santa Barbara, 1975. Professor.
- FLANAGAN, JAMES ROBERT (1959) .....Animal Sciences and Industry B.S., California State Polytechnic College, 1959; M.S., 1974. Professor.

- FLEISHON, NEIL L. (1985) ......Physics S.B., Massachusetts Institute of Technology, 1973; M.A., University of California, Berkeley, 1975; Ph.D., 1979. Professor.
- FLORES, ROBERT A. (1983) ......Agricultural Education B.S., California Polytechnic State University, San Luis Obispo, 1977; M.S., Texas A & M University, 1978; Ph.D., 1989. Associate Professor.
- FLOYD, BARRY (1990) ......Management B.S., Michigan State University, 1973; M.S., 1974; M.B.A., University of Michigan, 1983; Ph.D., 1985.
- FLOYD, DONALD R. (1974) ......Social Sciences B.A., University of California, Berkeley, 1967; M.A., 1968; Ph.D., 1976. Professor.
- 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. Associate Professor.
- FQSTER, THORE C. (1970) ......Physics B.S., University of Santa Clara, 1961; M.S., University of Washington, 1963; Ph.D., 1965. Professor.
- FOUNTAIN, H. PAUL (1965) .....Crop Science B.S., California State Polytechnic College, 1963; M.S., University of California, Davis, 1974. Professor.
- FRANKEL, RICHARD B. (1988) ......Physics B.S., University of Missouri, 1961; Ph.D., University of California, Berkeley, 1965. Professor.
- FREBERG, LAURA A. (1987)......Psychology and Human Development B.A., University of California, Los Angeles, 1974; M.A., 1975; Ph.D., 1979. Associate Professor and Department Head.
- FREEMAN, CAROL A. (1985) ......Health 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 Engineering B.I.E., Georgia Institute of Technology, 1966; M.S., University of Southern California, 1974; Ph.D., Stanford University, 1982. Professor and Department Chair.
- FRENCH, STEVEN P. (1981) .....City and Regional Planning B.A., University of Virginia, 1971; M.U.R.P., University of Colorado, 1973; Ph.D., University of North Carolina, 1980. Professor.
- 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 B.A., University of Oregon, 1965; Ph.D., University of Idaho, 1970. Professor.
- FRIEDMAN, FRED S. (1975) ......Engineering Technology B.S., University of California, Santa Barbara, 1969; M.S., Loyola University, Los Angeles, 1972. Professor. Registered Professional Engineer, California.
- FRIEDMAN, MARCIA A. (1973) .....Enrollment Support Services B.S., California Polytechnic State University, San Luis Obispo, 1984. Assistant Manager, Student Data Systems.
- FRISCH, SHERYL (1990).....Art and Design B.A., University of California, Riverside, 1983; M.A., 1988. Slide Curator.
- FRYER, ANN (1983) .....Student Academic Services B.A., University of San Francisco, 1972; M.A., California Polytechnic State University, San Luis Obispo, 1983. Learning Disabilities Specialist, Disabled Student Services.
- FUJITANI, SHARON H. (1977) ......University Library B.A., University of California, Santa Barbara, 1963; M.L.S., University of Hawaii, 1974; M.A., Pepperdine University, 1976. Senior Assistant Librarian.
- GAINES, MERRILL C. (1976) ......Architecture B.B.A., University of Wisconsin, Milwaukee, 1965; M.Arch. 1973. Professor. Registered Architect: California, Wisconsin. NCARB Certificate.
- GALLAGHER, MELISSA G. (1978) ......Health Services B.S., California State Polytechnic College, 1970; R.N., Cuesta College, 1972; N.P. Family Planning Nurse Practitioner Program, Campbell, 1987. Nurse Practitioner.

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- GAMBS, ROGER D. (1974) ......Biological Sciences B.S., University of Idaho, 1963; M.S., 1965; Ph.D., University of Montana, 1973. Professor.
- GARNER, EDWARD R. (1967) ......Mechanical Engineering B.S., Bradley University, 1962; M.S., University of Arizona, 1965; Ph.D., Montana State University, 1973. Professor.
- GARRETT, SOL M., III, LT. COL. (1987) ......Military Science B.S., University of Arkansas, 1967; M.S., Boston University, 1980. Department Head.
- GASCOIGNE, HAROLD E. (1984) ......Mechanical Engineering B.S.M.E., University of Kansas, 1957; M.S.E., University of Michigan, 1959; Ph.D., 1968. Professor. Registered Professional Engineer, Utah.
- 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. Licensed General Contractor.
- GEDAYLOO, TEYMOOR (1965) ......Physics B.A., Macalester College, 1957; M.S., University of Washington, 1959; Ph.D., University of Kansas, 1973. Professor.
- GEILMAN, WAYNE G. (1988) ......Dairy Science B.S., Utah State University, 1976; M.S., 1981; Ph.D., Mississippi State University, 1988. Research Scientist.
- GENEREUX, DOUGLAS G. (1970) ......Agribusiness B.S., University of Nebraska, 1964; M.S., 1969; Ph.D, Colorado State University, 1979. Professor.
- GEOGHAGEN, LOCKSLEY (1977) .....Student Life and Activities B.A., University of California, Los Angeles, 1970; M.A., California Polytechnic State University, San Luis Obispo, 1976; A.B.D., University of California, Santa Barbara; additional graduate study. Associate Director.
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- GILLHAM, JOHN F. (1975) .....Landscape Architecture B.L.A., University of Oregon, 1962; M.L.A., 1966. Professor.
- GILLIS, WILLIAM T. (1987) ......Dairy Science B.S., Mississippi State University, 1973; M.S., 1975; Ph.D., 1979. Associate Professor.
- GISH, ROBERT F. (1992) ......School of Liberal Arts B.A., University of New Mexico, 1962; M.A., 1967; Ph.D., 1972. Professor and Director, Ethnic Studies.
- GITTES, KATHARINE SLATER (1983) ......English B.A., University of California, San Diego, 1972; M.A., San Diego State University, 1975; M.A., University of California, San Diego, 1981; Ph.D., 1983. Associate Professor.
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- GLASSCO, D. EDWARD (1968)......Mathematics B.S., Harvey Mudd College, 1963; M.A., University of Southern California, 1966; Ph.D., 1971. Professor.
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- GOERS, JOHN W. F. (1980) ......Chemistry B.S., University of Illinois, 1969; Ph.D., University of California, Los Angeles, 1974. Professor.
- GOLDBERG, SAUL (1970)......Electronic and Electrical Engineering B.S., Fairleigh Dickinson University, 1963; M.E., University of Florida, 1964; Ph.D., 1968. Professor.
- GOODEN, REGINALD H., JR. (1970) ......Political Science B.A., University of California, Los Angeles, 1962; M.A., University of California, Santa Barbara, 1969; Ph.D., 1972. Professor.
- GOWGANI, GEORGE G. (1970) .....Crop Science B.S., California State Polytechnic College, San Luis Obispo, 1964; M.A., 1968; M.S., University of Nevada, 1972; Ph.D., 1975. Professor and Department Head.
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- GRANNEMAN, GARY A. (1978) .....Engineering Technology B.S., Iowa State University, 1962; M.S., 1972; Ph.D., 1978. Professor. Registered Professional Engineer, Iowa.
- GRANT, BRADFORD C. (1991) .....Architecture B.Arch., California Polytechnic State University, San Luis Obispo, 1976; M.Arch., University of California, Berkeley, 1981. Associate Professor. Registered Architect, California.
- GRANT, DONALD P. (1967).....Architecture B.Arch., University of Oklahoma, 1961; M.Arch., University of Utah, 1964; Ph.D., University of California, Berkeley, 1974. M.A., California Polytechnic State University, San Luis Obispo, 1985. Professor. Registered Architect, California, New York.

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- GRIFFIN, ROBERT E. (1976) ......University Foundation B.S., University of Southern California, 1966; J.D., Western State University, 1974. Associate Executive Director.
- GRIMES, JOSEPH E. (1973) ......Computer Science B.A., St. Ambrose College, 1963; M.S., Illinois State University, 1968; Ph.D., Iowa State University, 1973. Professor.
- GRINDE, DONALD A., Jr. (1977) ......History B.A., Georgia Southern College, 1966; M.A., University of Delaware, 1968; Ph.D., 1974. Professor.
- GRINNELL, ROBIN R. (1967) ......Agricultural Engineering B.S., Purdue University, 1955; M.S., University of Minnesota, 1961; Ph.D., Purdue University, 1976. Professor.
- GROVES, JOHN E. (1968) ......Statistics B.A., Pasadena College, 1963; M.A., University of California, Riverside, 1965; Ph.D., Kansas State University, 1972. Professor.
- HAFEMEISTER, DAVID W. (1969) ......Physics B.S., Northwestern University, 1957; M.S., University of Illinois, 1960; Ph.D., 1964. Professor.
- HAGEN, CHARLES T. (1980)......Philosophy B.A., Harvard University, 1968; M.A., University of Michigan, 1977; Ph.D., 1981. Associate Professor.
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- HALE, THOMAS E. (1966) ......Mathematics B.S., Indiana State University, 1960; M.S., 1963; M.S., St. Louis University, 1967; Ph.D., 1973. Professor and Department Chair.
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- HAMILL, DANIEL R. (1986) ......Business Affairs B.S., Arizona State University, 1971. Chief Engineer.
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- HAMPSON, BRIAN C. (1991) .....Food Science and Nutrition B.S., University of Illinois at Champaign-Urbana, 1981; M.S., 1983; Ph.D., 1988. Assistant Professor.
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- HANNINGS, DAVID W. (1974) ......Ornamental Horticulture B.S., Auburn University, 1972; M.S., Cornell University, 1974. Professor.
- HANSEN, CAROLE L. (1987) .....Housing B.A., Alfred University, 1985; M.S., 1987. Assistant Director.
- 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) ......Personnel and Employee Relations B.S., University of California, Los Angeles, 1974; B.S., California Polytechnic State University, San Luis Obispo, 1979. Administrative Operations Analyst.
- HARGRAVE, TERRY C. (1979) ......Architecture B.Arch.Eng., Washington State University, 1965; M.Arch., Massachusetts Institute of Technology, 1978. Professor.
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- HARPER, LOUIS W. (1977) .....Crop Science B.S., Montana State University, 1958; M.S., 1964. Professor.
- HARRIGAN, JOHN E., JR. (1969) .....Architecture B.A., University of California, Berkeley, 1959; M.A., San Jose State College, 1962; Ph.D., Colorado State University, 1966. Professor.
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- HARRIS, JAMES G. (1982).....Electronic and Electrical Engineering B.S., University of California, Berkeley, 1961; M.S., 1962; Ph.D., Syracuse University, 1968. Professor.
- HARRIS, JOHN H. (1978) ......Natural Resources Management B.S., Humboldt State College, 1968; M.S., 1970; Ph.D., Utah State University, 1972. Professor.

- HARRIS, WALTER L. (1973) .....University Outreach B.S., California Polytechnic State University, San Luis Obispo, 1973; M.A., 1975. Coordinator.
- HASSLEIN, GEORGE J. (1949) ......Architecture B.Arch., University of Southern California, 1945. Professor. FAIA.
- HATCHER, DAVID S. (1980).....Architectural Engineering B.S., University of Wyoming, 1953; Ph.D., University of Illinois, 1961. Professor. Registered Civil Engineer, California.
- HAVANDJIAN, NISHAN (1980).....Journalism B.A., Haigazian College, Lebanon, 1970; M.A., University of Georgia, 1972; Ph.D., University of Texas at Austin, 1979. Professor and Department Head.
- HAWES, MICHAEL (1967) ......Engineering Technology B.Engr., University College, Dublin, Ireland, 1958; M.S., Ohio State University, 1967. Professor. Registered Professional Engineer, Ohio.
- HAYDEN, JILL E. (1977) ......Career Services B.A., University of California, Riverside, 1972; M.A., California Polytechnic State University, San Luis Obispo, 1976. Career Counselor.
- HAYES, JAMES H. (1969) .....Journalism B.A., San Jose State College, 1950; M.A., University of Florida, 1966; additional graduate study, University of Minnesota. Professor.
- HAYNES, RAY M. (1989)......Management B.S., University of Arizona, 1967; M.B.A., 1970; Ph.D., Arizona State University, 1988. Associate Professor.
- HAYNES, ROY (1989) ......Student Academic Services B.S., Austin Peay State University, 1980. Academic Adviser, Minority Engineering Program.
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- HEESCH, HENRY J. (1989) ......Graphic Communication B.F.A., California School of Fine Arts, 1958; B.S., California State Polytechnic College, 1965; M.T., Arizona State University, 1988. Assistant Professor.
- HEIDERSBACH, ROBERT (1986) .......Materials Engineering B.Met.E., Colorado School of Mines, 1963; M.E., University of Florida, 1968; Ph.D., 1971. Professor and Department Head. Registered Professional Engineer, California.
- HELLYER, GEORGE J. (1980)......Agribusiness B.S., University of California, Davis, 1960; M.S., 1973. Professor.
- HENDERSON, STANLEY L. (1990) ......Dairy Science B.S., Iowa State University, 1973; M.S., Southern Illinois University, 1976; Ph.D., Utah State University, 1990. Associate Professor.
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- HEWITT, CLARISSA (1976).....Art and Design B.A., California State University, Northridge, 1971; M.F.A., Cranbrook Academy, 1976. Professor.
- HIEMSTRA, B. KRIS (1984) ......Career Services B.A., California State University, Northridge, 1974; M.A., 1978. Career Counselor.
- HILL, PATRICK D. (1975) ......Architecture B.Arch., University of Illinois, 1970; M.S., 1972. Professor. Registered Architect: Illinois and California.
- HINKLE, MARY ANN (1978) .....Financial Aid B.S., California State Polytechnic College, San Luis Obispo, 1969. Loan Program Manager.

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- HODGES, WILLIAM R. (1985) .....Engineering Technology B.Eng., Georgia Institute of Technology, 1975; M.S., 1976. Professor. Registered Professional Engineer, California.
- HOFFMAN, KENNETH A. (1974) ......Physics B.A., University of California, Berkeley, 1966; M.A., 1969; Ph.D., 1973. Professor.
- HOFFMANN, JON A. (1968) ......Aeronautical Engineering B.S., University of Wisconsin, 1964; M.S., 1966; additional graduate study, Wisconsin State University. Professor. Registered Professional Engineer, California.
- HOLLAND, V.L. (1972) ......Biological Sciences B.A., Fresno State College, 1966; M.A., 1969; Ph.D., University of California, Berkeley, 1973. Professor and Department Chair.
- HOMAN, DENNIS N. (1966) ......Biological Sciences B.A., University of Iowa, 1955; M.S., 1958; Ph.D., 1960. Professor.
- HOOVER, ROBERT L. (1970)......Social Sciences A.B., University of California, Berkeley, 1965; M.A., 1969; Ph.D., 1971; additional graduate study, University of California, Berkeley, Stanford University. Professor.
- HORTON, WILLIAM F. (1968) ......Electronic and Electrical Engineering B.S., California Institute of Technology, 1946; M.S., 1948; Ph.D., University of California, Los Angeles, 1966. Professor.
- HOULGATE, LAURENCE D. (1979) ......Philosophy B.A., California State College, Los Angeles 1960; M.A., Ph.D., University of California, Los Angeles, 1967. Professor.
- HOULIS, JEROME F. (1959) .....Chemistry B.S., California State Polytechnic College, 1958; graduate study, California State Polytechnic College. Associate Professor.
- HOWARD, WILLIAM A. (1980) .....City and Regional Planning B.A., University of Denver, 1958; M.A., 1960; graduate study, Johns Hopkins University, 1961–63; Ph.D. University of Edinburgh, 1973. Professor.
- HOWELL, ROBERT (1974).....Art and Design B.A., Brooks Institute, 1973; M.A., Pepperdine University, 1976. Professor.
- HSIEH, CARL C. F. (1970) .....Civil and Environmental Engineering B.S., National Taiwan University, 1961; M.S., So. Dakota School of Mines and Technology, 1965; Ph.D., Northwestern University, 1968. Professor. Registered Professional Engineer, California.
- HSU, JOHN Y. S. (1970) ......Computer Science B.S., National Taiwan University, 1959; M.S., University of California, Berkeley, 1964; Ph.D., 1969. Professor.
- HUEHN, KEMPTON L. (1968) ......Mathematics B.S., Iowa State University, 1957; M.S., 1962; Ph.D., Colorado School of Mines, 1975. Professor.
- HUFF, EARL D. (1970) ......Political Science B.A., San Francisco State College, 1959; M.A., University of Idaho, 1969; Ph.D., 1971. Professor.
- HUNT, ROGER M. (1979) .....Animal Sciences and Industry B.S., California State Polytechnic College, 1971; M.S., California Polytechnic State University, San Luis Obispo, 1978. Associate Professor.
- HUTCHINSON, JAMES R. (1971) ......Graphic Communication B.F.A., Carnegie Institute of Technology, 1955; B.S., 1959; M.A., California State University, Dominguez Hills, 1977. Professor.

- HYNES, C. DENNIS (1957) ......Biological Sciences B.A., Macalester College, 1951; M.S., University of Michigan, 1953; Ph.D., University of Florida, 1957. Professor.
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- IKENOYAMA, GEORGE K. (1964) .....Architecture B.S., California State Polytechnic College, 1955; M.Arch., University of Hawaii, 1972. Professor. Registered Architect, California.
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- IQBAL, M. ZAFAR (1979) ......Accounting B.S., University of Nevada, Reno, 1969; M.B.A., Northern Illinois University, 1972; Ph.D., University of Nebraska, Lincoln, 1979. Professor. Certified Public Accountant, Certified Management Accountant, Certified Internal Auditor, Certified Cost Analyst.
- IRVIN, GLENN W. (1986) .....Academic Programs B.A., Arizona State University, 1964; M.A., 1971; Ph.D., 1978. Associate Vice President for Academic Affairs and University Dean.
- JACKSON, LORRAINE D. (1992) .....Speech Communication B.A., University of Western Ontario, 1987; M.A., Pennsylvania State University, 1989; Ph.D. candidate. Assistant Professor.
- JACKSON, THOMAS R., JR. (1990) ......Housing B.S., Southwest State University, 1985; M.S., Shippensburg University, 1987. Academic Development Specialist.
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- JASTER, EDWIN H. (1992)......Dairy Science B.S., University of Wisconsin, 1970; M.S., University of Arizona, 1977; Ph.D., 1979. Department Head.
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- JENNINGS, CHARLES W. (1968) ......Art and Design B.A., Wheaton College, 1966; M.A., M.F.A., Northern Illinois University, 1968. Professor and Department Chair.
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- JOHNSON, ERIC V. (1969) ......Biological Sciences B.A., Brown University, 1964; Ph.D., Cornell University, 1969. Professor.
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- KANN, DAVID J. (1969) ......English B.A., Brandeis University, 1964; M.A., New York University, 1966; Ph.D., Occidental College, 1971. Professor.
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- KEEP, ROGER L. (1968)......Industrial Technology B.S., Brigham Young University, Hawaii, 1967; M.S., Stout State University, 1968; Ed.D., Utah State University, 1972. Professor. Licensed General Contractor.
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- KNIGHT, RANDALL D. (1989) ......Physics B.S., Washington University, 1972; Ph.D., University of California, Berkeley, 1979. Associate Professor.
- KOHLEN, KEN (1983) .....Architecture B.S., California State Polytechnic College, 1966; B.Arch., 1967; M.Arch., Sheffield University, England, 1982. Professor. Registered Architect, California.
- KOLKAILAH, FAYSAL A. (1984) .....Aeronautical 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.
- KOOB, ROBERT D. (1990) .....Academic Affairs B.A., University of Northern Iowa, 1962; Ph.D., University of Kansas, 1967. Vice President for Academic Affairs and Senior Vice President.
- KOURAKIS, JOSEPH M. (1970) .....City and Regional Planning B.A., University of Illinois, 1954; M.Arch., University of Illinois, 1957; M.C.R.P., University of California, Berkeley, 1961. Professor. Registered Architect, California.
- 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.
- KREJSA, RICHARD J. (1968) ......Biological Sciences B.S., Michigan State College, 1954; M.A., University of California, Los Angeles, 1958; Ph.D., University of British Columbia, Vancouver, 1964. Professor.
- KRIEGER, DANIEL E. (1971)......History B.A., San Jose State College, 1965; Ph.D., University of California, Davis, 1973. Professor.
- KRISHNAN, R. (1987) ......Business Administration B.Eng., College of Engineering, Guindy, India, 1974; M.Tech.I.E., Indian Institute of Technology, New Delhi, India, 1976; Ph.D., Virginia Polytechnic and State University, 1984. Associate Professor.
- KUBINSKI, A. MARK (1975) ......Biological Sciences B.S., Gonzaga University, 1968; M.S., Washington State University, 1971; Ph.D., 1974. Professor.
- LaBARBERA, JEANNE (1984) .....University Union B.A., University of California, Los Angeles, 1973; M.A., 1976; Ph.D., University of California, Santa Barbara, 1988. Galerie Director.
- LABHARD, LEZLIE A. (1967) ......Home Economics B.S., University of California, Davis, 1965; M.S., 1967. Professor.
- LAKEMAN, SANDRA DAVIS (1981) .....Architecture B.S., University of Cincinnati, 1960; M.Arch., University of Oregon, 1977. Professor. Registered Architect, Oregon and Arizona.
- LAMB, STEPHAN R. (1979) ......Housing B.A., Santa Clara University, 1973; M.A., University of the Americas, 1975. Associate Director.

- LAMBERT, ROYCE L. (1969)......Soil Science B.S., Purdue University, 1964; M.S., 1966; Ph.D., 1969. Professor. Certified Professional Soil Scientist, Certified Professional Soil Erosion and Sediment Control Specialist.
- LAMBERT, WALTER M. (1975) ......Student Life and Activities B.A., California State College, Long Beach, 1962. Coordinator of Greek Affairs.
- LANDWEHR, ALFRED W. (1970) ......English B.A. University of Missouri, 1963; M.A., 1964; Ph.D., 1970. Professor.
- LANG, ROBERT J. (1991) .....Civil and Environmental Engineering B.S., University of California, Davis, 1978; M.S., 1982; Ph.D., 1989. Associate Professor. Registered Professional Engineer, California.
- LANGE, JOHN H. (1975) .....Architecture B.S., University of Cincinnati, 1968; M.Arch., Stanford University, 1972; Ph.D., University of Pennsylvania, 1975. Professor. Registered Architect, California.
- LANGE, KAREN F. (1991) .....Home Economics B.Arch., California Polytechnic State University, San Luis Obispo, 1980; M.Arch., Columbia University, 1982. Assistant Professor.
- LANT, KATHLEEN MARGARET (1983) ......English B.A., University of Illinois, 1971; M.A., University of Oregon, 1975; Ph.D., 1982. Associate Professor.
- LAPORTE, MARY L. (1985) .....Art and Design B.A., Washington State University, 1975; M.F.A., 1980. Professor.
- LARSEN, STUART E. (1969) ......Civil and Environmental Engineering B.S., University of Cincinnati, 1963; M.S., 1965. Professor.
- LASCOLA, RUSSELL A. (1970) ......Philosophy B.A., California State College, Los Angeles, 1962; M.A., University of Southern California, 1964; Ph.D., 1969. Professor.
- LASSANSKE, DANIEL E. (1975) .....Ornamental Horticulture B.S., California State Polytechnic College, 1970; M.S., 1971. Professor.
- LAU, FREDERICK C. (1991)......Music B.A., Chinese University of Hong Kong, 1981; Flute Performance Artist Diploma, Guildhall School of Music and Drama, London, 1982; M.M., University of Illinois at Urbana-Champaign, 1984; D.M.A., 1991. Assistant Professor.
- LAZERE, DONALD P. (1977) .....English B.A., Northwestern University, 1958; M.A., Columbia University, 1964; Ph.D., University of California, Berkeley, 1973. Professor.
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- LEE, PETER Y. (1981)......School of Engineering B.S., National Taiwan University, 1961; M.S. Tulane University, 1965; Ph.D., 1968. Professor and Dean. Registered Professional Engineer, Louisiana.
- LEONESIO, ROBERT B. (1972) ......Materials Engineering B.S., University of Massachusetts, 1963; M.S., Stanford University, 1964; Ph.D., Lehigh University, 1970. Professor. Registered Professional Engineer, California.
- LEONG, KINGSTON L. (1970) ......Biological Sciences B.S., University of Hawaii, 1963; M.S., 1966; Ph.D., Oregon State University, 1970. Professor.
- LERNER, NORMAN (1986).....Art and Design B.A., 1951, New York University; M.A., 1964. Professor.
- LEVENSON, HARVEY R. (1983) ......Graphic Communication B.S., Rochester Institute of Technology, 1967; M.S., South Dakota State University, 1968; Ph.D., University of Pittsburgh, 1980. Department Head.
- LEVI, DANIEL J. (1982).....Psychology and Human Development B.A., Lehigh University, 1973; M.S., University of Arizona, 1979; Ph.D., 1981. Assistant Professor.
- LEVISON, ROBERT L. (1969) ......University Center for Teacher Education B.S., Southern Oregon College, 1963; M.Ed., University of Wyoming, 1966; Ed.D., New Mexico State University, 1972. Professor.

- LILJE, KARL D. (1981).....Engineering Technology B.S., Pennsylvania State University, 1957; M.S., New York University, 1960. Professor. Registered Professional Engineer, Ohio.
- LINDVALL, JOHN R. (1973) ......Business Administration B.A., Whitman College, 1962; M.B.A., Indiana University, 1971; Ph.D., 1973. Professor.
- LINSTRUM, HELEN M. (1970) ......University Outreach B.A., University of California, Los Angeles, 1961; M.A., California State Polytechnic College, San Luis Obispo, 1970. Outreach Associate.
- LITTLE, H. CLAY (1973) ......Agribusiness B.S., University of Missouri, 1950; M.S., 1957; Ph.D., 1965. Professor.
- LITTLE, WILLIAM T. (1983)......Foreign Languages B.A., California State College, Northridge, 1966; M.A., Indiana University, 1968; Ph.D., Washington University, 1973. Professor and Department Head.
- LIU, HONG-TING (1984).....Architectural Engineering B.S., Zhejian University, 1952; Ph.D., University of Minnesota, 1984. Professor.
- LO, CHIEN-KUO (1983) ......Civil and Environmental Engineering B.S., National Cheng Kung University, 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. Librarian.
- LOFTUS, ROBIN L. (1978) ......Financial Aid B.A., California Polytechnic State University, San Luis Obispo, 1976; M.A., 1978. Assistant Director.
- LOH, ALICE C. (1974) .....Landscape Architecture B.Arch., University of Manitoba, 1966; M.L.A., University of Oregon, 1972. Professor. Registered Architect and Landscape Architect, California.
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- LONG, DIANNE N. (1982) ......Political Science B.S., State University of New York College at Buffalo, 1964; M.P.A., Michigan State University, 1977; Ph.D., 1982. Professor and Department Chair.
- LOPEZ, JORGE A. (1989) ......Physics B.S., University of Texas, El Paso, 1977; M.S., 1979; Ph.D., Texas A & M University, 1986. Assistant Professor.
- LORD, DAVID (1985) .....Architecture B.S., University of Arizona, 1966; M.Arch., University of California, Berkeley, 1972; Ph.D., University of London, 1987. Professor.
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- LUCAS, NANCY (1977) .....English B.A., Incarnate Word College, 1964; M.A., University of Illinois, 1966; Ph.D., 1973. Professor.
- LUCAS, ROBERT A. (1975) .....Graduate Studies and Research A.B., John Carroll University, 1961; M.A., University of Illinois, 1963; Ph.D., 1970. Associate Vice President.
- LUND, JOAN (1977) ......Personnel and Employee Relations B.A., California Polytechnic State University, San Luis Obispo, 1985; M.A., 1990. Personnel Programs Manager.
- LUND, MICHAEL W. (1984) .....Animal Sciences and Industry B.S., North Dakota State University, 1970; M.S., 1981. Associate Professor.

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- LUTRIN, CARL E. (1970) ......Political Science B.A., Adelphi University, 1962; M.S., University of Wisconsin, 1965; Ph.D., University of Missouri, 1971; additional graduate work, Stanford University. Professor.
- LUTRIN, PATRICIA (1975).....Student Life and Activities B.A., St. Cloud State University, 1965; M.A., University of Iowa, 1969. Coordinator, Human Corps.
- MAAS, DONALD K. (1976) ......University Center for Teacher Education B.A., University of California, Los Angeles, 1966; M.Ed., State University of New York at Buffalo, 1969; Ed.D., 1971. Professor.
- MacCARLEY, CARL A. (1988) .....Electronic and Electrical Engineering B.S., University of California, Los Angeles, 1976; M.S., 1978; Ph.D., Purdue University, 1987. Associate Professor.
- MacCURDY, CAROL A. (1987)......English B.A., Southwestern at Memphis, 1972; M.A., University of South Carolina, 1975; Ph.D., 1980. Associate Professor.
- MACIAS, RAY (1980) ......Business Affairs B.A., University of Texas, 1965. Certified Purchasing Manager. Director, Support Services.
- MACK, MARGARET A. (1986) ......Career Services B.A., Northern Colorado University, 1961. CoOp Coordinator.
- MALKIN, MICHAEL R. (1974)......Theatre and Dance A.B., Tufts University, 1965; M.A., 1970; Ph.D., 1971. Professor and Department Chair.
- MALLAREDDY, H. (1981) .....Civil and Environmental Engineering B.E., Mysore University, India, 1958; M.E., University of Oklahoma, 1966; Ph.D., 1968. Professor. Registered Professional Engineer, California, Indiana and Louisiana.
- MARAVIGLIA, JAMES L. (1991).....Enrollment Support Services B.S., Elmhurst College, 1976; M.S., Chicago State University, 1984. Director of Admissions.
- MARK, WALTER R. (1972) ......Institutional Studies B.S., Utah State University, 1968; M.S., Colorado State University, 1970; Ph.D., 1972. Director. Registered Professional Forester, California.
- MARLIER, JOHN F. (1981) .....Chemistry B.S., University of Wisconsin, Stevens Point, 1972; Ph.D., University of Wisconsin, Madison, 1978. Professor.
- MARLOW, MICHAEL L. (1991)......Economics B.A., George Washington University, 1975; Ph.D., Virginia Polytechnic Institute. 1978. Professor.
- MARPLE, DEBBIE L. (1976) .....Business Affairs B.A., California Polytechnic State University, San Luis Obispo, 1976. Associate Director, Budget Planning and Administration.
- MARTIN, W. MIKE (1985) ......Architecture B.Arch., University of Colorado, 1969; M.Arch., University of Washington, 1971; Ph.D., University of California, Berkeley, 1983. Professor and Department Head. Registered Architect, Kansas and California. NCARB Certificate.
- MARTINEZ, EVERARDO (1982) ......University Outreach B.S., California Polytechnic State University, San Luis Obispo, 1980; M.S., 1983. Outreach Associate.
- MARX, STEVEN R. (1988) ......English A.B., Columbia University, 1963; A.M., 1966; Ph.D., Stanford University, 1981. Associate Professor.
- MAXWELL, JOHN C. (1978) .....Chemistry B.S., Whitworth College, 1969; Ph.D., Colorado State University, 1979. Professor.

- MAYO, EDWARD L. (1968) ......History B.A., Claremont Men's College, 1959; M.A., 1966; Ph.D., Claremont Graduate School, 1969. Professor.
- McBRIDE, SUSAN L. (1979) ......University Center for Teacher Education B.S., University of Akron, 1963; M.S., 1972; Ph.D., 1979. Professor.
- McBURNEY, KATHLEEN A. (1991).....Food Science and Nutrition B.S., Michigan State University, 1965; M.P.H., University of Michigan, 1972; Dr.P.H., University of California, Berkeley, 1989. Assistant Professor. Registered Dietitian.
- McCORKLE, ROBERT E. (1962) ......Agribusiness B.S., California State Polytechnic College, 1960; M.S., University of California, 1962; additional graduate study, Oregon State University, University of Wisconsin. Professor.
- McDERMOTT, STEVEN T. (1989) ......Speech Communication B.A., San Jose State University, 1973; M.A., 1976; Ph.D., Michigan State University, 1980. Associate Professor.
- McDILL, JEAN M. (1973) ......Mathematics B.S., University of Texas, 1957; M.S., University of Florida, 1968; Ph.D., 1971. Professor.
- McDONALD, ANNA J. (1991)......Affirmative Action B.A., Lincoln University, 1963; M.A., California State University, Fresno, 1980; A.M., Stanford University, 1986; Ph.D. candidate. Director.
- McDONALD, LUANN A. (1983)......Financial Aid B.A., California Polytechnic State University, San Luis Obispo, 1978; M.A., 1981. Counselor.
- McDONALD, MARGOT (1992) ......Architecture B.A., B.S., University of California, Santa Barbara, 1980; M.Arch., University of Oregon, 1987. Assistant Professor.
- McDOUGALL, MICHAEL E. (1972) ......City and Regional Planning B.Arch., University of Hong Kong, 1955; graduate study, Architectural Association School, London, 1956–57; M.C.R.P., Cornell University, 1958. Professor.
- McFARLAND, STEVE (1983) ......Intercollegiate Athletics B.Sc., California Polytechnic State University, San Luis Obispo, 1972. Head Coach.
- McGARY, STEPHEN D. (1984) .....Agribusiness B.S., Brigham Young University, 1979; M.S., 1980; Ph.D., Washington State University, 1984. Professor.
- McKIBBIN, CARROLL R. (1974) ......Political Science B.A., Drake University, 1959; M.A., 1960; Ph.D., University of Kansas, 1967. Professor.
- McKIM, PATRICK C. (1973) ......Social Sciences B.A., University of California, Berkeley, 1967; M.A., 1970; Ph.D., 1973. Professor.
- 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. Assistant Professor.
- McMORRAN, WAYNE E. (1962)......Electronic and Electrical Engineering B.S., California State Polytechnic College, 1960; M.S., New York University, 1962. Professor.
- McNEIL, MARILYN (1979) ......intercollegiate Athletics B.P.E., The University of Calgary, Canada, 1968; M.A., McGill University, Montreal, Canada, 1974. Associate Director.
- McNEIL, ROBERT J. (1976) .....Crop Science B.S., Rutgers University, 1967; M.S., 1970; Ph.D., 1975. Professor.
- MEAGHER, JAMES M. (1988) ......Mechanical Engineering B.S., University of Akron, 1978; M.S., 1981; Ph.D., University of California, Berkeley, 1987. Associate Professor.
- MEHDIZADEH, AMROLLAH (1984) ......Mechanical Engineering B.S., Abadan Institute of Technology, 1978; M.S., University of Southern California, 1980; Ph.D., 1984. Professor.
- MELVIN, BARBARA A. (1973) ......Personnel and Employee Relations B.S., California Polytechnic State University, San Luis Obispo, 1973; M.P.A., University of San Francisco, 1981. Human Resource Manager.
- MENDENHALL, JOHN P. (1980) .....Art and Design B.F.A., University of Illinois, 1972; M.A., Stanford University, 1974. Professor.

- MENG, SHIEN YI (1968) ......Electronic and Electrical Engineering B.S., Taiwan Provincial Cheng Kung University, 1953; M.S., Oklahoma State University, 1958; Ph.D., Ohio State University, 1968. Professor.
- MENON, UNNY (1978).....Industrial Engineering A.P., Sheffield Polytechnic, England, 1969; M.Phil., 1972; Ph.D. University of Nottingham, 1985. Professor. Registered Professional Engineer, Great Britain.
- METCALF, LYNN E. (1986) .....Business Administration B.A., University of Oregon, 1978; Ph.D., M.I.M. American Graduate School of International Management, 1981. Associate Professor.
- MEYERS, ROBERT E., JR. (1977) .....Physical Education and Recreation Administration A.B., Stanford University, 1953; M.S., San Jose State University, 1965; D. Crim., University of California, Berkeley, 1974. Professor.
- MICHELFELDER, DIANE P. (1981) ......Philosophy B.A., Bryn Mawr College, 1975; Ph.D., University of Texas, 1982. Professor and Department Head.
- 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. Assistant Professor.
- MILLER, CHARLES R. (Tad) (1987).....Accounting B.A., College of Wooster, 1970; M.B.A., University of Arizona, 1980; Ph.D., 1987. Associate Professor. Certified Public Accountant.
- MILLER, SANDRA D. (1984) .....Architecture B.A., Oberlin College, 1963; M.Arch., University of California, Berkeley, 1978. Professor. Registered Architect, California.
- MITCHELL, ANDREA (1983) .....Student Academic Services B.S., California Polytechnic State University, San Luis Obispo, 1984. Director, Upward Bound.
- MOAZZAMI, SARA (1991) .....Civil and Environmental Engineering B.S., George Washington University, 1981; M.S., University of California, Berkeley, 1982; Ph.D., 1987. Assistant Professor.
- MOIR, NEIL J. (1970) ......Chemistry B.S., Lewis and Clark College, 1952; M.S., University of Oregon Medical School, 1966; Ph.D., 1968; Postdoctoral Fellow, Cornell University, 1968- 1970. Professor.
- MONTECALVO, JOSEPH (1983) .....Food Science and Nutrition B.S., University of Rhode Island, 1972; M.S., 1975; Ph.D., 1979. Professor and Department Head.
- MONTEEN, GINNY (1983) .....University Relations and Development B.S., University of Illinois, 1966. Publications Editor.
- MONTGOMERY, WAYNE R. (1982) ......University Library A.B., University of California, Berkeley, 1977; M.L.S., University of California, Los Angeles, 1981. Senior Assistant Librarian.
- MOORE, CAROLE M. (1980) ......Career Services B.A., California Polytechnic State University, San Luis Obispo, 1976; M.A., 1978, Career Counselor.
- MORENO, J. KELLY (1991) .....Psychology and Human Development B.S., University of California, Santa Barbara, 1980; M.S., University of Utah, 1985; Ph.D., 1988. Assistant Professor.
- MOREY, KRISHNAKUMAR (KRIS) S. (1970) ......Food Science and Nutrition B.S., Nagpur University, India, 1955; M.S., 1958; M.S., University of California, San Francisco, 1963; Ph.D., University of California, Berkeley, 1967. Professor.
- MORGAN, ANN (1980) .....Psychology and Human Development B.A., Texas Tech University, 1971; M.A., 1975; Ph.D., 1980. Professor.
- MORI, BARBARA L. ROWLAND (1986) ......Social Sciences B.A., Hofstra University, 1967; M.A., University of Hawaii, 1983; Ph.D., 1987. Assistant Professor.
- MORRIS, DON M. (1957–62) (1969) ......University Center for Teacher Education
- B.S., California State Polytechnic College, 1953; M.A., 1958; Ed.D., University of California, Los Angeles, 1968. Professor.
- MORRIS, NANCY A. (1985) ......Home Economics B.S., Central Michigan University, 1973; M.S., 1978; Ph.D., Ohio State University, 1983. Associate Professor.
- MORRISON, KENT E. (1979)......Mathematics B.A., University of California, Santa Cruz, 1971; Ph.D., 1977. Professor.

- MORROBEL-SOSA, ANNY (1990) ......Materials Engineering B.Sc., University of Puerto Rico, 1976; M.Sc., State University of New York, Stony Brook, 1980; Ph.D., University of Southern California, 1985. Associate Professor.
- MOTT, W. STEPHEN (1972) ......Graphic Communication B.S., California State Polytechnic College, 1959; M.A., California Polytechnic State University, San Luis Obispo, 1973. Professor.
- MOTTELER, ZANE C. (1982) ......Computer Science B.S., Stanford University, 1957; M.S., 1962; Ph.D., 1964; M.S., Michigan State University, 1981; additional graduate study, University of Minnesota, University of New Mexico. Professor.
- MOTTMANN, JOHN (1974) ......Physics B.A., University of California, Los Angeles, 1966; M.A., 1967; Ph.D., 1972. Professor.
- MOUSTAFA, SAFWAT M. A., (1984)......Mechanical Engineering B.S., University of Alexandria, 1960; M.S., University of California, Davis, 1963; Ph.D., Michigan State University, 1967. Professor. Registered Professional Engineer, Illinois and Iowa.
- MOUTON, JOHN C. (1988) .......Construction Management B.S., Northeast Louisiana University, 1972; M.S., University of Florida, 1978. Associate Professor.
- MUELLER, GERRY K. (1984) ......Office of the President B.A., University of Hawaii, 1972. Presidential Aide.
- MUELLER, WESLEY J. (1984) ......Crop Science B.S., Brigham Young University, 1977; M.S., 1981, Ph.D., 1983, Utah State University. Associate Professor.
- MULLIGAN, PATRICIA A. (1988) ......University Center for Teacher Education B.A., Arizona State University, 1971; M.Ed., Kent State University, 1977; M.A., Northern Arizona University, 1978; Ph.D., Arizona State University, 1987. Assistant 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.
- MUNROE, PATRICK A. (1980) ......Graphic Communication A.O.C.A., Ontario College of Art, 1976; M.F.A., Virginia Commonwealth University, 1986. Professor.
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- MURRAY, RANDALL L. (1977) ......Journalism B.S., Ohio University, 1960; M.S., 1961; Ph.D., University of Minnesota, 1973. Professor.
- MUSSULMAN, RONALD (1986) ......Mechanical Engineering B.S., University of Illinois, 1965; M.S., 1967; Ph.D., 1973. Professor and Department Head. Registered Professional Engineer, Montana.
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- NORDEEN, RONALD D. (1991) .....University Relations and Development B.A., Pomona College, 1954. Director, Gift Planning.
- NOVAK, MATTHEW S. (1989)......English B.A., Cleveland State University, 1976; M.A., 1978; Ph.D., Case Western Reserve University, 1989. Assistant Professor.
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- NULMAN, DENNIS M. (1977) ......University Center for Teacher Education B.A., University of San Diego, 1970; M.Ed., 1972; Ph.D., University of Southern California, 1977. Professor.
- NUTTER, DAVID E. (1974) ......Accounting A.B., West Virginia University, 1954; M.B.A., Indiana University, 1958; D.B.A., University of Southern California, 1974. Professor. Certified Public Accountant.
- OCHS, NANCY C. (1977) ......Agribusiness B.S., St. Louis University, 1966; M.Acct., University of Arizona, 1975. Professor. Certified Public Accountant, Certified Financial Planner.

- OFFERMANN, GENE P. (1970) .....Crop Science B.S., Southern Illinois University, 1964; M.S., 1965; Ph.D., University of California, Davis, 1970. Professor.
- O'KEEFE, TIMOTHY G. (1983)......Natural Resources Management B.S., New York State College of Forestry, 1955; M.F., 1957; M.A., Northern Arizona University, 1973; Ph.D., 1977. Professor.
- OLDS, ALEXIS S. (1988) ......Speech Communication B.A., San Jose State University, 1975; M.A., 1980; Ph.D., University of Utah, 1989. Assistant Professor.
- OLIVER, S. RONALD (1988) ......Computer Science B.A., Morningside College, 1970; M.S., University of Kansas, 1975; Ph.D., Colorado State University, 1988. Associate Professor.
- O'NEILL, GERTRUDIS M. (1972) ......University Library B.A., Inter-American University, Puerto Rico, 1955; M.F.A., University of Cincinnati, 1962; M.L.S., Western Michigan University, 1967; additional graduate study, Art Academy of Cincinnati. Senior Assistant Librarian.
- ORROCK, JILL (1983) ......Intercollegiate Athletics B.Sc., California Polytechnic State University, San Luis Obispo, 1979; M.A., 1985. Head Coach.
- 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.
- ORTIZ, MARIA E. (1972).....Biological Sciences B.S., Southwest Texas State University, 1968; M.A., 1970; Ph.D., Texas Woman's University, 1973. Professor.
- OSBALDESTON, ROGER J. (1972) .....Landscape Architecture Diploma in Architecture, School of Architecture, Nottingham, England, 1957; M.L.A., University of Pennsylvania, 1961. 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. Associate Professor.
- PAGE, JOYCE M. (1984)......Health Services B.A., California State University, Fresno, 1976. Fiscal Officer.
- PALMER, KENNETH F. (1984) ......University Center for Teacher Education B.S., Iowa State University, 1964; M.S., 1969; Ph.D., 1972. Professor.
- PANETTA, DANIEL L. (1986) ......Architecture B.S., California Polytechnic State University, San Luis Obispo, 1976; M. Arch., University of California, Berkeley, 1986. Associate Professor. Registered Landscape Architect, California.
- PANGOTRA, PREM P. (1989) .....City and Regional Planning B.T., Indian Institute of Technology, Delhi, 1974; M.B.A., Indian Institute of Technology, Calcutta, 1976; M.S., University of Wisconsin, Madison, 1981; Ph.D., 1988. Assistant Professor.
- PAPAKYRIAZIS, ARTEMIS (1982) ......Economics B.A., Athens School of Political Science, 1962; M.A., University of California, Santa Barbara, 1969; Ph.D., University of California, Riverside, 1982. Professor.
- PARKER, LEE R. (1974) ......Biological Sciences B.S., Brigham Young University, 1966; M.S., 1968; Ph.D., Michigan State University, 1976. Professor.
- PATTEE, ROBERT K. (1991) .....Business Affairs B.S., Texas A&M, 1976. Associate Director, Plant Operations.
- PATTERSON, WILLIAM B. (1977) ......Mechanical Engineering B.S., U.S. Naval Academy, 1962; M.S., Air Force Institute of Technology, 1972. Associate Professor.

- PAUTZ, ROLAND K. (1959)......Animal Sciences and Industry B.S., Oregon State College, 1957; M.S., Oregon State University, 1968. Professor.
- PEACH, DAVID (1987) ......Management B.Sc., Ohio University, 1962; M.B.A., 1964; D.B.A., Harvard University, 1969. Professor and Department Head.
- PECK, ROXY L. (1979) ......Statistics B.A., University of California, Riverside, 1972; Ph.D., 1979. Professor and Department Chair.
- PEDERSEN, MARY E. (1981).....Food Science and Nutrition B.A., University of California, Santa Barbara, 1973; M.S., University of California, Los Angeles, 1976; Ph.D., 1980. Professor.
- PENDSE, PRATAPSINHA C. (1966) ......Biological Sciences B.S., Bombay University, 1947; M.S., Poona University, 1951; M.S., Utah State University, 1959; Ph.D., 1965. Professor.
- PERLICK, WALTER W. (1979).....Business Administration B.S., M.S., Northern Illinois University, 1965; Ph.D., Pennsylvania State University, 1973. Professor.
- PERRYMAN, ELIZABETH K. (1972) ......Biological Sciences B.S., Memphis State University, 1964; M.S., Texas Technological College, 1967; Ph.D., University of Arizona, 1972. Professor.
- PETERS, RALPH A. (1969) ......Physics B.S., Georgetown University, 1949; M.S., Pennsylvania State University, 1951; Ph.D., Fordham University, 1967. Professor.
- PEZO-SILVA, ARMANDO A. (1973) .....Student Academic Services B.S., California State Polytechnic College, 1970; M.A., California Polytechnic State University, San Luis Obispo, 1974; M.S., 1979. Director.
- PHILLIPS, JOHN C. (1974) .....Crop Science B.S., Washington State University, 1967; M.S., Colorado State University, 1969; Ph.D., Oregon State University, 1974. Professor.
- PHILLIPS, PETER K. (1968).....Business Affairs B.S., California State Polytechnic College, 1959. Architectural Coordinator.
- PIEL, DANIEL D. (1980) ......Art and Design B.A., Yale University, 1951; B.F.A., Pratt Institute, 1954; M.S., 1971. Professor.
- PIEPER, JANET L. (1984).....Personnel and Employee Relations B.S., University of Nebraska, 1954; M.A., 1969; Ph.D., 1976. Director.
- PIERCE, DAVID R., JR. (1981) ......Construction Management B.S., Virginia Polytechnic Institute, 1963; M.B.A., University of West Florida, 1971. Professor.
- 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. 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.
- PIPPIN, LOUIS D. (1970) ......University Center for Teacher Education B.S., West Texas State College, 1952; M.Ed., 1956; Ed.D., North Texas State University, 1970. Professor.
- PLUMB, TIMOTHY R. (1981) ......Natural Resources Management B.S., Oregon State University, 1954; M.S., University of California, Berkeley, 1959; Ph.D. University of California, Riverside, 1970. Professor. Registered Professional Forester, California.
- PLUMMER, WILLIAM E. (1979) .....Animal Sciences and Industry B.S., North Carolina State University, 1970; M.S., 1976; Ph.D., Utah State University, 1979. Professor.

- POHL, JENS G. (1973).....Architecture B.Arch., University of Melbourne, Australia, 1964; M.Bldg.Sci., University of Sydney, 1967; Ph.D., 1970. Professor. 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).....Student Academic Services B.A., San Diego State University, 1985; M.S., University of Rhode Island, 1987. Academic Adviser.
- 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) ......Physical Education and Recreation Administration B.S., California State Polytechnic College, 1970; M.S., 1971; Ph.D., University of Utah, 1978. Professor.
- PROCTOR, CAROLYN (1973) ......Career Services B.S., Kansas State University, 1972; M.A., California Polytechnic State University, San Luis Obispo, 1975. Career Counselor.
- PUNCHES, GERALD N. (1971) ......Enrollment Support Services B.A., Western Washington State College, 1970; M.Ed., 1971; additional graduate study, University of California, Santa Barbara. Registrar.
- QUINLAN, CHARLES W. (1966) ......Architecture B.Arch., Cornell University, 1959; M.A., University of Sheffield, 1974. Professor. Registered Architect, California.
- RAGSDALE, DAVID O. (1991) ......Business Affairs B.S., California Polytechnic State University, San Luis Obispo, 1984. Registered Environmental Health Specialist. Environmental Specialist.
- RAILEY, JIMMY H. (1977).....Physical Education and Recreation Administration B.S., Murray State University, 1957; M.S., Indiana University, 1959; D.P.E., 1969. Professor.
- RAMIREZ, RICHARD M. (1975) ......Business Affairs B.B.A., New Mexico State University, 1971. Director, Budget Planning and Administration.
- RATHBUN, LARRY P. (1970).....School of Agriculture B.S., California State Polytechnic College, 1964; M.A., 1967; Ph.D., Ohio State University, 1974. Professor and Associate Dean.
- REGAN, CYNTHIA L. (1989) ......Home Economics B.S., California State Polytechnic College, 1970; M.S., University of Wisconsin, Stout, 1985. Assistant Professor.
- REGIER, RONALD (1987)......School of Liberal Arts B.A., University of Puget Sound, 1973; M.F.A., Michigan State University, 1977; M.A., University of Wisconsin, 1987. Director, Center for the Arts.

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.

- REILLY, PETER E. (1987) ......Housing B.S., University of Oregon, 1979; M.A., California Polytechnic State University, San Luis Obispo, 1985. Leadership Development Specialist.
- REYNOLDS, NANCY J. (1986).....Business Affairs B.S., California Polytechnic State University, San Luis Obispo, 1977. Assistant Director, Accounts Management.
- REYNOLDS, ROBERT G. (1963) .....Art and Design B.P.A., Art Center College of Design, Los Angeles, 1962; M.A., California Polytechnic State College, San Luis Obispo, 1970. Professor.
- REYNOSO, WENDY DEMKO (1978)......Financial Aid B.A., California Polytechnic State University, San Luis Obispo, 1978; M.A., 1984. Counselor.
- RIBEAU, SIDNEY (1990) ......School of Liberal Arts B.S., Wayne State University, 1971; M.A., University of Illinois, Champaign-Urbana, 1973; Ph.D., 1979. Dean.
- RICE, MARILYNN F. (1977) ......Psychology and Human Development A.B., University of California, Los Angeles, 1960; M.Ed, California State University, Northridge, 1969; Ph.D., University of California, Santa Barbara, 1977. Professor.
- RICE, THOMAS J., JR. (1981) ......Soil Science B.S., University of Wisconsin, Madison, 1974; M.S., Montana State University, 1976; Ph.D., North Carolina State University, 1981. Professor. Certified Professional Soil Scientist.
- RICE, WALTER E. (1964) ......Economics B.A., San Francisco State College, 1960; M.A., 1963; M.A., Claremont Graduate School, 1970; Ph.D., 1973. Professor.
- RICH, RITA A. (1985) ......Health Services R.N., Cuesta College, 1983. Registered Nurse.
- RICHARDS, THOMAS L. (1969) .....Biological Sciences B.S., California State College, Long Beach, 1964; M.A., 1966; Ph.D., University of Maine, 1969. Professor.
- RIEDLSPERGER, MAX E. (1969) ......History A.B., Wabash College, 1959; M.A., University of Michigan, 1961; Ph.D., University of Colorado, 1969. Professor.
- RIENER, KENNETH (1983) .....Business Administration B.S., University of Idaho, 1968; M.S., Purdue University, 1969; Ph.D., 1976. Professor.
- RIFE, WILLIAM C. (1977) ......Chemistry B.A., North Central College, 1956; Ph.D., University of Illinois, 1960. Professor.
- RIGGINS-PIMENTEL, RHONDA L. (1972) ......Biological Sciences B.S., Austin Peay State College, 1966; M.S., Iowa State University, 1969; Ph.D., 1972. Professor.
- RIHAL, SATWANT S. (1969) ......Architectural Engineering B.S., University of Delhi, India, 1961; M.S., University of Minnesota, 1964; Ph.D., University of New Mexico, 1969. Professor. Registered Civil Engineer, California.
- RINGER, PAULA J. (1974) ......Enrollment Support Services B.A., Chico State College, 1957. Manager, Evaluations.
- RISSER, JOSEPH C. (1982) ......Business Affairs B.A., Humboldt State College, 1971; M.A., Humboldt State University, 1978. Director Housing and Conference Services.
- ROACH, DAVID M. (1966) ......Physics B.S., South Dakota School of Mines and Technology, 1961; M.S., 1963; Ph.D., Oregon State University, 1974. Professor.
- ROBERTS, GREGORY (1990) .....Student Academic Services B.A., Idaho State University, 1979; M.Ed., University of Idaho, 1980. Director, Student Support Services.
- ROBERTS, VICTORIA S. (1991) ......Psychological Services B.A., California State University, Sacramento, 1980; M.S.W., 1983. Counselor.

- ROCKMAN, ILENE F. (1975) ......University Library B.A., University of California, Los Angeles, 1972; M.S., University of Southern California, 1974; M.A., California Polytechnic State University, San Luis Obispo, 1978; Ph.D., University of California, Santa Barbara, 1985. Librarian and Interim Associate Dean.
- RODGER, JAMES A. (1976).....Construction Management B.Bldg.Cstr., University of Florida. 1970; M.S., 1977. Professor and Department Head. Certified General Contractor, Florida.
- ROGERS, JOHN C. (1986) .....Business Administration B.S., Point Park College, 1970; M.B.A., Pennsylvania State University, 1972; Ph.D., Virginia Polytechnic Institute and State University, 1979. Professor and Department Head.
- ROGERS, JOHN M. (1970)......Statistics B.S., Marion College, 1962; M.S., Kansas State University, 1966; Ph.D., Virginia Polytechnic Institute and State University, 1975. Associate Professor.
- ROGERS, ROLF E. (1975) ......Management M.A., University of Washington, 1968; Ph.D., 1970. Professor.
- ROJAS-OVIEDO, RUBEN (1991) ......Aeronautical Engineering B.S., Instituto Politecnico Nacional, 1976; M.S., North Carolina State University, 1981; Ph.D., Auburn University, 1987; M.S., 1989. Assistant Professor.
- ROPER, SUSAN S. (1991)......University Center for Teacher Education B.A., University of California, Berkeley, 1963; M.A., Stanford University, 1968; Ph.D., 1971. Professor and Center Director.
- ROSEN, ARTHUR Z. (1953) ......Physics A.B., University of California, 1941; Ph.D., 1952. Professor.
- ROSENFIELD, STANLEY (1979) ......Business Affairs B.A., Occidental College, 1970. Assistant Director, Payment Management.
- ROSENMAN, MONA G. (1971) ......English B.A., University of Michigan, 1955; M.A., Case-Western Reserve University, 1960; Ph.D., Kent State University, 1970. Professor.
- ROSENTHAL, BIANCA (1971) ......Foreign Languages B.S., University of Washington, 1952; M.A., 1966; Ph.D., 1970. Professor.
- ROSSI, RICHARD J. (1991)......Statistics B.A., California State University, Sacramento, 1978; M.S., Iowa State University, 1980; Ph.D., Oregon State University, 1988. Assistant Professor.
- ROWELL, ROBERT (1991) ......Intercollegiate Athletics B.Sc., California Polytechnic State University, San Luis Obispo, 1990. Business Manager.
- RUEHR, THOMAS A. (1974) ......Soil Science B.S., Ohio State University, 1966; M.S., Iowa State University, 1970; Ph.D., Colorado State University, 1976. Professor.
- RUGGLES, JOANNE BEAULE (1973).....Art and Design B.F.A., Ohio State University, 1968; M.F.A., 1970. Professor.
- RUGGLES, PHILIP K. (1966-67) (1971).....Graphic Communication B.S., West Virginia Institute of Technology, 1965; M.S., South Dakota State University, 1966. Professor.
- RUSSELL, CRAIG H. (1982)......Music B.M., University of New Mexico, 1973; M.M., 1976; Ph.D., University of North Carolina, 1981. Professor.
- RUSSELL, JOHN G. (1968) ......Music B.A., Fresno State College, 1959; M.A., California State University, Chico, 1968. Professor.
- RUTHERFORD, ROBERT T. (1974) ......Animal Sciences and Industry B.S., University of California, Davis, 1970; M.S., California Polytechnic State University, San Luis Obispo, 1976. Professor.
- RYAN, KATHLEEN A. (1981)......Psychology and Human Development B.A., San Diego State University, 1975; M.A., Bowling Green State University, 1978; Ph.D., 1980. Professor.
- RYAN, L. DIANE (1973) ......Financial Aid B.A., California Polytechnic State University, San Luis Obispo, 1973; M.A., 1976. Director.

- RYUJIN, DONALD H. (1989) .....Psychology and Human Development B.A., Stanford University, 1968; M.A., University of Michigan, 1972; Ph.D., 1983. Assistant Professor.
- SAAM, PATRICIA (1966) .....Food Science and Nutrition B.S., College of St. Catherine, 1950; M.S., California Polytechnic State University, San Luis Obispo, 1973. Professor. Registered Dietitian.
- SABOL, JOSEPH E. (1972) ......School of Agriculture B.S., Fresno State College, 1963; M.Ed., University of California, 1965; Ph.D., Colorado State University, 1976. Professor and Interim Dean.
- SAENZ, RICHARD A. (1980) ......Physics A.B., University of California, Berkeley, 1972; M.S., Cornell University, 1975; Ph.D., 1977. Professor.
- SALTZMAN, JUDY D. (1975) ......Philosophy B.A., San Jose State College, 1963; M.A., University of California, Berkeley, 1965; M.A., 1973; Ph.D., University of California, Santa Barbara, 1977; Fulbright scholar, Freie Universitat, Berlin, 1970–71. Professor.
- SANCHEZ, DAVID J. (1970) .......University Center for Teacher Education B.B.A., University of Texas at El Paso, 1950; graduate study, University of California, Santa Barbara. Associate Professor.
- SANDERSON, JAMES D. (1967) .....intercollegiate Athletics A.B., Fresno State College, 1962; M.S., California State Polytechnic College, 1969. Executive Director, Athletic Fundraising.
- SANDLIN, DORAL R. (1969) ......Aeronautical Engineering B.S., U.S. Naval Academy, 1954; M.S., Air Force Institute of Technology; Ph.D., University of Arizona, 1972. Professor and Department Chair.
- SCHAFFNER, DAVID J. (1972) ......Agribusiness B.S., University of California, Davis, 1964; M.B.A., University of California, Berkeley, 1970; M.S., California Polytechnic State University, San Luis Obispo, 1978; Ph.D., Golden Gate University, 1980. Professor.
- SCHELL, THOMAS A. (1984) .....Business Affairs B.S., Arizona State University, 1978. Certified Instructor, Federal Emergency Management Agency. Radiation Safety Officer/Assistant Director, Public Safety.
- SCHERER, MARLENE (1991).....Student Academic Services B.A., University of California, Davis, 1985; M.A., Michigan State University, 1987. Academic Adviser, Student Support Services.
- SCHULTZ, NED W. (1976) .....Psychology and Human Development B.S., Pennsylvania State University, 1973; M.A., 1975; Ph.D., Ohio State University, 1976. Professor.
- SCHUMANN, THOMAS G. (1971) ......Physics B.S., California Institute of Technology, 1958; M.A., University of California, Berkeley, 1960; Ph.D., 1965. Professor.
- SCOTT, HAZEL J. (1988)......Student Affairs B.S., Southern Illinois University, 1964; M.S., University of Illinois, 1967; Advanced Certificate in Education, University of Illinois, 1967; Ph.D., Southern Illinois University, 1972. Vice President for Student Affairs.
- SCOTT, JACK F. (1967) ......Agribusiness B.S., California State Polytechnic College, 1961; M.A., 1967. Professor.
- SCOTT, KENNETH C. (1975)......Agribusiness B.S., Brigham Young University, 1970; Ph.D., Washington State University, 1975. Associate Professor.
- SCOTTO, KENNETH C. (1970) ......Animal Sciences and Industry B.S., California State Polytechnic College, 1966; M.S., University of Nevada, 1969. Professor.
- SCRIVEN, TALMAGE ERNEST (1980) ......Philosophy B.A., University of South Florida, 1976; M.A., 1977; Ph.D., University of Southern California, 1980. Professor.
- SEATON, HOLLY L. (1991)......Psychological Services B.S., California Polytechnic State University, San Luis Obispo, 1980; M.S., University of Pittsburgh, 1985; Ph.D., Sierra University, 1987. Counselor.
- SEIFODDINI, AHMAD K. (1984) ......industrial Engineering B.S., Abadan Institute of Technology, 1965; M.S., Oklahoma State University, 1973; Ph.D., 1976. Professor.
- SEIM, EDWIN C. (1978) .....Crop Science B.S., University of Missouri, 1954; M.S., University of Minnesota, 1966; Ph.D., 1970. Professor.

- SELBY, MICHAEL J. (1991) ......Psychology and Human Development B.S., University of California, Santa Barbara, 1971; M.S., California Polytechnic State University, San Luis Obispo, 1981; Ph.D., Memphis State University, 1988. Assistant Professor.
- 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.
- SENNETT, ROBERT EARL (1970) ......Civil and Environmental Engineering B.S., University of Pennsylvania, 1959; M.S., 1961; Ph.D., 1963. Professor. Registered Professional Engineer, California.
- SETENCICH, LYLE (1987) ......Intercollegiate Athletics B.A., Fresno State College, 1968. Head Football Coach.
- SETTLE, ALLEN K. (1970) ................Political Science B.A., University of California, Santa Barbara, 1966; M.A., 1967; Ph.D., 1970. Professor.
- SHABAN, ALI O. (1984) ......Electronic and Electrical Engineering B.S., University of Tripoli, 1974; M.S., University of Southern California, 1978; Ph.D., Oregon State University, 1985. Associate Professor.
- SHAFFER, RICHARD A. (1974) .......Social Sciences B.A., Stanislaus State College, 1971; M.A., University of Notre Dame, 1974; Ph.D., 1975. Professor.
- SHAH, RAMESH T. (1969) ......Mechanical Engineering B.E., Maharaja Sayajirao University of Baroda, India; Dr. Ing., Hochschule Fur Schwermaschinenbau, Magdeburg, East Germany, 1959. Professor. Registered Professional Engineer, California.
- SHANK, CAROLYN B. (1974) .....Physical Education and Recreation Administration B.S., California State Polytechnic College, 1969; M.S., 1975; Ed.D., University of
- B.S., California State Polytechnic College, 1969; M.S., 1975; Ed.D., University of Utah, 1981. Professor.
- SHARP, HARRY, JR. (1975) .......School of Liberal Arts A.B., College of the Pacific, 1959; M.S., Purdue University, 1961; Ph.D., 1967. Professor and Associate Dean.
- SHEIK, HABIB (1967).....English
   B.S., Fresno State College, 1959; A.B., 1960; M.A., California State Polytechnic
   College, 1961; M.A., University of California, Los Angeles, 1966; Ph.D.,
   University of Nebraska, 1979. Professor.
- SHELTON, MARK D. (1982).....Crop Science B.S., University of Idaho, 1977; M.S., Purdue University, 1980; Ph.D., Utah State University, 1989. Professor. Registered Professional Entomologist.
- SHEMENSKE, DONALD (1982)......University Foundation B.A., St. Mary's College, 1979. Director, Financial Services.
- SHIBATA, MARTIN (1990) ......Career Services B.A., University of California, Los Angeles, 1975; M.P.A., California State University, Los Angeles, 1983; additional graduate work, University of Southern California, 1985. Assistant Director.
- SHIERS, ALDEN F. (1975) ......Economics B.S., University of Maine, 1967; Ph.D., University of California, Santa Barbara, 1977. Associate Professor.
- SHOCKLEY, STEVEN B. (1985) .....University Relations and Development B.S., University of Alabama, 1971. Director, Alumni Relations.
- SILVESTRI, MICHAEL G. (1978) ......Chemistry B.S., University of California, Santa Barbara, 1973; Ph.D., University of California, Santa Cruz, 1977. Professor.
- SIMEK, JAN. W. (1977) ......Chemistry B.A., Kalamazoo College, 1970; M.S., Stanford University, 1971; Ph.D., 1975. Professor.
- SIMMONS, JAMES E. (1966) ......English B.A., University of California, Santa Barbara, 1959; M.A., University of Wisconsin, 1960; Ph.D., 1966. Professor.
- SIMON, RICHARD K. (1988) ......English B.A., University of Michigan, 1967; M.A., 1968; Ph.D., Stanford University, 1977. Associate Professor.
- SINGLETON, DAVID R., CPT. (1988)......Military Science B.A., University of South Florida, 1978; M.A., 1980.

SLACK, DARLENE L. (1983) ......University Relations and Development B.A., California State College, Northridge, 1969. Director of Communications and Special Events.

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- SMITH, BRENDA (1989) .....Crop Science B.S., University of California, Davis, 1983; M.S., California State University, Fresno, 1986; Ph.D., Oklahoma State University, 1989. Assistant Professor.
- SMITH, DALE A. (1973) ......Animal Sciences and Industry B.S., University of California, Davis, 1971; D.V.M., 1973. Professor.
- SMITH, DOUGLAS B. (1977) ......English B.A., Johns Hopkins University, 1969; M.A., Fairfield University, 1975; Ph.D., Rensselaer Polytechnic Institute, 1979. Professor.
- SMITH, GERALD L. (1980) ......Landscape Architecture B.S., Iowa State University, 1961; M.L.A., University of Illinois, 1968. Professor and Department Head. Registered Landscape Architect, Utah.
- SMITH, NELSON L., III (1962) ......Industrial Technology B.S., Lowell Technological Institute, 1960; M.S., 1962; additional graduate study, University of Iowa. Professor.
- SMITH, PATRICK (1976) ......University Foundation B.A., University of Central Florida, 1975. Director, Vocational Education Productions.
- SMITH, TERRY L. (1980) ......Soil Science B.S., University of Nebraska, Lincoln, 1972; M.S., 1975; Ph.D., Iowa State University, 1980. Professor and Department Head.
- SNETSINGER, JOHN (1970) ......History A.B., University of California, Los Angeles, 1963; M.A., University of California, Berkeley, 1966; Ph.D., Stanford University, 1969; additional graduate study, Stanford School of Law. Professor.
- SOENEN, LUC A. (1989) .....Business Administration B.S., Leuven University, Belgium, 1970; M.B.A., Cornell University, 1972; D.B.A., Harvard University, 1977. Professor.
- SOMAYAJI, SHAN (1979) .....Civil and Environmental Engineering B.E., University of Mysore, 1968; M.Tech., 1974; M.S., South Dakota School of Mines and Technology, 1975; Ph.D., University of Illinois, Chicago, 1979. Professor. Registered Professional Engineer, California.
- SOMPPI, SUSAN (1978) ......Student Academic Services B.S., University of Texas, 1970; M.A., California Polytechnic State University, San Luis Obispo, 1978. Academic Adviser.
- SORENSEN, DAREL F. (1984) ......Extended Education B.A., Occidental College, 1958; M.A., Fresno State College, 1964; Ed.D., University of the Pacific, 1973. Associate Director.
- SPILLER, ROBERT (1989) ......Animal Sciences and Industry 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. Assistant Professor.
- STALEY, CLINTON A. (1988)......Computer Science B.A., Principia College, 1980; M.S., University of California, Santa Barbara, 1982; Ph.D., 1987. Associate Professor.
- STALLARD, MARY L. (1965) ......Physical Education and Recreation Administration B.A., Fresno State College, 1957; M.S., University of Washington, 1965; Ph.D., University of Utah, 1974. Professor.
- STANSFIELD, WILLIAM D. (1963) .....Biological Sciences B.S., California State Polytechnic College, 1953; M.A., 1959; M.S., University of California, Davis, 1962; Ph.D., 1963. Professor.
- STANTON, GEORGE C. (1981) ......Psychological Services B.A., Lake Forest College, 1963; M.A., Cornell University, 1968; Ph.D., Stanford University, 1980. Test Officer.

- STEARNS, DANIEL J. (1986) ......Computer Science B.S., University of California, 1965; M.S., California Polytechnic State University, San Luis Obispo, 1974. Associate Professor.
- STEARNS, JOSEPHINE S. (1969) .....Psychology and Human Development B.A., University of New Hampshire, 1958; M.A., Michigan State University, 1969; Ph.D., Texas Woman's University, 1982. Professor.
- STEFANCO, CAROLYN (1990) ......History B.A., University of Colorado, 1979; M.A., S.U.N.Y., Binghamton, 1981; Ph.D., Duke University, 1987. Assistant Professor.
- STEWART, PATRICIA A. (1971).....Learning Center B.S., California State Polytechnic College, 1970; M.A., California Polytechnic State University, San Luis Obispo, 1972. Coordinator.
- STIPICEVICH, JOHN (1985) ......University Union B.A., San Jose State University, 1985. Assistant Director of Operations.
- STIRLING, JEAN E. (1979) ......University Outreach B.S., California Polytechnic State University, San Luis Obispo, 1989. Outreach Associate.
- STOKES, CLIFFORD (1988) ......Animal Sciences and Industry B.S., Ohio State University, 1975; M.S., 1976; Ph.D., Colorado State University, 1989. Assistant Professor.
- STOLTZ, RONALD R. (1990) .....Landscape Architecture B.S., University of Massachusetts, Amherst, 1970; M.L.A., 1973. Professor.
- STONEMAN, PATRICIA-ANN (1990) ......Extended Education B.A., California State University at Northridge, 1974; M.A., 1978. Associate Director.
- STOVER, VICKI R. (1969) ......Business Affairs B.S., California Polytechnic State University, San Luis Obispo, 1979; M.B.A., 1986. Business Affairs Associate.
- 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 Engineering B.S., Michigan Technological University, 1966; M.S., 1969. Professor. Registered Professional Engineer, Ohio.
- STROHMAN, ROLLIN D. (1969) ......Agricultural Engineering B.S. (Agricultural Engineering), B.S. (Agricultural Science), University of Illinois, 1962; M.S., 1965; Ph.D., Purdue University, 1969. Professor.
- STRONG, CHARLES W. (1971) ......English B.S., Arizona State University, 1965; M.A., University of Missouri, 1969. Associate Professor.
- STUBBS, DANIEL F. (1963–66) (1968) ......Computer Science B.S., Purdue University, 1960; M.S., Rensselaer Polytechnic Institute, 1962; Ph.D., 1973. Professor.
- STULTZ, W. FRED (1977) .....Psychology and Human Development B.A., University of Southern Colorado, 1970; M.S., Purdue University, 1973; Ph.D., 1974. Professor.
- SUESS, MICHAEL H. (1975).....Personnel and Employee Relations B.S., California Polytechnic State College, San Luis Obispo, 1970; M.S., 1971; additional graduate study, Brigham Young University and La Verne University. Associate Director.
- SUHR, MOON JA MINN (1969-71) (1972).....Theatre and Dance B.S., Ewha Women's University, Seoul Korea, 1963; M.A., University of Northern Colorado, 1969; Ph.D., Texas Woman's University, 1988. Professor.
- SULLIVAN, EDWARD C. (1989) .....Civil and Environmental Engineering B.S., Massachusetts Institute of Technology, 1966; M.S., 1967; Ph.D., University of California, Berkeley, 1971. Associate Professor.
- SULLIVAN, GERALD J. (1968) .....English B.A., University of Wichita, 1957; M.A., University of Oklahoma, 1959; Ph.D., 1964. Professor.

- SUN, CHENG (1989) ......Electronic and Electrical Engineering B.S., National Taiwan University, Taiwan, 1958; M.S., Cornell University, 1962; Ph.D., 1965. Professor.
- SUTLIFF, DALE A. (1973) .....Landscape Architecture B.S., California State Polytechnic College, Pomona, 1965; M.R.P., University of Pennsylvania, 1973. Professor. Registered Landscape Architect, California.
- SWANSON, ROGER M. (1984) ......Student Affairs B.A., North Central College, 1963; M.A., University of Illinois, Urbana, 1964; Ph.D., 1968. Associate Vice President.
- SWARTZ, TERESA A. (1991) .....Business Administration 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.
- SWIDERSKI, MICHAEL (1983) .....Physical Education and Recreation Administration B.S., University of Southern California, 1972; M.A., 1974; Ph.D., University of Oregon, 1981. Associate Professor.
- SYDNOR, WILLIAM E. (1981) ......Learning Center B.A., Whittier College, 1971; M.A., University of California, Riverside, 1974; M.A., California Polytechnic State University, San Luis Obispo, 1986. Counselor.
- TAKKEN, MEREDITH R. (1976) .....Financial Aid B.A., California State College, Chico, 1971; M.A., California Polytechnic State University, San Luis Obispo, 1990. Pell Grant Program Manager.
- TANDON, SHYAMA (1983) .....Electronic and Electrical Engineering B.S., Banaras University, India, 1965; M.S., University of Iowa, 1971; Ph.D., Texas A & M, 1976. Professor.
- TARTAGLIA, LAURE CHANTAL (1982) ......Associated Students, Inc. B.S., California Polytechnic State University, San Luis Obispo, 1982. Program Coordinator.
- TASKEY, RONALD D. (1977) ......Soil Science
   B.S., University of Montana, 1970; M.S., 1972; Ph.D., Oregon State University, 1978. Professor. Certified Professional Soil Scientist; Certified Professional Soil Erosion and Sediment Control Specialist.
- TERRY, RAYMOND D. (1974) ......Mathematics B.S., State University of New York, 1966; M.S., Michigan State University, 1968; Ph.D., 1972. Professor.
- THOMAS, JOHN W. (1968) ......Biological Sciences B.A., Los Angeles State College, 1957; Ph.D., University of Southern California, Los Angeles, 1968. Professor.
- THOMPSON, RICHARD P. (1990) ......Natural Resources Management B.S., Oklahoma State University, 1974; M.S., 1978; Ph.D., Texas A&M University, 1990. Associate Professor.
- THOMPSON, ROBERT C. (1981) ......Agribusiness B.S., California State Polytechnic College, 1969; M.S., University of California, Davis, 1970. Professor.
- TICE, RUSSELL L. (1965) .....Chemistry B.S., Marshall University, 1960; Ph.D., University of California, Los Angeles, 1965. Professor.
- TONG, PHILLIP S. (1988) ......Dairy Science B.S., University of California, Davis, 1977; M.S., Cornell University, 1982; Ph.D., 1986. Director, 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. 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. Assistant Professor.
- TROY, BERNARD A. (1970) .......University Center for Teacher Education B.A., University of Notre Dame, 1957; S.T.L., Universidad Catholica de Chile, 1961; M.A., University of Notre Dame, 1965; Ph.D., University of Southern California, 1974. Professor.

- TRYON, BETTE W. (1976) .....Psychology and Human Development B.S., University of Maryland, 1966; M.S., 1973; Ph.D., Syracuse University, 1976. Professor. Registered Landscape Architect, Maryland and Massachusetts.
- TRYON, WALTER M. (1976).....Landscape Architecture B.S., Syracuse University, 1964; M.L.A., 1974. Professor.
- TSENG, JAMES H. W. (1969) ......Electronic and Electrical Engineering LL.B., National Taiwan University, 1950; LL.M. Southern Methodist University, 1957; B.S., Illinois Institute of Technology, 1964; M.S., 1966; Ph.D., Southern Methodist University, 1978. Professor. Registered Professional Engineer, Texas.
- TSO, JIN (1988) ......Aeronautical Engineering B.S., National Taiwan University, 1971; M.S., 1973; Ph.D., Johns Hopkins University, 1983. Associate Professor.
- ULLERICH, STANTON G. (1984)......Agribusiness B.A., Buena Vista College, 1982; M.S., Iowa State University, 1984. Associate Professor.
- URISTA, ALBERTO (ALURISTA) (1986) ......Foreign Languages B.A., San Diego State College, 1970; M.A., University of California, San Diego, 1979; Ph.D., 1982. Associate Professor.
- VALENCIA-LAVER, DEBRA (1991) ......Psychology and Human Development B.S., University of California, Irvine, 1983; M.S., The Claremont Graduate School, 1988; Ph.D., 1992. Assistant Professor.
- VAN ACKER, DONALD E. (1976).....Business Affairs B.S., California Polytechnic State University, San Luis Obispo, 1977; M.P.A., University of San Francisco, 1981. Registered Environmental Assessor, Certified Hazardous Materials Manager, Certified Hazard Control Manager. Environmental Health and Occupational Safety Officer/Assistant Director, Public Safety.
- VANCE, ROBERT D. (1972) .....Food Science and Nutrition B.S., Brigham Young University, 1966; M.S., Ohio State\University, 1968; Ph.D., 1971. Professor.
- VAN 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.
- VELÁSQUEZ, GLORIA (1985) ......Foreign Languages B.A., University of Northern Colorado, 1978; M.A., Stanford University, 1980; Ph.D., 1985. Associate Professor.
- VIGIL, SAMUEL A. (1982) ......Civil and Environmental Engineering B.S., University of California, Berkeley, 1969; M.S., Texas A & M University, 1974; Ph.D., University of California, Davis, 1981. Professor. Registered Professional Engineer, California.
- VILKITIS, JAMES R. (1980) ......Natural Resources Management B.S., Michigan State University, 1965; M.S., University of Idaho, 1968; Ph.D., University of Massachusetts, 1970; additional graduate study 1973–74. Professor.
- VILLEGAS, DANIEL J. (1987) ......Economics B.S., University of Southern California, Los Angeles, 1972; A.M., Stanford University, 1975; Ph.D., 1979. Associate Professor.
- VIX, MARLIN DALE (1977) .....Agribusiness B.S., San Jose State College, 1968; M.S., California Polytechnic State University, San Luis Obispo, 1977. Assistant Professor.
- VOCHATZER, DEANNE (1990) .....Intercollegiate Athletics B.A., California State University, Chico, 1972; M.A., University of Florida, 1976. Head Coach.
- VOLLMER, HOWARD M. (1982) .....Extended Education B.A., Stanford University, 1950; M.A., 1951; Ph.D., University of California, Berkeley, 1959. Director, Extended Education.
- VOSS, LARRY R. (1968) ......University Relations and Development B.A., Sacramento State College, 1956; graduate study, Sacramento State College, California State College at Los Angeles. Associate Vice President, and Director, Endowment Development and University Development Services.
- WADDELL, JOSEPH JAMES (1976) ......University Library B.A., California State College at San Bernardino, 1972; M.L.S. University of California, Los Angeles, 1975. Associate Librarian.

- WALCH, DAVID B. (1980) .....University Library B.A., Eastern Oregon College, 1958; M.L.S., University of Illinois, 1962; Ph.D., University of Utah, 1973. Dean.
- WALKER, KENDRICK W. (1973) ......Philosophy B.A., University of Southern California, 1965; M.A. 1969; Ph.D., 1974. Professor.
- WALKER, ROBERT E. (1983) ......Agricultural Engineering
   B.S., California State Polytechnic College, 1968; M.S., Utah State University,
   1978. Professor. Registered Professional Engineer, California and Colorado.
- WALL, LEONARD W. (1969).....Physics B.S., Louisiana Tech University, 1963; Ph.D., Iowa State University, 1969. Professor.
- WALL, MATTHIAS R. (1976) .....Construction Management B.S., University of Wisconsin, 1962; M.B.A., 1972; Ph.D., Texas A & M, 1976. Professor.
- WALLACE, WILLIAM CARL (1970) ......Student Affairs B.S., California State Polytechnic College, 1967; California Polytechnic State University, San Luis Obispo, M.A., 1973. Director, Campus Student Relations/Judicial Affairs.
- WALLER, JULIA R. (1983) ......Financial Aid B.A., California State University, Sacramento, 1982; M.A., California Polytechnic State University, San Luis Obispo, 1987. Counselor.
- WALSH, DANIEL W. (1986) ......School of Engineering B.S., Rensselaer Polytechnic Institute, 1973; M.S., 1976; Ph.D., 1985. Professor, Materials Engineering, and Associate Dean.
- WALTER, VIRGINIA R. (1974) ......Ornamental Horticulture B.S., Ohio State University, 1970; M.S., 1972. Professor.
- WALTERS, DIRK R. (1969) ......Biological Sciences B.S., Western Illinois University, 1965; M.A., Indiana University, 1966; Ph.D., 1969. Professor.
- WALTERS, ROBERT W. (1970) .....Student Life and Activities B.A., California State College, Fullerton, 1962; M.A., California State Polytechnic College, 1971. Assistant Director.
- WARFIELD, DAVID L. (1975).....Crop Science B.S., University of California, Davis, 1966; M.S., 1968; Ph.D., Washington State University, 1973. Professor.
- WASSEL, GUSTAV N. (1980) ......Electronic and Electrical Engineering B.S., California Institute of Technology, 1960; M.S., 1962; Ph.D., University of California, Irvine, 1972. Professor.
- WATERBURY, ARCHIE M. (1973) ......Biological Sciences B.A., San Jose State College, 1966; M.A., 1968; Ph.D., University of California, Davis, 1972. Professor.
- WATKINS, HARRY S. (1992) .....Business Administration B.S., Willamette University, 1972; M.B.A., University of Arizona, Tucson, 1978; Ph.D., University of Oregon, 1992. Associate Professor.
- WEATHERBY, JOSEPH N., JR. (1968) ......Political Science B.A., Baylor University, 1958; B.F.T., American Institute for Foreign Trade, 1961; M.A., Baylor University, 1962; Ph.D., University of Utah, 1968; additional graduate study, Baldwin Wallace College, Ohio; Hamline University, Minnesota; American University, Cairo; Cambridge University. Professor.
- WEATHERFORD, ALAN M. (1986) .....Business Administration B.A., Louisiana State University, 1969; A.D., Northwestern State University, 1977; M.B.A., University of Dallas, 1981; Ph.D., The University of Texas, Dallas, 1985. Associate Professor.
- WEBB, JAMES L. (1969) .....Physical Education and Recreation Administration B.S., University of North Dakota, 1962; M.S., 1963; Ph.D., University of
- B.S., University of Nevada, 1951; M.A., California State Polytechnic College, 1968; additional graduate study, University of Nevada, California Polytechnic State University, San Luis Obispo, Oregon State University. Professor and Department Head.
- WEBRE, NEIL W. (1969) ......Computer Science B.S., Louisiana State University, 1960; A.M., Harvard University, 1968; additional graduate study, Columbia University, University of Munich. Professor.

- WEISENTHAL, HOWARD (1984) ......Architecture B. Arch., University of Florida, 1972; M. Arch., 1974. Associate Professor. Registered Architect, Florida.
- WENŹL, MICHAEL J. (1969) .....English B.A., University of Oregon, 1961; M.A., 1965; Ph.D., University of New Mexico, 1969; postdoctoral study, University of California, Berkeley. Professor.
- WESSELS, HENRY (1970) ......Art and Design B.S., Northern Illinois University, 1957; M.F.A., University of Southern California. 1970. Professor.
- WEST, HOWARD (1959) ......Office of the President B.A., Pepperdine College, 1956; M.A., California State Polytechnic College, 1971. Executive Assistant to the President.
- WESTOVER, JAMES D. (1971) ......Chemistry B.S., Arizona State College, 1960; M.S., 1962; Ph.D., Brigham Young University, 1966. Professor.
- WHALEY, GLENN V. (1963) ......University Library B.A., Carroll College, 1949; M.L.S., University of Wisconsin, 1953; M.A., Drake University, 1965. Associate Librarian.
- WHEATLEY, JO ANN C. (1980) .....Crop Science B.A., Southeastern Louisiana University, 1961; M.S., California Polytechnic State University, San Luis Obispo, 1978; Ph.D., Louisiana State University, 1990. Professor.
- WHEATLEY, PATRICK O. (1970) ......Computer Science B.A., St. Mary's Seminary, 1956; M.S., University of Chicago, 1963; Ph.D., University of Houston, 1970. Professor.
- WHEELER, MARYLINDA (1975) .....Physical Education and Recreation Administration B.A., Stanford University, 1958; M.A., 1959; Ph.D., University of Utah, 1979. Professor.
- WHEELER, ROBERT R. (1961).....Animal Sciences and Industry B.S., Colorado State University, 1952; M.S., 1955; Ph.D., Oregon State University, 1962. Professor.
- WHITEFORD, MARY A. (1982).....Academic Programs B.S., New York University, 1978. Academic Programs Analyst.
- WIGHT, HEWITT G. (1952) ......Chemistry B.S., University of Utah, 1943; Ph.D., University of California, 1955. Professor.
- WILK, EDWARD A. (1966) .....University Library B.A., Western Michigan University, 1965; M.S.L., 1966. Associate Librarian.
- WILLIAMS, DOUGLAS W. (1983) ......Agricultural Engineering B.S., Kansas State University, 1967; M.S., Iowa State University, 1969; Ph.D., University of California, Davis, 1973. Professor. Registered Mechanical Engineer, California.
- WILLIAMS, JEFFERY T. (1989) ......Information Systems B.S., Appalachian State University, 1972; M.B.A., 1983. Director, Administrative Systems.
- WILLIAMS, NANCY (1988)......University Foundation B.S., Illinois State University, 1973; M.A., Ball State University, 1980. Director, Campus Dining.
- WILLIAMSON, DAVID G. (1968) ......Chemistry
   B.A., University of Colorado, 1963; Ph.D., University of California, Los Angeles, 1966; postdoctoral fellow, National Research Council of Canada. Professor.
- WILLS, MAX T. (1967) ......Chemistry B.S., University of Puget Sound, 1961; Ph.D., University of Washington, 1965. Professor.
- WILSON, WALTER D. (1969) ......Physics B.S., University of California, Berkeley, 1957; Ph.D., 1966. Professor.
- WILT, PETER J. (1983) ......Theatre B.A., Brigham Young University, 1971; M.A. 1980. Manager, University Theatre.

- WILVERT, CALVIN H. (1973).....Social Sciences B.A., University of California, Los Angeles, 1963; M.A., University of California, Berkeley, 1967; Ph.D., 1971. Professor.
- WINEBRENNER, TERRENCE C. (1983) ......Speech Communication B.S., Southwest Missouri State University, 1971; M.A., 1972; Ph.D., Ohio State University, 1985. Associate Professor.
- WINGER, DONLEY J. (1963) ......Electronic and Electrical Engineering B.S., University of North Dakota, 1960; M.S., 1963; Ph.D., Iowa State University, 1971. Professor.
- WOLF, ROBERT S. (1975) .......Mathematics B.S., Massachusetts Institute of Technology, 1966; M.S., Stanford University, 1967; Ph.D., 1974. Professor.
- WOLFF, PAUL (1971) ......Architecture B.Arch., University of California, Berkeley; graduate study, Academy of Art and Architecture, Munich, Germany; M.S., Environmental Psychology, University of Surrey, England, 1975. Professor. Registered Architect, California.
- WOLLMAN, MICHAEL T. (1982) ......Electronic and Electrical Engineering B.E.E., Cornell University, 1964; M.S., University of Hawaii, 1966; Ph.D., University of California, Santa Barbara, 1975. Professor.
- WOOLARD, DONALD S. (1986).....Architecture B.Arch., University of Auckland, 1964; M.F.A., University of Hawaii, 1970; Ph.D., University of Queensland, 1980. Professor. Registered Architect, Australia, New Zealand.
- WOOLPERT, JANIS K. (1982) ......School of Liberal Arts B.S., Oklahoma State University, 1959. Administrative Operations Analyst.
- WOOTEN, RUDY A. (1977) .....Food Science and Nutrition B.S., University of Arizona, 1971; M.S., 1973; Ph.D., 1976. Professor.
- WU, SING-CHOU (1969) ......Statistics
   B.A., National Taiwan University, 1959; M.S., Utah State University, 1966;
   Ph.D., Colorado State University, 1970. Professor.
- YAMADA, KERRY T. (1981)......Psychological Services B.A., Dakota Wesleyan University, 1952; M.A., University of South Dakota, 1960; Ph.D., Ottawa University, Canada, 1968. Director.
- YANG, DAVID J. (1972).....Information Systems B.A., Southern Illinois University, 1965; M.S., 1972. Director, Computing Center.
- YANG, TAO H. (1987) ......Industrial Engineering B.S., Tunghai University, Taiwan, 1978; M.S., San Jose State University, 1982; Ph.D., Arizona State University, 1987. Associate Professor.
- YEH, CHUAN-SUNG (1970) ......Electronic and Electrical Engineering B.S., Naval College of Technology, Taiwan, 1953; M.S., National Chiao-Tung University, Taiwan, 1964; M.E., McMaster University, Canada, 1966; Ph.D., 1969. Professor.
- YIP, CHRISTOPHER L. (1988) .....Architecture B.A., University of California, Berkeley, 1971; M. Arch., 1977; Ph.D., 1985. Associate Professor.
- YONEDA, STEVEN H. (1972) ......Intercollegiate Athletics B.S., California State Polytechnic College, 1970; M.S. 1972; NATA Certified Athletic Trainer, 1975. Coach.
- YORK, MARILYN R. (1975) .....Graduate Studies and Research B.S., California Polytechnic State University, San Luis Obispo, 1974; M.A., 1981. Coordinator, Graduate Student Services and International Programs.
- YOSHIMURA, MICHAEL A. (1975) ......Biological Sciences B.A., Stanford University, 1970; M.S., University of Hawaii, 1972; Ph.D., University of Arizona, 1975. Professor.
- ZAMMIT, RONALD E. (1986)......Physics B.S., Louisiana State University, 1969; M.S., Purdue University, 1971; Ph.D., 1975. Professor.

- ZETZSCHE, JAMES B., JR. (1968) ......Agricultural Engineering B.S., Texas Technological College, 1962; M.S., 1967. Professor. Registered Agricultural Engineer, California.

- ZEUSCHNER, RAYMOND F. (1980) ......Speech Communication A.B., University of California, Berkeley, 1966; M.A., San Francisco State College, 1968; Ph.D., University of California, Los Angeles, 1973. Professor and Department Chair.
- ZIA, OMAR (1988).....Engineering Technology B.S.E.E., Warsaw Technical University, Poland, 1966; M.S.E.E., 1968; Ph.D., 1972. Associate Professor. Registered Professional Engineer, California and Oregon.
- ZOHNS, MICHAEL D. (1974) .....Ornamental Horticulture B.S., California Polytechnic State University, San Luis Obispo, 1972; M.S., 1975. Professor.
- ZUUR, THOMAS L. (1983) .....Enrollment Support Services B.S., Sonoma State College, 1967; M.P.A., University of San Francisco, 1981. Manager, Student Data Systems Office.

ZWEIFEL, K. RICHARD (1972) .....School of Architecture and Environmental Design B.S.L.A., University of Wisconsin, 1970; M.S.L.A., 1975. Professor and Associ-

ate Dean. Registered Landscape Architect, California.



# APPENDIX

#### **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 institution. Further, it is not possible in a publication of this size to include all of the rules, policies and other information which pertain to the student, 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, 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.

# PRIVACY RIGHTS OF STUDENTS IN EDUCATION RECORDS

The federal Family Educational Rights and Privacy Act of 1974 (20 U.S.C. 1232g) and regulations adopted thereunder (34 C.F.R. 99) and California Education Code Section 67100 et seq., set out requirements designed to protect the privacy of students concerning their records maintained by the campus. Specifically, the statute and regulations govern access to student records maintained by the campus, and the release of such records. In brief, the law provides that the campus must provide students access to records directly related to the student and an opportunity for a hearing to challenge such records on the grounds that they are inaccurate, misleading or otherwise inappropriate. The right to a hearing under the law does not include any right to challenge the appropriateness of a grade as determined by the instructor. The law generally requires that written consent of the student be received before releasing personally identifiable data about the student from records to other than a specified list of exceptions. The institution has adopted a set of policies and procedures concerning implementation of the statutes and the regulations on the campus. Copies of these policies and procedures may be obtained at the Judicial Affairs Office. Among the types of information included in the campus statement of policies and procedures are: 1) the types of student records and the information contained therein; 2)

the official responsible for the maintenance of each type of record; 3) the location of access lists which indicate persons requesting or receiving information from the record; 4) policies for reviewing and expunging records; 5) the access rights of students; 6) the procedures for challenging the content of student records; 7) the cost which will be charged for reproducing copies of records; and 8) the right of the student to file a complaint with the Department of Education. An office and review board have been established by the Department to investigate and adjudicate violations and complaints. The office designated for this purpose is: The Family Educational Rights and Privacy Act Office (FERPA), U.S. Department of Education, 330 "C" Street, Room 4511, Washington, D.C. 20202.

The campus is authorized under the Act to release "directory information" concerning students. "Directory information" includes the student's name, address, telephone listing, date and place of birth, major field of study, participation in officially recognized activities and sports, weight and height of members of athletic teams, dates of attendance, degrees and awards received, and the most recent previous educational agency or institution attended by the student. The above designated information is subject to release by the campus at any time unless the campus has received prior written objection from the student specifying information which the student requests not to be released. Written objections should be sent to the Director, Judicial Affairs.

The campus is authorized to provide access to student records to campus officials and employees who have legitimate educational interests in such access. These persons are those who have responsibilities in connection with the campus' academic, administrative or service functions and who have reason for using student records connected with their campus or other related academic responsibilities. Disclosure may also be made to other persons or organizations under certain conditions (e.g., as part of accreditation or program evaluation; in response to a court order or subpoena; in connection with financial aid; to other institutions to which the student is transferring).

## USE OF SOCIAL SECURITY NUMBER

Applicants are required to include their Social Security account number in designated places on applications for admission pursuant to the authority contained in Title 5, *California Code of Regulations*, Section 41201. The Social Security account number is used as a means of identifying records pertaining to the student as well as identifying the student for purposes of financial aid eligibility and disbursement and the repayment of financial aid and other debts payable to the institution.

#### **CAREER PLACEMENT**

The campus may furnish, upon request, information about the employment of students who graduate from programs or courses of study preparing students for a particular career field. This information includes data concerning the average starting salary and the percentage of previously enrolled students who obtained employment. The information may include data collected from either graduates of the campus or graduates of all campuses in The California State University.

## STUDENT DISCIPLINE

Inappropriate conduct by students or by applicants for admission is subject to discipline as provided in Sections 41301 through 41304 of Title 5, *California Code of Regulations*. These sections are as follows:

Article 1.1, Title 5, California Code of Regulations

41301. **Expulsion, Suspension and Probation of Students.** Following procedures consonant with due process established pursuant to Section 41304, any student of a campus may be expelled, suspended or placed on probation or given a lesser sanction for one or more of the following causes which must be campus related:

(a) Cheating or plagiarism in connection with an academic program at a campus.

(b) Forgery, alteration or misuse of campus documents, records, or identification or of knowingly furnishing false information to a campus.

(c) Misrepresentation of oneself or of an organization to be an agent of a campus.

(d) Obstruction or disruption, on or off campus property, of the campus educational process, administrative process, or other campus function.

(e) Physical abuse on or off campus property of the person or property of any member of the campus community or of members of his or her family or the threat of such physical abuse.

(f) Theft, of, or non-accidental damage to, campus property, or property in the possession of, or owned by, a member of the campus community.

(g) Unauthorized entry into, unauthorized use of, or misuse of campus property.

(h) On campus property, the sale or knowing possession of dangerous drugs, restricted dangerous drugs, or narcotics as those terms are used in California statutes, except when lawfully prescribed pursuant to medical or dental care, or when lawfully permitted for the purpose of research, instruction or analysis.

(i) Knowing possession or use of explosives, dangerous chemicals or deadly weapons on campus property or at a campus function without prior authorization of the campus president.

(j) Engaging in lewd, indecent, or obscene behavior on campus property or at a campus function.

(k) Abusive behavior directed toward, or hazing of, a member of the campus community.

(1) Violation of any order of a campus President, notice of which had been given prior to such violation and during the academic term in which the violation occurs, either by publication in the campus newspaper, or by posting on an official bulletin board designated for this purpose, and which order is not inconsistent with any of the other provisions of this Section.

(m) Soliciting or assisting another to do any act which would subject a student to expulsion, suspension or probation pursuant to this Section.

(n) For purposes of this Article, the following terms are defined:

(1) The term "member of the campus community" is defined as meaning California State University Trustees, academic, non-academic and administrative personnel, students, and other persons while such other persons are on campus property or at a campus function.

(2) The term "campus property" includes:

(A) real or personal property in the possession of, or under the control of, the Board of Trustees of the California State University, and

(B) all campus feeding, retail, or residence facilities whether operated by a campus or by a campus auxiliary organization.

(3) The term "deadly weapons" includes any instrument or weapon of the kind commonly known as a blackjack, slingshot, billy, sandclub, sandbag, metal knuckles, any dirk, dagger, switchblade knife, pistol, revolver, or any other firearm, any knife having a blade longer than five inches, any razor with an unguarded blade, and any metal pipe or bar used or intended to be used as a club.

(4) The term "behavior" includes conduct and expression.

(5) The term "hazing" means any method of initiation into a student organization or any pastime or amusement engaged in with regard to such an organization which causes, or is likely to cause, bodily danger, or physical or emotional harm, to any member or the campus community; but the term "hazing" does not include customary athletic events or other similar contests or competitions.

(o) This Section is not adopted pursuant to *Education Code* Section 89031.

(p) Notwithstanding any amendment or repeal pursuant to the resolution by which any provision of this Article is amended, all acts and omissions occurring prior to that effective date shall be subject to the provisions of this Article as in effect immediately prior to such effective date.

41302. **Disposition of Fees: Campus Emergency; Interim Suspension.** The President of the campus may place on probation, suspend, or expel a student for one or more of the causes enumerated in Section 41301. No fees or tuition paid by or for such student for the semester, quarter, or summer session in which he or she is suspended or expelled shall be refunded. If the student is readmitted before the close of the semester, quarter, or summer session in which he or she is suspended, no additional tuition or fees shall be required of the student on account of the suspension.

During periods of campus emergency, as determined by the President of the individual campus, the President may, after consultation with the Chancellor, place into immediate effect any emergency regulations, procedures, and other measures deemed necessary or appropriate to meet the emergency, safeguard persons and property, and maintain educational activities.

The President may immediately impose an interim suspension in all cases in which there is reasonable cause to believe that such an immediate suspension is required in order to protect lives or property and to insure the maintenance of order. A student so placed on interim suspension shall be given prompt notice of charges and the opportunity for a hearing within 10 days of the imposition of interim suspension. During the period of interim suspension, the student shall not, without prior written permission of the President or designated representative, enter any campus of the California State University other than to attend the hearing. Violation of any condition of interim suspension shall be grounds for expulsion.

41303. **Conduct by Applicants for Admission.** Notwithstanding any provision in this Chapter 1 to the contrary, admission or readmission may be qualified or denied to any person who, while not enrolled as a student, commits acts which, were he enrolled as a student, would be the basis for disciplinary proceedings pursuant to Sections 41301 or 41302. Admission or readmission may be qualified or denied to any person who, while a student, commits acts which are subject to disciplinary action pursuant to Section 41301 or Section 41302. Qualified admission or denial of admission in such cases shall be determined under procedures adopted pursuant to Section 41304.

41304. Student Disciplinary Procedures for the California State University. The Chancellor shall prescribe, and may from time to time revise, a code of student disciplinary procedures for the California State University. Subject to other applicable law, this code shall provide for determinations of fact and sanctions to be applied for conduct which is a ground of discipline under Sections 41301 or 41302, and for qualified admission or denial of admission under Section 41303; the authority of the campus President in such matters; conduct related determinations on financial aid eligibility and termination; alternative kinds of proceedings, including proceedings conducted by a Hearing Officer; time limitations; notice: conduct of hearings, including provisions governing evidence, a record, and review; and such other related matters as may be appropriate. The Chancellor shall report to the Board actions taken under this section.

Among the specific causes for which the University will take such disciplinary action are: the bringing or drinking of alcoholic beverages on campus; being intoxicated on campus; repeated violations of campus rules and regulations, including those pertaining to driving and parking of vehicles.

In accordance with provisions of Section 41301 above, the President has issued and posted officially an order which prohibits the consumption, possession, or use of alcoholic beverages on campus. Students who violate this order are subject to the penalties provided for in Sections 41301 and 41302, Title 5 of the *California Administrative Code*.

Disciplinary action varies with the severity of the violation. If the unacceptable behavior involves use of motor vehicles, the student may be restricted from driving or parking on campus. If the unacceptable behavior involves matters pertaining to on-campus housing or dining, the student may be restricted from living or dining on campus.

## INSTITUTIONAL AND FINANCIAL ASSISTANCE

The following information concerning student financial assistance may be obtained from the Director, Financial Aid, Administration 212, 756-2927:

- 1. student financial assistance programs available to students who enroll at Cal Poly;
- 2. the methods by which such assistance is distributed among recipients who enroll at Cal Poly;
- the means, including forms, by which application for student financial assistance is made and requirements for accurately preparing such application;
- 4. the rights and responsibilities of students receiving financial assistance; and
- 5. the standards which the student must maintain in order to be considered to be making satisfactory progress for the purpose of establishing and maintaining eligibility for financial assistance.

The following information concerning the cost of attending Cal Poly is available from the Director, Financial Aid, Administration 212, 756-2927:

- 1. fees and tuition (where applicable);
- 2. estimated costs of books and supplies;
- 3. estimates of typical student room and board costs and typical commuting costs; and
- 4. any additional costs of the program in which the student is enrolled or expresses a specific interest.

Information concerning the refund policy of Cal Poly for the return of unearned tuition and fees or other refundable portions of costs is available from the Registrar, Administration 222, 756-2541.

Information concerning Cal Poly policies regarding any refund due to the federal Title IV student assistance programs as required by the regulations is available from the Director, Financial Aid, Administration 212, 756-2927.

Information concerning the academic programs of Cal Poly may be obtained from the Vice President for Academic Affairs, Administration 305, 756-2186. This information may include:

- 1. the current degree programs and other educational and training programs;
- 2. the instructional, laboratory, and other physical plant facilities which relate to the academic program;
- 3. the faculty and other instructional personnel;
- data regarding student retention at Cal Poly and, if available, the number and percentage of students completing the program in which the student is enrolled or has expressed interest; and

5. the names of associations, agencies, or governmental bodies which accredit, approve, or license the institution and its programs, and the procedures under which any current or prospective student may obtain or review upon request a copy of the documents describing the institution's accreditation, approval, or licensing.

Information regarding special facilities and services available to handicapped students may be obtained from Disabled Student Services, University Union 202, 756-1395.

#### AVERAGE ANNUAL COST OF EDUCATION AND SOURCES OF FUNDS PER FULL-TIME EQUIVALENT STUDENT

The 20 campuses and the Chancellor's Office of The California State University are financed primarily through funding provided by the taxpayers of California. The total state appropriation to the CSU for 1991/92, including capital outlay and employee compensation increases, is \$1,788,282,238. However, the total cost of education for CSU is \$2,128,676,028 which must provide support for a projected 280,220 full-time equivalent (FTE) <sup>a</sup> students.

The total cost of education in the CSU is defined as the expenditures for current operations, including payments made to the students in the form of financial aid, and all fully reimbursed programs contained in state appropriations, but excluding capital outlay appropriations. The average cost of education is determined by dividing the total cost by the total FTEs. The average cost is further differentiated into three categories: State Support (the state appropriation, excluding capital outlay), Student Fee Support, and Support from Other Sources (including Federal Funds).

Thus, excluding costs which relate to capital outlay (i.e., building amortization), the average cost of education per FTE student is \$7,596. Of this amount, the average student fee support per FTE is \$1,376. The calculation for this latter amount includes the amount paid by nonresident students.

#### Source of Funds and Average Costs for 1991/92 CSU Budget (Projected Enrollment: 280,220 FTES)

		Average	
	Cost Per Student		
	Amount	(FTE)	centage
Total Cost of Education	\$2,128,676,028 <sup>b</sup>	\$7,596	100.0
-State Appropriation	1,647,249,238 °	5,878	77.4
-Student Fee Support	385,707,990	1,376 <sup>d</sup>	18.1
-Support from Other Sources	95,718,800	342	4.5

<sup>a</sup> For budgetary purposes, full-time equivalent (FTE) translates total head count into total academic student load equivalent to 15 units per term. Some students enroll for more than 15 units; some students enroll for fewer than 15 units.

<sup>b</sup> The total cost of education does not include the amount related to lottery and the capital investment of the CSU. The estimated replacement cost of all the system's permanent facilities and equipment on the 20 campuses is currently valued at \$6.5 billion, excluding the cost of land.

<sup>c</sup> This figure does not include the capital outlay appropriation of \$141,033,000.
<sup>d</sup> The average costs paid by a student include the State University Fee, Application Fee, and Nonresident Tuition. Individual students may pay less that f1.27

than \$1,376 depending on whether they are part-time, full-time, resident or nonresident students.



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